A checklist of the non-acarine arachnids (Chelicerata: Arachnida) of the De Hoop Nature Reserve, Western Cape Province, South Africa

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ABSTRACT

As part of the South African National Survey of Arachnida (SANSA) in conserved areas, arachnids were collected in the De Hoop Nature Reserve in the Western Cape Province, South Africa. The survey was carried out between 1999 and 2007, and consisted of five intensive surveys between two and 12 days in duration. Arachnids were sampled in five broad habitat types, namely fynbos, wetlands, i.e. De Hoop Vlei, *Eucalyptus* plantations at Potberg and Cupido's Kraal, coastal dunes near Koppie Alleen and the intertidal zone at Koppie Alleen. A total of 274 species representing five orders, 65 families and 191 determined genera were collected, of which spiders (Araneae) were the dominant taxon (252 spp., 174 genera, 53 families). The most species rich families collected were the Salticidae (32 spp.), Thomisidae (26 spp.), Gnaphosidae (21 spp.), Araneidae (18 spp.), Theridiidae (16 spp.) and Corinnidae (15 spp.). Notes are provided on the most commonly collected arachnids in each habitat.

Conservation implications: This study provides valuable baseline data on arachnids conserved in De Hoop Nature Reserve, which can be used for future assessments of habitat transformation, alien invasive species and climate change on arachnid biodiversity.

INTRODUCTION

The South African National Survey of Arachnida (SANSA) was initiated in 1997 to record the biodiversity of arachnids in South Africa (Dippenaar-Schoeman & Craemer 2000). As part of this initiative, surveys are underway in various conservancies, agroecosystems, provinces and biomes. So far, only two long-term surveys have been carried out in Western Cape Province conservancies, namely of the spiders of the Karoo National Park, falling within the Nama Karoo biome (Dippenaar-Schoeman *et al.* 1999), and the Swartberg Nature Reserve, falling within the Succulent Karoo biome (Dippenaar-Schoeman *et al.* 2005). These two surveys indicate a moderately high diversity of spiders in these conservancies, with 116 species (38 families) and 186 species (45 families) recorded from the two reserves, respectively.

The Cape Floristic Region comprises unique vegetation types such as fynbos, which are characterised by high levels of plant endemism. According to Linder (2005) some 9,000 species can be found in the region in an area of approximately 90,000 km^2. Although the factors influencing insect abundance and diversity in this biome have been well studied (e.g. Giliomee 2003; Procheş & Cowling 2006; Wright & Samways 1996, 1999), little is known on the diversity of arachnids in the Fynbos Biome. Coetzee *et al.* (1990) studied the spiders associated with five proteaceous plant species, Visser *et al.* (1999) studied the arachnids associated with *Protea nitida* Mill., and Sharratt (2000) included arachnids in their assessment of the conservation status of cave-dwelling arthropods of the Cape Peninsula.

The general lack of information regarding arachnid diversity, as well as that for many other invertebrate groups in the Western Cape Province, is a great hindrance to effective conservation planning. Conservation strategies should not only take into account plants and vertebrates, but also need to recognise the role that invertebrates play in ecosystem functioning. Arachnids, with the exception of some phytophagous and parasitic Acari, form an important group of predatory terrestrial arthropods that feed on a wide variety of prey using a range of capture methods, including webs and active hunting strategies. Arachnids are frequently regarded as suitable candidates for studying ecological processes, as 1) they are diverse and abundant, 2) they can be easily sampled, 3) they are functionally significant in ecosystems as predators, and as food for other predators, and 4) they interact with their abiotic and biotic environment in a manner that reflects ecological change (Churchill 1997). Therefore, arachnids can be used to monitor ecosystem stability and changes over time, making them useful organisms in long-term conservation planning. Since fynbos vegetation, which is largely endemic to the Western Cape Province, is under increasing threat from urbanisation, agriculture, alien invasive species and climate change (e.g. Picker & Samways 1996; Richardson *et al.* 1996; McNeely 2001; Midgley *et al.* 2003; Witt & Samways 2004), arachnids provide an alternative taxonomic group to monitor changes in this unique vegetation type.

The present paper aims to report on the diversity of arachnids (excluding the Acari) in the De Hoop Nature Reserve (DHNR) in the Western Cape, which consists of large areas of pristine fynbos and protected marine habitats. Apart from its value as a biodiversity and conservation tool, this checklist can thus be used as a baseline to assess impacts of the aforementioned effects on biodiversity in areas surrounding the reserve. This study forms part of the South African National Survey of Arachnida in conserved areas and the Fynbos Biome, and also contributes towards the checklists of species of the Western Cape Province.

STUDY AREA

DHNR is situated on the south coast of the Western Cape Province, South Africa, and covers an area of

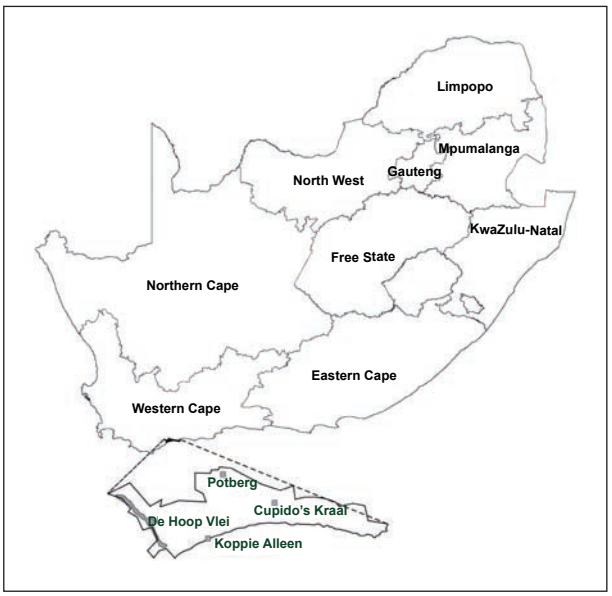

FIGURE 1
Location of the De Hoop Nature Reserve along the South Coast of South Africa. Enlarged map shows key sampling points in the reserve

FIGURES 2–7
Habitats sampled in the De Hoop Nature Reserve: 2) Fynbos (FB); 3) *Eucalyptus* plantation at Potberg (EP); 4) Wetland at De Hoop Vlei (WL); 5–6) Coastal dunes at Koppie Alleen (CD), with natural vegetation (5) and dunes covered with invasive alien *Acacia* species (6); 7) Intertidal zone at Koppie Alleen (IZ)

32,279 hectares terrestrially (Figure 1). In addition, the coastline and adjacent marine areas are also included in the reserve for the protection of the marine environment and its diversity. For the purposes of this survey the reserve was divided into five broad sampling habitats (plant classification follows Germishuizen *et al.* 2006):

1. Fynbos (FB) – the largest portion of the reserve contains typical fynbos vegetation characteristic of this particular floral biome (Figure 2). An upper vegetative layer consisting primarily of taller *Protea* spp. (*P. aurea potbergensis* Rourke, *P. obtusifolia* H.Buek ex Meisn. and *P. repens* (L.) L.) is found in certain areas, particularly near hills and mountains. The field layer comprises a high diversity of fynbos plants, including *Agathosma* spp., *Cliffortia* spp., *Leucodendron* spp., *Phylica* spp., *Serruria fasciflora* Salisb. ex Knight and *Thamnochortus* spp..
2. *Eucalyptus* plantation (EP) – two large plantations at Potberg and Cupido's Kraal consist primarily of *Eucalyptus camaldulensis* Dehnh., with endemic low-growing shrubs (e.g. *Carissa bispinosa* (L.) Desf. ex Brenan) and other short vegetation (*Agaranthus* sp., *Asparagus falcatus* L., *Bidens* sp., *Cynodon dactylon* (L.) Pers. and *Sansevieria hyacinthoides* (L.) Druce) (Figure 3).
3. Wetlands (WL) – a single inland wetland, i.e. the De Hoop Vlei, is situated in the south-west of the reserve (Figure 4). The wetland is separated from the ocean by coastal dunes, and therefore does not form a lagoon *per se*. The De Hoop Vlei is fed by water from the Zout River, the catchment of which receives most of its rainfall during the winter rainfall season. The shores of the wetland are dominated by *Sarcocornia* spp. and *Exomis microphylla* (Thunb.) Aellen., with scattered patches of the reed *Phragmites australis* (Cav.) Steud.. Beyond the shoreline the dominant vegetation includes *Sideroxylon inerme* L. trees and a variety of fynbos species.
4. Coastal dunes (CD) – coastal dune vegetation is found along the entire coastline of the reserve (Figure 5). Sea-facing dunes consist primarily of endemic shrub species, including *Carissa bispinosa*, *Cynanchum obtusifolium* L.f., *Euclea racemosa* Murray, *Passerina rigida* Wikstr., *Ptaeroxylon* spp., *Robsonodendon* sp., *Rhus glauca* Thunb. and *Secamone* spp., interspersed with shorter species such as *Arctotheca populifolia* (P.J.Bergius) Norl., *Asparagus falcatus*, *Bassia diffusa* (Thunb.) Kuntze, *Chironia baccifera* L., *Dasispermum suffruticosum* (P.J.Bergius) B.L.Burtt, *Gazania krebsiana* Less., *Limonium scabrum* (Thunb.) Kuntze, *Plantago crassifolia* Forssk., *Silene primuliflora* Eckl. & Zeyh., *Spirobolus* sp., *Trachyandra ciliata* (L.f) Kunth and fynbos vegetation. Many dunes are strongly overgrown with invasive alien plant species such as *Acacia cyclops* A.Cunn ex G.Don and *A. saligna* (Labill.) H.L.Wendl. (Figure 6), occasionally interspersed with fynbos elements.
5. Intertidal zone (IZ) – this habitat includes all rocky shores along the coastline and the vegetation immediately associated with the high tide breaker line (Figure 7). On the rocky shores themselves, various marine algae dominate, while plants associated with the high tide mark include scattered fynbos insertions and coastal dune shrubs.

SAMPLING PERIOD AND METHODS

Intensive sampling for arachnids was carried out during five visits to the reserve. Three of the trips were carried out during early autumn (March 1999 – April 1999, 2004 and 2005) and lasted 10 – 12 days each, the fourth trip was undertaken during the middle of winter (July 2005) and lasted four days, and the last trip took place in spring (September 2007) for two days.

Sampling was undertaken *ad hoc* in each of the habitats by active searching under rocks, logs and in leaf litter, beating foliage, sifting leaf litter and sweeping low-growing vegetation. Additional sampling was conducted by searching under bark in the EP, as this was the only habitat in which loose bark was available. Material was preserved in 70% ethanol for sorting and identification. Due to time and logistical constraints during the sampling trips, material was not collected quantitatively (i.e. according to a set sampling protocol). Thus, the sampling intensity varied considerably between habitats with a bias towards collecting in FB and EP, as these were the easiest habitats to access. However, adequate sampling was conducted in the other three habitats using various methods to give a good indication of the arachnid diversity of each.

Guilds observed

All arachnids were grouped into guilds based on the typical habits known for each family or genus, but also took into consideration the strata in which each species was sampled.

All arachnid orders collected, with the exception of spiders, can be classified as wanderers. Spiders can be separated into wandering and web-building guilds. The wandering arachnids can be broadly separated into ground wanderers (GW) and plant wanderers (PW). For the latter group, distinction was made between spiders associated with foliage (PWF) of plants and those associated with the bark of trees (PWB). Web-building spiders can be separated into various guilds based on the types of webs they construct, namely orb-web builders (OWB), funnel-web builders (FWB), sheet-web builders (SWB), space-web builders (SpWB), hackle-web builders (HWB) and gum-foot-web builders (GWB).

Representative specimens of each species are deposited in the institutions of the various specialists listed in the Acknowledgements, who provided identifications for their respective groups. Material of all the remaining taxa is deposited in the National Collection of Arachnida at the Plant Protection Research Institute, Pretoria, South Africa.

RESULTS & DISCUSSION

Diversity

A total of 274 species of arachnids were collected in DHNR, representing five orders, 65 families and 191 determined genera (Table 1, Appendix 1). The most species rich order was the Araneae, with 252 species in 54 families. This includes one published record of a species that was not collected in the current survey, *Nephila fenestrata* Thorell (Nephilidae) (Fromhage *et al.* 2007). The spider family diversity represents the highest from South Africa, exceeding the 46 families collected in the Western Soutpansberg in Limpopo Province (Foord *et al.* 2002) and Ndumo Game Reserve in KwaZulu-Natal (Haddad *et al.* 2006). The relatively high spider diversity from fynbos is impressive when compared to more structurally complex habitats such as savanna, where greater species diversity could be expected (see Table 2).

The remaining arachnid orders were relatively poorly represented, the most species rich being the Pseudoscorpiones (nine species, five families), followed by Opiliones (eight species, three families), Scorpiones (four species, three families), and Solifugae (one species, one family). One published record of Scorpiones, of *Parabuthus planicauda* (Pocock) (Buthidae), was found in the literature (Prendini 2004).

TABLE 1
Order composition of the non-acarine arachnids of the De Hoop Nature Reserve, Western Cape Province, South Africa

ORDER	COMMON NAME	FAMILIES	GENERA	SPECIES
Araneae	Spiders	53	174	252
Opiliones	Harvestmen	3	5	8
Pseudoscorpiones	False scorpions	5	7	9
Scorpiones	Scorpions	3	4	4
Solifugae	Sun spiders	1	1	1
Total		**65**	**191**	**274**

As in several other South Africa surveys, Salticidae were the most species rich family (32 spp., 12.7% of spiders), followed by the Thomisidae (26 spp., 10.3%) and Gnaphosidae (21 spp., 8.3%). Several other families contributed 5% or more of the spider species: Araneidae (18 spp., 7.1%), Theridiidae (16 spp., 6.3 %) and Corinnidae (15 spp., 6.0%). In contrast to some other reserves previously sampled in South Africa, such as the Ndumo Game Reserve in KwaZulu-Natal, the family composition of spiders was considerably less skewed in the current study (Figure 8). At Ndumo, the five dominant spider families contributed 52% of the species, with the Salticidae dominant (82 spp., 19.0%) (Haddad *et al.* 2006). In contrast, the five families dominating the current study contributed 44.7% of the total spiders, with the dominant Salticidae only contributing 12.7% of the total.

Guilds

The majority of the arachnid species collected in DHNR are wanderers (73.0%), while web-builders comprise 27.0%. When spiders alone are considered, 70.6% are wanderers while 29.4% are web-builders. This compares well with several surveys completed in South Africa (Table 2). This indicates that fynbos and associated habitats sampled in this study are sufficiently heterogeneous to support a fauna similar to that found in more structurally complex habitat types, such as savanna.

Common taxa by stratum

This study was qualitative in its entirety and thus there is no data available on the relative abundance of arachnids. However, based on the frequency of collection and observations made during the study the following species can be recognised as representative of each stratum and guild:

Ground wanderers: A large proportion of the species collected are wandering arachnids on the soil surface (Appendix 1). The coastal dune (CD) fauna was largely dominated by *Pardosa* and *Trabea* spp. (Lycosidae), *Griswoldia robusta* (Simon) (Zoropsidae), *Opopaea speciosa* (Lawrence) (Oonopidae), *Zelotes anchora* Tucker (Gnaphosidae), *Natta* spp. (Salticidae), *Diores simoni* O. P.-Cambridge (Zodariidae) and *Orthobula infima* Simon (Corinnidae).

In the *Eucalyptus* plantation (EP), various gnaphosids (especially *Zelotes*, *Camillina* and *Xerophaeus* spp.), *Caponia capensis* Purcell (Caponiidae), *Opopaea speciosa*, *Xysticus lucifugus* Lawrence (Thomisidae), *Griswoldia robusta* and *Phanotea digitata* Griswold (Zoropsidae), *Lepthercus rattrayi* Hewitt (Nemesiidae), various lycosids, *Fuchiba* and *Fuchibotulus* spp. (Corinnidae) and *Drassodella vasivulva* Tucker (Gallieniellidae) were common.

TABLE 2
Guild composition of spiders collected in the De Hoop Nature Reserve, compared to other surveys carried out in South African conservation areas. Abbreviations: WA – wanderers; WB – web-builders

CONSERVANCY	BIOME	SPP.	%WA	%WB	REFERENCE
De Hoop Nature Res.	Fynbos	252	70.6	29.4	**Current study**
Karoo Nat. Park	Nama Karoo	116	66.4	33.6	Dippenaar-Schoeman *et al.* (1999)
Kruger Nat. Park	Savanna	152	79.0	21.0	Dippenaar-Schoeman & Leroy (2003)
Makalali Game Res.	Savanna	268	69.4	30.6	Whitmore *et al.* (2002)
Mountain Zebra Nat. Park	Nama Karoo	76	53.9	46.1	Dippenaar-Schoeman (2006)
Ndumo Game Res.	Savanna	431	74.2	25.8	Haddad *et al.* (2006)
Polokwane Nature Res.	Savanna	275	69.5	30.5	Dippenaar *et al.* (2008)
Roodeplaat Dam Nature Res.	Savanna	110	65.5	34.5	Dippenaar-Schoeman *et al.* (1989)
Sovenga Hill	Savanna	76	83.9	16.1	Modiba *et al.* (2005)
Swartberg Nature Res.	Succulent Karoo	186	76.5	23.5	Dippenaar-Schoeman *et al.* (2005)
Western Soutpansberg	Savanna	127	63.8	36.2	Foord *et al.* (2002)

Opistacanthus capensis Thorell (Liochelidae) and *Uroplectes lineatus* (C. L. Koch) (Buthidae) were often collected under logs and rocks.

The fynbos (FB) fauna was dominated primarily by lycosids (particularly *Pardosa*, *Trabea* and *Zenonina* spp.), *Drassodella vasivulva*, various gnaphosids (*Camillina*, *Xerophaeus* and *Zelotes* spp.), *Philodromus guineensis* Millot and *Suemus punctatus* Lawrence (Philodromidae) and *Afrilobus* sp. (Orsolobidae). Large numbers of Pseudoscorpiones were collected by sifting leaf litter of *Protea* spp..

The fauna at De Hoop Vlei (WL) was strongly dominated by gnaphosids (*Zelotes* and *Xerophaeus* spp., and *Drassodes ereptor* Purcell), lycosids (*Geolycosa* and *Pardosa* spp.), and *Heliophanus* spp. (Salticidae). Various gnaphosids, corinnids and pseudoscorpions were common in sifted leaf litter of *Sideroxylon inerme* (milkwood) trees near to the wetland.

In the intertidal zone (IZ), only two species were particularly common. *Amaurobioides africanus* Hewitt (Anyphaenidae) was commonly found in retreats constructed in sandstone formations at the back end of the intertidal zone, while *Desis formidabilis* (O.P.-Cambridge) (Desidae) was occasionally collected from beneath limpet shells and between algae on the rocky shores. These two species are regarded as marine specialists, occurring only in association with the intertidal zone along rocky shores (Lamoral 1968).

Ground web-builders: Web-builders were generally uncommon on the ground surface, but several species can be singled out. In CD leaf litter, *Hahnia* spp. (Hahniidae) were frequently found in their sheet-webs, while in FB leaf litter, *Benoitia ocellata* (Pocock) (Agelenidae) and various linyphiids were common. *Lamaika* sp. and *Vidole capensis* (Pocock) (Phyxelididae) were frequently collected in leaf litter and under logs in the EP. The most common web-builders in the WL were *Steatoda capensis* Hann and *Euryopis* sp. 1 (Theridiidae), while very few web-builders were collected from the ground level in IZ.

Arachnids associated with bark: Due to the vegetative structure of fynbos, very few large shrubs and trees are found in most of the habitats sampled. Only the EP contained *Eucalyptus* trees that were large enough to sample arachnids from under bark. Common wandering arachnids collected include *Clubiona* spp. (Clubionidae), *Aneplasa sculpturata* Tucker, *Poecilochroa anomala* (Hewitt) and *Upognampa aplanita* Tucker (Gnaphosidae), *Pseudicius* spp. and *Menemerus bivittatus* (Dufour) (Salticidae), *Platyoides quinquedentatus* Purcell (Trochanteriidae), *Cetonana martini* (Simon) (Corinnidae) and *Uroplectes lineatus* (Buthidae). Dominant web-dwelling spiders include *Theridion* spp. (Theridiidae) and *Neoscona subfusca* (C.L. Koch) (Araneidae). Interestingly, several specimens of the tree trapdoor spider *Moggridgea peringueyi* Simon (Migidae) were collected from their silken burrows under bark.

Foliage wanderers: The fauna of CD was dominated by *Massagris regina* Wesolowska and *Heliophanus* sp. (Salticidae) and predominantly immature *Palystes superciliosus* L. Koch (Sparassidae). Wandering spiders were quite rare in WL, comprising primarily of *Heliophanus* spp., various philodromids, and ground-dwelling lycosids (particularly *Pardosa* spp.) that had wandered onto short vegetation.

In EP, various salticids (*Massagris regina*, *Thyene* and *Heliophanus* spp.), *Oxyopes* and *Hamataliwa* spp. (Oxyopidae), *Synema* spp. (Thomisidae), immature *Tibellus minor* Lessert (Philodromidae) and *Clubiona* spp. (Clubionidae) were collected from short shrubs and creepers. The FB plant-dwellers were considerably more diverse. The most common species collected include *Chariobas* spp. (Zodariidae), various thomisids (*Tmarus*, *Thomisus* and *Misumena* spp.), and salticids (*Thyene* and *Menemerus* spp.).

Foliage web-dwellers: Web-dwellers in the CD and FB were particularly dominated by *Neoscona* and *Cyclosa* spp. (Araneidae), *Theridion* spp. and various linyphiids. Several rare species were also collected in the FB and EP, particularly. The only common web-dweller near the

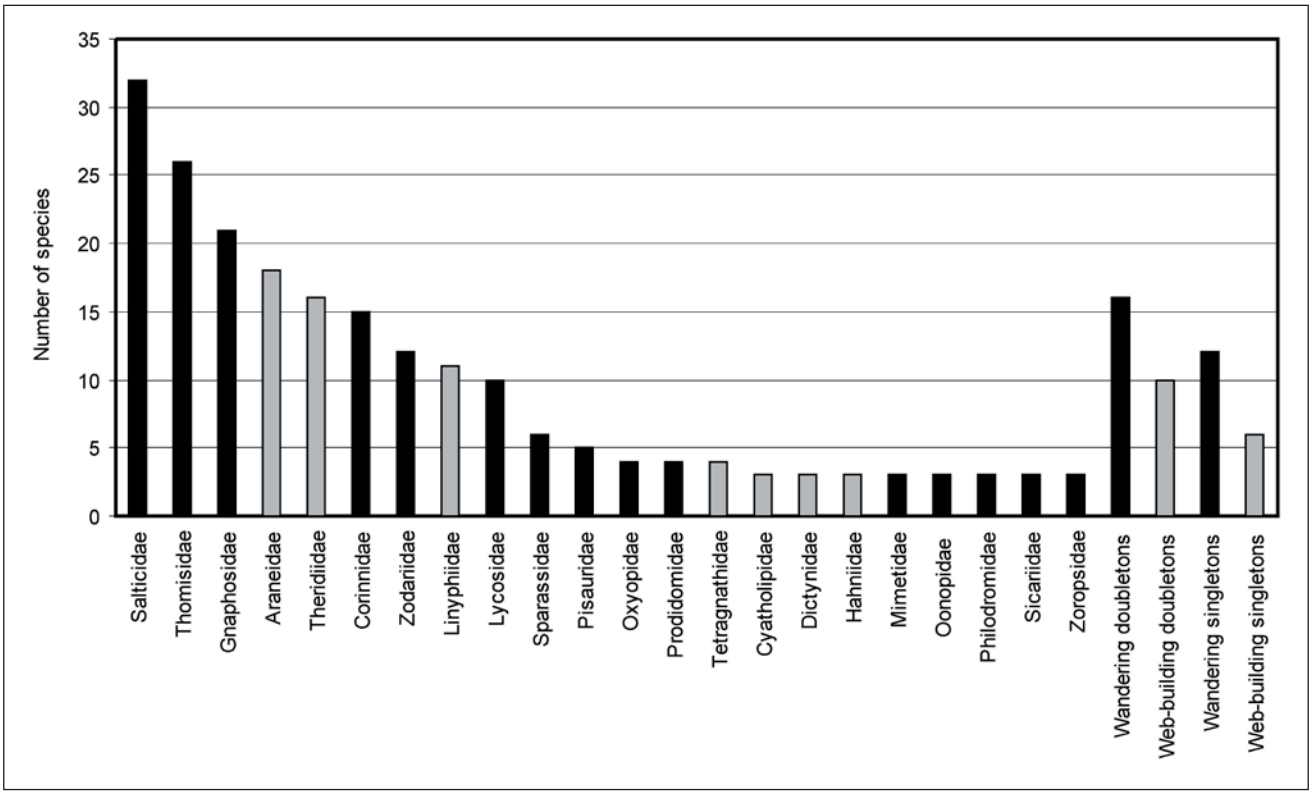

FIGURE 8
Species diversity of spider families collected in the De Hoop Nature Reserve as ranked from highest to lowest. Black bars indicate wandering spiders and grey bars indicate web-builders

IZ was *Larinia natalensis* (Grasshoff) (Araneidae), which constructs its orb-web in creepers and other vegetation between rocky outcrops surrounding the intertidal zone.

CONCLUSION

This study provides the first intensive data on spider diversity in the Fynbos Biome, although two studies have previously been conducted in this vegetation type (Coetzee *et al.* 1990; Visser *et al.* 1999). In total, 274 species of arachnids were collected, with spiders the dominant group (252 species). This diversity represents approximately 12.5% of the currently known South African fauna of approximately 2000 species (Dippenaar-Schoeman & Haddad, unpubl.). While the species diversity is slightly lower than surveys conducted in the Savanna Biome, it compares favourably with studies conducted in the Succulent and Nama Karoo Biomes. The relatively high number of arachnid species collected, and the presence of several fynbos endemics (e.g. 10 of the 15 Corinnidae species), supports the generalised perception that fynbos contains a unique fauna and flora.

The only spiders currently considered to be of conservation importance are the baboon spiders, *Harpactira cafreriana* (Walkenaer) and *Harpactirella* sp. Both species are relatively common under rocks and within tussocks of *Thamnochortis* grasses and populations are unlikely to be threatened by occasional collecting. Perhaps also worth noting was the unusual *Stasimopes* sp. (trapdoor spider), of which only males were collected. These have unusual spine-like tubercles in the eye region, something which could not be traced to any described species in the literature. Consequently, this species may possibly be new or an undescribed male of a described species.

The scorpions collected all have a relatively broad distribution within the Western Cape Province (Prendini pers. comm.). For example, *Parabuthus planicauda* (Pocock) was recorded from DHNR by Prendini (2004), but is widespread throughout the Western and Eastern Cape Provinces. The occurrence of these scorpions within a protected area such as DHNR can be considered important for the conservation of the species, particularly when the growing threats to the Fynbos Biome are considered.

In this study several new species and three new genera were collected, some of which have recently been described (Haddad 2006; Haddad & Lyle 2008). This study expanded the distribution ranges known for many species, and provided valuable material for future taxonomic studies. This emphasises the need to expand efforts to survey the arachnid faunas of conservancies throughout South Africa, but particularly within the Western Cape Province, where invertebrate endemism may be relatively high compared to other areas.

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APPENDIX 1

A checklist of the non-acarine arachnids of the De Hoop Nature Reserve.

Guild abbreviations are provided in the text. Habitat abbreviations: CD – coastal dunes; EP – *Eucalyptus* plantation; FB – fynbos; IZ – intertidal zone; WL – wetlands.
Symbols: † indicates a new species, ‡ indicates a possible new species, and ? indicates a dubious identification.

FAMILY/GENUS/SPECIES	GUILDS	HABITATS
ORDER: ARANEAE (SPIDERS)		
Family: Agelenidae		
Benoitia ocellata (Pocock 1900)	FWB	FB
Family: Anapidae		
Crozetulus rhodesiensis (Brignoli 1981)	OWB	FB
Family: Anyphaenidae		
Amaurobioides africana (Hewitt 1917)	GW	IZ

APPENDIX 1 (CONT...)

FAMILY/GENUS/SPECIES	GUILDS	HABITATS
Family: Araneidae		
Araneus apricus (Karsch 1884)	OWB	EP
A. nigroquadratus (Lawrence 1937)	OWB	EP
Argiope trifasciata (Forskål 1775)	OWB	WL
Caerostris sexcuspidata (Fabricius 1793)	OWB	EP, WL
Cyclosa insulana (Costa 1834)	OWB	CD, EP, FB
C. oculata (Walckenaer 1802)	OWB	FB
Cyrtophora citricola (Forskål 1775)	OWB	FB
Gea infuscata (Tullgren 1910)	OWB	WL
Ideocaira transversa (Simon 1903)	OWB	EP
Isoxya cicatricosa (C.L. Koch 1844)	OWB	FB
Kilima sp.‡	OWB	WL
Larinia natalensis (Grasshoff 1971)	OWB	FB, IZ
Lipocrea longissima (Simon 1881)	OWB	FB, WL
Nemoscolus tubicola (Simon 1887)	OWB	WL
Neoscona rufipalpis (Lucas 1858)	OWB	WL
N. subfusca (C.L. Koch 1837)	OWB	CD, EP, FB
Paralarinia bartelsi (Lessert 1933)	OWB	FB
Prasonica sp.?	OWB	FB
Family: Caponiidae		
Caponia capensis (Purcell 1904)	GW/PWB	CD, EP, FB, WL
Family: Clubionidae		
Clubiona abbajensis (Strand 1906)	GW/PWB	EP, FB, WL
Clubiona sp. 2	PWB	EP, FB
Family: Corinnidae		
Apochinomma sp.†	GW	FB
Castianeira fulvipes (Simon 1896)	GW	CD, EP, FB
Cetonana martini (Simon 1896)	GW/PWB	EP, FB
Cetonana sp. 2†	GW	EP
Cetonana sp. 3†	GW	FB
Cetonana sp. 4†	GW	FB
Copa flavoplumosa (Simon 1885)	GW	CD, EP, FB
Fuchiba capensis (Haddad & Lyle 2008)	GW	EP, FB, WL
Fuchibotulus bicornis (Haddad & Lyle 2008)	GW	EP, FB, WL
Graptartia tropicalis (Haddad 2004)	GW	CD, EP, FB
Orthobula infima (Simon 1897)	GW	CD, EP, FB, WL
Pronophaea natalica (Simon 1897)	GW	EP
Spinotrachelas capensis (Haddad 2006)	GW	EP, FB, WL
Trachelas sp. 1†	PWF	FB
Trachelas sp. 2†	PWF	FB
Family: Ctenidae		
Thoriosa sp.‡	GW	EP, FB
Family: Ctenizidae		
Stasimopus sp.‡	GW	EP, FB
Family: Cyatholipidae		
Cyatholipus quadrimaculatus (Simon 1894)	GWB	EP
Cyatholipus sp. 2‡	GWB	EP, FB
Ulwembua denticulata (Griswold 1987)	OWB	EP
Family: Cyrtaucheniidae		
Homostola reticulata (Purcell 1902)	GW	EP
Family: Deinopidae		
Avellopsis capensis (Purcell 1904)	MOWB	EP, FB
Menneus camelus (Pocock 1902)	MOWB	EP, FB
Family: Desidae		
Desis formidabilis (O.P.-Cambridge 1890)	GW	IZ
Family: Dictynidae		
Archaeodictyna sp.	HWB	FB
Dictyna sp. 1	HWB	FB
Dictyna sp. 2	HWB	FB
Family: Eresidae		
Dresserus collinus (Pocock 1900)	SWB	EP, FB
Gandanameno spenceri (Pocock 1900)	SWB	EP, FB

APPENDIX 1 (CONT...)

FAMILY/GENUS/SPECIES	GUILDS	HABITATS
Family: Gallieniellidae		
Drassodella quinquelabecula (Tucker 1923)	GW	FB
D. vasivulva (Tucker 1923)	GW	CD, EP, FB
Family: Gnaphosidae		
Aneplasa sculpturata (Tucker 1923)	GW/PWB	EP, FB
Aphantaulax stationis (Tucker 1923)	GW	CD
Asemesthes sp. imm.	GW	CD
Camillina corrugata (Purcell 1907)	GW	EP, FB
C. pavesii (Simon 1897)	GW	EP, FB, WL
C. procurva (Purcell 1908)	GW	EP, FB
Drassodes ereptor (Purcell 1907)	GW	WL
Echeminae sp. indet.	GW	PW
Echemus sp. imm.	GW	WL
Megamyrmaekion schreineri (Tucker 1923)	GW	WL
Micaria sp.	GW	CD, FB
Poecilochroa anomala (Hewitt 1915)	GW/PWB	EP, WL
Setaphis subtilis (Simon 1897)	GW	EP
Upognampa aplanita (Tucker 1923)	GW/PWB	EP, WL
Xerophaeus capensis (Purcell 1907)	GW	FB
X. crusculus (Tucker 1923)	GW	CD, EP, FB, WL
X. phaseolus (Tucker 1923)	GW	EP, FB
Zelotes anchora (Tucker 1923)	GW	CD, EP, FB, WL
Z. capsula (Tucker 1923)	GW	EP, WL
Z. fuligineus (Purcell 1907)	GW	EP, FB, WL
Z. montanus (Purcell 1907)	GW	EP, FB
Family: Hahniidae		
Hahnia clathrata (Simon 1898)	SWB	FB
H. tabulicola (Simon 1898)	SWB	CD, EP, FB
Hahnia sp. 3‡	SWB	EP
Family: Idiopidae		
Idiopidae sp.	GW	EP
Family: Liocranidae		
Rhaeboctesis sp.	GW	FB
Family: Linyphiidae		
Callitirchia sp.	SWB	CD, FB
Ceratinopsis dippenaari (Jocqué, 1984?)	SWB	CD, FB
Linyphiidae sp. 1	SWB	FB
Linyphiidae sp. 2	SWB	FB
Linyphiidae sp. 3	SWB	FB
Linyphiidae sp. 4	SWB	FB
Mecynidis sp.†	SWB	FB
Meioneta sp.	SWB	FB
Metaleptyphantes sp.	SWB	FB
Microlinyphia sterilis (Pavesi 1883)	SWB	EP, FB
Ostearius melanopygius (O.P.-Cambridge 1879)	SWB	WL
Family: Lycosidae		
Arctosa sp.	GW	CD
Hogna sp.	GW	EP, FB, WL
Lycosa sp.	GW	EP
Pardosa sp. 1	GW	CD
Pardosa sp. 2	GW	CD
Proevippa albiventris (Simon 1898)	GW	WL
Trabea purcelli (Roewer 1951)	GW	CD, WL
T. rubriceps (Lawrence 1952)	GW	EP, FB, WL
Trochosa sp.?	GW	WL
Zenonina sp.	GW	EP, FB, WL
Family: Migidae		
Moggridgea peringueyi (Simon 1903)	PWB	EP
Family: Mimetidae		
Ero sp.	PWF	EP
Mimetus sp. 1‡	PWF	EP
Mimetus sp. 2‡	PWF	WL

TABLE CONTINUES ON THE NEXT COLUMN

APPENDIX 1 (CONT...)

FAMILY/GENUS/SPECIES	GUILDS	HABITATS
Family: Miturgidae		
Cheiramiona ansiae (Lotz 2002)	PWF	FB
Family: Nemesiidae		
Lepthercus rattrayi (Hewitt 1917)	GW	CD, EP, FB, WL
Pionothele sp.†	GW	EP
Family: Nephilidae		
Nephila fenestrata (Thorell 1859)	OWB	FB
Family: Oecobiidae		
Oecobius navus (Blackwall 1859)	PWB	CD, FB
Family: Oonopidae		
Gamasomorpha humicola (Lawrence 1947)	GW	FB
Oonopinae sp.	GW	EP, FB
Opopaea speciosa (Lawrence 1952)	GW	CD, EP, FB, WL
Family: Orsolobidae		
Afrilobus sp.†	GW	CD, EP, FB
Family: Oxyopidae		
Hamataliwa kulczynski (Lessert 1915)	PWF	EP, FB
Hamataliwa sp. 2	PWF	EP, FB
Oxyopes russoi (Caporiacco 1940?)	PWF	EP
Oxyopes sp. 2 imm.	PWF	EP
Family: Palpimanidae		
Palpimanus sp. 1	GW	EP, FB, WL
Palpimanus sp. 2	GW	EP
Family: Philodromidae		
Philodromus guineensis (Millot 1941)	GW	FB
Suemus punctatus (Lawrence 1938)	GW	CD, EP, FB, WL
Tibellus minor (Lessert 1919)	PWF	EP, FB
Family: Pholcidae		
Quamtana sp.	SpWB	CD, FB
Smeringopus sp.	SpWB	EP, FB
Family: Phyxelididae		
Lamaika sp.†	HWB	EP, FB
Vidole capensis (Pocock 1900)	HWB	EP, FB
Family: Pisauridae		
Chiasmopes sp. imm.	PWF	FB
Cispius sp.	PWF	FB
Euprosthenopsis sp. imm.	PWF	FB
Rothus purpurissatus (Simon 1898)	PWF	EP, FB
Thallassius spinossissimus (Karsch 1879)	GW	WL
Family: Prodidomidae		
Prodidomus capensis (Purcell 1904)	GW	FB
Theuma ababensis (Tucker 1923)	GW	EP
T. capensis (Purcell 1907)	GW	FB
T. schreineri (Purcell 1907?)	GW	FB
Family: Salticidae		
Asemonea sp.	PWF	EP
Baryphas ahenus (Simon, 1902)	PWF	FB
Dendryphantes purcelli (Peckham & Peckham 1903)	PWF	EP
Euophrys purcelli (Peckham & Peckham 1903)	GW	FB
Euophrys sp. 2‡	GW	EP, FB
Evarcha dotata (Peckham & Peckham 1903)	PWF	EP
Habrocestum sapiens (Peckham & Peckham 1903)	GW	FB
Habrocestum sp. 2	GW	EP
Heliophanus claviger (Simon 1901)	PW	FB
H. modicus (Peckham & Peckham 1903)	GW	EP, FB, WL
H. patellaris (Simon 1901)	GW	WL
Heliophanus sp. 4	GW/PWF	CD, IZ
Massagris regina (Wesolowska 1993)	GW	CD, EP, FB, IZ, WL
Menemerus bivittatus (Dufour 1831)	PWB	EP
Menemerus sp. 2	PWF	FB
Myrmarachne leleupi (Wanless 1978)	GW	CD, FB
Myrmarachne sp. 2	GW	FB

APPENDIX 1 (CONT...)

FAMILY/GENUS/SPECIES	GUILDS	HABITATS
Natta chionogastra (Simon 1901)	GW	EP, FB
N. horizontalis (Karsch 1879)	GW	CD, EP, FB
Pellenes geniculatus (Simon, 1868)?	GW	FB, WL
Phintella aequipes (Peckham & Peckham 1903)	GW	EP
Phlegra sp.?	GW	EP
Pignus sp.‡	GW	EP
Pseudicius africanus (Peckham & Peckham 1903)	PWB	EP
Pseudicius sp. 2	PWF	FB
Rhene sp. imm.	PWF	FB
Salticidae sp. indet. 1	PWF	FB
Salticidae sp. indet. 2	GW	CD
Thyene inflata (Gerstaecker 1873)	PWF	EP, FB
T. ogdeni (Peckham & Peckham 1903?)	PWF	EP, FB
Thyene sp. 3	PWF	FB
Thyenula sp.?	GW	EP
Family: Scytodidae		
Scytodes cedri (Purcell 1904)	GW	CD, EP, FB, WL
Scytodes sp. 2	GW	EP
Family: Segestriidae		
Ariadna sp.	TWB	FB
Family: Selenopidae		
Anyphops capensis (Lawrence 1940)	PWB	EP, FB
Anyphops sp. 2	PWB	EP, FB, WL
Family: Sicariidae		
Loxosceles spinulosa (Purcell 1904)	GW	EP, FB
Loxosceles sp.‡	GW	EP
Sicarius spatulatus (Pocock 1901)	GW	EP, FB
Family: Sparassidae		
Olios sp. 1	PWF	FB
Olios sp. 2	PWF	FB
Palystes castaneus (Latrielle 1819)	PWF	EP, FB
P. superciliosus (L. Koch 1875)	PWF	CD, EP, FB
Panaretella sp.	PWF	FB
Pseudomicrommata sp.	PWF	FB
Family: Tetragnathidae		
Leucauge festiva (Blackwall 1866)	OWB	EP, FB, WL
L. levanderi (Kulzcynski 1901)	OWB	EP, FB, WL
Tetragnatha ceylonica (O.P.-Cambridge 1869)	OWB	EP, FB
Tetragnatha sp. 2	OWB	EP
Family: Theraphosidae		
Harpactira cafreriana (Walkenaer 1837)	GW	EP, FB
Harpactirella sp.	GW	FB
Family: Theridiidae		
Achaearanea sp.	GWB	EP
Anelosimus sp. 1	GWB	FB
Anelosimus sp. 2	GWB	FB
Dipoena sp. 1	GWB	CD, EP, FB
Dipoena sp. 2	GWB	FB
Dipoenura sp.	GWB	FB
Euryopis sp. 1	GWB	FB, WL
Euryopis sp. 2	GWB	FB
Latrodectus geometricus (C.L. Koch 1841)	GWB	EP, FB
L. indistinctus (O.P.-Cambridge 1904)	GWB	EP
Pholcomma sp.?	GWB	FB
Phoroncidia capensis (Simon 1895)?	GWB	EP
Steatoda capensis (Hann 1990)	GWB	EP, FB, IZ
Theridion delicatum (O.P.-Cambridge 1904)	GWB	EP, FB
Theridion sp. 2	GWB	EP, FB
Theridion sp. 3	GWB	EP
Family: Theridiosomatidae		
Theridiosomatidae sp.	OWB	FB

APPENDIX 1 (CONT...)

FAMILY/GENUS/SPECIES	GUILDS	HABITATS
Family: Thomisidae		
Avelis hystriculus (Simon 1895)?	PWF	EP
Diaea sp.†	PWF	EP, FB
Firmicus abnormis (Lessert 1923)	PWF	EP, FB
F. bragantinus (Brito Capello 1866)	PWF	FB
Heterogriffus berlandi (Lessert 1938)	PWF	EP, FB
Heterogriffus sp. 2‡	PWF	FB
Holopelus almiae (Dippenaar-Schoeman 1986)	PWF	FB
Monaeses pustulosus (Pavesi 1895)	PWF	FB
Oxytate argenteooculata (Simon 1886)	PWF	EP, FB
Pactactes obesus (Simon 1895)	GW	CD, EP, FB, WL
Pherecydes tuberculatus (O.P.-Cambridge 1883)	PWF	FB
Pherecydes sp. 2†	PWF	EP, FB
Phrynarachne melloleitoa (Lessert 1933)	PWF	EP
P. rugosa (Latreille 1804)	GW	EP
Runcinia aethiops (Simon 1901)	PWF	EP, FB
Simorcus capensis (Simon 1895)	PWF	FB
Stiphropus sp.	GW	FB
Synema abnorme (Lessert 1923)	PWF	EP, FB
S. decens (Karsch 1878)	PWF	EP, FB
S. nigrotibiale (Lessert 1919)	PWF	EP, FB
Thomisus australis (Comellini 1957)	PWF	FB
T. stenningi (Pocock 1900)	PWF	FB
Tmarus comellinii (Garcia-Neto 1989)	PWF	EP, FB
T. foliatus (Lessert 1928)	PWF	FB
Tmarus sp. 3‡	PWF	EP, FB
Xysticus lucifugus (Lawrence 1937)	GW	EP, FB
Family: Trochanteriidae		
Platyoides leppanae (Pocock 1902)	PWB	EP
P. quinquedentatus (Purcell 1907)	PWB	EP
Family: Uloboridae		
Miagrammopes brevicaudus (O.P.-Cambridge 1882)	MOWB	EP
Uloborus sp. imm.	OWB	CD, EP, FB
Family: Zodariidae		
Caesetius globicoxis (Lawrence 1942)	GW	EP, FB
Chariobas cylindraceus (Simon 1893)?	PWF	EP, FB
Chariobas sp. 2‡	PWF	FB
Chariobas sp. 3‡	PWF	FB
Cyrioctea griswoldorum (Platnick & Jocqué 1993)	GW	EP, FB
Diores simoni (O.P.-Cambridge 1904)?	GW	CD, FB, WL
Heradida extima (Jocqué 1987)	GW	WL
Procydrela procursor (Jocqué 2000)	GW	FB
Psammorygma sp.	GW	FB
Ranops sp.?	GW	CD
Rotundrela rotunda (Jocqué 2000)	GW	EP, FB
Systenoplacis sp.‡	GW	EP, FB
Family: Zoridae		
Voraptus sp.	GW/PWF	EP, FB
Family: Zoropsidae		
Griswoldia robusta (Simon 1898)	GW	CD, EP, FB, IZ, WL
Machadoniinae sp.	GW	FB
Phanotea digitata (Griswold 1994)	GW	CD, EP, FB
ORDER: OPILIONES (HARVESTMEN)		
Family: Caddidae		
Caddella sp.†	GW	CD
Family: Phalangiidae		
Rhampsinitus vittatus (Lawrence 1931)?	GW	CD, EP, FB
Family: Triaenonychidae		
Adaeum spatulatum (Lawrence 1931)	GW	EP, FB, WL
Ceratomontia annae (Lawrence 1934)	GW	FB
C. karooensis (Lawrence 1931)	GW	FB, WL
C. minor (Lawrence 1931)	GW	FB, WL

APPENDIX 1 (CONT...)

FAMILY/GENUS/SPECIES	GUILDS	HABITATS
Larifuga granulosa (Lawrence 1931)	GW	EP, FB
Triaenonychidae sp. imm.	GW	EP
ORDER: PSEUDOSCORPIONES (FALSE SCORPIONS)		
Family: Atemnidae		
Cyclatemnus sp.	GW	IZ
Family: Cheliferidae		
Beierius simplex (Beier 1955)	GW	FB
B. walliskewi (Ellingsen 1912)	GW	FB
Hansenius sp.	GW	EP
Family: Chernetidae		
Caffrowithius biseriatus (Mahnert 1983)	GW	FB
C. natalensis (Beier 1947)	GW	FB
Pselaphochernes natalensis (Beier 1947)	GW	FB
Family: Geogarypidae		
Geogarypus purcelli (Ellingsen 1912)	GW	EP, IZ
Family: Tridenchthoniidae		
Anaulacodithella angustimana (Beier 1955)	GW	FB
ORDER: SCORPIONES (SCORPIONS)		
Family: Buthidae		
Parabuthus planicauda (Pocock 1889)	GW	CD, EP, FB
Uroplectes lineatus (C.L. Koch 1844)	GW/PWB	EP, FB, WL
Family: Liochelidae		
Opistacanthus capensis (Thorell 1877)	GW	EP, FB
Family: Scorpionidae		
Opistophthalmus macer (Thorell 1877)	GW	EP
ORDER: SOLIFUGAE (SUN-SPIDERS)		
Family: Solpugidae		
Solpugema sp. imm.	GW	FB