A survey of *Alenatea* Song et Zhu, 1999 (Aranei: Araneidae)

Обзор пауков рода *Alenatea* Song et Zhu, 1999 (Aranei: Araneidae)

Yuri M. Marusik¹–³, Mikhail M. Omelko⁴–⁵, Pavel S. Simonov⁶, Xiaoqi Mi⁷

Ю.М. Марусик¹–³, М.М. Омелько⁴–⁵, П.С. Симонов⁶, С. Ми⁷

¹ Institute for Biological Problems of the North, FEB RAS, Portovaya Str. 18, Magadan, Russia. E-mail: yurmar@mail.ru
² Department of Zoology & Entomology, University of the Free State, Bloemfontein 9300, South Africa.
³ Zoological Museum, University of Turku, FI-20014, Finland.
⁴ Federal Scientific Center of East Asia Terrestrial Biodiversity, FEB RAS, Vladivostok 690022, Russia. E-mail: omelkom@gmail.com
⁵ Far Eastern Federal University, Laboratory of ecology and evolutionary biology of aquatic organisms (LEEBAO), School of Natural Sciences, Vladivostok 690091, Russia.
⁶ Pacific Geographical Institute, FEB RAS, Radio Str. 7, Vladivostok, 690041, Russia E-mail: palzpss@yandex.ru
⁷ College of Agriculture and Forestry Engineering and Planning, Guizhou Provincial Key Laboratory of Biodiversity Conservation and Utilization in the Fanjing Mountain Region, Tongren University, Tongren 554300, Guizhou, China. E-mail: mixiaoqi1018@163.com

Introduction

The current paper is the third in our series on Araneidae of the Far East [Marusik et al., 2015, 2020], and concerns *Alenatea* Song et Zhu, 1999, a small genus with three named species distributed in the southeastern Palaearctic [WSC, 2020]. Two species of *Alenatea*, *A. wangii* Zhu et Song, 1999, and *A. touxie* Song et Zhu, 1999, are restricted to China and known from females only [WSC, 2020]. While studying spiders from the Russian Far East, we recognized several females whose epigynes are similar to those of *A. wangii*. Recently, we obtained a sample containing such females collected together with males. The goals of this paper are to provide a description of the unknown male of *A. wangii*, a detailed redescription of both sexes of the generotype and the female of *A. wangii*, establish a new combination and discuss the limits and relationships of the genus.

Material and Methods

Specimens were photographed using a Nikon DS-Ri2 camera attached to a Nikon SMZ25 stereomicroscope at the Far Eastern Federal University (Vladivostok). Photographs

KEY WORDS: Araneae, Far East Asia, Primorski Krai.

КЛЮЧЕВЫЕ СЛОВА: Araneae, Дальневосточная Азия, Приморский край, Приморье.
Figs 1–8. General appearance and legs II of the males of *Alenatea fuscocolorata* (1–4) and *A. wangi* (5–8). 1, 3, 5, 7 — dorsal; 2, 6 — ventral; 4, 8 — prolateral. Scale = 1 mm for general appearance and 0.5 mm for legs.

Abbreviations used in the text and figure plates: Leg segments: Fe — femur, Pt — patella, Mt — metatarsus, Ti — tibia, Ta — tarsus. Copulatory organs: Bt — base of terminal apophysis, Co — conductor, Cg — copulatory opening, Em — embolus, Ma — median apophysis, Mt — major tooth of the median apophysis, Sa — subterminal apophysis, Ss — sickle shaped tip of Tr, Tp — prolateral arm of terminal apophysis, Tr — retrolateral arm of terminal apophysis.

were taken in dishes filled with alcohol, with soft white paper at the bottom. Digital images were montaged by using Zerene Stacker software (http://zerenesystems.com/cms/stacker). All measurements are in millimeters. All examined material will be deposited in the Zoological Museum of the Moscow State University, Moscow, Russia (ZMMU), Far Eastern Federal University (FEFU), Vladivostok, Russia and Tongren University (TRU), Tongren China.
Figs 9–12. General appearance of females of *Alenatea fuscocolorata* (9–10) and *A. wangi* (11–12). 9, 11 — dorsal; 10, 12 — ventral. Scale = 1 mm.

Рис. 9–12. Внешний вид *Alenatea fuscocolorata* (9–10) и *A. wangi* (11–12). 9, 11 — дорзально; 10, 12 — вентрально. Масштаб 1 мм.

**Taxonomic survey**

*Alenatea* Song et Zhu, 1999

*Alenatea* Song et Zhu in Song et al., 1999: 230.

**TYPE SPECIES:** *Aranea fuscocolorata* Bösenberg et Strand, 1906 from Japan.

**COMMENTS.** The genus was briefly described in the illustrated catalogue of Chinese spiders and compared to *Agalenatea* Archer, 1951, which was assumed to be a close relative in the informal diagnosis [Song et al., 1999]. This assumption is merely based on the similarities of the abdomen shape, which is wider than long. The copulatory organs of the two genera are considerably different, and they apparently belong to different suprageneric taxa. According to Scharff et al. [2020] and Kallal et al. [2020], *Agalenatea* is grouped in the same clade as *Neoscona* Simon, 1864. Both genera *Neoscona* and *Agalenatea* have similar copulatory organs (e.g. epigyne with inflexible scape and male palp with median apophysis having a claw-like process, a short embolus and a long terminal apophysis subdivided into two arms). *Alenatea* (was never subject of the phylogenetic study) appears more similar to *Araneus* Clerck, 1757 s.l. by having a flexible scape, a large median apophysis with 2 claws and a long embolus and terminal apophysis. However, *Alenatea* males can be distinguished from *Araneus* by the long, almost filamentous embolus, and the terminal apophysis deeply divided into two branches, rather than having short emboli bearing caps and an undivided terminal apophysis as in *Araneus*.

**DIAGNOSIS.** The shape of the abdomen in females is similar to some small *Araneus* species by being wider than long. *Alenatea* species can be distinguished from somatically similar, small-sized *Araneus* spp. by the straight, short and not sigmoid scape (vs. scape longer than wide, with several turns). Males can be recognized by the long, filamentous embolus lacking a cap (vs. a short, non-filamentous embolus with a cap), straight median apophysis with 1–2 teeth on the distal side (vs. median apophysis with processes on both sides), terminal apophysis with a large base (Br) and 2 arms: prolateral (Tp) and retrolateral (Tr) (vs. terminal apophysis with a small base and only one arm), long (as long as the tegulum), roundly bent embolus (vs. short embolus, no longer than the median apophysis).

**COMPOSITION.** We consider four species in this genus: *A. fuscocolorata*, *A. acusiseta* (Zhu et Song, 1994) comb.n., *A. touxie* Song et Zhu, 1999 and *A. wangi* Zhu et Song, 1999.

**DISTRIBUTION.** Restricted to the southeastern Palaearctic (Eastern China, Korea, Japan and the southern part of easternmost Russia).
**Alenatea fuscocolorata** (Bösenberg et Strand, 1906)


**Alenatea fuscocolorata**: Song et al., 2001: 183, f. 107A–G (©).


**Alenatea fuscocolorata**: Yin et al., 2012: 588, f. 283a–g (©). For the complete list of taxonomic references see WSC [2020].


**DIAGNOSIS.** The male of this species differs from the sibling *A. wangi* by the prolateral arm of the terminal apophysis (*Tp*): apophysis in mesal view longer than bulb vs shorter (cf. Figs 13 and 16); prolateral arm of the terminal apophysis sigmoid vs. roundly bent (cf. Figs 13, 14 and 16, 18).
DESCRIPTION. Male. Total length 3.83. Carapace 2.02 long, 1.71 wide. Carapace dark brown with light brown pars cephalica. Chelicerae gray with yellow mesal side. Maxillae dark brown, labium brown with yellowish anterior edge. Sternum black with yellow asterisk-like mark (Fig. 2). Femora yellow, dark gray distally. Other leg segments brown

17); relatively longer median apophysis (Ma), 3 times longer than wide vs. 2.5; more inclined major tooth (Mm) of the median apophysis (cf. Figs 13 and 16). The female of *A. fuscocolorata* differs from congeners by the pentagonal scape being wider than long vs. scape rounded, and longer than wide.

with yellow spots and rings. Tibia II with 4 large prolateral spines (Figs 3–4).

Abdomen dorsally almost black with complex pattern (Fig. 1) consisting of white spots and yellowish areas. Sides of abdomen blackish with yellow spots. Abdomen ventrally dark gray with white guanine II-mark (Fig. 2).

Palp as in Figs 13–15. Femur short, almost 2 times shorter than cymbium, 2.7 times longer than wide; patella and tibia subequal in length; cymbium unmodified; tegulum long, sperm duct roundly bent in terminal 1/3; median apophysis (Ma) long, ca 2.9 times longer than wide, with 2 teeth terminally; terminal apophysis with large base (Bt) and 2 arms: prolateral (Tp) and retrolateral (Tr), prolateral arm obscures long, belt-like embolus (Em), prolateral arm long, gently sigmoid, longer than bulb in prolateral view; retrolateral arm (Tr) sigmoid, long, with sickle-shaped tip (Ss) together with prolateral arm and embolus on elongate conductor (Co); subterminal apophysis (Sz) elongate, about as long as median apophysis.

Leg lengths

| I  | 2.31 | 0.89 | 1.91 | 1.60 | 0.77 | 7.48 |
| II | 1.76 | 0.86 | 1.54 | 1.25 | 0.68 | 6.09 |
| III | 1.28 | 0.46 | 0.64 | 0.73 | 0.51 | 3.62 |
| IV  | 1.82 | 0.64 | 1.05 | 1.09 | 0.56 | 5.16 |

Female. Total length 5.00–5.07. Carapace 2.02–2.16 long, 1.72–1.87 wide. Carapace brown with light V-mark (Fig. 9) on pars cephalica (weakly visible in one of the specimens). Chelicerae brown or dark brown with yellow medial sides. Coloration of mouthparts as in male. Sternum black with yellow asterisk-like mark, size of which differs in different specimens (Fig. 10). Coloration of the legs as in male, slightly lighter.

Abdomen dorsally brown with numerous guanine spots forming a complex pattern (Fig. 9) which differs among all studied specimens. Sides of abdomen gray with guanine spots. Ventrally as in male, II-mark more pronounced (Fig. 10).

**A. wangi** Zhu et Song, 1999


**A. touxie** Song et al., 2001: 185, f. 108A–C, reproduced figs of **A. wangi** from Song et al., 1999).

**COMMENTS.** Reproduced figures of the original description of **A. wangi** were used to illustrate **A. touxie** in Song et al. [2001]. We failed to locate the type specimens as they were not found at Hebei University where M.S. Zhu and D.S. Song used to work.

**MATERIAL EXAMINED:** RUSSIA, Primorskiy Kray: 3 $^\oplus$ (FEFU), Askold Isl., 42°45’E 132°20’N, meadow, 1.08.2016 (P.S. Simonov); 1 $^\ominus$ 3 $^\oplus$ (FEFU), Shikotanskiy Dist., env. of Anisimovka Vill., 43°09’N 132°48’E, meadow, 18.06.2015 (P.S. Simonov); 1 $^\ominus$ 1 $^\oplus$ (ZMMU), same data; 3 $^\ominus$ (ZMMU), Lazo Distr., Lazo, 43°23’N 133°54’E, 6–10.07.2006 (V. Shokhrin, Y. Sundukov).

**DIAGNOSIS.** For the male, see the diagnosis of **A. fuscolorata**. The female of **A. wangi** is similar to that of **A. touxie** but differs by having a shorter scape (length/width ratio 1.3 vs. 1.7).
DESCRIPTION. Male. Total length 3.25–3.33. Carapace 1.69–1.70 long, 1.41–1.43 wide.

Carapace dark brown with yellowish spot on pars cephalica (clearly visible in one specimen (Fig. 5) and barely visible in others). Pars cephalica covered with long, white setae. Chelicerae light brown with yellow mesal sides. Maxillae brown, labium brown with yellowish anterior edge. Sternum yellow with indistinct gray spots at edges (Fig. 6). Femora brown distally and yellow proximally; patellae brown; other leg segments brown with yellow rings. Tibia II with 4 large prolateral and dorsal spines (Figs 7–8).

Abdomen almost black dorsally, with a complex pattern (Fig. 5) consisting of white spots and dark stripes. Dorsal pattern differs among different specimens. Coloration of legs as in males. Coloration of legs as in males, slightly lighter.

Abdomen dorsally gray with a complex pattern (Fig. 11) consisting of white spots and dark stripes of different shapes. Dorsal pattern differs among different specimens. Coloration of legs as in males, slightly lighter.

Abdomen ventrally grayish with 3 distinct areas of guanine spots. Abdomen grey with several large prolateral and dorsal spines (Figs 7–8).

Legs length (smallest specimen)

<table>
<thead>
<tr>
<th>Leg</th>
<th>Fe</th>
<th>Pa</th>
<th>Ti</th>
<th>Mt</th>
<th>Ta</th>
<th>Total</th>
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</thead>
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<tr>
<td>I</td>
<td>2.42</td>
<td>0.84</td>
<td>2.17</td>
<td>1.66</td>
<td>0.77</td>
<td>7.86</td>
</tr>
<tr>
<td>II</td>
<td>1.84</td>
<td>0.73</td>
<td>1.43</td>
<td>1.25</td>
<td>0.62</td>
<td>5.87</td>
</tr>
<tr>
<td>III</td>
<td>1.11</td>
<td>0.41</td>
<td>0.57</td>
<td>0.62</td>
<td>0.46</td>
<td>3.17</td>
</tr>
<tr>
<td>IV</td>
<td>1.65</td>
<td>0.56</td>
<td>0.94</td>
<td>1.05</td>
<td>0.53</td>
<td>4.73</td>
</tr>
</tbody>
</table>

Female. Total length 4.37–5.65. Carapace 1.70–2.06 long, 1.47–1.7 wide. Carapace dark yellowish brown on pars cephalica and medially in some specimens (Fig. 11). Whole carapace covered with long, white setae. Chelicerae brown with slightly lighter mesal sides. Coloration of mouthparts as in males. Sternum light brown with bright yellow spots at anterior edge (Fig. 12). Number and shape of these spots differ among different specimens. Coloration of legs as in males, slightly lighter.

Epigyne as in Figs 22–24, 27–28. Plate 2.5 times wider than long in anterior view; scape ca. 1.3 times longer than wide in anterior view and 1.5 times longer than wide in ventral view; copulatory openings separated by about 3 diameters; copulatory ducts forming about 2 loops; receptacles oval, touching.

DISTRIBUTION. Exact distribution is unclear because the same figures have been used to illustrate both A. wangi in Song et al. [1999] and A. touxie in Song et al. [2001]. This species was described from Shanxi, and the new records presented here extend the known range over 1800 km to the northeast (Map 1).

Alenatea touxie Song et Zhu, 1999

Agalenatea angulopicta: Yin et al., 1997: 111, f. 36a–d (C, misidentified).
Compliance with ethical standards
Conflict of Interest: The authors declare that they have no conflict of interest.
Ethical approval: No ethical issues were raised during our research.

References

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