

## Reassignment of the Indian species of *Zygoballus* to *Bianor* and *Rhene* (Araneae: Salticidae)<sup>1</sup>

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### Introduction

Prior to the molecular phylogenetic studies done in the last decade (Maddison and Hedin 2003, Maddison *et al.* 2008), it was common to populate individual salticid genera with both Old and New World species based on similarities in body form or other superficial characters. It is now understood that the evolutionary radiation of most salticid clades was restricted by the continental boundaries established following the break-up of Pangaea (Maddison and Hedin 2003, Hill and Richman 2009). Thus, closely allied salticid clades tend to be restricted to either the eastern or western hemisphere. In the case of *Zygoballus* Peckham & Peckham 1885, which is endemic to North and South America, three species from India were placed in the genus due to somatic similarities with previously described western species. These Indian species were almost certainly misclassified, however.

Recently, Prószyński (2000) tentatively transferred two of the species to the genus *Modunda* Simon 1901, and suggested that the third species may belong to either *Bianor* Peckham & Peckham 1885 or *Modunda*. *Bianor* and *Modunda* belong to a clade of Old World genera known as the Harmochireae. The Harmochireae exhibit several superficial similarities to *Zygoballus*, including similar body size, enlarged legs I, and modified male chelicerae in some genera (Logunov 2000, 2009).

Of the seven genera of Harmochireae, four are known from Southern Asia: *Bianor*, *Modunda*, *Harmochirus* Simon 1885, and *Sibianor* Logunov 2000 (Logunov 2009). I have compared the typical characters of these four genera with the described characters of the three Indian “*Zygoballus*” species. As a result of this comparison, I have determined that *Z. pashanensis* and *Z. narmadaensis* should be transferred to *Bianor* rather than *Modunda*. The third species, *Z. citri*, does not conform with any genus of the Harmochireae and appears to belong to the dendryphantine genus *Rhene* Thorell 1869.

It should be noted that due to difficulties in obtaining specimen loans from India (Prathapan 2008), I have not examined any of the type specimens for the three species. All of my comparisons are based solely on written descriptions and figures.

#### *Bianor pashanensis* (Tikader, 1975) **new combination**

*Zygoballus pashanensis* Tikader, 1975: 151, figures 1–4 (female).

*Modunda pashanensis* Prószyński, 2000–2006 (tentative transfer from *Zygoballus*).\*

This species was originally described by the Indian arachnologist, B. K. Tikader, as *Zygoballus pashanensis*. He described the species from a single female specimen collected in Pashan, Maharashtra, India. Prószyński (2000) tentatively transferred the species to *Modunda*, although he stated that it “may be also *Bianor*.”

This species appears to be a better fit for *Bianor* than *Modunda* (Table 1). Firstly, the body is significantly

larger than the two valid *Modunda* species (*M. aeneiceps* and *M. staintoni*). In particular, the length and width of the cephalothorax (2.30 mm, 2.00 mm) are far larger than those of the aforementioned species (Logunov 2000: figs 345, 352). Secondly, the shape of the body is inconsistent with *Modunda*. The cephalothorax is high (CH/CL ratio  $\sim 0.5$ ) rather than low, and the abdomen is round/oval rather than elongated. Thirdly, the PME are closer to the ALE than the PLE, rather than being midway between the two as in *Modunda*.

Table 1: Compatibility of *Z. pashanensis* with four genera of Harmochireae (based on Logunov 2000, Table 1). In this and in subsequent tables, most compatible characters are highlighted in green, least compatible in pink.

	<i>Bianor</i>	<i>Harmochirus</i>	<i>Sibianor</i>	<i>Modunda</i>
Body size	3.3–6.4 mm	2.5–4.3 mm	2.4–4.7 mm	3.5–4.6 mm
Retromarginal tooth	unidentate	fissidentate/unidentate	unidentate	unidentate
Carapace ratio (CH/CL)	high ( $\geq 0.40$ )	high ( $\geq 0.40$ )	high ( $\geq 0.40$ )	low ( $\leq 0.35$ )
Position of PME	slightly closer to ALE	midway between ALE and PLE	midway between ALE and PLE	midway between ALE and PLE
Tibia I	normal	swollen	thickened	thickened
Longest leg	leg I in both sexes	leg I in both sexes	leg I in ♂, leg III/IV in ♀	leg I in both sexes
Abdomen	oval/elongated	oval/rounded	oval	elongated

The relatively narrow tibiae I of this species eliminates *Harmochirus* from consideration. The large size of the body (5.10 mm in length) disfavors all the genera of Harmochireae other than *Bianor*. *Sibianor* is eliminated by the position of the PME and the fact that legs I are longest in the female (rather than legs III or IV). This leaves only *Bianor* with no conflicting characters. Thus I propose that the species be placed in *Bianor*.

As this species has only a minimal description of the female and no description of the male, it should be considered a *species inquirenda*.

\* Prószyński's catalog actually lists the species as "*pashanensis* Tikader, 1975 = *Modunda narmadaensis*." Prószyński (pers. comm.) clarified that this was an error in listing the transfer rather than an attempt to synonymize *pashanensis* with *narmadaensis*.

### *Bianor narmadaensis* (Tikader, 1975) **new combination**

*Zygoballus narmadaensis* Tikader, 1975: 151–152, figures 5–8 (female).

*Modunda narmadaensis* Prószyński, 2000–2006 (tentative transfer from *Zygoballus*).

This species was originally described by Tikader as *Zygoballus narmadaensis*. He described the species from 4 female specimens collected along the bank of the Narmada river near Jabalpur, Madhya Pradesh, India. Prószyński (2000) tentatively transferred the species to *Modunda*, although he stated that it "may be also *Bianor*."

Morphologically, this species is similar to *B. pashanensis*, but exhibits the following differences: the body is significantly smaller (3.50 mm in length), the abdomen is more elongated (although still oval in shape), legs IV are longest rather than legs I, and the epigynum is structurally different (Tikader 1975).

This species is slightly more difficult to place (Table 2). The longer legs IV suggest *Sibianor*, although the proximity of the PME to the ALE suggests *Bianor*. The shape of the body and height of the cephalothorax (CH/CL ratio  $\sim 0.5$ ) exclude *Modunda*, while the shape of the tibiae I excludes *Harmochirus* and disfavors *Sibianor* and *Modunda*. This species seems to be a good fit for *Bianor* with the exception of the legs IV being longest in the female. Having legs I longest in both sexes is not a universal character in *Bianor*, however. The female *B. albobimaculatus*, for example, has longer legs IV. Thus, I believe that this

inconsistency is not a compelling reason to exclude it from the genus, and I propose that the species be placed in *Bianor*.

Table 2: Compatibility of *Z. narmadaensis* with four genera of Harmochireae (based on Logunov 2000, Table 1).

	<i>Bianor</i>	<i>Harmochirus</i>	<i>Sibianor</i>	<i>Modunda</i>
Body size	3.3–6.4 mm	2.5–4.3 mm	2.4–4.7 mm	3.5–4.6 mm
Retromarginal tooth	unidentate	fissidentate/unidentate	unidentate	unidentate
Carapace ratio (CH/CL)	high ( $\geq 0.40$ )	high ( $\geq 0.40$ )	high ( $\geq 0.40$ )	low ( $\leq 0.35$ )
Position of PME	slightly closer to ALE	midway between ALE and PLE	midway between ALE and PLE	midway between ALE and PLE
Tibia I	normal	swollen	thickened	thickened
Longest leg	leg I in both sexes	leg I in both sexes	leg I in ♂, leg III/IV in ♀	leg I in both sexes
Abdomen	oval/elongated	oval/rounded	oval	elongated

As this species has only a minimal description of the female and no description of the male, it should be considered a *species inquirenda*.

### *Rhene citri* (Sadana, 1991) **new combination**

*Zygoballus citri* Sadana, 1991: 73–75, figures 1–6 (female and male).

*Zygoballus citri* Prószyński, 2000–2006.

This species was originally described by the Indian arachnologist, G. L. Sadana, as *Zygoballus citri*. He described the species from 5 female and 3 male specimens collected from a citrus orchard near Ludhiana, Punjab, India. Prószyński (2000) left the species in *Zygoballus*, but commented that it was an “apparent misclassification... possibly *Bianor* or *Modunda*.” It does not appear that this species belongs with the genera of Harmochireae, however, as the male palpal organ exhibits a bifurcated terminal apophysis, while none of the Harmochireae are known to have terminal apophyses. Several somatic characters also exclude this species from the Harmochireae (Table 3).

Table 3: Compatibility of *Z. citri* with four genera of Harmochireae (based on Logunov 2000, Table 1).

	<i>Bianor</i>	<i>Harmochirus</i>	<i>Sibianor</i>	<i>Modunda</i>
Body size	3.3–6.4 mm	2.5–4.3 mm	2.4–4.7 mm	3.5–4.6 mm
Male chelicerae	modified	not modified	not modified	modified
Retromarginal tooth	unidentate	fissidentate/unidentate	unidentate	unidentate
Position of PME	slightly closer to ALE	midway between ALE and PLE	midway between ALE and PLE	midway between ALE and PLE
Longest leg	leg I in both sexes	leg I in both sexes	leg I in ♂, leg III/IV in ♀	leg I in both sexes
Abdomen	oval/elongated	oval/rounded	oval	elongated
Terminal apophysis	absent	absent	absent	absent

This species appears to belong to the genus *Rhene* (originally proposed by Maddison, pers. comm.). Characters exhibited by this species that are typical of *Rhene* include: predominantly brown coloration, male pedipalp with bifurcated terminal apophysis, enlarged legs I with dense covering of hairs on ventral surface, male chelicerae with prominent notch on inner side, carapace wider than long; top of carapace flat and trapezoidal in shape, leg formula 1–4–2–3, eye field occupying more than half the length of carapace, PME much closer to ALE than PLE, epigynum with simple openings (Murphy and Murphy 2000, Jastrzębski 1997, Prószyński 2006). In addition, the total body length (6.25–6.80 mm) is within the range given by Jastrzębski (1997) for *Rhene*.

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