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A review of the East Palaearctic *Aradus orientalis* – *compar* group, with descriptions of two new species (Heteroptera, Aradidae)

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A b s t r a c t

Based on examination of types and additional material, the East Palaearctic *Aradus orientalis* - *compar* species group is revised. Two of the seven species belonging to this group are described as new : *Aradus holzschuhi* sp. n. and *Aradus yunnanus* sp. n., both from China. A key to species is given and the hitherto unknown male genital structures are figured.

Z u s a m m e n f a s s u n g

Die ostpalaearktische *Aradus orientalis* - *compar* Artengruppe wird anhand von Typen und zusätzlichem Material revidiert. Zwei der sieben Arten dieser Gruppe: *Aradus holzschuhi* sp. n., *Aradus yunnanus* sp. n. von China werden neu beschrieben. Ein Bestimmungsschlüssel für die Arten sowie Abbildungen der bisher unbekanntenen männlichen Genitalstrukturen werden vorgelegt.

Key words : Heteroptera, Aradidae, *Aradus*, new species, China, Korea, Japan, Russian Far East.

I n t r o d u c t i o n

The genus *Aradus* FABRICIUS, 1803, occurring in the East Palaearctic region, comprises several species – groups showing close similarities to Euro – Siberian taxa. However, one of them, the *orientalis* - *compar*- species group, is exclusively known from China, Korea, the Russian Far East and Japan.

Due to the scarcity of material this species group is still insufficiently known, and no genitalic structures have been reported to date.

Examination of types (as far as available) and of additional material of this species group made it possible to assemble new data on taxonomy, to figure genitalic structures and to give new distribution records. Furthermore, two species from China are recognized as new and described below.

M a t e r i a l a n d m e t h o d s

The specimens studied were borrowed from entomological institutions and private collections listed below or are in the collection of the author.

Measurements of the mounted specimens were taken with a micrometer eyepiece, 20 units equaling 1 mm, unless otherwise stated.

Acronyms for collections:

CEHI	Collection E. Heiss, Tiroler Landesmuseum, Innsbruck, Austria
CYST	Collection Yoshinori Shono, Takarazuka, Hyogo, Japan
MHNG	Muséum d' Histoire Naturelle, Geneva, Switzerland
MNHN	Muséum National d' Histoire Naturelle, Paris, France
NKUM	Nankai University, Department of Biology, Tianjin, P.R. China
NSMT	National Science Museum (Natural History), Tokyo, Japan
ZMAS	Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia
ZMNB	Zoologisches Museum, Humboldt Universität, Berlin, Germany

T a x o n o m y

Among the species of the flat bug genus *Aradus* occurring in the East Palaearctic region (HEISS 2001a), the following species belong to the *orientalis* – *compar* group:

Aradus orientalis BERGROTH 1885

syn. *iguchii* IGUCHI 1908

syn. *iguchii* MATSUMARA 1913

Aradus bergrothianus KIRITSHENKO 1913

nom. nov. for preoccupied *emarginatus* BERGROTH 1885

Aradus compar KIRITSHENKO 1913

Aradus holzschuhi sp. n.

Aradus discompar HSIAO 1964

Aradus sinensis KORMILEV 1955

Aradus yunnanus sp. n.

Diagnosis of the species group: Macropterous larger species of 6.5 – 9.7 mm length; colour dark brown with unicolourous brown to blackish antennae, of which segment II and IV are longer than III (*orientalis*, *bergrothianus*), or with apical 3/5 of antennal segment III straw yellow (*compar*, *holzschuhi* sp. n., *discompar*, *sinensis*, *yunnanus* sp. n.); yellowish are the anterolateral borders of the pronotum, the base of corium, the depressed middle section of carinate lateral margins of scutellum, the postero-exterior angles (pe) of dorsal external laterotergites (deltg) II – VIII, a small basal and preapical ring on femora and two larger rings on tibiae. Pronotum with large laterally wing – like expanded paranota. Scutellum triangular, elongate or stout. Abdomen with progressively projecting pe-angles of deltg II – VII.

Key to species of the *orientalis* - *compar* group

- 1(4) Antennae shorter and thicker, cylindrical, entirely unicolourous dark brown to black 2
- 2(3) Paranota expanded laterally (fig. 1), ratio width / length of pronotum 2.48 – 2.65, posterior exterior angles of deltg II – VII moderately projecting, antennae shorter, ratio length of antennae / width of head 1.88 – 2.08 1. *orientalis* BERGROTH
- 3(2) Paranota larger, expanded more anterolaterally (fig. 2), ratio width / length of pronotum 2.79 – 2.96, posterior exterior angles of deltg II – VII more and angularly projecting, antennae relatively longer, ratio length of antennae / width of head 2.04 – 2.25 ... 2. *bergrothianus* KIRITSHENKO

- 4(1) Antennae longer and more slender with segment II and III slightly constricted at middle, the latter yellowish at apical 3/5. 5
 5(8) Antennal segment I shorter than clypeus, II without a paler ring at middle 6
 6(7) Paranota expanded laterally forming an obtuse angle, maximum width of pronotum is across middle of its length (fig. 13), scutellum longer, particularly in males, parameres and parandria as fig. 15 - 17, 20 3. *compar* KIRITSHENKO
 7(6) Paranota expanded anterolaterally, maximum width of pronotum is across anterior 1/3 of its length (fig. 14), scutellum more stout, parameres and parandria as fig. 21 - 23, 26. 4. *holzschuhi* sp. n.
 8(5) Antennal segment I distinctly longer than clypeus, II with a pale ring at middle 9
 9(10) Antennal segment II longer than III (fig. 33 - 34) 5. *discompar* HSIAO
 10(11) Antennal segment II shorter than III 11
 11(12) Width of pronotum wider than width of corium (fig. 32) 6. *sinensis* KORMILEV
 12(11) Width of pronotum smaller than width of corium (fig. 35 - 36) *yunnanus* sp. n.

1. *Aradus orientalis* BERGROTH 1885 (Fig. 1, 3 - 7, photo 1 - 2)

The species was described from a single female from >Japan<, without further locality data. It was borrowed from ZMHB.

M a t e r i a l e x a m i n e d : Holotype ♀, pinned specimen, right antenna and left antennal segments III+IV missing, labelled >Japan, Dönitz< (yellow, handwritten) / >10656< (white, printed) / >Aradus orientalis Bergr.< (Bergroth's handwriting) / >Type< (red, printed) / >Museum Berlin, Germany< (white, printed). According to ICZN 73.1.2 this specimen is to be regarded as >holotype by monotypy< (ZMHB).

J a p a n : 1 ♂ Honshu, Nagano Pref., Hirayutogo 25 II 1940 S. Nomura (CEHI); 1 ♂ Honshu, Masutomi Kai, 25 VIII 1956 S Miyamoto (CEHI); 1 ♂ Honshu, Nikko N.P., 1974 H. Franz (CEHI); 1 ♂ Honshu, Nagano Pref., Mt. Nyugara, IV 1984 Ito (CEHI); 1 ♂ Honshu, Nagano Pref., Shimashima-dani, Azumimura, 27 VII 1985 Y. Shono (CYST); 3 ♂ 1 ♀ Honshu, Nagano Pref., Tobia Spa, 3 VII 1979 M. Tomokuni (NSMT); 1 ♀ Honshu, Kanagawa Pref., Mt. Ooyama, 27 IX 1971 M. Tomokuni (NSMT); 2 ♀ Honshu, Yamagata Pref., Iide Spa, 14 IX 1971 M. Tomokuni (NSMT); 1 ♂ Honshu, Nagano Pref., Mt. Tokura, VIII 1983 Oshima (CEHI); 1 ♂ Honshu, Camp Fuji, screen, 7 VI 1954 Teller (CEHI); 2 ♂ Honshu, Tochigi Pref., Nikko N.P., Senjogahara 1400m, 15 VII 1980 I. Löbl (MHNG, CEHI); 1 ♂ 1 ♀ Honshu, Toyama Pref., 8 km S Gero, 500m, 31 VIII 1980 I. Löbl (MHNG, CEHI); 2 ♀ Honshu, Gunma Pref., 3 km N Tsumagoi, 1100m, 18 VII 1980 I. Löbl (MHNG); 1 ♀ Honshu, Gunma Pref., Kaminkawa Arimine, 1150m, 29 VII 1980 I. Löbl (MHNG); 2 ♂ Honshu, Gunma Pref., J.E. Kogen N.P., Shirane, 1750m, 22 VII 1980 I. Löbl (MHNG, CEHI); 1 ♂ Honshu, Iwate Kawai, Joshibezaawa, 1050m, 15 VIII 1991 A. Smetana (CEHI); 1 ♂ Honshu, Iwate Pref., Iwaizumi Hitsutori, 790m, 11 VIII 1991 A. Smetana (CEHI).

1 ♀ Shikoku, Tokushima Pref., Mt. Ko-ji-san, 3 VI 1989 Y. Shono (CYST); 1 ♀ Shikoku, Komenoko, 2 VII 1972 (NSMT); 1 ♂ 1 ♀ Shikoku, Tokushima Pref., Mt. Takashiro Nakagun, 1450m, M. Yoshida (NSMT); 2 ♂ Shikoku, Ehime, Ishizuchi N.P., Omogo 900m, 12 VIII 1980 I. Löbl (MHNG, CEHI).

1 ♀ Kiushu, Kumamota Pref., Mt. Shirator, 15 VII 1990 Linser (CEHI).

1 ♀ Hokkaido, Ikutahara Pref., Ikutahara 180m, 29 VII 1991 A. Smetana (CEHI).

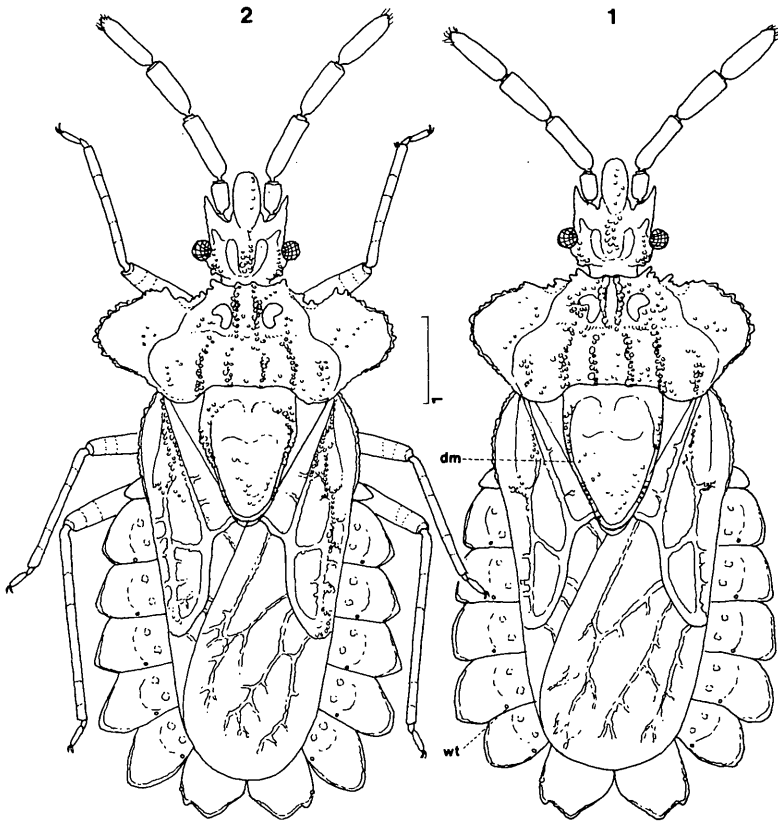


Fig. 1 - 2 Dorsal view of males. 1 - *Aradus orientalis* BERGR. (Japan, Honshu); 2 - *Aradus bergrothianus* KIR. (Ussuri). Abbreviations : dm - depressed whitish portion of carinate lateral margin; wt - larger whitish tubercle. Scale bar 1 mm.

Kuril Islands : ♂♂ ♀♀ Kunashir, Golovnina vulcano, 24 VII 1973 I. Kerzhner (as *bergrothianus*, in KERZHNER 1978) (ZMAS, CEHI).

Distribution : Known from all larger islands of Japan : Honshu, Shikoku, Kiushu, Hokkaido (also mentioned by MATSUMARA 1913), and the adjacent Kuril Islands (Russia): Kunashir.

Brief description : Male. Macropterous. Body, legs and antennae covered with coarse fine granulation. Colour and general features as given in the diagnosis of the species-group.

Head : Slightly longer than wide, clypeus with parallel sides, rounded at apex. Antenniferous tubercles straight, apex acute, reaching ° antennal segment I. Antennae cylindrical, about 2.04 to 2.08 x (♂♂) or 1.88 – 1.93 x (♀♀) as long as width of head; segment I shortest, II slightly more than twice the length of I and as long or somewhat longer than III, IV longest, its apex pilose. Preocular tubercles distinct and acute. Vertex with 2 elongate smooth depressions. Postocular tubercles formed by a patch of larger granules. Rostrum reaching posterior margin of prosternum.

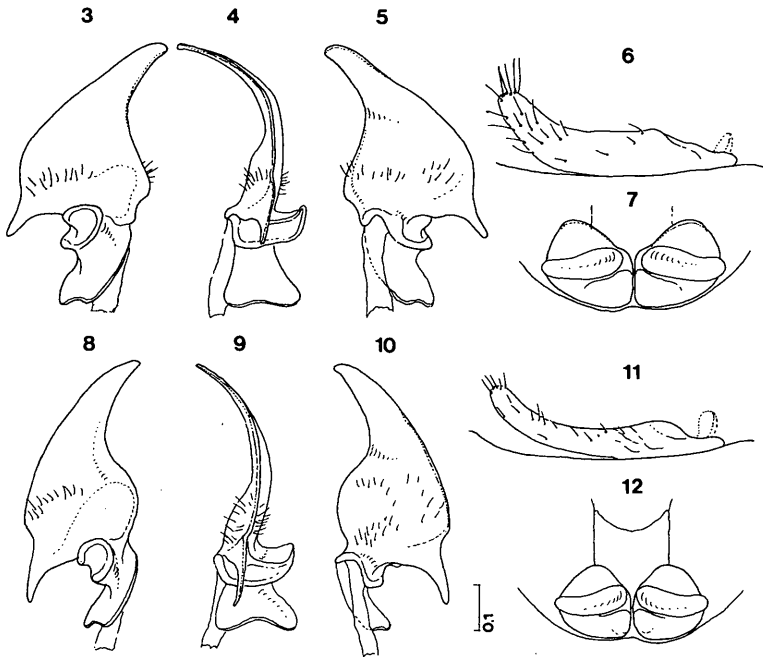


Fig. 3 - 12 Male genitalic structures. 3 - 7 *Aradus orientalis* BERGR. : 3 - 5 left paramere dorsal (3), lateral (4), ventral (5) view; 6 - right parandrium; 7 - tergite IX. 8 - 12 *Aradus bergrothianus* KJR. : 8 - 10 left paramere, 11 - right parandrium; 12 tergite IX. Scale bar 0.1 mm.

Pronotum : About 2.5 x as wide as long with broadly expanded and reflexed paranota. Lateral margins widely rounded and finely serrate. Anterolateral angles with several larger teeth. Disk with four longitudinal carinae consisting of rows of larger tubercles; the middle ones reaching from anterior to posterior border with a distinctly higher crest anterior to the transverse depression and 2 (1+1) ovate smooth areas laterally; the lateral ones are shorter.

Scutellum : About 1.4 – 1.5 x as long as wide with granulate elevated lateral margins which are smoother at the depressed portion at middle, apex rounded and reflexed.

Abdomen : Of egg-shaped outline with pe-angles of deltg II – VII progressively projecting, their lateral margins first rounded, then straight. Paratergites VIII trapezoidal with a blunt tooth laterally. A larger whitish tubercle is present on inner posterior margin of deltg II – VII. Base of corium dilated and reflexed with granulate lateral border, veins formed by larger irregular granules. Spiracles II – VII ventral, VIII lateral and visible from above.

Legs : Slender, femora and tibiae cylindrical, trochanters completely fused to femora on fore- and middle legs, fused but separated by a suture on hind legs.

Male genital structures : Parameres (fig. 3 - 5) sickle-shaped with a short basal projection on outer margin; parandria as fig. 6; tergite IX composed of 2 (1+1) ovate plates with an oblong ovate elevated transversal ridge (fig. 7).

Female : Generally as in male but larger and abdomen wider; paratergites VII triangular with a distinct lateral tooth and widely cleft at middle.

Measurements: ♂ (Honshu, Mt. Nyugawa) : Length 7.6 mm; length (l) / width (w) of head 27 / 26; l / w pronotum 27 / 67; l / w scutellum 34 / 24; width of corium 59; width of abdomen 74; antennal segments I / II / III / IV = 7 / 15 / 15 / 17; ratio length of antennae (la) / width of head (wh) 2.08. ♂ (Honshu, Tobira) : Length 7.45 mm; l / w head 27 / 25.5; l / w pronotum 24 / 62; l / w scutellum 33 / 22; width of corium 56; width of abdomen 68; antennal segments I / II / III / IV = 7 / 15 / 15 / 16; ratio la / wh 2.08. ♂ (Kunashir) : Length 7.2 mm; l / w head 25 / 25; l / w pronotum 23 / 59; l / w scutellum 35 / 22; width of corium 54; width of abdomen 65; antennal segments I / II / III / IV = 7 / 15 / 14 / 16; ratio la / wh 2.08.

♀ (Honshu, Mt. Nyugawa) : Length 8.8 mm; l / w head 29 / 26.5; l / w pronotum 27 / 68; l / w scutellum 37 / 26; width of corium 65; width of abdomen 88; antennal segments I / II / III / IV = 7 / 16 / 15 / 17; ratio la / wh 1.93. ♀ (Kunashir) : Length 8.7 mm; l / w head 27 / 28; l / w pronotum 26 / 69; l / w scutellum 40 / 27; width of corium 64; width of abdomen 84; antennal segments I / II / III / IV = 7 / 15.5 / 15 / 16; ratio la / wh 1.90.

Range of body length : ♂♂ 7.2 – 7.6 mm; ♀♀ 8.4 – 9.0 mm (holotype ♀ 8.8 mm)

Discussion : *Aradus orientalis* is restricted to Japan and the adjacent Kuril Islands north of Hokkaido and no records from mainland Asia are known so far. The one reported from Korea by LEE & KWON (1991) refers to *A. compar* (LEE & KERZHNER, 1994). The most closely related species is *A. bergrothianus*, which in turn is reported from mainland Asia only. For the differences between these two species see discussion of *bergrothianus*.

2. *Aradus bergrothianus* KIRITSHENKO 1913 (Fig. 2, 8 - 12, photo 3)

BERGROTH (1885) described this species as *A. emerginatus* from a single male specimen from China (Beijing) in the same paper as *A. orientalis*, however KIRITSHENKO (1913) discovered that it is a junior homonym of the neotropical *A. emerginatus* SAY 1832 (now *Mezira emerginata*) and renamed it *bergrothianus*. The type specimen (according to ICZN 73.1.2 holotype by monotypy), presumably in the Fallou collection (MHNP), could not be located.

Material examined :

Russia : ♂♂ ♀♀ Russia (FE), Kamenka River, Ussuri, VI – VII 1935 Samoljov (det. Kiritshenko) (ZMAS, CEHI); 3♂ 5♀ Russia (FE), Vinogradovka, Ussuri, VI 1929 Kiritshenko (ZMAS, CEHI); 1♂ Russia (FE), Khabarovsk Prov., SE Boitsava 12 km NE Bikin, 26 V – 4 VI 1990, 250-350m, W.Schawaller (CEHI).

China : 1♀ China (SE), Sichuan Prov., Abazhou-Nanoing, Juizhaigou 2000m, 8 – 13 VI 1991 C. Holzschuh (CEHI).

Distribution : Sister species of *A. orientalis*, reported from mainland Asia : Russian Far East, Korea, China (NO: Hebei; SW: Sichuan - new record).

In addition to the detailed original description by BERGROTH (1885) and the redescription by KIRITSHENKO (1913), information on some unreported characters, the male genital structures and measurements for both sexes are given.

Brief description : Male. Macropterous species, with general characters as given for the species-group diagnosis. Yellowish colour is more extended on corium and membrane than in *A. orientalis*.

Head : Slightly longer than wide, clypeus with subparallel sides, rounded at apex. Antenniferous tubercles diverging anteriorly, apex acute, reaching about ° antennal segment I. Antennae cylindrical, about 2.14 to 2.25 x (♂♂) or 2.04 – 2.14 x (♀♀) as long as width

of head; segment I shortest, II slightly more than twice the length of I and longer than III, IV longest, its apex pilose. Preocular tubercles distinct and acute. Vertex with 2 elongate smooth depressions. Postocular tubercles formed by prominent larger tubercles. Rostrum reaching slightly beyond posterior margin of prosternum.

Pronotum: About 2.9 x as wide as long with very broadly expanded and reflexed paranota. Other structures as *A. orientalis*.

Scutellum: About 1.4 – 1.6 x as long as wide with granulate elevated lateral margins which are smoother at the depressed portion at middle, apex rounded and reflexed.

Abdomen: Of egg-shaped outline with pe-angles of deltg II – VII progressively projecting, their lateral margins first straight, then forming an obtuse angle. Other characters as in *A. orientalis*.

Legs: Basically as in *A. orientalis*.

Male genital structures: Parameres (fig. 8 - 10) sickle-shaped with a long basal projection on outer margin; parandria as fig. 11; tergite IX composed of 2 (1+1) ovate plates with an oblong ovate elevated transversal ridge (fig. 12).

Female: Generally as in male but larger and abdomen wider; paratergites VII triangular with a distinct lateral tooth and widely cleft at middle.

Measurements: ♂ (Russia, Vinogradovka): Length 7.6 mm; length (l) / width (w) of head 26 / 25.5; l / w pronotum 24 / 71; l / w scutellum 33 / 23; width of corium 52; width of abdomen 72; antennal segments I / II / III / IV = 7 / 16.5 / 15 / 16; ratio length of antennae (la) / width of head (wh) 2.14. ♂ (Russia, Vinogradovka): Length 7.7 mm; l / w head 26 / 24; l / w pronotum 24 / 70; l / w scutellum 35 / 22; width of corium 54; width of abdomen 71.5; antennal segments I / II / III / IV = 7 / 16 / 15 / 16; ratio la / wh 2.25.

♀ (Russia, Vinogradovka): Length 8.9 mm; l / w head 28 / 27.5; l / w pronotum 29 / 81; l / w scutellum 36 / 27; width of corium 63; width of abdomen 87; antennal segments I / II / III / IV = 8 / 19 / 16 / 17; ratio la / wh 2.14.

Range of body length: ♂♂ 6.7 – 7.7 mm; ♀♀ 8.2 – 9.7 mm (holotype ♂ 6.5 mm)

Discussion: *A. bergrothianus* is the second species with entirely dark brown to black antennae and widely expanded paranota and is closely related to its Japanese vicariant, *A. orientalis*. It differs, however, by more laterally expanded paranota, ratio w / l of pronotum 2.79 – 2.96 (2.48 – 2.65 in *A. orientalis*); by posteroexterior angles of deltg II – VII more and angularly projecting; by slightly longer antennae, ratio la / wh 2.04 – 2.25 (1.88 – 2.08 in *orientalis*); by the shape of the parameres which are less curved, more slender and have a longer basal projection (fig. 8 - 10) and by more slender parandria (fig. 11). Tergite IX is of the same structure as in *A. orientalis*.

3. *Aradus compar* KIRITSHENKO 1913 (Fig. 13 - 15, photo 4 - 6)

This species was described from a single male specimen from the Russian Far East, which was borrowed and examined.

Material examined: Holotype ♂ (glued to triangular card, left antennal segments III + IV, left fore leg, tibia and tarsus of middle- and right foreleg missing), labelled: >Vladivostok, 1911 M.(alkina) Planina< (white, handwritten) / >golden confetti< (type indication used by Kiritshenko) / >Aradus compar n. sp., Kiritshenko det.< (white, handwritten & printed) / >VIII< (white, pencil). According to ICZN 73.1.2 this species is to be regarded as >holotype by monotypy< (ZMAS).

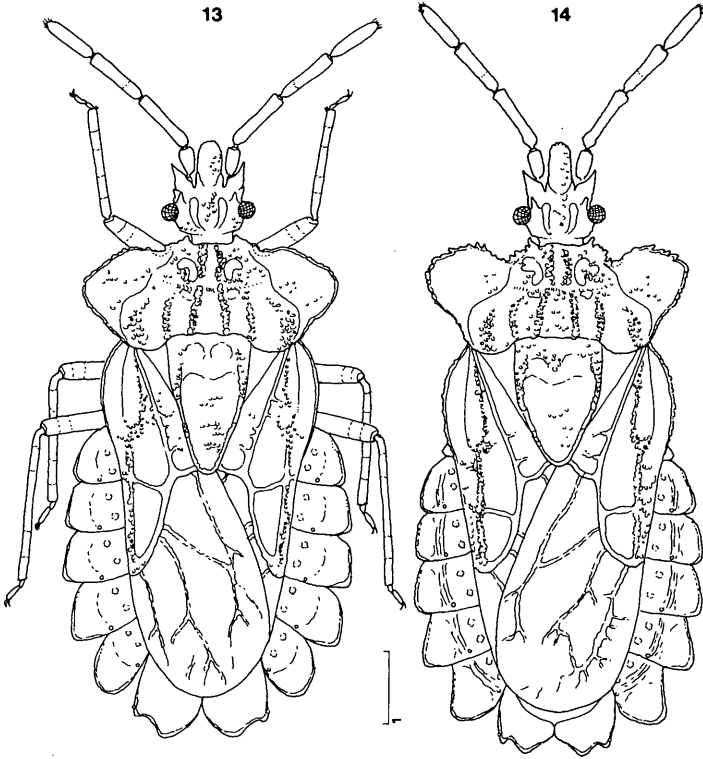


Fig. 13 - 14 Dorsal view of males. 13 - *Aradus compar* KIR., holotype; 14 - *Aradus holzschuhi* sp. n., holotype. Scale bar 1mm.

Russia: 1♂ 1♀ Russia (FE), Vladivostok, 6 XI 1926 (ZMAS, CEHI).

China: 1♂ 1♀ China (SE), Sichuan, Abazhou – Nanping, Juizhaigou 2000m, 8 – 13 VI 1991 C. Holzschuh & L. Ji (CEHI); 1♂ China (NO), Gansu, Cheumen, 10 V 1911 Licent (CEHI).

Distribution: Known only from mainland Asia : Russian Far East (FE); Korea; China (CE : Hubei, NW : Gansu, NO : Shaanxi, SW : Sichuan – new record).

Kiritshenko figured the holotype (1915 : table 1, fig. 6) and gave a detailed description. For better comparison a brief redescription is given, including that of the unknown male genital structures and measurements of both sexes.

Brief redescription: Holotype male, macropterous. Colouration as given for the species group diagnosis.

Head: Longer than wide (27 / 25.5), antenniferous tubercles slightly diverging anteriorly, apex acute. Preocular portion with a small lateral tooth and a larger acute one dorsally. Antennae long and slender, 2.33 x width of head, segment I + II lighter in colour, II and III somewhat constricted medially, II pale yellow on apical 3/5. Relative length of antennal segments I / II / III / IV = 7.5 / 18.5 / 17.5 / 16. Postocular portion rounded. Rostrum reaching anterior margin of mesosternite.

Pronotum : 2.8 x wider than long (70 / 25), with wing-like lateral expanded paranota, lateral margin obtuse-angled, with coarse granulation. Anterolateral notch shallow. Disk with four longitudinal carinae consisting of rows of larger tubercles; the middle ones reaching from anterior to posterior border with a distinctly higher crest anterior to the transverse depression and 2 (1+1) ovate smooth areas laterally; the lateral carinae are shorter.

Scutellum : Triangular, 1.72 x as long as wide (38 / 22), with granulate elevated lateral margins which are smoother at the depressed portion at middle, apex rounded and reflexed.

Abdomen : Of egg-shaped outline, pe-angles of deltg II – VII progressively projecting, their lateral margins first rounded, then straight. Paratergites VIII bisinuate posteriorly. A larger whitish tubercle is present on inner posterior margin of deltg II – VII. Base of corium dilated and reflexed, veins formed by larger irregular granules. Spiracles II – VII ventral, VIII lateral and visible from above.

Legs : Slender, femora and tibiae cylindrical, trochanters completely fused to femora on fore- and middle legs, fused but separated by a suture on hind legs.

Male genital structures : Parameres (fig. 15 - 17), blade with outer margin obtuse at base, then straight to a small hook-shaped apex; inner margin sinuate with a narrow triangular basal projection; parandria as fig. 20, stout with subtriangular apical portion; tergite IX composed of 2 (1+1) ovate plates with an oblong ovate elevated transversal ridge (fig. 18 - 19).

Female : Generally as in male but larger and abdomen wider; paratergites VII triangular with a distinct lateral tooth and widely cleft at middle.

Measurements : Holotype ♂ : Length 8.1 mm; width of corium 59, width of abdomen 78.5. ♂ (China, Cheumen) : Length 7.4 mm; l / w of head 27 / 24; ; l / w pronotum 22 / 68; l / w scutellum 36 / 21; width of corium 56.5; width of abdomen 69; antennal segments I / II / III / IV = 7 / 18.5 / 17 / 14; ratio la / wh 2.35. ♀ (Vladivostok) : Length 9.3 mm; l / w of head 29 / 27; ; l / w pronotum 26 / 76; l / w scutellum 42 / 26; width of corium 69.5; width of abdomen 102; antennal segments I / II / III / IV = 8 / 19 / 18 / 16; ratio la / wh 2.26.

Range of size of examined specimens : ♂♂ 7.1 – 8.1mm.

Discussion : Within the group of species with yellow apical antennal segment III, *A. compar* shares an antennal segment I shorter than clypeus only with *A. holzschuhi* sp. n. However, the shape of pronotum and scutellum are different.

4. *Aradus holzschuhi* sp. n. (Fig. 14, 21 - 26, photo 7 - 9)

Material examined : Holotype ♂ (glued to a card, pygophore and left paramere on separate card beneath) labelled : (China) >W Sichuan, 2-6 VII 1994, 29,36 N 102,06 E, 1900 – 2900 m, Gongga shan – Hailuogou, D. Král & J. Farkac <(white, printed)> / >Holotype *Aradus holzschuhi* sp. n., des. E. Heiss 2002 <(red, printed), (CEHI); 2 ♀ from the same locality (CEHI); 2 ♀ China, Sichuan, Daxue Shan, Gongga Shan Mts. 2100 m, 27 V 1997 Pütz (coll. Günther, Ingelheim, Germany); 1 ♂ 1 ♀ from same locality 3000 m, 30 V 1997 Pütz (CEHI); 2 ♂ 1 ♀ China, Yunnan, Heishui 27,13 N, 100,19 E, 35 km N Lijiang, 1-19 VII 1992 S. Beèvar (CEHI); 1 ♂ 1 ♀ China, Yunnan Habashan Mts. 27,20 N, 100,11 E, SE slope, 3-6 VI 1995 S. Beèvar (CEHI); 20 ♂ 10 ♀ China, Yunnan, Habashan Mts. 29,19 N, 100,08 E 6-11 VI 2002 S. Beèvar & R.+ H. Fouquè (NKUM, ZMAS, CEHI).

Distribution : So far known only from high altitude localities in southwestern China (SW) : Sichuan, Yunnan.

Dagnosis : Very close to *A. compar*, from which it can immediately be distinguished by mean larger size, different shape of pronotum and shorter scutellum.

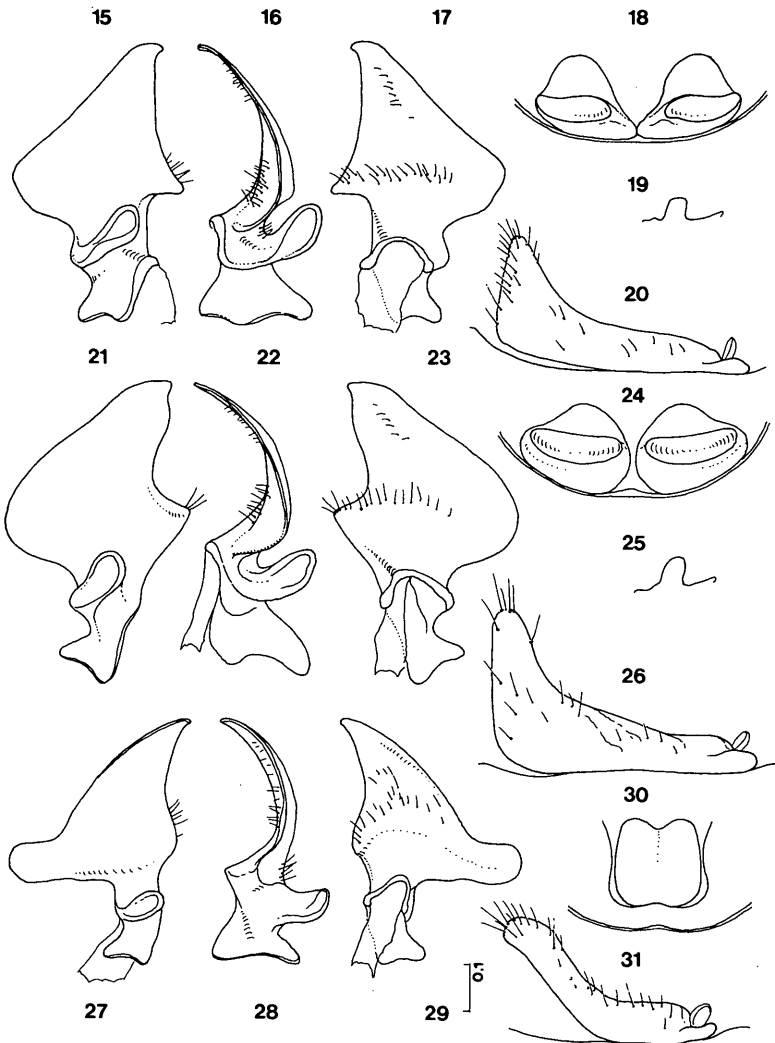


Fig. 15 - 31 Male genital structures. 15 - 20 *Aradus compar* KIR. : 15 - 17 left paramere, 18 - tergite IX, 19 - cross section of tergite IX through elevated ridge, 20 - right parandrium. 21 - 26 *Aradus holzschuhi* sp. n. : 21 - 23 left paramere, 24 - tergite IX, 25 - cross section of tergite IX through elevated ridge, 26 - right parandrium. 27 - 31 *Aradus yunnanus* sp. n. : 27 - 29 left paramere, 30 - tergite IX, 31 - right parandrium. Scale bar 0.1 mm.

Brief description: Holotype male, macropterous. Colouration of body, legs and antennae as well as other structures generally as described for *A. compar*. They are therefore compared with the latter and only described when differing.

Head: Longer than wide (29 / 25), preocular portion without a lateral tooth but a larger acute one dorsally. Antennae long and slender, 2.26 x width of head 56.5 / 25, relative length of antennal segments I / II / III / IV = 8 / 18.5 / 16 / 14.

Pronotum : 2.6 x wider than long (71 / 26), paranota more anterolaterally expanded, their margins irregularly dentate, anterolateral notch deeper.

Scutellum : More stout, 1.4 x longer than wide (35 / 25), lateral margins subparallel on anterior 1/3.

Abdomen : Deltg III – VII longitudinally striate at middle, corium mostly shorter.

Male genital structures : Parameres as fig. 21 - 23, outer margin of blade more rounded, inner margin bisinuate, basal triangular projection nearly rectangular, not recessed; parandria as fig. 26, with longer apical portion; tergite IX as fig. 24 - 25, basal plate and transverse elevation showing slight differences.

Measurements : Holotype ♂ : Length 8.5 mm; width of corium 63, width of abdomen 78. Paratypes : ♂ (Heishui) : Length 8.2 mm; l / w of head 28.5 / 25; ; l / w pronotum 25 / 67; l / w scutellum 37 / 22; width of corium 61; width of abdomen 81; antennal segments I / II / III / IV = 8 / 17 / 15 / 14; ratio la / wh 2.16. ♀ (locality of holotype) : Length 8.9 mm; l / w of head 30 / 27; l / w pronotum 25 / 74.5; l / w scutellum 37 / 25; width of corium 68; width of abdomen 96; antennal segments I / II / III / IV = 8 / 20 / 17 / 11; ratio la / wh 2.22. ♀ (Gongga Shan) : Length 9.1 mm; l / w of head 30 / 27; l / w pronotum 28 / 73; l / w scutellum 39 / 26; width of corium 70; width of abdomen 100; antennal segments I / II / III / IV = 9 / 19 / 17.5 / 15; ratio la / wh 2.24.

Range of size of examined specimens : ♂ ♂ 7.8 – 8.7mm; ♀ ♀ 9.1 – 9.55mm.

Etymology : This interesting species is dedicated to my coleopterist friend Carolus Holzschuh (Villach, Austria), who successfully collected Aradidae in East Asia and donated them to my collection.

Discussion : *A. holzshuhi* sp. n. is closest related to *A. compar* and has been confounded with the latter. Although there is some variation in shape of paranota and scutellum of both species – the main external characters for separating them – there are significant differences in the male genital structures to justify two taxa.

5. *Aradus discompar* HSIAO 1964 (Fig. 33 - 34)

Hsiao described this species from a male (holotype) and a female (allotype) from China (SW), Szechuan (= Sichuan), Mt. Emei. The type specimens could not be located at the presumed repository institution (NKUM). Another female in their collection from China (CE: Hubei), reported as *crenatus* by LIU (1981) was examined by the author earlier and proved to belong to *discompar* (HEISS 2001b).

Brief redescription (after HSIAO 1964 : 75, English summary): Holotype male, macropterous. Very similar to *A. compar* in general appearance and colour pattern, but much darker, proportion of length of antennal segments different, segment I passing apex of head (clypeus), carinae on pronotum less distinct.

Black, antennal segments I + II and legs lighter in colour; lateral margins of pronotum anteriorly, lateral margins of scutellum medially, basal portion of corium, posterior margins of connexival segments (= deltg), antennal segment III excepting base, margins of acetabula, two annulations on each femur and two on each tibia pale.

Measurements : ♂. Length 7.9 mm, width of pronotum 3.35 mm, width at base of hemelytra 3.05 mm, width of abdomen 3.85 mm. Length of antennal segments 0.45 / 1.0 / 0.65 / 0.7 mm, segment I passing apex of head (clypeus). Rostrum passing anterior coxae, length of segments 0.75 / 0.5 / 0.4 mm.



1



2



3



4



5



6

Photo 1 - 6. 1 - *Aradus orientalis* BERGR. ♂ (Japan); 2 - ditto ♀ (Japan); 3 - *Aradus bergrothianus* KIR. ♂ (Ussuri); 4 - *Aradus compar* KIR., holotype ♂; 5 - ditto ♂ (Vladivostok); 6 - ditto ♀ (Sichuan).



7



8



9



10



11

Photo 7 - 11. 7 - *Aradus holzschuhi* sp. n., holotype ♂; 8 - ditto paratype ♂ (Yunnan, Heishui); 9 - ditto paratype ♀ (Sichuan, Daxue Shan); 10 - *Aradus yunnanus* sp. n., holotype ♂; 11 - ditto paratype ♀.

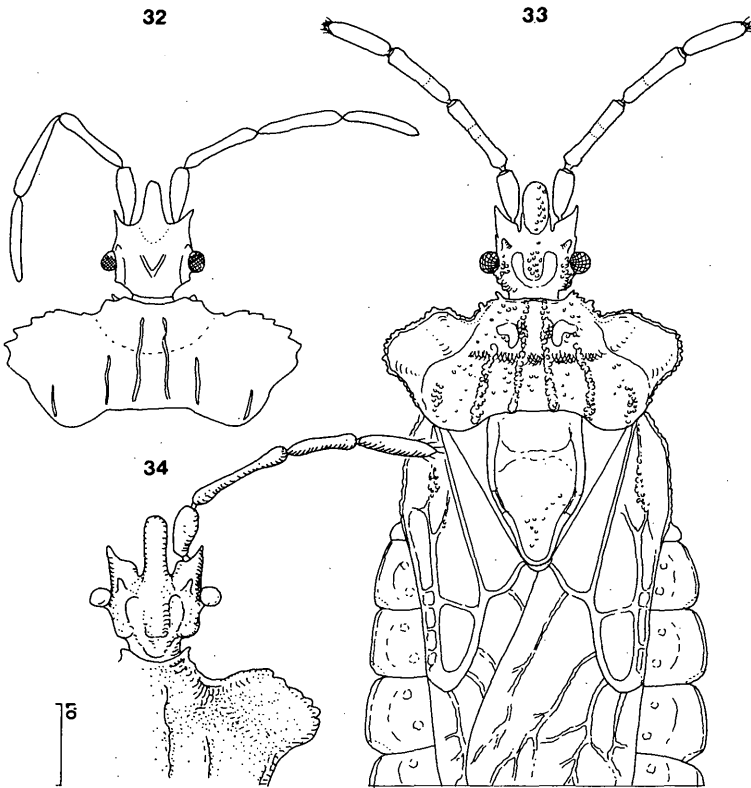


Fig. 32 - 34 Dorsal view of head and pronotum. 32 - *Aradus sinensis* KORM., holotype (after KORMILEV 1955, plate I, fig. 1); 33 - *Aradus discompar* HSIAO (China, Hubei) ♀; 34 - *Aradus discompar* HSIAO (after LIU 1981, fig. 740). Figures are drawn to same scale. Scale bar 1 mm.

The female from Hubei corresponds to this description but also shows a small paler median ring on antennal segment II (as *A. sinensis* and *A. yunnanus* sp. n.).

Distribution : So far known only from the type locality in southwestern China (SW) : Sichuan and (CE) : Hubei.

Discussion : As no male was available for study, its genital structures still remain unknown. The differences to other species are given in the key.

6. *Aradus sinensis* KORMILEV 1955 (Fig. 32)

This species was described from a single female from Shaowu, Tachulan, 25 IV 1943 (China (SE) : Fujian) from the collection of the late T. Ch. Maa, now in the National Chung Hsing University, Taichung Taiwan. This specimen was already designated as holotype, but was not available for examination. No further record is known to date.

According to the description and figures given by Kormilev, the species belongs to this species group. As the description was published in Taiwan and is difficult to obtain, a brief

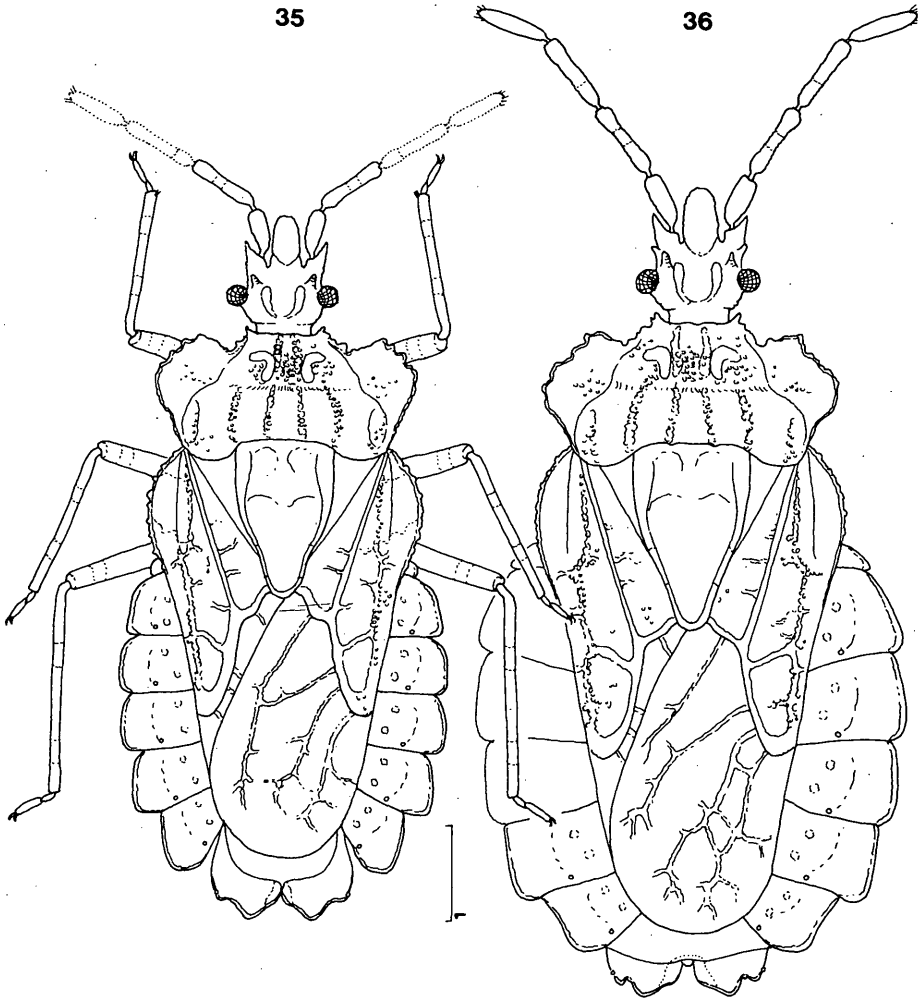


Fig. 35 - 36 *Aradus yunnanus* sp. n. dorsal view. 35 - holotype ♂; 36 - paratype ♀ Scale bar 1 mm.

redescription is presented here. Measurements of the original description are of a different scale, about 9.5 units equaling 1 mm.

Brief redescription (after KORMILEV 1955): Holotype ♀: Colouration brown, ivory yellow are the apical 3/5 of antennal segment III, the anterolateral angles of pronotum, base of corium and a few irregular spots on disk of corium, interior border of paratergites VIII; the ring at middle of antennal segment II, base and apex of rostral segment I, subapical ring of femora, base and two rings at middle tibiae and posteroexterior angles of connexiva (deltg) II - VII ochraceous.

Head: As long as wide (15 / 15), antenniferous spines slender, apically pointed; preocular spines robust, apically pointed and directed upwards and slightly forwards, postocular border

rounded. Antennae 2.5 x as long as width of head (37.5 / 15), more slender than femora, longer than head + pronotum together (37.5 / 30), segment I the stoutest, basally slightly thinner, II slightly constricted at middle, III a little thickened towards apex, IV subcylindrical; relative length of antennal segments I / II / III / IV = 7 / 10 / 11 / 9.5. Rostrum reaching fore border of mesosternum.

P r o n o t u m : 2.85 x as wide as long (40 / 15), lateral borders expanded, wing-like, rounded and somewhat reflexed, roughly denticulate and roundly cut out near humeral angles. Carinae of pronotum rather low, the interiors anteriorly with a high tubercle, the exteriors slightly divergent backwards.

S c u t e l l u m : Longer than wide (22 / 15), elevated on basal 2/5 of disk; lateral borders parallel at first, then convergent and reflexed, apically rounded.

A b d o m e n : Hemelytra basally narrower than pronotum, corium with exterior border basally roundly expanded and reflexed, tip of corium reaching to base of 5th connexivum. Posteroexterior angles of connexiva II – V slightly protruding and rounded, those of 6th more projecting and rectangular and those of 7th and 8th somewhat acutely projecting and bidentate. Spiracles all ventral, except the 8th, which are lateral and visible from above.

M e a s u r e m e n t s : ♀ 9.3 mm; width of pronotum 3.8 mm; width of abdomen 4.2 mm.

D i s c u s s i o n : *A. sinensis* seems related to *A. discompar* und *A. yunnanus* sp. n., sharing the long first antennal segment, which is distinctly projecting beyond apex of clypeus. However it can be distinguished from these and other species by the characters given in the key. The male is still unknown, its genital structures cannot be compared.

7. *Aradus yunnanus* sp. n. (Fig. 27 - 31, 35 - 36, photo 10 - 11)

M a t e r i a l e x a m i n e d : Holotype ♂ (glued to a card, pygophore and left paramere on separate card beneath; antennal segments III + IV missing) labelled : >China, Yunnan, Heishui 27,13 N, 100,19 E, 35 km N Lijiang, 1-19 VII 1992 S. Beèvar< (CEHI); Paratype ♀ collected with holotype (CEHI); 1 ♂ China, Yunnan, Habashan, Habashan Mts. 29,19 N, 100,08 E 6-11 VI 2002 S. Beèvar & R.+H. Fouqué (CEHI).

D i s t r i b u t i o n : So far known only from southwestern China (SW) : Yunnan.

D i a g n o s i s : Distinguished from the related species with antennal segment I distinctly longer than clypeus (*A. discompar*, *A. sinensis*) by width of pronotum smaller than width of corium due to less expanded paranota, furthermore from *A. discompar* by antennal segment III longer than II.

B r i e f d e s c r i p t i o n : Holotype male, macropterous. Colour dark brown to black, yellowish are the apical 3/5 of antennal segment III, a small median annulus of II, anterolateral margins of pronotum, pe-angles of deltg II – VIII, two rings on femora and tibiae, base and apex of rostral segment I, depressed median portion of reflexed lateral margins of scutellum; corium with a basal white spot, irregularly mottled between the veins and on membrane.

H e a d : Longer than wide (26 / 24), antenniferous tubercles subparallel, apex acute, lateral margins with a lateral tooth and pointed preocular tubercles. Antennal segment I longer than clypeus, II constricted at middle, III+IV missing. Length of antennal segments I / II = 10 / 16. Eyes globose, protruding laterally. Vertex with 2 (1+1) ovate longitudinal depressions. Postocular portion rounded with larger granules. Rostrum reaching anterior margin of mesonotum.

P r o n o t u m : 2.44 x as wide as long (55 / 22.5) with moderately expanded and reflexed paranota. Anterolateral margins irregularly dentate with a distinct notch, posterolateral

margins nearly straight and finely granulate. Disc with 4 longitudinal carinae as in other species of this group.

Scutellum : 1.57 x as long as wide (33 / 21), lateral margins carinate and granulate, straight on basal half, then constricted to broadly rounded apex, with a depressed portion at middle. Disk raised at basal half, depressed posteriorly.

Abdomen : Corium wider than pronotum (58 / 55), roundly expanded and reflexed laterally. Pe-angles of deltg II-VI moderately projecting, VII truncate posteriorly, paratergites VIII bisinuate. Spiracles II – VII ventral, VIII lateral and visible from above.

Legs : Slender, as in other species of the group.

Male genital structures : Parameres as fig. 27 - 29, with a basal dilatation on outer margin, inner margin bisinuate; parandria as fig. 31, slender and curved upwards; tergite IX as fig 30, consisting of a smooth sclerite without transversal elevations.

Female : Generally as the male but larger and with wider abdomen.

Measurements : Holotype ♂ : Length 7.5 mm; width of corium 58, width of abdomen 68.5. ♀ paratype : Length 8.7 mm; l/w head 29.5 / 25.5; l/w pronotum 25 / 63 (ratio 2.52); l/w scutellum 40 / 24; length of antennal segments I / II / III / IV = 12 / 17 / 18 / 15, ratio la / wh 2.43; width of corium 66; width of abdomen 94.

Etymology : Named after the province of Yunnan, where this and other interesting Aradidae were found.

Discussion : This species is easily recognized by the narrow paranota and shape of parameres and tergite IX, which are different from all species of the group.

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