1998. P. A. Selden (ed.). *Proceedings of the 17th European Colloquium of Arachnology*, *Edinburgh 1997*.

Hogg's phantom spider from Central Australia: a century-old mystery solved

Barbara York Main

Zoology Department, University of Western
Australia, Nedlands, Western Australia 6907

Summary

A trapdoor spider collected by the Horn Scientific Expedition to Central Australia in 1894 was identified by H. R. Hogg as belonging to the New Zealand species *Migas paradoxus* L. Koch of the family Migidae. A few years later, Hogg suggested that the species should be in a new genus. The Migidae is a Gondwanan family. Several genera are known from Australia, where all species occur in wet habitats. No spiders of the family have ever subsequently been collected from Central Australia. Hogg's fragmented specimen has not been traced, and later authors have doubted his identification. The taxonomic and biological rationale for now regarding Hogg's specimen as a species of *Conothele* Thorell is presented. It is suggested that *Conothele* should be synonymized with *Ummidia* Thorell.

Introduction

In his introduction to the report of The Horn Scientific Expedition to Central Australia of 1894, Horn (1896) cited the opinion of Australian scientists of the day "that when the rest of the continent was submerged the elevated portions of the McDonnell Range existed as an island, and that consequently *older forms of life* [my italics] might be found in the more inaccessible parts ". At that time it was already known that during the Cretaceous the extensive lakes of Central Australia effectively divided the continent into western and eastern blocks. Later geological studies suggest that there were three island continents (Morgan, 1980). The ancient inland seas in turn account for many of the affinities of relict biota in the southwestern and eastern parts of the present day landscape. In addition, the prediction that "older forms of life" might be preserved in the McDonnell Range is still being fulfilled, as there continue to be discoveries of examples of relict biota from the region.

The Horn Expedition, sponsored by the wealthy South Australian W. A. Horn who had mining and pastoralist interests, and supported by several state Governments, covered a large area of central Australia. The primary aim of the expedition was to gather information on the plants and animals, and on the social customs of the Aborigines, of the area. The collections were first returned to Adelaide and Melbourne, then they were dispersed amongst specialists for identification and description. Professor Baldwin Spencer of Melbourne, who had been in the expedition team, subsequently edited the resultant scientific reports (Spencer, 1896a).

In the collections were 150 specimens of spiders, which Hogg (1896) attributed to 36 genera and 57 species, of which 18 were described as new. One of the mygalomorph (trapdoor) spider species he identified as *Migas paradoxus* L. Koch, a species originally described from New Zealand (Koch, 1872). Occurrence of *Migas* (or any member of the Migidae) in Central Australia would be of considerable biogeographic significance. However, Hogg's specimen which he noted as "mutilated" has not been seen subsequently and is believed lost (Main, 1985).

Transport of the expedition collections was by camel (Fig. 1) and various authors have considered this as the cause of the damaged and fragmented condition of some of the invertebrate material (Yen, 1996). Earlier, Spencer (1896b) described the discomfort of camel travel which had a "peculiar churning effect on specimens", and that it was "not always possible

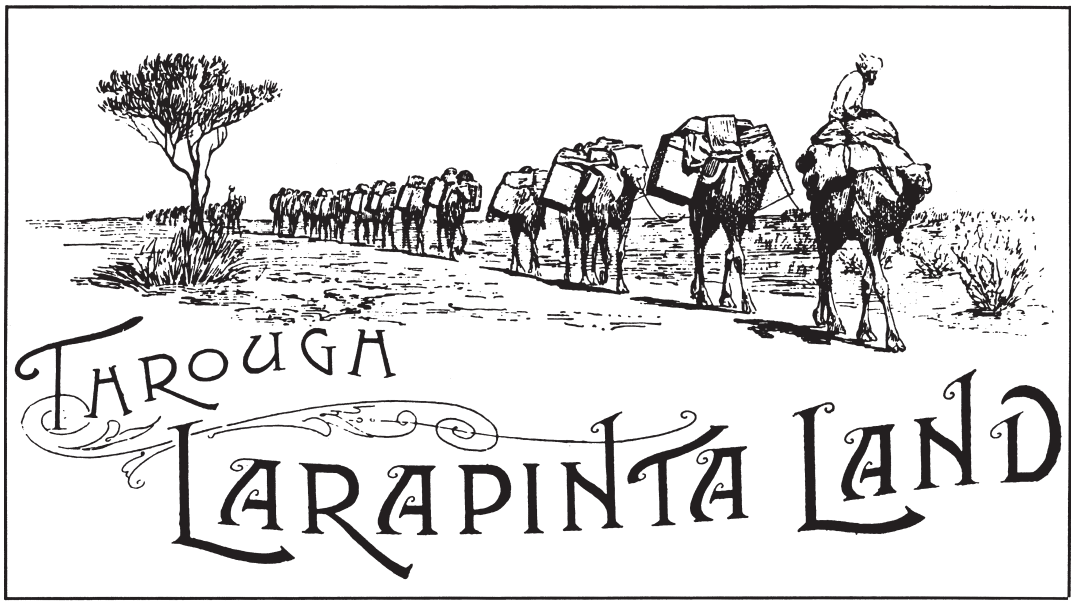


Fig. 1: Camel train such as carried the collections made on the Horn Scientific Expedition. Reproduced from the Report of the Horn Scientific Expedition.

to stow them away when on the march", and thus that many became "bruised and spoilt"; hence Hogg's "mutilated" specimen of "*Migas paradoxus*". In the absence of the specimen, Australian arachnologists have generally doubted Hogg's identification (Hickman, 1927; Raven, 1984; Main, 1985).

The possible identity of Hogg's specimen and the biogeographic implications are the subject of this paper.

Background to the systematic dilemma

Although Hogg (1896) attributed a "mutilated" specimen of a spider to *Migas paradoxus*, on reconsidering his notes a few years later he stated that it "must be a new genus—to be described when more material is available" (Hogg, 1901). Nevertheless, Hogg inferred that the specimen was a migid. His use at that time of the subfamily name Miginae, within the family Avicularíidae, and thus according to Simon's (1892) classification, is equivalent to current usage of the family Migidae. However, the family now comprises three subfamilies (Fig. 2) and is much more diverse than he realized at the turn of the century. Also the distribution of the genus *Migas* is broader than accounted for in Hogg's time. It occurs in South America (Chile), New Caledonia, New Zealand, Norfolk Island and eastern Australia including Tasmania (Raven, 1984; Main, 1991). Within Australia, *Migas* has a wide but fragmented distribution down the east coast and Tasmania (Hickman, 1927, 1929; Raven, 1984; Raven & Churchill, 1990).

Migids, at least in New Zealand and Australia, are confined to permanently moist "Gondwanan"-type habitats. Hence occurrence of the family in arid central Australia, even in such a refuge as Palm Creek on the Finke River (the alleged locality of the mystery spider), has generally been regarded with scepticism (Hickman, 1927; Raven, 1984; Main, 1985). Over the last century, in spite of cursory and fortuitous collecting in central Australia by various expeditions and individuals yielding some mygalomorph spiders, no migids have been found.

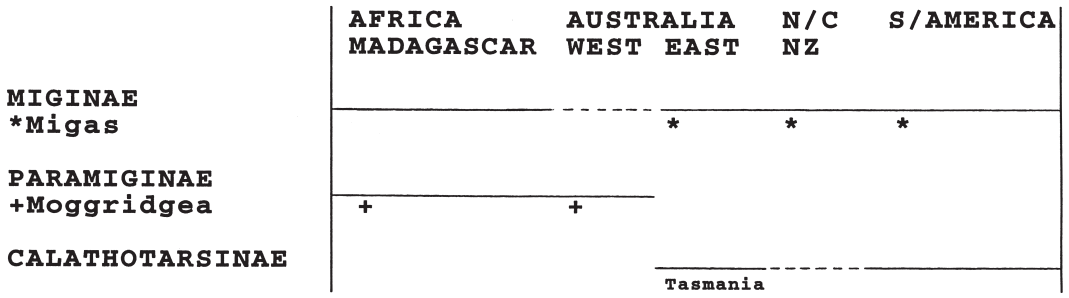


Fig. 2: Distribution of subfamilies of the Migidae. The only genera common to more than one continent are *Moggridgea* (Africa, western part of southern Australia) and *Migas* (Tasmania, eastern Australia, New Caledonia, New Zealand and South America (Chile)).

The biogeographic case for a Central Australian migid occurrence

However, Main (1991) reopened the issue as a result of the discovery of the African genus *Moggridgea* of the Paramiginae, in southwestern Australia and Kangaroo Island in South Australia. She suggested that a migid (either *Migas* or *Moggridgea)* could possibly occur in the wet gorges of Central Australia. Migidae are known to occur in wet, shaded habitats. Two genera, *Moggridgea* and *Migas*, make shallow burrows in moist soil and are facultatively arboreal, in which situation they build cocoon-like tubes on bark (Fig. 3). Indeed the biological possiblity of a migid in Central Australia has given Hogg's spider a legendary aura and presented a challenge for mygalomorph systematists to determine its true identity.

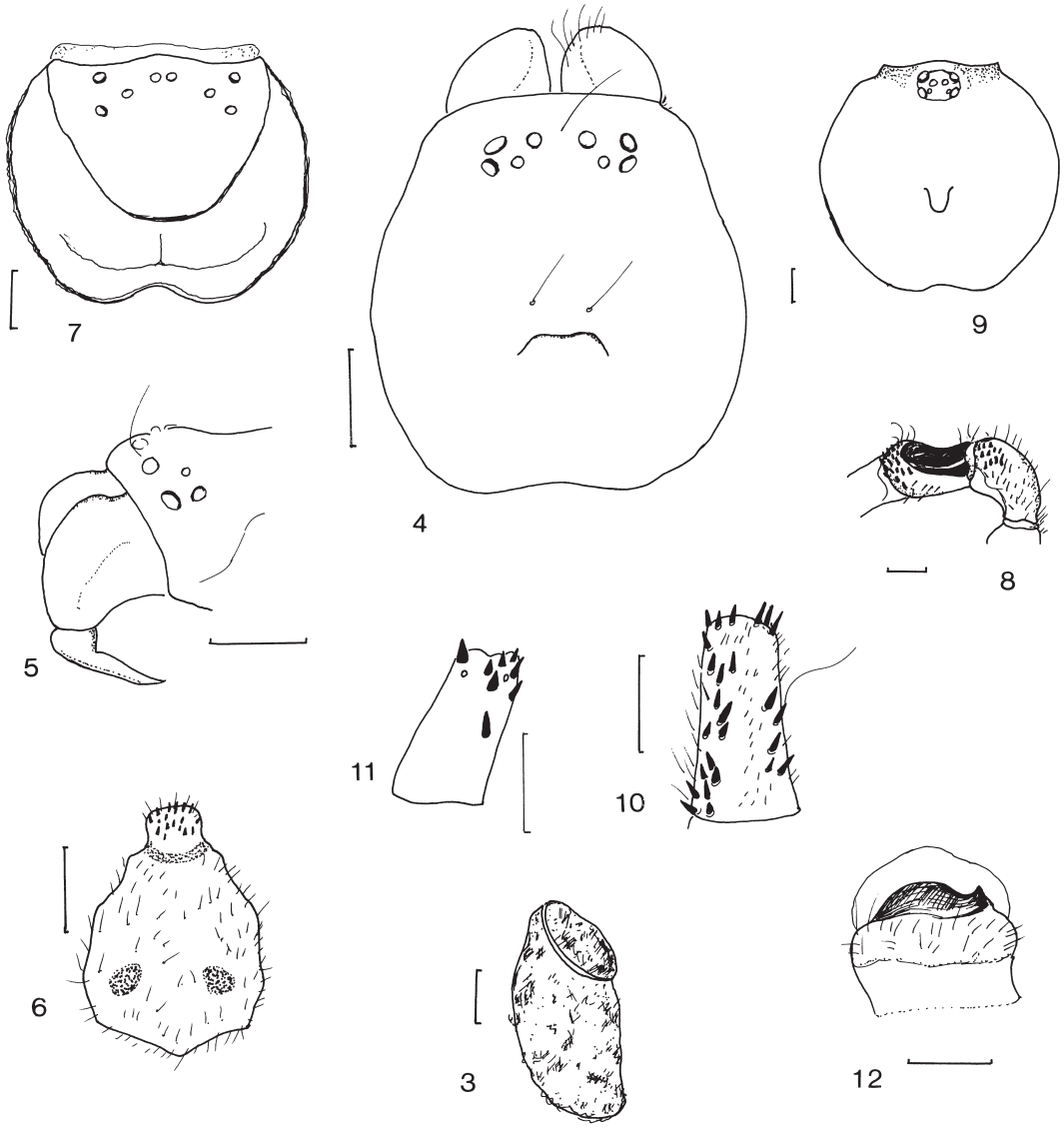
In 1994, the re-enactment and associated commemorative symposium of the Horn Expedition intensified interest in the spider for several arachnologists. I also, independently, visited Palm Creek and other likely localities in Central Australia in 1995 specifically to search for the phantom spider. Again, no migids were found.

However, by taking into account the geological history of the continent and the biogeography of those migid genera represented in Australia, we could postulate that either *Migas* or *Moggridgea* could occur in the mountains of Central Australia. There is supporting evidence for a *Migas* occurrence from certain Gondwanan insect groups with South American affinities, such as the water penny beetles (*Sclerocyphon* Blackburn) which occur in Tasmania and Central Australia (Davis, 1986) and whose larvae live in permanently running streams. Likewise, the Gondwanan scorpion *Cercophonius* Peters, which is found in South America and is widely distributed in southern Australia (Koch, 1977), occurs in refugial habitats in Central Australia (Smith, 1983). Conversely, there is some recent evidence to support a *Moggridgea* occurrence in Central Australia from the midge *Archaeochloss* Brundin, another Gondwanan insect with an aquatic larva but with African rather than South American affinity. In Australia it was formerly thought to be confined to the Precambrian block of Western Australia (Cranston *et al*., 1987) but is now also known from Central Australia (Cranston, pers. comm.). By arguing from either of these analogous distributions, the possibility of a migid genus in Central Australia has some logical and hypothetical support.

So, from biogeographic considerations it seems possible (if unlikely) that a migid could exist in the permanently wet gorges of Central Australia which have been much mooted as refugia for relict biota (Morton *et al*., 1995).

The case for misidentity

In spite of the relatively strong case, based on comparative biogeography, for possible occurrence of a migid in Central Australia, there remains the continuing failure of modern collectors, including those familiar with mygalomorph biology, e.g. Robert Raven, Tracey Churchill and myself, to find any evidence of a migid in likely habitats. The cumulative failure of



Figs. 3–12: **3** A tube with trapdoor of a migid from tree bark; **4** Carapace of *Migas paradoxus* showing widespread eye arrangement; **5** Chelicerae and caput edge, profile of *Migas paradoxus*; **6** Sternum of a migid, two sigillae; **7** Carapace of *Missulena* (Actinopodidae) showing widespread eyes; **8** Third tibia with saddle-like depression of a *Conothele* specimen; **9** Carapace of a *Conothele* specimen, eyes in close group; **10** Metatarsus III of *Ummidia funereus* with disorderly group of spines; **11** Metatarsus III of a *Conothele* specimen with few dorsal spines; **12** Notched trochanter I of *Ummidia funereus*. Scale lines = 1 mm, except 3 = 5 mm.

positive evidence points to the alternative possibility: i.e. did Hogg misidentify his sorry specimen? Hogg referred to his specimen as "consisting of a cephalothorax and three pairs of legs". Although he did not state which pair of legs was missing, it is deduced from his remarks in later publications that the third pair was present.

If indeed Hogg misidentified his specimen, then what other mygalomorph could he have confused with a migid? The Migidae possess several characters not shared *in combination* by

other families of Mygalomorphae: widely spread eyes that extend over half the width of the caput (Fig. 4); chelicerae which lack a rastellum and which are sometimes vertical or strongly geniculate ("kneed") (Fig. 5); one pair only (posterior) sternal sigillae (Fig. 6); and no scopulae on legs of females.

The Actinopodidae share with the Migidae a Gondwanan distribution. Morphologically the Actinopodidae is the only family sharing with the Migidae widely spread eyes (Fig. 7), but they have non-geniculate chelicerae which possess a pronounced rastellum, they have at least three pairs of sternal sigillae, and females generally have scopulae on at least some tarsi. So it would seem unlikely that Hogg had an actinopodid even though the Australian genus *Missulena* occurs across the continent.

Next, we might consider some other characters possessed by migids and shared by other mygales which Hogg may have regarded as more important than the widely spread eyes. What other mygales for example have vertical chelicerae? *Conothele* Thorell does. But *Conothele* is generally placed in the Ctenizidae because it has a rastellum. Nevertheless, it seems worthwhile to look again at any publications of Hogg's where he might have mentioned *Conothele*. Hogg (1914, 1915) described *Conothele spinosa* from the Setakwa River, in what was then "Dutch New Guinea" (now Irian Jaya). He noted the "hooked spines" on the anterior legs of this species (a feature shared to some degree with migids) and, more importantly, the peculiar vertical chelicerae, which however also possessed a rastellum—which would place the species in the Ctenizidae. Nevertheless he argued that the vertical chelicerae and flattened forepart of the fang, like the vertical chelicerae noted by Pocock (1898) for the arboreal *C. arboricola* Pocock, gave both these species a similarity with the Miginae, which were already cited by Simon (1903) as having these cheliceral features. The rastellum teeth on Hogg's specimen (of *C. spinosa*) and of *C. arboricola* he dismissed as being poorly developed and not as important as the shape of the "mandible and fang". Hogg noted also that *C. spinosa* had "at the base of tibia III . . . a depression as in the Myrtaleae", another feature noted by Simon (1903) as characteristic of the Myrtaleae. The Myrtaleae are equivalent to the current Paramiginae (family Migidae). Thus, it was on the basis of the vertical chelicerae and third tibial depression (Fig. 8), and regardless of presence or absence of a rastellum, compact eye arrangement (Fig. 9) and various other characters, that Hogg (1915) placed *Conothele* with "no hesitation . . . among the Miginae [=Migidae] where, in view of the shape of tibia III, it comes into the group Myrtaleae [=Paramiginae]."

So, if in 1915 Hogg was of the opinion that *Conothele* should be placed not in the Ctenizidae but in the Migidae, was that also his earlier opinion in 1896? Did he blur his taxa and characters? Could he have had a *Conothele* specimen from Palm Creek, Central Australia and, on the basis of vertical chelicerae, third tibial depression and hooked anterior leg spines, have misidentified it as "*Migas* ", which opinion he revised eight years later to suggest that it was a "new" genus (but still presumably considering it a migid)?

On the foregoing evidence this interpretation seems the most rational. Furthermore, it is supported by the many recent collections of *Conothele* from Central Australia. Various government agencies over the last 25 years have submitted specimens of *Conothele* to me for identification. I also have specimens of my own collected in 1965 from several sites. In addition Robert Raven and Tracey Churchill (pers. comm.) and I have recently and independently collected *Conothele* from Hogg's (Horn Expedition) site, i.e. Palm Creek. Throughout tropical Australia, *Conothele* occurs in rainforest (where some species are arboreal with tubes similar to those of migids) or in sclerophyll vegetation (Main, 1997). In the less humid areas, the stocking-like, silk tubes enclosed in burrows are frequently sited in banks of water courses. In the refugial habitats in mountain gorges, including those of Central Australia, burrows are situated in pockets of soil in crevices amongst rocks. Such inhospitable looking habitats maintain at depth a humid environment into which the often long and sinuous burrows penetrate.

But while the above explanation appears to resolve the identity of Hogg's "phantom" spider it still does not rule out the tantalizing possibility, based on other biogeographic analogies, that indeed an illusive migid *just might* occur somewhere in those stony mountain gorges.

	Ummidia (=*Pachylomerus*, see Simon, 1897)	***Conothele***
	Character State	
	(a)	**(b)**
1.	Ocular area wider than long.	• Ocular area twice as wide as long.
2.	Anterior eyes strongly procurved. AME smaller than ALE.	• Anterior eyes slightly procurved. AME & ALE subequal.
3.	Labium, apically few and widely spaced spinules, spread over whole area.	• Labium with single series of large spinules or several series. Maxillae few spinules.
4.	Metatarsus III with numerous dorsal spines in disorderly group (Simon).	• Metatarsus III few spines and arranged in apical transverse series (Simon; Raven).
5.	Tarsal claws strongly dentate (Simon).	• Paired claws (I-III) one short tooth (Raven).
6.	Trochanters I & II distinctly notched (Raven).	• Trochanters I & II not notched (Raven).
7.	Spain (Thorell, 1875), Portugal (Bacelar, 1937), North & Central America.	• India, Australia, W Pacific (Doleschall, 1859; Raven).

Table 1: Character states as described in the literature (primarily drawn from Simon (1897) and Raven (1985) as definitive for the two genera (**a**) *Ummidia,* and (**b**) *Conothele*).

Systematic status of *Conothele*

There is a further taxonomic problem regarding *Conothele* which is pertinent to introduce at this stage. The genus is widely distributed in tropical and arid Australia, although restricted to moisture-holding, relictual sites and microhabitats when occurring within arid and semi-arid regions (Main, 1997). Extraterritorially it ranges through southeast Asia, various island groups and New Guinea, while its sister genus *Ummidia* Thorell occurs in the Americas, Portugal, Spain and possibly Algeria; the type species was first described from Spain (Thorell, 1875). A species has also been described from the Caroline Islands in Micronesia (Roewer, 1963), but Raven (1985) transferred this species to *Conothele*. The behaviour, e.g. burrow structure, feeding behaviour, aerial dispersal, general habitat features and the morphology of *Ummidia* (see Bond & Coyle, 1995 for literature review) and *Conothele* (Crome, 1962; Main, 1957, 1997) have many similarities. Both genera were described (but not clearly defined) by Thorell (1875, 1878). The characters used to distinguish the genera by Simon (1892) and Raven (1985) include: relative width of the eye group, curvature of the anterior row of eyes, spinular arrangement on the labium, grouping of spines on the third metatarsus (Figs. 10-11), denticles on the tarsal claws, degree of notch on anterior trochanters (Fig. 12), and geographic boundaries. However the "definitive" condition of these characters do not unequivocally differentiate the genera, as many specimens of several species (mostly undescribed) in Australia and New Guinea possess in combination defining characters of both genera (Tables 1 and 2).

Biogeographically it is logical to assume that the "super genus" is more or less circumtropical, with some north and south extensions in both hemispheres. Associated with the aerial dispersal the distribution of the group parallels many circumtropical orb-weaving genera such as *Nephila*, and even some species, e.g. *Argiope trifasciata.*

In conclusion, I postulate that the genera are synonymous and will discuss this proposition in detail elsewhere in a review of the Australian species.

Acknowledgements

I am grateful to the Conservation Commission of the Northern Territory for permission to collect spiders in National Parks. I also appreciated discussions regarding Central Australian

B.Y. Main Registration No. & Locality	CHARACTER STATE 1 a	1 b	2 a	2 b	3 a	3 b	4 a	4 b	5 a	5 b	6 a	6 b
W. Australia												
1961/4; Derby	x		x		x		x			x		x
54/286; Lakewood WA	x		x			x		x		x	x	
54/45; Jilakin Rock	x		x			x		x		x	x	
55/146; 17 miles NE Rabbit Proof Fence Gt Nth Hwy	x		x			x		x		x	x	
54/464; Bruce Rock	x		x			x		x		x	x	
54/129; Green River		x	x			x		x		x	x	
Central Australia												
65/552; Simpson's Gap, NT	x		x			x(i)		x		x		x
Torres Strait												
55/769; Thursday Is.	x		x			x		x		x?		x
Papua New Guinea												
(PNG) 79/303; Ama W. Sepik	x			x		x(i)	x		x			x
(PNG) 79/267; Sogeri		x	(x)	(x)		x		x	x			x

Table 2: Character states of female *Ummidia*/*Conothele* specimens indicating mixed combinations from the two genera in a sample of New Guinean and Australian specimens. (i) = intermediate state. See Table 1 for explanation of characters.

localities and biology with Dr Graham Griffin of the CSIRO Division of Wildlife and Ecology.

References

BACELAR, A. 1937: Trap-door spiders from Algarve (South of Portugal). *Comptes Rendus du XII Congrès International de Zoologie. Lisbonne, 1935*. Lisbon: Casa Portuguesa: 1567–1577, Pls. LXXVIII–LXXIX.

BOND, J. E. & COYLE, F. A. 1995: Observations on the natural history of an *Ummidia* trapdoor spider from Costa Rica (Araneae, Ctenizidae). *J. Arachnol*. **23**: 157–164.

CRANSTON, P. S., EDWARD, D. H. D. & COLLESS, D. H. 1987: *Archaeochloss* Brundin: a midge out of time (Diptera: Chironomidae). *Syst. Entomol*. **12**: 313–334.

CROME, W. 1962: Die wohnrohre von *Conothele arboricola* Pocock nebst Bemerkungen über die Lebenswisse dieser Fallturspinne (Araneae: Ctenizidae). *Zool. Anz*. **168**: 450–459.

DAVIS, J. 1986: Revision of the Australian Psephenidae (Coleoptera): systematics, phylogeny and historical biogeography. *Aust. J. Zool., Suppl. Ser.* **119**: 1–97.

DOLESCHALL, C. L. 1859: Tweede Bidjdrage tot de Kennis der Arachniden van den Indischen Archipel. *Verh. natuurk. Ver. Ned. Ind*. **5**: 1–60.

HICKMAN, V. V. 1927: Studies in Tasmanian spiders. Part I. *Pap. Proc. Roy. Soc. Tasm.* **1926**: 52–86.

HICKMAN, V. V. 1929: Studies in Tasmanian spiders. Part III. *Pap. Proc. Roy. Soc. Tasm.* **1928**: 96–118.

HOGG, H. R. 1896: Araneidae. *In* B. Spencer (ed.). *Report on the work of the Horn Scientific Expedition to Central Australia. Part II. Zoology.* London: Dulau & Co. and Melbourne: Melville, Mullen & Slade: 309–356, Pl. 24.

HOGG, H. R. 1901: On Australian and New Zealand spiders of the suborder Mygalomorphae. *Proc. zool. Soc. Lond.* **1901**: 218–279.

HOGG, H. R. 1914: Abstract, No. 137. *Proc. zool. Soc. Lond.* **1914**: 56–58.

HOGG, H. R. 1915: Report on the spiders collected by the British Ornithologists' Union Expedition and the Wollaston Expedition in Dutch New Guinea. *Trans. zool. Soc. Lond.* **22**: 425–484.

HORN, W. A. 1896: Introduction. *In* B. Spencer (ed.). *Report on the work of the Horn Scientific Expedition to Central Australia*. London: Dulau & Co. and Melbourne: Melville, Mullen & Slade: v–x.

KOCH, L. 1872: *Die Arachniden Australiens*. Nurnberg: Bauer & Raspe.

KOCH, L. E. 1977: The taxonomy, geographic distribution and evolutionary radiation of Australo-Papuan scorpions. *Rec. West. Aust. Mus.* **5**: 83–367.

MAIN, B. Y. 1957: Occurrence of the trap-door spider *Conothele malayana* (Doleschall) in Australia [Mygalomorphae: Ctenizidae]. *W. Aust. Nat.* **5**: 209–216.

MAIN, B. Y. 1985: Mygalomorphae. *In* D. W. Walton (ed.). *Zoological Catalogue of Australia,* **3**. Canberra: Australian Government Publishing Service: 1–48.

MAIN, B. Y. 1991: Occurrence of the trapdoor spider genus *Moggridgea* in Australia with descriptions of two new species (Araneae: Mygalomorphae: Migidae). *J. nat. Hist.* **25**: 383–397.

MAIN, B. Y. 1997: Tropical rainforest spiders in the Australian desert: the irony of an adaptive legacy. *Mem. natn. Mus. Vic.* **56**: 339–347.

MORGAN, R. 1980: Eustacy in the Australian early and middle Cretaceous. *Bull. geol. Surv. N.S.W.* **27**: 1–105.

MORTON, S. R., SHORT, J. & BARKER, R. D. 1995: Refugia for biological diversity in arid and semi-arid Australia. Biodiversity Series, Paper No. 4. Canberra: Biodiversity unit, Department of Environment Sport and Territories: 1–105.

POCOCK, R. I. 1898: Scorpions, Pedipalpi and spiders collected by Dr. Willey in New Britain, the Solomon Islands etc. *In* A. Willey (ed.). *Zoological results based on material from New Britain, New Guinea, Loyalty Islands and elsewhere*, *Part 1*. Cambridge: Cambridge University Press: 95–120.

RAVEN, R. J. 1984: Systematics and biogeography of the mygalomorph spider family Migidae (Araneae) in Australia. *Aust. J. Zool.* **32**: 379–390.

RAVEN, R. J. 1985: The spider infraorder Mygalomorphae (Araneae): cladistics and systematics. *Bull. Am. Mus. nat. Hist.* **182**: 1–180.

RAVEN, R. J. & CHURCHILL, T. B. 1989: A new species of *Migas* (Araneae, Migidae), with notes on *Heteromigas* in Tasmania. *Bull. Br. arachnol. Soc.* **8**: 5–8.

ROEWER, C. F. 1963: Insects of Micronesia. Araneina: Orthognatha, Labidognatha. *Insects of Micronesia,* **3**(4). Honolulu: Bishop Museum: 103–132.

SIMON, E. 1892: *Histoire naturelle des araignées,* **1**(1). 2nd ed. Paris: Roret: 1–256.

SIMON, E. 1897: *Histoire naturelle des araignées*, **2**(1). 2nd ed. Paris: Roret: 1–192.

SIMON, E. 1903: *Histoire naturelle des araignées,* **2**(4). 2nd ed. Paris: Roret: 669–1080.

SMITH, G. T. 1983: The survival, habitat and a new record for the scorpion *Cercophonius squama* (Scorpionida: Bothriuridae). *W. Aust. Nat.* **15**: 140.

SPENCER, B. (ed.). 1896a: *Report on the work of the Horn Scientific Expedition to Central Australia. Parts I–IV*. London: Dulau & Co. and Melbourne: Melville, Mullen & Slade.

SPENCER, B. 1896b: Through Larapinta Land. A narrative of the Horn Expedition to Central Australia. *In* B. Spencer (ed.). *Report on the work of the Horn Scientific Expedition to Central Australia. Part I.* London: Dulau & Co. and Melbourne: Melville, Mullen & Slade: 1–136.

THORELL, T. 1875: Diagnoses Aranearum Europaearum aliquot novarum. *Tijdschr. Ent.* **18**: 81–108.

THORELL, T. 1878: Studi sui ragni Malesi e Papuani. Part II. Ragni di Amboina raccolti dal Prof. O. Beccari. *Annali Mus. civ. Stor. nat. Genova* **13**: 1–317.

YEN, A. 1996: The contribution of the Horn Expedition to our knowledge of terrestrial invertebrates in central Australia. *In* S. R. Morton & D. J. Mulvaney (eds.). *Exploring Central Australia. Society, the Environment and the 1894 Horn Expedition*. Chipping Norton, Sydney: Surrey Beatty & Sons: 230–244.