The Short-Range Endemic Invertebrate Fauna of Roy Hill (*Ecologia* Project 1106) (Western Australia)

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Summary

The samples from Roy Hill Station (Ecologia project 1106) submitted to the Western Australian Museum on the 31st July 2009 (accession no. A6617) included mygalomorph spiders in the families Actinopodidae (*Missulena*), Barychelidae (*Synothele*) and Idiopidae (*Aganippe*), pseudoscorpions in the families Atemnidae (*Oratemnus*) and Olpiidae (*Austrohorus*, *Beierolpium*, *Indolpium*), and some unidentifiable fragments of a millipede.

Whilst the mygalomorph spiders and some pseudoscorpions (e.g. in the genus *Beierolpium*) may represent short-range endemic species, lack of mature specimen and/or poor taxonomic knowledge of these groups in Australia does not allow an accurate interpretation of their conservation status.

Short-Range Endemism

The terrestrial invertebrate fauna of inland Australia contains a plethora of species, and the arthropods alone were recently estimated to consist of more than 250,000 species (Yeates *et al.* 2004). The vast majority of these are found within the Insecta and Arachnida, although significant numbers of millipedes are to be expected. For many years, the prospect of including invertebrates in assessments of biological systems subject to alteration proved daunting, and were largely ignored as being too diverse and too difficult to comprehend to satisfy the rapid turn-around needed for environmental surveys.

In a recent publication, the issue of Short-Range Endemism in the Australian invertebrate fauna was examined (Harvey 2002a) and series of major groups were nominated as having a very high proportion of individual species that satisfied a certain set of criteria. The main criterion nominated for inclusion as a Short-Range Endemic (SRE) was that the species had a naturally small range of less than 10,000 km^2. Harvey (2002b) found that those species possessed a series of ecological and life-history traits, including:

- poor powers of dispersal;
- confinement to discontinuous habitats;
- usually highly seasonal, only active during cooler, wetter periods; and
- low levels of fecundity.

The Western Australian fauna contains a number of SRE taxa, including millipedes, land snails, trap-door spiders, some pseudoscorpions, slaters, and onychophorans, that should be considered in Environmental Impact Assessment studies (EPA 2009). The south coast region is relatively well known compared with other regions of the state (Framenau *et al.* 2008) but there are many poorly known species and gaps in our understanding of the distributions of many species.

Methods

The short-range endemic fauna of Roy Hill Station (Ecologia Project 1106) was assessed by examination of mygalomorph spiders and pseudoscorpions collected by staff from *Ecologia Environment*, preserved in ethanol and submitted to the Western Australian Museum for identification on 31st July 2009 (WAM Acc. No. A6617). The specimens were examined using Leica dissecting microscopes (MZ6 & MZ16).

ARANEAE (spiders)

Infraorder Mygalomorphae (Trapdoor Spiders)

Mygalomorph ("trapdoor") spiders belong to one of the focal groups in surveys of short-range endemic taxa (Harvey 2002a). Many mygalomorph spiders show low dispersal capabilities, may be restricted to relictual habitats, and have long life cycles with low fecundity. A number of mygalomorph spiders, e.g. *Aganippe castellum*, *Idiosoma nigrum*, *Kwonkan eboracum*, *Moggridgea tingle*, are listed on Schedule 1 ("Fauna that is rare or likely to become extinct" of the Wildlife Conservation (Specially Protected Fauna) Notice 2008 of the Western Australian Government. The Western Australian mygalomorph fauna is vast and, despite long-term and ongoing research by Drs Barbara Main (University of Western Australia) and Robert Raven (Queensland Museum), remains taxonomically poorly known for many families and genera (e.g. Barychelidae: *Idiommata*; Idiopidae: *Aganippe*; Nemesiidae: *Aname*, *Chenistonia*, *Kwonkan*).
The best taxonomic features to distinguish mygalomorph spiders are found within the genitalia of males. Females or juveniles may be indistinguishable, although burrow morphology may allow identification to species level in some cases (B.Y. Main, personal communication). The Western Australian Museum has recently initiated a reference collection of male mygalomorph morphospecies to facilitate an assessment of distribution patterns of these spiders. This collection is assembled in cooperation with Dr Barbara Main and will eventually be consolidated with her collection at the University of Western Australia. Mygalomorph morphospecies are consecutively numbered ("MYG001", "MYG002" etc.) to allow a comparison of taxa between different surveys.

Missulena sp. (female) (family Actinopodidae)

Spiders of the actinopodid genus *Missulena* are commonly known as "Mouse Spiders". Males are often strikingly coloured with a distinctly red cephalic area and chelicerae, contrasting against a black thoracic part and abdomen, although some species have a black cephalic region. The abdomen itself sometimes has a velvety shine. The entrance of the burrow of *Missulena* is ovoid in shape and equipped with two neighbouring doors (Main 1956). Emergent juveniles of *Missulena* are known to disperse via ballooning, thus potentially allowing them to disperse large distances and thereby reducing the predisposition for short-range endemism.
The survey of Roy Hill Station included a juvenile of *Missulena*; however, only an examination of the genitalia of mature males allows an accurate species identification. It is recommended that mature males are obtained from the sample site of the female to assess the conservation status of this species.

***Synothele* 'MYG127` (family Barychelidae)**

Members of the Barychelidae, the "Brush-footed Trapdoor Spiders" are cryptic spiders. Their burrow often lacks the firm and thick door of the Idiopidae or the extensive web of the Dipluridae (Raven 1994). The genus *Synothele* is presumably widespread throughout Western and South Australia and a number of species are currently described from Western Australia, some of them with narrow known distributions (Raven 1994).
Two male *Synothele* were found on Roy Hill Station (Appendix 1). These specimens apparently represent a new species (`MYG127`) previously not present in the WAM reference collection and not collected during the recent DEC Pilbara survey. It is morphologically similar to *Synothele* `MYG069` from near Red Hill Station (21°52`00"S, 116°04`63"E). It is possible, that *Synothele* `MYG127` represents a short-range endemic species and we recommend it to be sent to Robert Raven (Queensland Museum) further morphological evaluation. Robert is currently revising Australian *Synothele*.

***Idiommata* `MYG128` (family Barychelidae)**

Idiommata are distinguished from other Australian barychelid genera by very dense scopula on the legs, paired claws half the size of the claw tufts, and the presence of a distinct lyra (15-120 clavate setae) on the maxillae in most species. The genus is known mostly from xeric areas but occurs also in rainforests throughout Australia (Raven 1994). The genus currently includes four Australian species but many undescribed species do exist. It was not treated in the most recent monograph of Australian Barychelidae (Raven 1994).
The single male from Roy Hill Station (Appendix 1) appears to be a different species to *Idiommata* `MYG013` and *Idiommata* `MYG111`, both previously collected in the Pilbara region (e.g. DEC Pilbara survey). It is possible, that *Idiommata* `MYG128` represents a short-range endemic species pending further examination of *Idiommata* males in the WAM arachnology collection.

***Aganippe* `MYG126` (family Idiopidae)**

The idiopid genus *Aganippe* is common throughout Western Australia. Fourteen species are described from Australia and many new species await description (Main 1985). Five males of a single *Aganippe* species (`MYG126`) were collected at Roy Hill (Appendix 1). This species was

previously not represented in the WAM mygalomorph reference collection and was also not recovered by DEC during their recent Pilbara survey. It is possible, that *Aganippe* `MYG126` represents a short-range endemic species pending further examination of *Aganippe* males in the WAM arachnology collection.

PSEUDOSCORPIONS

The Western Australian pseudoscorpion fauna is fairly diverse with representatives of 17 different families. They are found in a variety of biotopes, but can be most commonly collected from the bark of trees, from the underside of rocks, or from leaf litter habitats. The pseudoscorpion fauna of Mulga Downs Station was found to consist of members of the Atemnidae and Olpiidae (Appendix 1).

Oratemnus sp. (family Atemnidae)

A single female *Oratemnus* was collected during the survey on Roy Hill Station (Appendix 1). Atemnids are frequently found under bark of trees in Western Australia, but the systematics of the group, particularly of the genus *Oratemnus*, is uncertain and the taxonomy of individual species unclear. However, based upon current evidence, it seems that most species will eventually be found to be widely distributed. For this reason, we do not believe that this represents a short-range endemic species.

Austrohorus sp. (family Olpiidae)

This species collected on Roy Hill Station (Appendix 1) appears to be very similar to other samples of *Austrohorus* collected elsewhere in the Pilbara. Based on our current levels of knowledge, it is not possible to state whether this species is a short-range endemic species.

Beierolpium (family Olpiidae)

Beierolpium were collected at two sites on Roy Hill Station (Appendix 1) The systematic status of members of this genus in the Pilbara has not been fully assessed. At present it is not possible to firmly establish the identity of these species until a complete systematic revision of the Western Australian members of *Beierolpium* is undertaken. It is possible that these specimens represent short-range endemic species, but a full taxonomic revision of the genus *Beierolpium* in the Pilbara region, and other regions of WA, is necessary to confirm their status.

***Indolpium* sp. (family Olpiidae)**

A large number of specimens of this pseudoscorpion species were collected at a number of sites on Roy Hill Station (Appendix 1). The specimens comprise a single species and extremely similar specimens have been collected from other regions of Western Australia, suggesting that only a single species is involved. Based on our current levels of knowledge, it appears that this species is not a short-range endemic species.

MILLIPEDES

The badly preserved fragments of an unidentifiable millipede (Appendix 1) do not allow an identification even to order level.

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Appendix 1. Identification of short-range endemic fauna from Mulga Downs Station.

REGNO	FLDNO	ORDER	FAMILY	GENUS	SPECIES	LATITUDE	LONGITUDE	SEX	NO
98176	EE09:0726	(Diplopoda)	`indet. `	`indet.`	`indet.`	22°29`48.09"S	120°00`34.69"E		1
98152	EE09:0819	Araneae	Actinopodidae	*Missulena*	`sp. (juv.)`	22°34`37.81"S	120°01`28.93"E		1
98160	EE09:1147	Araneae	Barychelidae	`?Synothele`	`sp. (juv.)`	22°27`32.72"S	119°54`08.19"E		1
98157	EE09:0843	Araneae	Barychelidae	*Idiommata*	`MYG128`	22°28`45.69"S	119°56`31.70"E	M	1
98154	EE09:1157	Araneae	Barychelidae	*Synothele*	`MYG127`	22°33`23.62"S	119°58`13.08"E	M	1
98159	EE09:0835	Araneae	Barychelidae	*Synothele*	`MYG127`	22°29`46.26"S	120°00`37.38"E	M	1
98155	EE09:1155	Araneae	Idiopidae	*Aganippe*	`sp. (juv.)`	22°33`23.62"S	119°58`13.08"E		1
98151	EE09:0845	Araneae	Idiopidae	*Aganippe*	`MYG126`	22°34`36.87"S	119°59`42.67"E	M	1
98153	EE09:1156	Araneae	Idiopidae	*Aganippe*	`MYG126`	22°33`23.62"S	119°58`13.08"E	M	1
98156	EE09:0837	Araneae	Idiopidae	*Aganippe*	`MYG126`	22°33`32.97"S	119°56`32.47"E	M	1
98158	EE09:1144	Araneae	Idiopidae	*Aganippe*	`MYG126`	22°27`17.17"S	119°52`15.11"E	M	2
93272	EE09:0839	Pseudoscorpiones	Atemnidae	*Oratemnus*		22°32`17.97"S	119°56`32.47"E	F	1
98167	EE09:1143	Pseudoscorpiones	Olpiidae	`indet. (juv.)`		22°27`17.17"S	119°52`15.11"E		1
93250	EE09:0833	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°29`46.26"S	120°00`37.38"E		1
93254	EE09:0755	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°30`14.28"S	120°01`15.75"E	F	1
93257	EE09:0623	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°28`51.99"S	119°53`03.92"E		1
93259	EE09:0649	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°27`17.17"S	119°52`15.11"E		1
93263	EE09:0631	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°28`51.99"S	119°53`03.92"E		1
93264	EE09:0715	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°33`23.62"S	119°58`13.08"E		1
93268	EE09:0671	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°29`39.48"S	119°55`18.28"E		3
93270	EE09:0778	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°26`22.68"S	119°56`43.02"E		2
93271	EE09:0710	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°33`23.62"S	119°58`13.08"E	M	1
98161	EE09:0832	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°34`37.81"S	120°01`28.93"E	M	1
98162	EE09:0673	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°29`39.48"S	119°55`18.28"E		1
98164	EE09:0745	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°30`14.28"S	120°01`15.75"E	M	2
98170	EE09:0644	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°27`17.17"S	119°52`15.11"E	F	1
98454	EE09:0768	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°48`45.69"S	119°56`31.70"E		1
98456	EE09:1410	Pseudoscorpiones	Olpiidae	*Austrohorus*		22°30`14.28"S	120°01`15.75"E		4
98172	EE09:1408	Pseudoscorpiones	Olpiidae	*Beierolpium*		22°29`46.26"S	120°00`37.38"E		2
98457	EE09:0764	Pseudoscorpiones	Olpiidae	*Beierolpium*		22°28`45.69"S	119°56`31.70"E		1
93248	EE09:0768	Pseudoscorpiones	Olpiidae	*Indolpium*		22°28`45.69"S	119°56`31.70"E		1

93249	EE09:0761	Pseudoscorpiones	Olpiidae	*Indolpium*	22°28`45.69"S	119°56`31.70"E		1
93251	EE09:1421	Pseudoscorpiones	Olpiidae	*Indolpium*	22°30`36.50"S	119°55`37.04"E		16
93252	EE09:0620	Pseudoscorpiones	Olpiidae	*Indolpium*	22°28`51.99"S	119°53`03.92"E		2
93253	EE09:0754	Pseudoscorpiones	Olpiidae	*Indolpium*	22°30`14.28"S	120°01`15.75"E		1
93255	EE09:0759	Pseudoscorpiones	Olpiidae	*Indolpium*	22°28`45.69"S	119°56`31.70"E	F	1
93256	EE09:0657	Pseudoscorpiones	Olpiidae	*Indolpium*	22°27`32.72"S	119°54`08.19"E	F	1
93258	EE09:1160	Pseudoscorpiones	Olpiidae	*Indolpium*	22°28`11.10"S	119°52`39.97"E		2
93260	EE09:0741	Pseudoscorpiones	Olpiidae	*Indolpium*	22°33`24.90"S	119°58`11.95"E		1
93261	EE09:0684	Pseudoscorpiones	Olpiidae	*Indolpium*	22°29`39.48"S	119°55`18.28"E		1
93262	EE09:1418	Pseudoscorpiones	Olpiidae	*Indolpium*	22°33`23.62"S	119°58`13.08"E		2
93265	EE09:0691	Pseudoscorpiones	Olpiidae	*Indolpium*	22°29`39.48"S	119°55`18.28"E		1
93266	EE09:1410	Pseudoscorpiones	Olpiidae	*Indolpium*	22°30`14.28"S	120°01`15.75"E	F	1
93267	EE09:0788	Pseudoscorpiones	Olpiidae	*Indolpium*	22°26`22.68"S	119°56`43.02"E		1
93269	EE09:0764	Pseudoscorpiones	Olpiidae	*Indolpium*	22°28`45.69"S	119°56`31.70"E	F	1
98163	EE09:0815	Pseudoscorpiones	Olpiidae	*Indolpium*	22°34`37.81"S	120°01`28.93"E		1
98165	EE09:0626	Pseudoscorpiones	Olpiidae	*Indolpium*	22°28`51.99"S	119°53`03.92"E		1
98166	EE09:0680	Pseudoscorpiones	Olpiidae	*Indolpium*	22°29`39.48"S	119°55`18.28"E	M	1
98168	EE09:0796	Pseudoscorpiones	Olpiidae	*Indolpium*	22°34`36.87"S	119°59`42.67"E		2
98169	EE09:0635	Pseudoscorpiones	Olpiidae	*Indolpium*	22°29`23.53"S	119°53`42.49"E		1
98171	EE09:0784	Pseudoscorpiones	Olpiidae	*Indolpium*	22°26`22.68"S	119°56`43.02"E		1
98173	EE09:0617	Pseudoscorpiones	Olpiidae	*Indolpium*	22°28`51.99"S	119°53`03.92"E		2
98174	EE09:0775	Pseudoscorpiones	Olpiidae	*Indolpium*	22°26`22.68"S	119°56`43.02"E		2
98175	EE09:0720	Pseudoscorpiones	Olpiidae	*Indolpium*	22°29`48.09"S	120°00`34.69"E		1
98455	EE09:0623	Pseudoscorpiones	Olpiidae	*Indolpium*	22°48`51.99"S	119°53`03.92"E	M	3
98458	EE09:0710	Pseudoscorpiones	Olpiidae	*Indolpium*	22°33`23.62"S	119°58`13.08"E		2