

The genus *Hersilia*: phylogeny and distribution in Australia and New Guinea (Arachnida, Araneae, Hersiliidae)

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Summary

Nine species of the genus *Hersilia* are known from Australia and New Guinea. Three belong to the *australiensis*-group of Baehr & Baehr (1987): *H. australiensis* Baehr & Baehr, 1987; *H. novaeguineae* Baehr & Baehr, 1993b; *H. madang* Baehr & Baehr, 1993b (and *H. pernix*, if this should turn out to be a valid species). Of these, only *H. australiensis* is found in Australia. Six species belong to the *Hersilia bifurcata*-group: *H. mimbi* Baehr & Baehr, 1993a; *H. mainae* Baehr & Baehr, 1995; *H. bifurcata* Baehr & Baehr, 1998; *H. wellswebberae* Baehr & Baehr, 1998; *H. longbottomi* Baehr & Baehr, 1998; and *H. tenuifurcata* Baehr & Baehr, 1998. The species of the *bifurcata*-group are known only from Australia. In the structure of the male palpus, the species of the *australiensis*-group are generally more plesiomorphic than those of the *bifurcata*-group. Hence, from New Guinea, only rather plesiomorphic species are recorded, whereas apomorphic species are so far only known from northern and northwestern Australia. Surprisingly, no *Hersilia* species has so far been recorded from northern Queensland.

Introduction

Until about 10 years ago, when Baehr & Baehr (1987) described *Hersilia australiensis*, the genus *Hersilia* was not known from Australia, though one species had been recorded from New Guinea (*H. pernix* Kulczyński, 1911). In the meantime, additional species were described from northern and northwestern Australia (*H. mimbi* Baehr & Baehr, 1993a and *H. mainae* Baehr & Baehr, 1995), and at present four additional species from the same areas are in the process of description. Two additional species were also recently described from New Guinea (*H. novaeguineae* Baehr & Baehr, 1993b and *H. madang* Baehr & Baehr, 1993b). These species, with *H. australiensis*, form the *australiensis* species-group, and *H. mimbi*, *H. mainae* and the four new species mentioned above form the *bifurcata*-group.

Phylogenetic approach

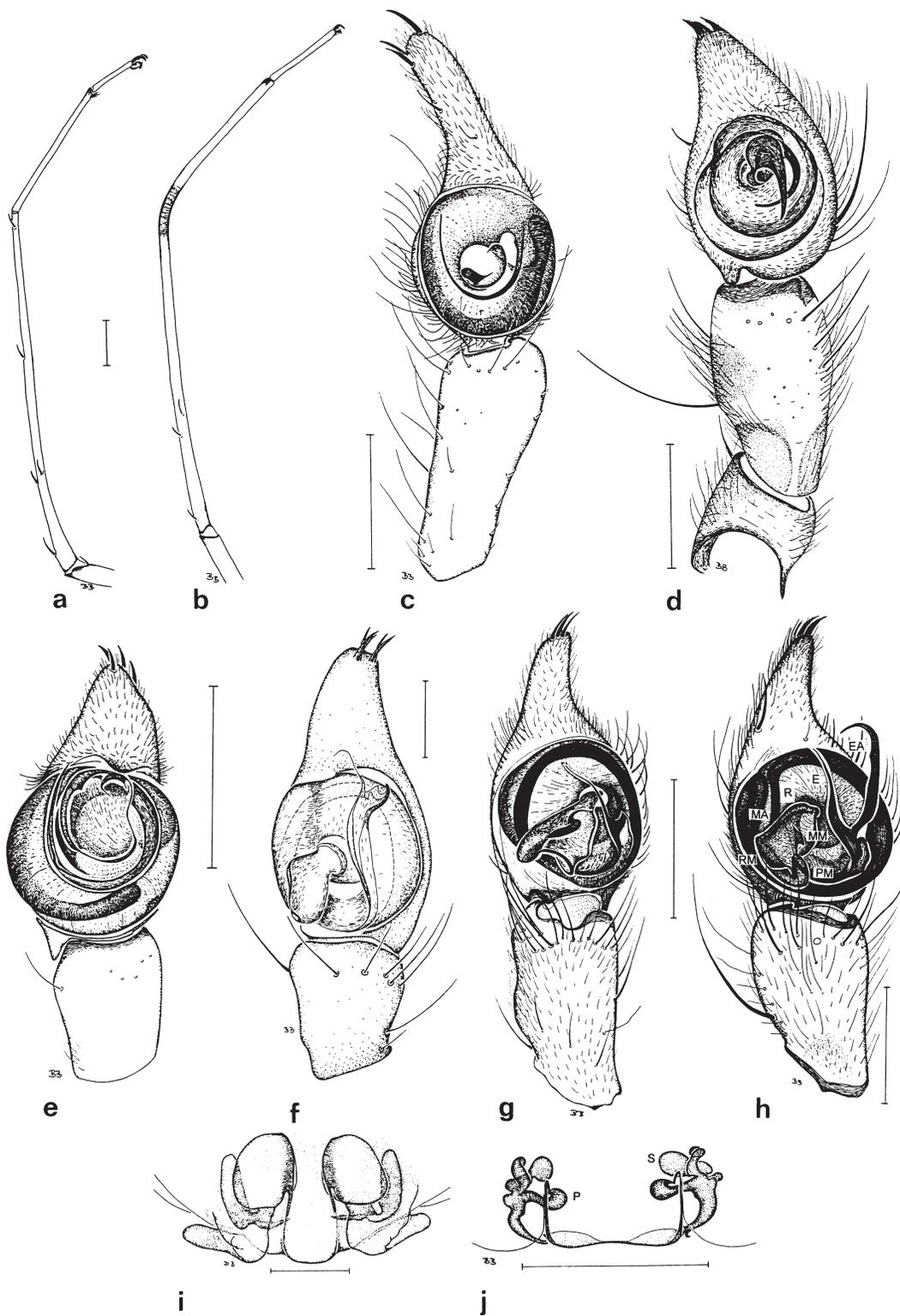
For a phylogenetic approach the classical cladistic method of Hennig (1966, 1981) was

chosen for several reasons that need not be discussed in this paper. For tracking biogeographic history the progression rule of Hennig (1981) was followed: it postulates that derived taxa should have evolved at the margins of the common range, when the origin of new taxa by vicariance is proposed, whereas primitive taxa should persist in the centre of the range. Nevertheless, this rule is also applicable when migration was involved in the process of range spreading.

Phylogenetic relations of and within Hersiliidae

Postulates for phylogenetic relations of the family Hersiliidae, of some genera, and of certain species-groups of the genus *Hersilia* are supported by the following apparent synapomorphic character states:

- The family Hersiliidae itself is characterized by the generally very long legs I, II, IV and, in particular, by markedly elongate posterior lateral spinnerets.



- The genus *Hersilia* is characterized by a two-segmented metatarsus (Fig. 1a).

- The adelphotaxon of *Hersilia* is presumably the genus *Neotama*, which shares the elongate and flexible metatarsus with *Hersilia*, but in *Neotama* the metatarsus is not divided, but has a small flexible zone (Fig. 1b). *Neotama* is also used as the outgroup for polarization of characters within the genus *Hersilia*.

- Both *Neotama* and *Hersilia* share in primitive species the hook-shaped median tegular apophysis and the circular-acute apex of the embolus in the male palpus (Fig. 1c–d). Therefore, these character states presumably belong to the ground-plan of the genus *Hersilia*.

- Of the named species-groups of the genus *Hersilia* (Baehr & Baehr, 1993b) the *caudata*-group is presumably the most plesiomorphic, because it has retained the ground-plan character states of the male palpus mentioned above. The *caudata*-group ranges over large parts of Africa (several species described by Benoit, 1967) and western Asia (*H. caudata*).

- According to the presence of a hollowed median tegular apophysis, eight species-groups within the genus *Hersilia* presumably form a monophyletic unit (Baehr & Baehr, 1993b), viz. *albomaculata*-, *asiatica*-, *savignyi*-, *flagellifera*-, *pectinata*-, *impressifrons*-, *australiensis*-, and *bifurcata*-groups, of which the *albomaculata*-group has retained many plesiomorphic character states (Fig. 1e). The position of the other Asiatic groups is not discussed in this paper.

- The *australiensis*- and *bifurcata*-groups form a monophyletic unit according to the apically widened and incised embolus (Fig. 1f).

- Synapomorphies of the *australiensis*-group are: very high eye mound with concave lateral border; very large spermathecae; very large scapus that is laterally markedly deeply separated from the lateral plates (Fig. 1i). The small spermathecae and the absence of the lateral plates in the *bifurcata*-group is obviously the more plesiomorphic state (Fig. 1j).

- Synapomorphies of the *bifurcata*-group are: deeply bifurcate embolus; median tegular apophysis hollowed and with several sharp ridges and folds (Fig. 1g–h). Certainly, the complex structure of embolus and median tegular apophysis in the *bifurcata*-group render it the more highly evolved group (at least in male palpal morphology) as compared with the rather simple condition in the *australiensis*-group. However, within the *bifurcata*-group some evolution of the palpal structure occurred, as is demonstrated by the rather simple configuration in *H. mimbi* (Fig. 1g).

Distribution and postulated biogeographic history

Baehr & Baehr (1993b) gave some support to the idea that the genus *Hersilia*, and perhaps Hersiliidae altogether, originated in (eastern) Africa, where at present the (supposedly) most primitive species persist, namely those of the *caudata*-group. From that region, still-primitive stocks of *Hersilia* could have reached western Asia, but evolution worth mentioning and taxonomic radiation within the genus took place only in tropical Asia, where several very differently structured species-groups evolved. The Australian-Papuan region must have been colonized from stocks of Asiatic origin that reached New Guinea and/or Australia either by drifting or by migration.

Figure 2 shows the distribution of the species of the *australiensis*- and *bifurcata*-groups. No species of the latter group has yet been recorded from New Guinea. This absence and the phylogenetic relations point to the origin of the *bifurcata*-group in Australia. Actually, it is possible that this group might have evolved from an ancestor showing much of the structure of the *australiensis*-group. The *australiensis*-group itself could have evolved in New Guinea, or an ancestral stock could have entered this island

Fig. 1: **a–b** Structure of the metatarsus, right leg I: **a** *Hersilia pectinata* Thorell; **b** *Neotama longimana* Baehr & Baehr. **c–h** Right male palpus, ventral view: **c** *Neotama variata* (Pocock); **d** *Hersilia caudata* Audouin; **e** *Hersilia albomaculata* Wang & Yin; **f** *Hersilia australiensis* Baehr & Baehr; **g** *Hersilia mimbi* Baehr & Baehr; **h** *Hersilia bifurcata*-group, sp. nov. 4. **i–j** Vulva, ventral view: **i** *Hersilia australiensis* Baehr & Baehr; **j** *Hersilia mimbi* Baehr & Baehr. E = embolus, EA = embolar apophysis, MA = median tegular apophysis, MM = median margin, P = pocket, PM = prolateral margin, R = ridge, RM = retrolateral margin, S = spermatheca. Scale lines = 0.5 mm.

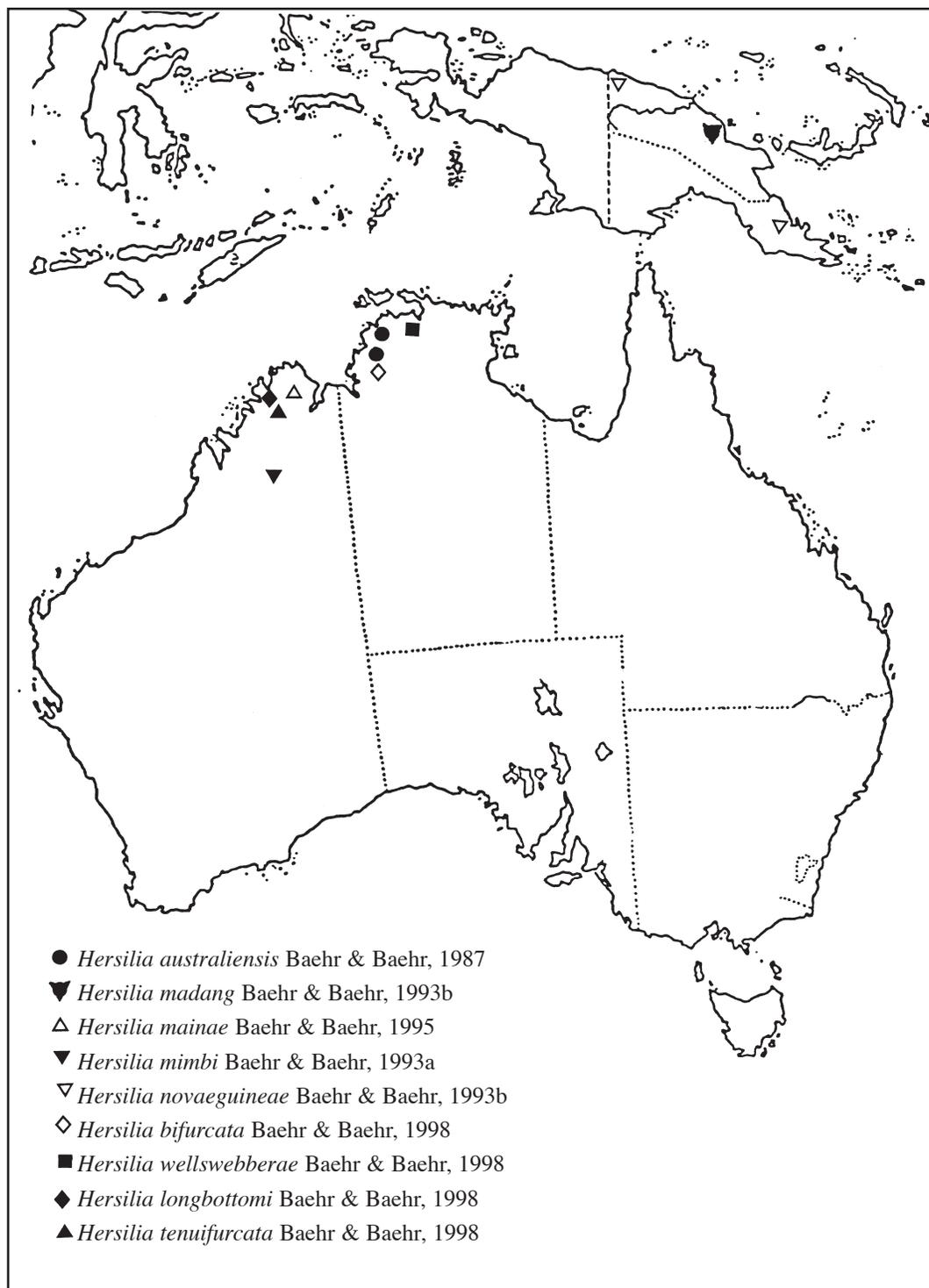


Fig. 2: Distribution of the species of the *australiensis*- and *bifurcata*-groups.

from anywhere in the Oriental region. However, which is the true scenario has yet to be settled.

The six species of the *bifurcata*-group are distributed in the northernmost parts of Northern Territory and Western Australia but, as yet, no *Hersilia* species has been recorded from (like-wise tropical) northern Queensland. Three explanations for this apparent absence are possible:

1. Species of *Hersilia* occur in north Queensland but have not yet been recorded there owing to unsatisfactory exploration.

2. The genus *Hersilia* formerly occurred in north Queensland, but has died out.

3. The genus *Hersilia* never existed in north Queensland.

The first and second explanations would imply immigration of the genus *Hersilia* into Australia via north Queensland (Cape York Peninsula), like the majority of Oriental faunal elements present in Australia. However, why the original stocks would have died out in northern Queensland would need explaining, if the second scenario is chosen.

In the third scenario, immigration via New Guinea would be excluded, or at least would be highly improbable, in favour of direct immigration into Northern Territory or northernmost Western Australia via the Timor Sea during dry interpluvials in Pleistocene, when the gap between north Australia and the Lesser Sunda Islands was considerably (almost two-thirds) narrower than it is today. However, the occurrence of species of the *australiensis*-group in New Guinea, but their apparent absence in Timor or any of the neighbouring islands, would not be explained by this scenario.

In conclusion, present knowledge of distribution of the Australian–Papuan *Hersilia* is as yet rather limited and apparently indicates a rather enigmatic biogeographic history of this genus. However, it may change considerably when additional material is sampled.

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References

- BAEHR, B. & BAEHR, M. 1987: The Australian Hersiliidae (Arachnida: Araneae): taxonomy, phylogeny, zoogeography. *Invertebr. Taxon.* **1**: 351–437.
- BAEHR, B. & BAEHR, M. 1993a: Further new species and new records of Hersiliidae from Australia, with an updated key to all Australian species (Arachnida, Araneae, Hersiliidae). Fourth supplement to the revision of the Australian Hersiliidae. *Rec. West. Aust. Mus.* **16**: 347–391.
- BAEHR, B. & BAEHR, M. 1995: New species and new records of Hersiliidae from Australia (Arachnida, Araneae, Hersiliidae). Fifth supplement to the revision of the Australian Hersiliidae. *Rec. West. Aust. Mus., Suppl.* **52**: 107–118.
- BAEHR, B. & BAEHR, M. 1998: New species and new records of Hersiliidae from Australia (Arachnida, Araneae, Hersiliidae). Sixth supplement to the revision of the Australian Hersiliidae. *Rec. West. Aust. Mus.* **19**: 13–38.
- BAEHR, M. & BAEHR, B. 1993b: The Hersiliidae of the Oriental region including New Guinea. Taxonomy, phylogeny, zoogeography (Arachnida, Araneae). *Spixiana (Suppl.)* **19**: 1–96.
- BENOIT, P. L. G. 1967: Révision des espèces africaines du genre *Hersilia* Sav. et Aud. *Rev. Zool. Bot. afr.* **76**: 1–36.
- HENNIG, W. 1966: *Phylogenetic systematics*. Urbana: University of Illinois Press.
- HENNIG, W. 1981: *Insect phylogeny*. Chichester and New York: John Wiley & Sons.
- KULCZYŃSKI, W. 1911: Spinnen aus Nord-Neu-Guinea. *Res. Scient. Exped. Wichmann Nova Guinea* **5** (Zool. 3): 423–518.