Zootaxa 3669 (1): 076–084
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3669.1.8
http://zoobank.org/urn:lsid:zoobank.org:pub:091325DA-3633-4C29-8936-DDA29403D77C

Adinopsis nippon, a new species of marsh-dwelling rove beetle (Coleoptera: Staphylinidae: Aleocharinae: Deinopsini) from Japan, with an annotated catalogue of *Adinopsis* species of the world

MUNETOSHI MARUYAMA[1,3] & HIROMU KAMEZAWA[2]

[1]*The Kyushu University Museum, Fukuoka, 812-8581 Japan*
[2]*Tsukiyoshi-chô 32-17, Kawagoe-shi, Saitama-ken, 350-0825 Japan*
[3]*Correspoding author: E-mail: dendrolasius@gmail.com*

Abstract

Adinopsis nippon **sp. n.** is described from Japan and represents the first discovery of the genus *Adinopsis* in the temperate zone of the East Palearctic region. It is closely related to *A. myllaenoides* (Kraatz) known from North and South America and is placed in the *myllaenoides* species group. An annotated catalogue of the world species of *Adinopsis* is presented.

Key words: *Carex* community, Japanese fauna, *myllaenoides* species group, rove beetles, Tone-gawa riverbed

Introduction

The rove beetle tribe Deinopsini embraces a small group of Aleocharinae and shares numerous plesiomorphic character states with the tribe Gymnusini (Hammond, 1975). Together these two tribes comprise the basal-most lineage within the Aleocharinae (Ashe, 2007). Deinopsini is composed of four genera and 51 species from all zoogeographical regions. The genus *Adinopsis* Cameron, 1919 currently contains 28 species (including the present new species) from Africa, Asia, Australia, North and South America, and one from Baltic amber. In Asia, only four *Adinopsis* species are known from tropical areas, namely, Sri Lanka, Nepal, Singapore and Hong Kong. *Adinopsis* species are inhabitants of marsh detritus and mud at the margins of ponds and streams (Klimaszewski 1979, Klimaszewski & Jansen 1994). Recently, we collected an undescribed species of *Adinopsis* at two sites of lowland marsh along the riverside of Tone-gawa, near Tôkyô. This represents the first record of the genus from the temperate zone in the East Palearctic region. In Japan, environmental conditions of lowland marshes have drastically worsened in recent decades. In light of this, the Tone-gawa riverbeds represent one of the most well-preserved marshes in Japan, harboring various marsh-dwelling insects (e.g., Maruyama *et al.*, 2000; Ohkawa, 2002). The present finding of *Adinopsis* rove beetles is biogeographically interesting given the species group the species belongs to, as discussed below, and reaffirms the importance of the Tone-gawa riverbeds as an important ecosystem for biodiversity. The *Adinopsis* fauna is still poorly known especially in Asian tropics. For the future research of *Adinopsis*, we provide an annotated catalogue of the world *Adinopsis* species as basic information of the genus.

Material and methods

In total six specimens were examined (see, Bionomics). Terminology of body parts follows Kilimaszewski (1979). The technical procedures used were generally as described by Maruyama (2006). Pictures of specimens were taken using a digital camera (Canon EOS 7D, Canon, Tôkyô, JAPAN) with an extreme macro lens (Canon MP-E 65 mm F2.8 1–5×, Canon) and a macro flash (Macro Twin Lite MT-24EX Flash, Canon). Then, focus stacking was conducted using the automontage software Combine ZM (Alan Hadley, UK, http://www.hadleyweb.pwp.blueyonder.co.uk/). All

 Accepted by Jan Klimaszewski: 2 May 2013; published: 5 Jun. 2013

digital images were edited using Adobe Photoshop Elements 2.0 (Adobe, San Jose, CA, USA). Holotype and paratypes are deposited with M. Maruyama's collection at the Kyushu University Museum (KUM) and H. Kamezawa's private collection (cKam).

Adinopsis Cameron, 1919

Adinopsis Cameron, 1919: 242 (original description; type species: *Adinopsis rufoburunnea* Cameron, 1919, by original designation).

See, Klimaszewski (1979) for a detailed description.

Adinopsis nippon Maruyama & Kamezawa, sp. n.

Type series. Holotype male, Takahama (Tone-gawa riverbed), Kamisu-machi, Ibaraki-ken, Honshû, Japan, 19 III 2005, M. Maruyama (KUM). Paratypes: 1 male, 1 female, 1 unsexed, same data as holotype (KUM); 1 unsexed, same data but H. Kamezawa (cKam); 1 unsexed Shinshukushinden (Edo-gawa riverbed), Kasukabe-shi, Saitama-ken, Honshû, Japan, 8-9 I 2012, H. Kamezawa (cKam).

Etymology. *Nippon* - Japan in Japanese language, the same specific epithet as the past symbol of Japanese marsh, *Nipponia nippon* (Reichenbach, 1853) (Aves: Threskiornithidae).

Description of holotype male. Body (Fig. 1) blackish brown in ground color; antennae, mouthparts, legs yellowish brown; body length, ≈ 2.0 mm; fore body length, ≈ 0.8 mm. Head gently convex above. Antennae with segments I and II distinctly longer and wider than remaining segments. Mandible (Fig. 2) with two deplanate, broad teeth. Galea (Fig. 3) with apex long, gently curved, with two small spinose setae , and 3 large spinose setae of which the apical one is curved. Pronotum widest around posterior corners; several erect setae present around lateral margins. Elytra parallel-sided. Legs thick, mid and hind tibiae dilated apicad, widest around apical 1/5–1/4; fore- and midtarsi with segment II twice as long as I. Abdomen narrower than elytra; tergite VIII (Fig. 4) with a v-shaped emargination; sternite IX (Fig. 5) gently narrowed posteriad, tergite X (Fig. 5) elongate, narrowed apicad, slightly expanded around middle. Aedeagus with median lobe (Fig. 6) laterally narrow with hook-shaped distal crest; apical lobe of paramere (Fig. 9) widened around middle, subapical seta II longest.

Female. Spermatheca with basal part dilated apicad; apical part semi-spherical, with deep apical depression.

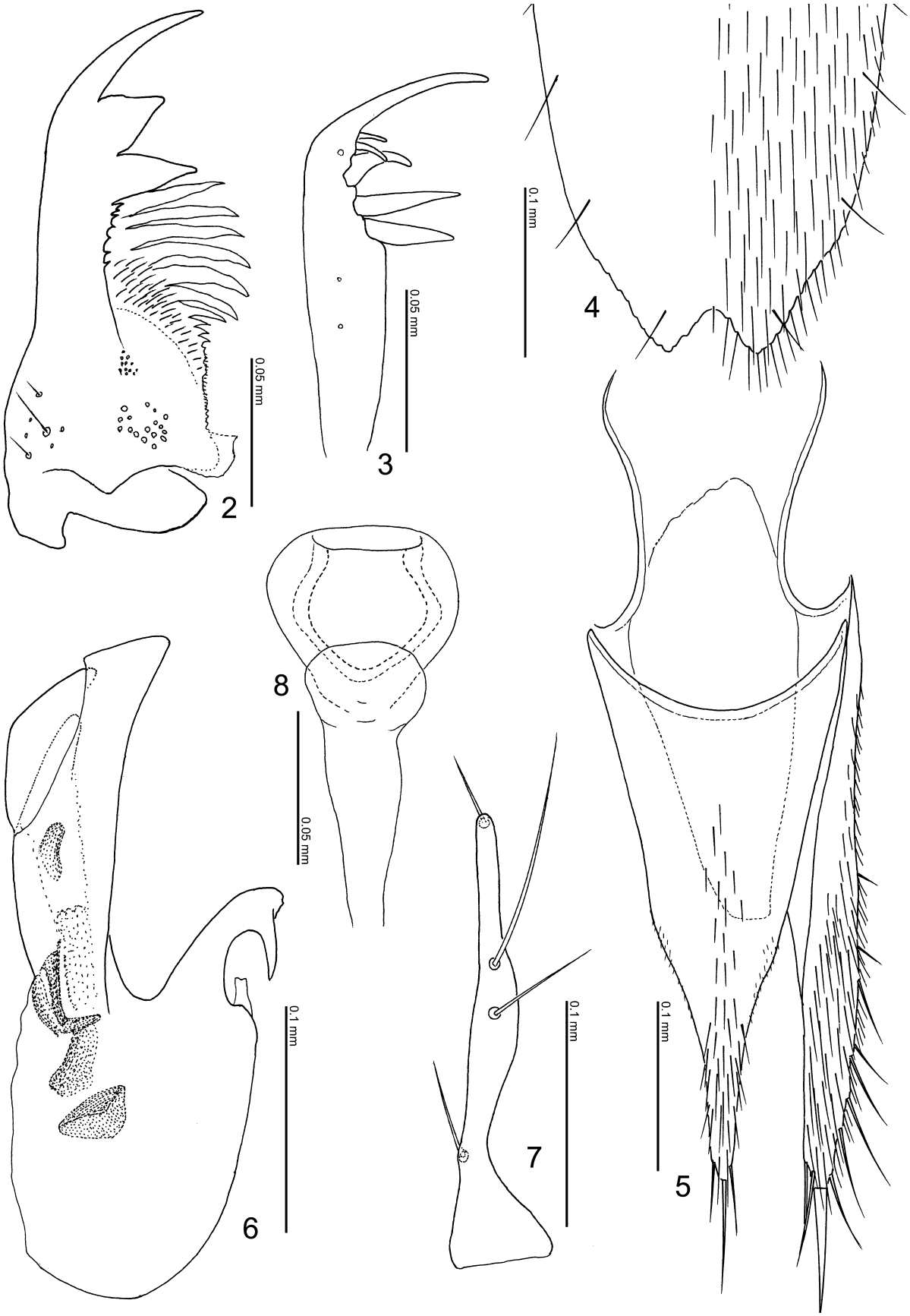
Diagnosis. This species appears to be closely related to *A. myllaenoides* (Kraatz, 1857) by resemblances in numerous character states, especially in shapes of abdominal tergite XI and X, and the shape of the aedeagus, but distinguished from it by the parameral setae II and III being situated close together while distant in *A. myllaenoides*. *Adinopsis nippon* is easily distinguished from the other Asian species by the elongate tergite X.

Remarks. No distinct sexual dimorphism was detected in abdominal segments VIII-X unlike other Oriental species. In numerous character states, including those of genitalia, *Adinopsis nippon* is thought to be closely related to *A. myllaenoides* and therefore a member of the *myllaenoides* species group which is restricted to but widely distributed within southern North America to South America. It is interesting that *A. nippon* is more closely related to a New world species than an Old World species. However, the *Adinopsis* fauna of continental East Asia and phylogenetic relationships of *Adinopsis* species are still poorly known. Clarification of the Asian *Adinopsis* fauna and phylogenetic relationships of *Adinopsis* species will help to elucidate the evolutionary history behind the distribution of *A. nippon*.

Bionomics. We collected in total six specimens at riverbeds of Tone-gawa and Edo-gawa (which feeds into Tone-gawa) (Figs. 9–12) in Kanto-chihô district. The riverbeds were predominantly covered by *Phragmites australis* and with few *Carex* sp., and the *Carex* dominated community appeared to be the primary habitat for *Adinopsis*. Treading the vegetation into the water caused the beetles to exit the substrate and float to the surface of water. At the same time *Deinopsis modesta* Sharp, 1874 (Deinopsini) were also collected but were much more abundant than the *Adinopsis*.

This species is listed in "The 4th Version of the Japanese Red Lists" as "*Adinopsis* sp., Data Deficient species" (Ministry of the Environment, Japan, 2012).

FIGURES 1. *Adinopsis nippon* Maruyama & Kamezawa, **sp. n.**, paratype.



FIGURES 2–8. *Adinopsis nippon* Maruyama & Kamezawa, **sp. n.:** 2, left mandible; 3, right galea; 4, apical half of male tergite VIII; 5, male abdominal tergite IX (half), and X; 6, median lobe of aedeagus (holotype); 7, apical lobe of paramere (holotype); 8, spermatheca.

FIGURES 9–12. Habitats of *Adinopsis nippon* Maruyama & Kamezawa, **sp. n.** and *Deinopsis modesta* Sharp in riverbed of Edo-gawa (Shôwa-machi). 9, 10, Distant views of the riverbed, with predominant *Phragmites australis* grasses; 11, 12, *Carex* communities between *Phragmites australis* grasses and *Salix* trees.

Annotated catalogue of *Adinopsis* species of the world

Fossil species

†The *groehni* group (Janák, 2010)

†*A. groehni* Zerche, 1999: 98 (original description; type locality: as fossil, Baltic amber deposits from Yantarnyi-Kaliningrad in all probability; Tertiary, Lower-Middle Eocene, as speculated in Weitschat & Wichard, 2002); Janák, 2010: 184 (checklist).

South and South East Asian species (Oriental Region)

The *rufobrunnea* species group (Klimaszewski & Jansen, 1995)

A. rufobrunnea Cameron, 1919: 243 (original description; type locality: "Sembawang", Singapore); Klimaszewski, 1979: 66 (redescription, lectotype designation); Klimaszewski & Jansen, 1995: 328 (checklist); Janák, 2010: 186 (checklist). Distribution: Singapore (Cameron, 1919; Klimaszewski, 1979).

The *cinnamomea* species group (Klimaszewski & Jansen, 1995)

A. cinnamomea Kraatz, 1859: 51 (original description, as *Deinopsis*; type locality: Sri Lanka, as "Ceylon"); Klimaszewski, 1979: 68 (redescription, lectotype designation); Klimaszewski & Jansen, 1995: 328 (checklist); Janák, 2010: 186 (checklist). Distribution: Sri Lanka (Kraatz, 1859; Klimaszewski, 1979), Andaman Islands, Malaysia (Cameron, 1939).

The *nepalensis* species group (Klimaszewski & Jansen, 1995)

A. nepalensis Pace, 1987: 399 (original description; type locality: "Dhading Distr., W. Samari Banjang, Topal Khola, 1000m", Nepal); Klimaszewski & Jansen, 1995: 328 (checklist); Smetana, 2004: 420; Janák, 2010: 186 (checklist). Distribution: Nepal (Pace, 1987).

Incertae sedis (Janák, 2010)

A. chinensis Pace, 1999: 666 (original description; type locality: "Hong Kong", China); Janák, 2010: 186 (checklist); Smetana, 2004: 420. Distribution: Hong Kong (Pace, 1999).

African species (Ethiopian Region)

The *hammondi* species group (Uhlig & Klimaszewski, 1995)

A. deckerti Uhlig & Klimaszewski, 1995: 306 (original description; type locality: "Kavango, Mahango Game Reserve, piknik site, Kavango river banks [Okavango banks], 18˚14'S / 21˚43'E", Namibia); Janák, 2010: 186 (checklist). Distribution: Namibia (Uhlig & Klimaszewski, 1995). Inside of angle brackets are original label data.

A. maraisi Uhlig & Klimaszewski, 1995: 304 (original description; type locality: "Kavango, Mahango Game Reserve, banks of a temporary lake connected with Kavango river [Seeufer], 18˚16[17]'S / 21˚43'E", Namibia); Janák, 2010: 186 (checklist). Distribution: Namibia (Uhlig & Klimaszewski, 1995). Inside of angle brackets are original label data.

A. flavicornis Klimaszewski, 1979: 62 (original description; type locality: "Tshiobo n'Goy", D. R. Congo); Uhlig & Klimaszewski, 1995: 299 (review; precise type locality as "Tshiobo n'Goy (=Ngoi, =Ngoy)"); Klimaszewski & Jansen, 1995: 328 (checklist); Janák, 2010: 186 (checklist). Distribution: D. R. Congo (Klimaszewski, 1979).

A. hammondi Klimaszewski, 1980: 114 (original description; type locality: "Roçadas", Angola); Uhlig & Klimaszewski, 1995: 299 (review; precise type locality as "Roçadas, R. Cunene"); Klimaszewski & Jansen, 1995: 328 (checklist); Janák, 2010: 186 (checklist). Distribution: Angola (Klimaszewski, 1980).

A. lemur Janák, 1996: 326 (original description; type locality: "Amparafara pr. Moramanga, 900-950m", Madagascar Est); Janák, 2010: 186 (checklist). Distribution: Madagascar (Janák, 1996).

A. mauritiana Janák, 2010: 182 (original description; type locality: "Mt. Cocotte, 600-650m, 20˚26'03"S / 57˚27'53"E", SW Mauritius). Distribution: Mauritius (Janák, 2010).

A. mmabolela Klimaszewski & Jansen, 1995: 329 (original description; type locality: "Northern Transvaal, Mmabolela Estate, 22˚40'S / 28˚15'E", South Africa); Uhlig & Klimaszewski, 1995: 299 (review; precise type locality as "Mmabolela Estate, Limpopo river banks"); Janák, 2010: 186 (checklist). Distribution: South Africa (Klimaszewski & Jansen, 1995).

A. ndumu Klimaszewski, 1991: 206 (original description; type locality: "Natal, Zululand, Ndumu Game Reserve, 26˚53'S / 32˚16'E", South Africa) ; Uhlig & Klimaszewski, 1995: 299 (review); Klimaszewski & Jansen, 1995: 328 (checklist); Janák, 2010: 186 (checklist). Distribution: South Africa (Klimaszewski, 1991).

The *africana* species group (Klimaszewski & Jansen, 1995)

A. africana Cameron, 1950: 98 (original description; type locality: "Flandria", D. R. Congo); Klimaszewski, 1979: 64 (review); Uhlig & Klimaszewski, 1995: 298 (review; precise type localiy: "Flandria (=Boteka), Prov. Ingende"); Klimaszewski & Jansen, 1995: 328 (checklist); Janák, 2010: 186 (checklist). Distribution: D. R. Congo (Cameron, 1950).

A. farakely Janák, 1996: 335(original description; type locality: "Andasibé [Périnet], 930-1000m", Madagascar Est); Janák, 2010: 186 (checklist). Distribution: Madagascar (Janák, 1996).

The *schoutedeni* species group (Klimaszewski & Jansen, 1995)

A. schoutedeni Bernhauer, 1933: 297 (original description, as *Deinopsis*; type locality: "Léopoldville", Kinshasa, D. R. Congo); Klimaszewski, 1979: 65 (redescription; lectotype designation); Uhlig & Klimaszewski, 1995: 300 (review) ; Klimaszewski & Jansen, 1995: 328 (checklist); Janák, 2010: 186 (checklist). Distribution: D. R. Congo (Bernhauer, 1933; Klimaszewski, 1979).

Incertae cedis (Uhlig & Klimaszewski, 1995)

A. klimaszewskii Uhlig, 1995: 293 (original description; type locality: "Popa Falls, Okavango banks, 18˚07'16"S / 21˚34'51"E", Namibia); Uhlig & Klimaszewski, 1995: 299 (review; precise type locality as "Kavango, Popa Falls, Kavango river banks"); Janák, 2010: 186 (checklist). Distribution: Namibia (Uhlig, 1995).

A. devroeyi Bernhauer, 1933: 296 (original description, as *Deinopsis*; type locality: D. R. Congo, Kinshasa, Tshiobo n'Goy, as "Léopoldville"); Klimaszewski, 1979: 64 (redescription); Uhlig & Klimaszewski, 1995: 299 (review; precise type locality as "Zaire, Leopoldville (=Kinshasa)"); Klimaszewski & Jansen, 1995: 328 (checklist); Janák, 2010: 186 (checklist). Distribution: D. R. Congo (Bernhauer, 1933).

Australian species (Australian Region)

The *australis* species group (Klimaszewski & Jansen, 1995)

A. australis Fauvel, 1878: 567 (original description, as *Deinopsis*; type locality: "Victoria", Australia); Klimaszewski, 1979: 69 (redescription; lectotype designation); Klimaszewski & Jansen, 1995: 328 (checklist); Janák, 2010: 184(checklist). Distribution: Australia (Fauvel, 1878; Klimaszewski, 1979).

North-South American and East Asian species (Nearctic, Neotropical, East Palaearctic Regions)

The *bicornis* species group (Klimaszewski & Jansen, 1995; description of subgenus *Codylopennis* for this group)

A. bicornis Klimaszewski, 1979: 71 (original description; type locality: "Michigan", USA); Klimaszewski, 1982: 328 (new distributional record); Klimaszewski, 1985: 143 (description of female, new distributional record); Klimaszewski & Frank, 1992: 247 (new distributional record); Klimaszewski & Jansen, 1995: 329 (checklist); Janák, 2010: 186 (checklist). Distribution: USA, Arkansas (Klimaszewski, 1985), Florida, Illinois (Klimaszewski, 1982), Michigan (Klimaszewski, 1979), Mississippi (Klimaszewski & Frank, 1992), Missouri (Klimaszewski, 1982), New York, Oklahoma (Klimaszewski & Frank, 1992).

A. cuspidata Klimaszewski, 1982: 330 (original description; type locality: "Maryland: Calvert Co., Scientists Cliff", USA); Klimaszewski & Frank, 1992: 248 (new distributional record); Klimaszewski & Jansen, 1995: 329 (checklist); Janák, 2010: 186 (checklist). Distribution: USA, Florida (Klimaszewski, 1982; Klimaszewski & Frank, 1992), Maryland (Klimaszewski, 1982), Mississippi (Klimaszewski & Frank, 1992).

The *myllaenoides* species group (Klimaszewski & Jansen, 1995)

A. myllaenoides Kraatz 1857: 38 (original description, as *Deinopsis*; type locality: "New Orleans [Novi Aureliani]" Louisiana, USA); Klimaszewski, 1979: 72 (redescription; lectotype designation; synonymy with *Deinopsis* gracilis Cameron, 1922); Klimaszewski, 1980: 120 (description of female, new distributional record); Klimaszewski, 1982: 330 (new distributional record); Klimaszewski, 1985: 143(new distributional record); Klimaszewski & Génier, 1985: 63 (new distributional record); Klimaszewski & Frank, 1992: 248 (new distributional record); Klimaszewski & Jansen, 1995: 328 (checklist); Pace, 2008: 227 (new distributional record); Janák, 2010: 186 (checklist). Distribution. USA: Alabama (Klimaszewski, 1982), Arkansas (Klimaszewski, 1985), Florida (Klimaszewski, 1979, 1980, 1982; Klimaszewski & Génier, 1985), Georgia (Klimaszewski, 1985), Louisiana (Kraatz 1857; Klimaszewski, 1979, 1982), Mississippi (Klimaszewski, 1980, 1982), Oklahoma (Klimaszewski & Frank, 1992); Brazil (Klimaszewski, 1979, 1982); Costa Rica (Klimaszewski, 1982); Cuba (Klimaszewski, 1980); Jamaica (Klimaszewski, 1980); Mexico (Klimaszewski, 1982; Klimaszewski & Génier, 1985; Klimaszewski & Frank, 1992); Nicaragua (Klimaszewski & Frank, 1992); Panama (Klimaszewski, 1985); Paraguay (Bernhauer, 1908; Klimaszewski & Jansen, 1995); Peru (Pace, 2008); St. Lucia (Cameron, 1922;

Klimaszewski, 1979), Trinidad (Klimaszewski, 1980); Venezuela (Klimaszewski, 1985). Inside of angle brackets are original label data.

A. peruviana Pace, 2008: 227 (original description; type locality: "Loreto, km 12 on Iquitos-Nauta Rd." Peru); Janák, 2010: 186 (checklist). Distribution: Peru (Pace, 2008).

A. nippon Maruyama & Kamezawa, sp. n. (present paper; type locality: Ibaraki-ken, Honshû, Japan).

The *pubescens* species group (Klimaszewski & Jansen, 1995)

A. braziliensis Klimaszewski, 1979: 76 (original description; type locality: "Para, Faz. Pirelli, Belem", Brazil); Klimaszewski, 1982: 328 (description of female, new distributional record); Klimaszewski & Génier, 1985: 63 (new distributional record); Klimaszewski & Jansen, 1995: 329 (checklist); Janák, 2010: 186 (checklist). Distribution: Brazil (Klimaszewski, 1979, 1982).

A. ferruginea Sharp, 1883: 294 (original description, as *Deinopsis*; type locality: "Coatepeque, 1300ft", Guatemala); Klimaszewski, 1979: 75 (redescription; lectotype designation); Klimaszewski & Jansen, 1995: 329 (checklist); Janák, 2010: 186 (checklist). Distribution: Guatemala (Sharp, 1883; Klimaszewski, 1979).

A. pubescens Klimaszewski, 1982: 332 (original description; type locality: "Para, Ipean, Belem", Brazil); Klimaszewski & Frank, 1992: 248 (new distributional record); Klimaszewski & Jansen, 1995: 328 (checklist); Janák, 2010: 186 (checklist). Distribution: Brazil (Klimaszewski, 1982; Klimaszewski & Frank, 1992), Colombia (Klimaszewski, 1982; Klimaszewski & Génier, 1985), Mexico (Klimaszewski, 1982; Klimaszewski & Génier, 1985), Panama (Klimaszewski, 1982), Paraguay (Klimaszewski & Jansen, 1995), Peru (Klimaszewski & Frank, 1992; Klimaszewski & Jansen, 1995).

Incertae cedis (Klimaszewski & Jansen, 1995)

A. angusta Sharp, 1883: 295 (original description, as *Deinopsis*; type locality: "Coatepeque 1300feet", Guatemala); Klimaszewski, 1979: 73 (redescription); Klimaszewski, 1982: 327 (new distributional record); Klimaszewski & Jansen, 1995: 329 (checklist); Pace, 2008: 227 (new distributional record); Janák, 2010: 186 (checklist). Distribution: Ecuador (Pace, 2008), Guatemala (Sharp, 1883), Peru (Klimaszewski, 1982).

Acknowlegements

We thank Dr. Jan Klimaszewski, Mr. Taro Eldredge and anonymous reviewers for critical comments on the manuscript.

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