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Volker W. Framenau

James W. Berry  
*Butler University*, jwberry@butler.edu

Joseph A. Beatty

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Author(s): Volker W. Framenau, James W. Berry, and Joseph A. Beatty
Published By: American Arachnological Society
DOI: http://dx.doi.org/10.1636/A08-54.1
URL: http://www.bioone.org/doi/full/10.1636/A08-54.1
Wolf spiders of the Pacific region: the genus Zoica (Araneae, Lycosidae)

Volker W. Framenau: Department of Terrestrial Zoology, Western Australian Museum, Welshpool D.C., Western Australia 6986, Australia; School of Animal Biology, University of Western Australia, Crawley, Western Australia 6009, Australia. E-mail: volker.framenau@museum.wa.gov.au

James W. Berry: Department of Biological Sciences, Butler University, Indianapolis, Indiana 46208, USA

Joseph A. Beatty: Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901-6501, USA

Abstract. The wolf spider genus Zoica Simon 1898 is currently known only from the Indo-Australasian region, including India in the west to northern Western Australia and Papua New Guinea in the east. Here we extend the known distribution of the genus into the Pacific region by describing two new species, Z. carolinensis new species from the Caroline Islands, Federated States of Micronesia, and Z. pacifica new species from the Republic of the Marshall Islands.

Keywords: Zoicinae, taxonomy, Marshall Islands, Caroline Islands, Micronesia

Our knowledge of the wolf spider fauna of the Pacific is only fragmentary. The fauna of New Caledonia and Vanuatu (e.g., Berland 1924, 1938) and Hawaii (Karch 1880; Simon 1899, 1900; Gertsch 1973) have received some attention, although most species were described in the late 1800s to early 1900s. Modern taxonomic descriptions that allow accurate species identifications do not exist and, in most cases, identification of species is impossible without recourse to type material. In addition, generic classification of most Pacific wolf spider species does not follow phylogenetic guidelines but is based on perceived similarities of species with genera originally described from the Northern Hemisphere, mainly Europe, where most arachnologists were then based.

The Pacific islands wolf spider fauna currently includes representatives of three subfamilies (cf. Dondale 1986; Murphy et al. 2006). The Lycosinae Sundevall 1833, which include genera such as Lycosa Laterille 1804, Hogna Simon 1885, Adelocosa Gertsch 1973 and Venatrix Roewer 1960, dominate the wolf spider fauna of the Pacific islands both in diversity and local abundance (e.g., Simon 1899, 1900; Framenau 2006, unpublished data); however, many Pacific lycosines are clearly misplaced at the genus level. The Artoriinae Framenau 2007 are represented by Artoria Thorell 1877, Lycosella Thorell 1890, and Syrolooma Simon 1900 and are currently reported from New Caledonia, Vanuatu, Hawaii, Samoa, and French Polynesia (e.g., Simon 1900; Berland 1929, 1934; Framenau 2007). Two species of Venonia Thorell 1894 in the subfamily Venoniinae Lehtinen & Hippa 1979 have been reported from Palau (Yoo & Framenau 2006). It appears that the lycosid fauna of the Pacific has strong affinities with Australia and Southeast Asia as, for example, Venoniinae and Artoriinae do not occur in the Americas to the east.

The wolf spider subfamily Zoicinae Lehtinen & Hippa 1979 has so far not been reported from the Pacific. Dondale (1986) synonymized this subfamily with the Venoniinae; however, this synonymy was rejected & the subfamily revalidated in a recent revision of Venonia (Yoo & Framenau 2006). Zoicinae include five genera from the Indo-Australasian region: Zoica Simon 1898, Lysania Thorell 1890, Zantheres Thorell 1887, Margonia Hippa & Lehtinen 1983, and Shapna Hippa & Lehtinen 1983 (Hippa & Lehtinen 1983; Yoo & Framenau 2006). Lehtinen & Hippa (1979; p. 2, table 1) proposed a number of diagnostic characters for the Zoicinae, two of which, regarding the male pedipalp, clearly represent synapomorphies for the subfamily: the lack of a median (= tegular) apophysis and the distal origin of the embolus.

With a body length of generally not more than 2.5 mm, members of the genus Zoica are amongst the smallest of all wolf spiders. The genus, with Z. parvula (Thorell 1895) as type species, was established by Simon (1898) replacing Zobia Thorell 1895, preoccupied by Zobia Saalmueller 1891, a butterfly genus. Zoica was revised by Lehtinen & Hippa (1979) who reported six species from India and Sri Lanka in the West, throughout Southeast Asia (Myanmar, Malaysia, Thailand, Indonesia) including Papua New Guinea to the east. More recently, a single species of Zoica was described from Bhuatan (Buchar 1997). The genus also occurs in northern Western Australia and the tropical parts of the Northern Territory and Queensland (Australia) (McKay 1979; Platnick 2008; VWF unpublished data).

This study reports the subfamily Zoicinae for the first time from the Pacific region by describing two new species of Zoica from the Federated States of Micronesia and the Republic of the Marshall Islands (see Fig. 13).

METHODS

A large collection of spiders ("BB" collection, presently housed at Southern Illinois University, Carbondale, Illinois, USA) was made by J.W. Berry, E.R. Berry, and J.A. Beatty in a series of collecting trips into the Pacific region: Marshall Islands (1968, three months; 1969, 3 mo); Palau (1973, 6 mo); Guam, Yap, Truk (= Chuuk), Ponape (= Pohnpei), Taiwan (1973, 1–2 wk each); Yap (1980, 6 mo); Marquesas Islands, Tuamotu, Society, Cook and Fiji Islands (1987 & 2004, 6 mo in total); Cook Islands (2002, 6 wk); and the Hawaiian islands (1995, 1997 & 1998, 3 mo in total). The collections reported herein are from the 1973 trip to the Caroline Islands, and 1968, 1969, and 1980 visits to the Marshall Islands. Spiders were generally hand collected.

Descriptions are based on specimens preserved in 70% ethanol. Female epigyna were prepared for examination by submersion in 10% KOH for 10 min. For clarity, the
illustrations of male pedipalps and female epigyna omit setae. The morphological nomenclature follows Lehtinen & Hippa (1979), Hippa & Lehtinen (1983) and Yoo & Framenau (2006). Lehtinen & Hippa (1979) introduced the term “truncus” in the Lycosidae for a sclerite of the male pedipalp that originates basally between the subtégulum and the tegulum in replacement of Kronestedt’s (1975) “terminal part” erroneously termed “terminal apophysis” in Lehtinen & Hippa (1979; p. 3). Consequently, they also called the distinct lateral apophysis originating at the truncus, “lateral truncal apophysis” but replaced this term later (Hippa & Lehtinen 1983) with “lateral apophysis” as this structure is referred to here (see Figs. 5, 9). The term “truncus” for the apical section of the male bulb has not been used in the lycosid morphology since Lehtinen & Hippa’s (1979) and Hippa & Lehtinen’s (1983) initial studies and was referred to as “embolic division” in Yoo & Framenau (2006). All measurements are given in millimeters (mm).

Images were taken with a Leica DFC500 digital camera that was attached to a Leica MZ16A stereomicroscope. Photographs were taken in different focal planes (ca. 10–15 images) and combined with the Leica Application Suite version 2.5.0R1.

Abbreviations.—Collections: BB, Berry-Beatty collection, presently at Southern Illinois University; BPBM, Bernice P. Bishop Museum, Honolulu (Hawai’i); WAM, Western Australian Museum (Perth). Morphology: AE (AME, ALE), anterior (median, lateral) eyes; AL (AW), abdomen length (width); CL (CW), carapace length (width); PE (PME, PLE), posterior (median, lateral) eyes; TL, total length.

SYSTEMATICS

Family Lycosidae Sundevall 1833
Subfamily Zoicinae Lehtinen & Hippa 1979
Zoica Simon 1898
Zobia Thorell 1895:53–54 (preoccupied by the butterfly genus Zobia Saalmüller 1891).
Zoica Simon 1898:248 (replacement name for Zobia Thorell 1895).

Type species.—Zobia parvula Thorell 1895, by original designation (Thorell 1895).

Diagnosis.—Within the Zoicinae, Zoica is most closely related to Lysania, based on the overall structure of the male pedipalp and absence of glistening setae on the abdomen (present in all other genera of the subfamily) (Hippa & Lehtinen 1983). However, Zoica is generally smaller, (TL 1.5–2.3) than Lysania (TL 2.2–3.0), although sizes may overlap.

The cephalic area of Zoica is gently sloping laterally, whereas it is steep in Lysania (and in all other genera of the Zoicinae). Lysania show distinct color patterns of white anterolateral abdominal bands and light annulations of the legs, whereas members of Zoica are uniformly yellow-brown to brown. In addition, Lysania build horizontal, sheet-like webs, whereas Zoica are vagrant (Lehtinen & Hippa 1979).

Description.—Minute to small spiders (TL 1.5–2.3); uniformly yellow-brown with gray pigmentation, centrally somewhat lighter, black around eyes (Fig. 1). Eyes: row of AE as wide as row of PME; row of AE very slightly procurred. Sternum: yellow, with some gray pigmentation marginally; brown macrosetae mainly marginally. Labium: yellow-brown. Chelicerae: yellow-brown with indistinct gray pigmentation, basally slightly darker; few whitish setae. Pedipalp (Figs. 5, 6): lateral apophysis tapering and bent dorsally at tip; embolus covered by terminal apophysis both of which are behind median tegular lobe (Fig. 5). Abdomen: yellow-brown with dense olive-gray pigmentation (Fig. 1); venter yellow. Legs: leg formula IV > I > II > III; uniformly yellow; spination of leg I: femur: 2 dorsal (only I on right leg), 1 apicoprolateral; tibia: 2 ventral pairs; metatarsus: 3 ventral pairs.

Female (based on paratype): In all details like male (Fig. 2), except row of AE straight. Epigynum (Figs. 7, 8): ventral view:

_**Zoica carolinensis**_ new species
(Figs. 1, 2, 5–8, 13)

Types.—Holotype male, Federated States of Micronesia, Caroline Islands, Ponape (= Pohnpei), E of Kolonia, 6°57′00″S, 158°12′30″E, 7 June 1973 J.A. Beatty, J.W. Berry (BPBM); paratype female, data as holotype (BPBM).

Other material examined.—FEDERATED STATES OF MICRONESIA: Caroline Islands: 1 female, Pohnpei, E of Kolonia, 6°57′N, 158°15′E, 7 June 1973; 2 males, 9 females, 2 females with egg sac, 5 juveniles, Pohnpei, Sokehs Island, 6°57′N, 158°11′E, 8 June 1973, J.A. Beatty, J.W. Berry (BB); 1 male, 3 females, same data (WAM T80644).

Diagnosis.—Zoica carolinensis is similar to *Z. wauensis* Lehtinen & Hippa 1979 from Papua New Guinea as illustrated in Lehtinen & Hippa (1979), in particular in regard to the structure of the male pedipalp. However, the basal part of the embolus is more exposed in *Z. wauensis* and the median tegular lobe is narrower and longer than that in *Z. carolinensis*. Both species differ considerably in the shape of the female epigynum, which is highly prominent in *Z. wauensis* (see Lehtinen & Hippa 1979), but is flat in *Z. carolinensis*. Unfortunately, we were not able to compare specimens of both species as material of *Z. wauensis*, including the type material, could not be located in the Zoological Museum, University of Turku, Finland, where it is supposed to be housed (S. Kopponen, personal communication to VWF). Zoica carolinensis differs from *Z. pacifica*, the second species described here, by the presence of a median tegular lobe in the male pedipalp (absent in *Z. pacifica*) and the lack of a posterior lip of the epigynum (present in *Z. pacifica*).

Description.—Male (based on holotype): Carapace: dorsal profile straight in lateral view; uniformly yellow-brown with gray pigmentation, centrally somewhat lighter, black around eyes (Fig. 1). Eyes: row of AE as wide as row of PME; row of AE very slightly procurred. Sternum: yellow, with some gray pigmentation marginally; brown macrosetae mainly marginally. Labium: yellow-brown. Chelicerae: yellow-brown with indistinct gray pigmentation, basally slightly darker; few whitish setae. Pedipalp (Figs. 5, 6): lateral apophysis tapering and bent dorsally at tip; embolus covered by terminal apophysis both of which are behind median tegular lobe (Fig. 5). Abdomen: yellow-brown with dense olive-gray pigmentation (Fig. 1); venter yellow. Legs: leg formula IV > I > II > III; uniformly yellow; spination of leg I: femur: 2 dorsal (only I on right leg), 1 apicoprolateral; tibia: 2 ventral pairs; metatarsus: 3 ventral pairs.

Female (based on paratype): In all details like male (Fig. 2), except row of AE straight. Epigynum (Figs. 7, 8): ventral view:
weakly sclerotized with narrow posterior openings (Fig. 7); dorsal view: fertilization ducts form slightly bent tubes (Fig. 8).

**Measurements:** Male holotype (female paratype): TL 1.63 (1.77), CL 0.90 (0.92), CW 0.65 (0.65). Eyes: AME 0.02 (0.03), ALE 0.03 (0.04), PME 0.06 (0.08), PLE 0.06 (0.06). Row of eyes: AE 0.15 (0.17), PME 0.14 (0.17), PLE 0.24 (0.26). Sternum (length/width) 0.54/0.42 (0.46/0.44). Labium (length/width) 0.10/0.12 (0.15/0.10). AL 0.79 (0.81), AW 0.73 (0.63).

Legs: lengths of segments (femur, patella/tibia, metatarsus, tarsus = total length): Pedipalp 0.38, 0.31, - , 0.36 = 1.06; leg I 0.63, 0.77, 0.48, 0.36 = 2.25; leg II 0.60, 0.67, 0.44, 0.35 = 2.05; leg III 0.56, 0.60, 0.48, 0.33 = 1.96; leg IV 0.77, 0.90, 0.73, 0.40 = 2.80 (Pedipalp 0.31, 0.38, - , 0.32 = 1.01; leg I 0.69, 0.83, 0.48, 0.36 = 2.36; leg II 0.65, 0.69, 0.44, 0.35 = 2.13; leg III 0.60, 0.63, 0.46, 0.33 = 2.02; leg IV 0.79, 1.02, 0.69, 0.38 = 2.88).

**Variation:** 5 (%) (range, mean ± SD): TL 1.61–1.82, 1.73 ± 0.11; CL 0.88–0.96, 0.92 ± 0.04; CW 0.63–0.69, 0.67 ± 0.03; n = 3 (TL 1.73–2.28, 2.00 ± 0.17; CL 0.90–1.15, 1.00 ± 0.07; CW 0.65–0.84, 0.75 ± 0.05; n = 12).

**Etymology.**—The specific epithet is an adjective derived from the Caroline Islands, where the species is found.

**Distribution.**—Known only from Ponape (= Pohnpei) in the Caroline Islands, Federated States of Micronesia (Fig. 13).

**Zoica pacifica** new species
(Figs. 3, 4, 9–13)

**Types.**—Holotype male, Republic of the Marshall Islands, Majuro Atoll, Majuro Islet, 7°05′N, 171°08′E, 2 August 1969, J.W. Berry, breadfruit/coconut litter (BPBM); paratype female, same data as holotype (BPBM).

**Other material examined.**—REPUBLIC OF THE MARSHALL ISLANDS: Majuro Atoll: 1 male, 3 females, 5
juveniles, 7°07'N, 171°21'E, 30 July 1969, J.W. Berry, grassy meadow (BB); 1 male, 2 females, 4 juveniles, Arnel Islet, 7°06'N, 171°22'E, 1 August 1969, J.W. Berry, grassy area in coconut forest, litter (BB); 1 male, 2 females, 5 juveniles, Dalap Islet, 7°06'N, 171°22'E, 1 August 1969, J.W. Berry, coconut/pandanus litter (BB); 1 male, 2 females, 5 juveniles, Long Island, 6 mi from Laura, 7°05'N, 171°08'E, 24 March 1980, J.A. Beatty, under coconut husks (BPBM); 1 female, 1 juvenile, Majuro Village, 7°05'N, 171°08'E, 2 August 1969, J.W. Berry, breadfruit/coconut litter (BB); 3 females, Majuro Village, 7°06'N, 171°22'E, 24 July 1968, J.W. Berry, wet tropical forest, litter (BB); 1 female, 2 juveniles, Uotjaa Islet, 7°07'N, 171°21'E, 26 July 1968, J.W. Berry, Scaevola litter (BPBM); 2 females, 3 juveniles, Uotjaa Islet, 7°07'N, 171°21'E, 26 July 1968, J.W. Berry, coconut litter (BPBM); 2 females, 1 juvenile, Uotjaa Islet, 7°07'N, 171°21'E, 26 July 1968, J.W. Berry, grass litter (BB); 6 females, 6 juveniles, Uotjaa Islet, 7°07'N, 171°21'E, 25 July 1968, J.W. Berry, under coconut litter (BB).

**Diagnosis.** — *Zoica pacifica* differs from all other species of *Zoica* by the absence of a median tegular lobe in the male pedipalp and the presence of a long posterior lip of the female epigynum.

**Description.** — Male (based on holotype): Carapace: dorsal profile straight in lateral view; uniformly yellow-brown with gray pigmentation, black around eyes (Fig. 3); light-brown macrosetae around eyes, one large bristle that is bent dorsally centrally below AME, two macrosetae below ALE. Eyes: row of AE as wide as row of PME; row of AE straight. Sternum: long yellow-brown macrosetae mainly marginally. Labium: yellow-brown. Chelicerae: yellow-brown. Pedipalp (Figs. 9, 10): cymbium tip with two ventral macrosetae, lateral apophysis with mesal protrusion (Fig. 9); terminal apophysis with two round lobes and a pointed tip. Abdomen: yellow-brown with dense olive-gray pigmentation (Fig. 3); venter yellow. Legs: leg formula IV > I > II > III; uniformly yellow; spination of leg I: femur: 2 dorsal (only 1 on right leg), 1 apicoprolateral; tibia: 2 ventral pairs; metatarsus: 1 ventral.

Female (based on paratype): In all details like male (Fig. 4), except leg spination: femur: 2 dorsal, 1 apicoprolateral; tibia: 2
ventral pairs; metatarsus: 3 ventral pairs. Epigynum (Figs. 11, 12): ventral view: weakly sclerotized with long posterior lip (Fig. 11); dorsal view: spermathecal heads slightly wider than spermathecal stalks, fertilization ducts long and curved (Fig. 12).

Measurements: Male holotype (female paratype): TL 1.92 (1.84), CL 0.98 (1.00), CW 0.71 (0.73). Eyes: AME 0.02 (0.03), ALE 0.03 (0.03), PME 0.07 (0.08), PLE 0.06 (0.07). Row of eyes: AE 0.16 (0.17), PME 0.16 (0.17), PLE 0.25 (0.27). Sternum (length/width) 0.46/0.44 (0.54/0.48). Labium (length/width) 0.12/0.16 (0.12/0.16). AL 0.79 (1.02), AW 0.56 (0.65). Legs: lengths of segments (femur, patella/tibia, metatarsus, tarsus = total length): Pedipalp 0.38, 0.34, - , 0.36 = 1.09; leg I 0.71, 0.81, 0.54, 0.40 = 2.46; leg II 0.69, 0.75, 0.50, 0.35 = 2.28; leg III 0.63, 0.69, 0.52, 0.33 = 2.17; leg IV 0.83, 1.00, 0.75, 0.42 = 3.00 (Pedipalp 0.29, 0.34, - , 0.31 = 0.94; leg I 0.71, 0.81, 0.50, 0.38 = 2.40; leg II 0.65, 0.75, 0.46, 0.36 = 2.23; leg III 0.63, 0.69, 0.48, 0.35 = 2.15; leg IV 0.81, 1.06, 0.73, 0.44 = 3.03).

Variation: δ (%) (range, mean ± SD): TL 1.65–1.92, 1.76 ± 0.11; CL 0.90–0.98, 0.94 ± 0.04; CW 0.65–0.71, 0.68 ± 0.03; n = 4 (TL 1.77–2.30, 2.03 ± 0.18; CL 0.92–1.11, 1.02 ± 0.05; CW 0.69–0.81, 0.75 ± 0.03; n = 12).

Etymology.—The specific epithet is an adjective derived from pacificus (Latin – peaceful) and refers to the Pacific region, where the species is found.

Distribution.—Only known from Majuro Atoll in the Republic of the Marshall Islands (Fig. 13).

ACKNOWLEDGMENTS

We are especially grateful for the Academic Research Grants from Butler University awarded to JWB which helped support the field work. The U.S. Department of Energy (formerly the Atomic Energy Commission) provided travel
funds for the work in the Marshall Islands. Two travel grants from the Indiana Academy of Science to JWB were of material assistance. Elizabeth Ramsey Berry’s contribution to all phases of the fieldwork in the Pacific and at home have been invaluable. The staff at the Bishop Museum, Honolulu, has been of assistance in many ways over a period of decades. This study was compiled while VWF received funds through the Australian Biological Resources Study (ABRS) to Mark Harvey (Western Australian Museum) and Andy Austin (The University of Adelaide) for a revision of the wolf spider fauna of Australia (2002–2005) and to VWF and Nikolaj Scharff (University of Copenhagen) for a revision of the orb-weaving spider fauna (Araneinae) of Australia. The senior author acknowledges, in particular, the support of his mentor Mark Harvey during studies at the Western Australian Museum.

LITERATURE CITED
Simon, E. 1900. Arachnida. Fauna Hauaiensis, or the zoology of the Sandwich Isles: being results of the explorations instituted by the Royal Society of London promoting natural knowledge and the British Association for the Advancement of Science and carried on with the assistance of those bodies and of the Trustees of the Bernice Pauahi Bishop Museum at Honolulu. Cambridge


Manuscript received 7 July 2008, revised 24 November 2008.