Salticid Spiders of Papua New Guinea

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Chapter 14

Salticid spiders of Papua New Guinea

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SUMMARY

We sampled jumping spiders (family Salticidae) from four areas in Papua New Guinea, most intensely at Wanakipa (600-1,400 m elevation, Southern Highlands Province), but also near Porgera (2,300-3,300 m, Enga Province), Mt. Gahavisuka (2,200-2,500 m, Eastern Highlands Province), and Varirata National Park (750 m, Central Province) to assess their diversity and endemicity. A conservative estimate of the total number of species found is 128, including perhaps as many as 50 species and 12 genera that are new to science.

INTRODUCTION

Jumping spiders (Salticidae) include more than 5000 described species (Platnick 2010) but many remain to be discovered, particularly in the tropics. Their excellent vision (Land 1969, Blest and Carter 1987) permits them to hunt insects by stalking and pouncing in diverse microhabitats from the ground to tree trunks and foliage, making them a major group of predators of small arthropods.

Recent phylogenetic work indicates that different continental regions contain evolutionarily distinct salticid faunas (Maddison et al. 2008). If this pattern were to hold for Australasia, we would expect New Guinea to have many endemic lineages. The salticid fauna of New Guinea is, however, little studied. As of 2008, about 180 species of salticids were reported from New Guinea (Platnick 2008), a small fraction of what might be expected to occur in a region with tropical rainforest and varied terrains.

This survey is the first attempt to sample salticids intensely at several sites in New Guinea in order to begin to build a more comprehensive view of the jumping spider fauna. The fact that in only a few weeks collecting at a few sites we were able to find more than 100 species of salticids shows that indeed the New Guinea salticid fauna is rich but poorly known.

METHODS

Sampling of salticids was done primarily by beating and visual inspection during the day. Beating involved a $1m^2$ white sheet stretched over tent poles and held beneath foliage, moss or suspended litter, which was then shaken or beaten with a stick to dislodge spiders onto the sheet. Visual inspection was used to find spiders on leaf litter and tree trunks. Occasionally, leaf litter was sampled by moving a handful of litter quickly onto the beating sheet and then brushing it carefully aside to leave spiders visible.

Identifications were based on external morphology using published literature and in some cases comparison with museum specimens. Because of the lack of adequate published descriptions, identification remains preliminary for all groups except the cocalodine salticids. The overall numbers of species is estimated roughly based on an approximate sorting to morphospecies,

with the number of new species estimated by considering the numbers of species already reported from New Guinea.

Study Sites

5-9 July 2008. Kai-ingri and Waile Creek area near Porgera, Enga Province; 3,100-3,300 m elevation is primarily a high elevation, cold and wet forest, with some alpine meadow habitats.

10, 28-29 July 2008. Suyan area, Porgera Township, Enga Province; 2,200-2,400 m.

11-27 July 2008. Wanakipa area, Southern Highlands Province. The lowest elevation site (Putuwé, ~570 m), at the junction of the Lagaip and Uruwabwa Rivers, was a lowland forest that has been periodically disturbed by slash and burn agriculture. The understory vegetation was not well developed, and the forest was relatively dry. The mid-elevation site (Tualapa, 1,100 m) was cooler, wetter and more pristine, but included a clearing that was recently farmed. The high-elevation site (Umgé, 1,400 m) was in pristine cool forest in a karst landscape with many sinkholes.

31 July - 2 August 2008. Goroka (1,650 m) and Mt. Gahavisuka (2,200-2,500 m), Eastern Highlands Province. Mt. Gahavisuka has a cool rich forest.

4 August 2008. Varirata National Park, Central Province; 740 m. Lowland/Hill rain forest.

RESULTS

Considerably more study will be needed before a detailed list of species can be given, and so (with the exception of the cocalodines) only a general overview of the salticids found will be given. Table 14.1 summarizes approximate minimum numbers of species in different genera. At least 100 species of salticids were found in the five areas, with a conservative estimate of 128 species. The most speciose group is the subfamily Euophryinae, including at least 73 species. The primarily-Australasian group Astioida includes at least 26 species, followed by the cocalodines with 9 species. The remaining 20 species belong to varied groups of salticids (heliophanines, plexippoids, and others). Almost all of the species found – probably at least 100 – are endemic to New Guinea. Exceptions would include some of the heliophanines (e.g., *Cosmophasis*) and astioids (e.g., *Mopsus*, *Helpis*, *Arasia*) from disturbed habitats.

At the most intensively sampled site (Tualapa; ~1,100 m), at least 44 species of salticids were found. We have few good records of comparable sites elsewhere, but a recent effort at the Bigal Reserve in Ecuador found at least 56 species at 900 m elevation with twice as many people collecting but for half as many days (W. Maddison, unpublished).

Euophryine salticids

Compared to faunas of salticids elsewhere in the world, the diversity of euophryines is unusually high. Although this subfamily occurs throughout the world and is common in the neotropics and Asian tropics, in no other richly diverse area does it reach the dominance in species numbers seen in New Guinea, with the possible exception of the Caribbean. Our work uncovered a surprisingly large radiation of *Zenodorus*, which we found in areas from low to high elevations and habitats from leaf litter to foliage. We found at least 16 species of *Zenodorus*, even though only 7 are reported from New Guinea (Platnick 2010). We expect to describe at least 7 new species of *Zenodorus* in the near future from the material collected on these expeditions, and this represents only a portion of our sample.

Other commonly collected euophryine genera were *Bathippus*, *Thorelliola*, *Coccorchestes*, *Cytaea*, *Euryattus,* and *Canama*. Many of these species are new to science, based on the small number of species currently known from New Guinea (for instance, we found at least 11 species of *Thorelliola*, though only 4 are reported from New Guinea). Many species of euophryines that are new to science also do not pertain to known genera; we expect to describe at least four genera new to science from this material.

COCALODINE SALTICIDS

Cocalodines, endemic to New Guinea and nearby islands, are unusual basal salticids, outside the major radiation of the family. Because of its evolutionary relationships, this group will play an important role in understanding the early evolution of the family. Before the 2008 Upper Strickland expedition, this group was known from only two genera and 14 species. The expedition revealed 6 species new to science (Maddison 2009), including the distinctive new genus *Cucudeta* (the first known leaf litter-dwelling cocalodines). Two other genera new to science were also found, the tree trunk-dwelling *Yamangalea*, and *Tabuina*. These discoveries reveal that the cocalodines are a much more diverse group, in species and in ecology, than had been understood.

Astioid salticids

The Astioida is a primarily Australasian group (Maddison et al. 2008). About nine species of *Simaetha* and similar genera (e.g. *Porius* and *Uroballus*) were found. At least two species of *Myrmarachne* were also found, representing the first record of this genus from New Guinea. *Myrmarachne* is a very large genus of ant-like jumping spiders that is both abundant and speciose (more than 200 described species) throughout Australia, Asia and Africa, but its phylogenetic relationships within the astioids are unclear. We found several species that are new to science and appear to belong to new genera related to *Myrmarachne*, some of which are only slightly ant-like. These may provide an important phylogenetic context for *Myrmarachne*, and help elucidate the steps by which their striking ant mimicry evolved.

DISCUSSION

How little we have known of New Guinea salticids is indicated by our finding that the genus *Sobasina* is a ubiquitous inhabitant of leaf litter at almost all sites sampled, and yet the genus had previously not been recorded from New Guinea. Our samples, however, merely scratch the surface. If a few weeks of sampling can find 128 species of salticids, then the previously reported number of species from New Guinea (180) is likely a severe underestimate of total salticid diversity on the island, given that many habitats and biogeographic regions were not sampled by us. An especially under-sampled habitat is lowland rainforest, which in other tropical areas typically houses the most salticid diversity. If we found so many species and yet we sampled lowland forest for only a few days in an apparently disturbed site (Putuwé) and for a single day at an apparently healthier site (Varirata), then it can be expected that much of New Guinea's lowland salticid diversity remains to be discovered.

The material sampled on this expedition will provide an important basis for understanding the phylogenetic relationships of an unusual salticid fauna. One outstanding question is, where do the strange *Diolenius* and its relatives fit within salticid phylogeny? A second question is where the New Guinea euophryines fit within their subfamily: are they an evolutionary group distinct from those of south-east Asia and the Americas, or is their evolution intertwined with that of their geographically distant relatives?

The New Guinea salticid fauna is remarkable in many ways, such as the dominance of euophryines and the presence of unique lineages such as the cocalodines, *Coccorchestes* and *Diolenius*. However, after sampling for a few weeks we are left with another strong, and unexpected, impression of the fauna: there is a striking proportion of salticids in New Guinea that appear to look like things other than salticids. A strongly antlike body form occurs in at least three separate lineages (e.g., *Myrmarachne*, *Agorius*, *Paraharmochirus*). Exquisite beetle mimics can be found in the euophryine *Coccorchestes* and the astioid *Simaethula*. Males of *Leptathamas*

Table 14.1. List of salticid spiders collected (*= new genera). Numbers are minimum first approximations; that is, as the material is better studied more species may be distinguished.

Genus	Number of species	Number of species new to science
Afraflacilla	1	?
Agorius	1	0
Allococalodes	1	1
Arasia	1	0
Bathippus/Canama	8	4
Bavia and related genera	6	?
Bianor	1	?
Bulolia	1	?
Chalcolecta	1	?
Cocalodes	3	0
Coccorchestes	4	?
Cosmophasis	2	?
*Cucudeta**	3	3
Cytaea	4	?
Diolenius	2	0
Euryattus	6	?
Gelotia?	1	?
Hasarius	1	0
Helpis	1	0
Holoplatys	1	?
Leptathamas	1	?
Mopsus	1	0
Myrmarachne	3	?
Ohilimia	1	0
Omoedus	1	?
Orthrus	1	1
Palpelius	1	?
Paraharmochirus	1	1
Philates	2	?
Phintella	1	1
Portia	1	0
Simaetha and related genera	6	?
Sobasina	4	4
*Tabuina**	2	2
Thorelliola	11	7
Uroballus and related genera	3	3
*Yamangalea**	1	1
Zenodorus	16	9
two unidentified plexippine genera	2	?
four new euophryine genera*	8	8
three new genera near *Myrmarachne**	6	6
two new Astioid genera*	2	2
unidentified astioids	3	?
unidentified genus	1	?

hold strange poses and walk in jerky fashion, appearing to be piles of debris. Other *Simaetha* and *Porius* appear as small lumps, as if beetles or debris. *Leptathamas* females, as well of those of *Bulolia*, appear to be cicadellid bugs. Then there are those with no obvious model, but which appear completely unlike a typical salticid: the long and thin *Chalcolecta* waving first legs and abdomen hypnotically, the anxious *Diolenius* and *Ohilimia* with exaggerated first legs waving jerkily, and the elongate but robust-legged *Bulolia* males posing compactly along *Pandanus* leaves. The standard salticid body form we are accustomed to elsewhere is represented, for instance in the common *Zenodorus*, but a surprisingly large fraction of salticids have strange body forms in this remarkable fauna.

CONSERVATION RECOMMENDATIONS

Of the species collected, nearly all are, as far as known, endemic to New Guinea. This points to the critical importance of this island to preserving salticid biodiversity. Within New Guinea, we know too little to make definitive conclusions about local endemism and the conservation importance of particular sites. If our samples had included more comparable localities, or if comparable localities had been studied in the literature, we could estimate spatial turnover and thus endemism.

However, a few hints about local endemism can be obtained from the cocalodines, the one group whose material has been fully studied (Wanless 1982, Maddison 2009). Of the twelve species of *Cocalodes* which are reported from elevations lower than 1,100 m, eight (*C. papuanus*, *expers*, *longicornis*, *macellus*, *thoracicus*, *longipes*, *platnicki*, and *innotabilis*) have broad distributions (Wanless 1982, Maddison 2009) while four (*C. leptopus*, *cygnatus*, *protervus*, *turgidus*) are each known only from a single site (Wanless 1982). The other cocalodines known to live in low elevation forests are *Tabuina varirata* and *T. baiteta*, each known from a single site. In contrast, all cocalodines from higher elevation are known each from a single site (*Allococalodes madidus*, *Tabuina rufa*, the three *Cucudeta* species) with the exception of *Yamangalea frewana*, which occurs near Porgera and Goroka. In *Cucudeta*, spatial turnover at a small scale is seen near Wanakipa. *Cucudeta uzet* was found at 1,450 m elevation reasonably commonly, but about two kilometers away at 1170 m elevation, *C. uzet* was not found but instead a different species, *C. zabkai* was found in what appeared to be the same microhabitat (moist but well-drained leaf litter at the base of small *Pandanus*). If *Cucudeta* species are this finely specialized to elevation or site, there could be high local endemism and many species yet to be discovered in New Guinea. However, at this point we have too little information for any clear conclusions about endemism. What we can say from our results is that the New Guinea fauna is unique and rich.

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