

First Records of the Genera *Neokodaiana* and *Sinesarima* (Hemiptera: Fulgoroidea: Issidae) from Japan with Description of a New Species from the Ryukyus

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Abstract The genera *Neokodaiana* Yang, 1994 and *Sinesarima* Yang, 1994 are recorded from Japan for the first time. *Neokodaiana yaeyamana* sp. nov. is described from Iriomote and Ishigaki Islands. A key to species of the genus *Neokodaiana* is given. *Sarima ryukyuana* Hori, 1970 is transferred to the genus *Sinesarima* Yang, 1994 to become *Sinesarima ryukyuana* (Hori, 1970), comb. nov.

Introduction

The genus *Neokodaiana* belongs to the tribe Issini of the family Issidae *sensu* Gnezdilov (2013a). This genus was erected by Yang (*in Chan & Yang*, 1994) for a single species, *Neokodaiana chihpenensis* Yang, 1994 from SE Taiwan. Still now *N. chihpenensis* was known only from the type series (Chan & Yang, 1994). Below we describe one more species of the genus from the Southern Ryukyu Islands (Iriomote, Ishigaki and Yonaguni) and list one more record of *N. chihpenensis* from Taiwan. A new species is clearly differs from *N. chihpenensis* by the narrower metope.

Gnezdilov (2013b) in frame of revision of the genus *Sarima sensu lato* already transferred one Japanese species originally described in the genus *Sarima* Melichar, 1903 to the genus *Eusarima* Yang, 1994. Below we transfer *Sarima ryukyuana* Hori, 1970 to the genus *Sinesarima* Yang, 1994 based on the fore wing venation (radius with anterior branch short, media and cubitus anterior each with two branches) and the structure of male genitalia (ventral aedeagal hooks each with two branches, capitulum of style with apex turned to the left in view from above) (Hori, 1970, figs. 11, 15–17). The mentioned morphological features are diagnostic for the genus *Sinesarima* (Chan & Yang, 1994).

Material and Methods

Morphological terminology follows Anufriev & Emeljanov (1988) and Gnezdilov *et al.* (2014). Type specimens are deposited in Kyushu University, Fukuoka, Japan (ELKU), Tokyo University of Agriculture, Atsugi, Japan (TUA) and the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia (ZIN). A female of *Neokodaiana chihpenensis* is from the Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany (SDEI).

The drawings were made using camera lucida attached to stereomicroscope Leica MZ95. The photos were taken by Leica MZ 95 with camera Leica DFC 290 and then assembled with Helicon Focus 5.3 and Adobe Photoshop CS6.

Taxonomy

Family **Issidae** Spinola, 1839
Subfamily **Issinae** Spinola, 1839
Tribe **Issini** Spinola, 1839

Genus ***Neokodaiana*** Yang, 1994

Neokodaiana Yang, 1994: 92 (*in Chan & Yang*, 1994). Type species: *Neokodaiana chihpenensis* Yang, 1994.

Neokodaiana chihpenensis Yang, 1994
(Figs. 1, 5–7)

Neokodaiana chihpenensis Yang, 1994: 92 (*in Chan & Yang*, 1994).

Material examined. 1♀, Formosa, Kosempo, 7.IX., H. Sauter, 1911 (SDEI).

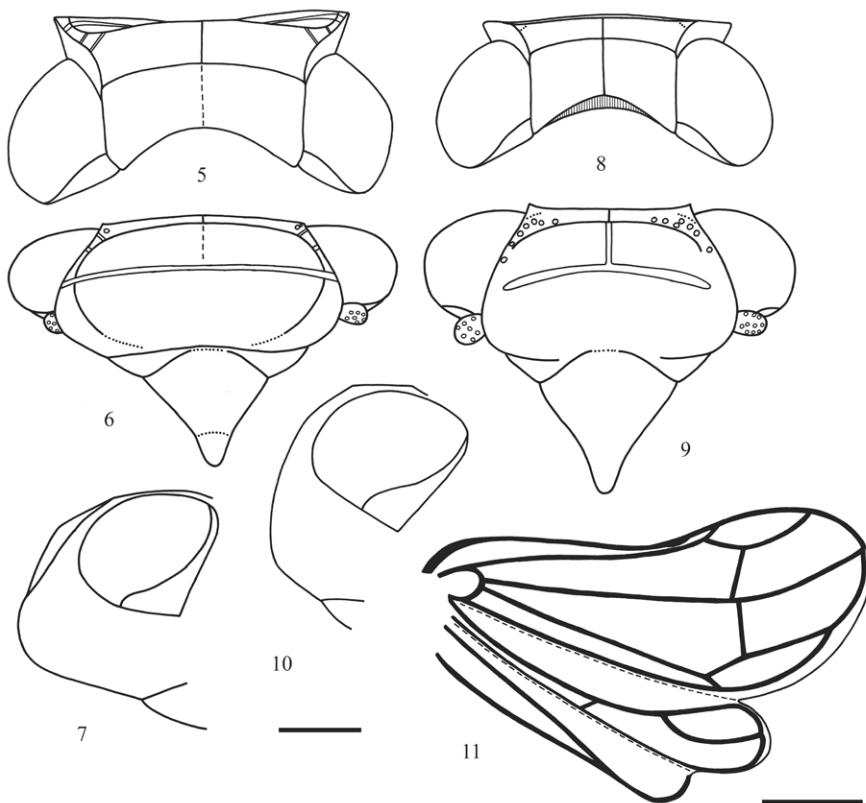
Note. The species was known only from Chihpen, Taitung Co., SE Taiwan (Chan & Yang, 1994).

Neokodaiana yaeyamana sp. nov.
(Figs. 2–4, 8–20)

Type material. Holotype, ♂, Japan, Ryukyus, Iriomote Is., Ōtomi, 25.VI.1996, M. Hayashi *et al.* leg., “Coll. M. Hayashi, Saitama Univ.” (ELKU, Type No. 3455). Paratypes: Japan, Ryukyus: 1♀, Ishigaki Is., Shiramizu, 17.III.1993, M. Hayashi *et al.* leg., “Coll. M. Hayashi, Saitama Univ.” (ZIN); 1♂, Ishigaki Is., Takeda/Omoto, 10.XI.1985, M. Hayashi leg. (TUA); 1♀, Ishigaki Is., Omoto, 26.IV.1985, K. Kishi leg. (TUA); 1♀, Ishigaki Is., Mt. Yarabu-dake, 25.XI.2004, M. Hayashi leg. (TUA); 1♀, Okinawa Pref., Ishigaki Is., 15.X.1999, S.A. Belokobylsky leg. (ZIN); 1♂, Iriomote Is., Ōtomi, 25.VI.1996, M. Hayashi *et al.* leg. (TUA); 1♂, same data except 26.VI.1996 (TUA); 2♀, same locality, 20.XI.2004, M. Hayashi leg. (TUA); 1♀, same locality, 18.III.2006, M. Hayashi leg. (TUA); 1♀, same locality, 30.VI.2009, M. Hayashi leg. (TUA); 1♀, Iriomote Is., Funaura, 9.X.1977, M. Taniguchi leg. (TUA); 1♂, same data except T. Tsutsumi leg. (TUA); 1♂, same locality, 27.VIII.1985, M. Hayashi leg.



Figs. 1–4. *Neokodaiana* spp. 1, *N. chihpenensis* Yang, frontal view; 2, *N. yaeyamana* sp. nov., frontal view; 3, same, dorsal view; 4, same, lateral view.



Figs. 5–11. *Neokodaiana* spp. 5–7, *N. chihpenensis* Yang; 8–11, *N. yaeyamana* sp. nov. 5, 8, Head, dorsal view; 6, 9, head, frontal view; 7, 10, head, lateral view; 11, hind wing. Scales, 0.5 mm (for Figs. 5–10) and 1.0 mm (for Fig. 11)

(TUA); 2♂, same locality, 25.III.1991, M. Hayashi leg. (TUA); 1♂, same locality, 25.X.2009, M. Hayashi leg. (TUA); 1♂, Iriomote Is., Mt. Sonai-dake, 1.VII.2009, M. Hayashi leg. (TUA); 1♂, Yonaguni Is., Tabaru-ue, 8.X.1993, M. Hayashi *et al.* leg. (TUA).

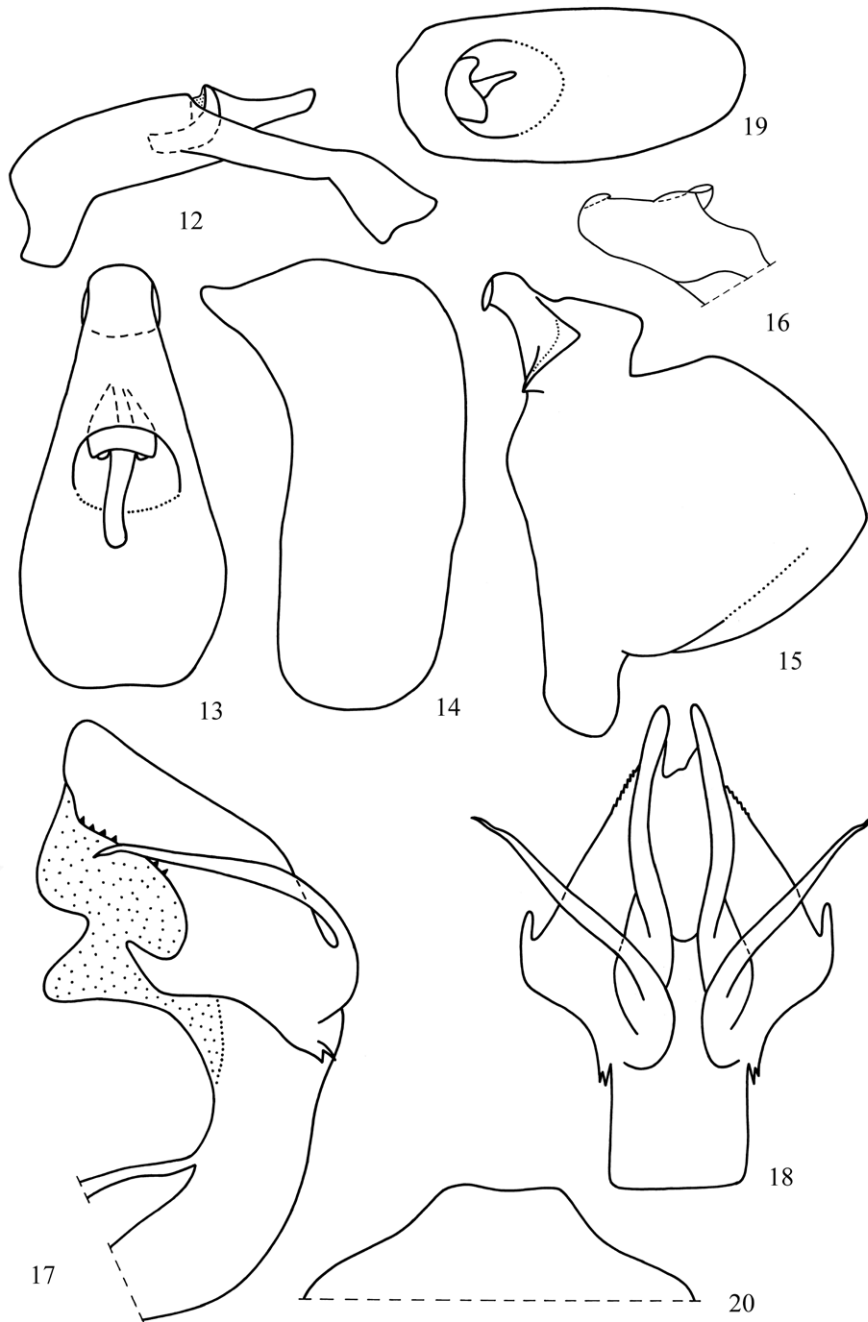
Description. Metope wide, nearly 1.5 times as wide as long at midline, with sublateral carinae joined below its upper

margin in form of horse-shaped carina (transverse part of the carina is distinct, but lateral parts rather weak) (Fig. 9). Pedicel cylindrical. Metope and coryphe joined at nearly 120° angle (in lateral view) (Fig. 10), thus, upper part of metope above horse-shaped carina is completely visible from above (Fig. 8). Metope enlarged above the clypeus, with median carina running from its upper margin down to narrow transverse prominence situated at the middle of metope between

sublateral carinae (inside of horse-shoe) (Fig. 9). Metopoclypeal suture distinct. Ocelli rudimentary. Postclypeus without carinae. Coryphe transverse, twice as wide as long at midline, with weak median carina, anterior margin weakly convex, posterior margin obtusely angulately concave (Fig. 8). Pronotum with weak median carina. Mesonotum a bit longer than pronotum, without carina. Scutellum depressed. Fore wings wide (Fig. 3), with wide hypocostal plate. Caudo-dorsal angle of the wing at least 130°. Basal cell oval. Longitudinal veins keel-shaped. R 2 M 3 CuA 2. Radius furcates very near to basal cell. Media furcates firstly in proximal part of the wing. Cubitus anterior furcates after wing middle. Fore wings have narrow appendix behind the marginal vein. Hind wings

3-lobed (Fig. 11). Basal cell large, oval. Anal lobe small, rudimentary. R 2 rm 1 M 1 mcu 1 CuA 2 CuP 1 Pcu 1 A₁ 2 A₂ 1. Radius furcates just after coupling lobe. First anal vein partly fused with postcubitus. Hind tibia with two lateral spines distally and with 11 apical spines. First metatarsomere with two latero-apical and 10–12 intermediate spines in entire row.

Coloration. General coloration brown yellowish with dark brown and black spots (Figs. 2–4). Metope dark brown between its upper margin and horse-shoe sublateral carina, with light yellow median carina and light yellow traces (spots) of larval sensory pits between lateral margins of metope and sublateral carina (Fig. 2). Metope black below transverse part of horse-shoe carina except light yellow median carina.



Figs. 12–20. *Neokodaiana yaeyamana* sp. nov., genitalia. 12, Male anal tube, lateral view; 13, same, dorsal view; 14, pygofer, lateral view; 15, style (left), lateral view; 16, capitulum of style (right), dorsal view; 17, aedeagus, lateral view; 18, same, ventral view; 19, female anal tube, dorsal view; 20, female sternite VII.

Narrow transverse prominence at the middle of metope ivory. Metope ivory above metopoclypeal suture. Scapus and pedicel dark brown. Genae ivory, with dark brown spot near to pedicel. Preocular fields brown near to eyes. Postclypeus, except ivory basal part, and anteclypeus dark brown. Rostrum brown yellowish with dark brown apex. Coryphe yellow brownish with dark brown spots (Fig. 4). Anterior margin and median carina of coryphe light yellow. Pronotum brown yellowish to dark brown (paranotal lobes) with light yellow median carina. Mesonotum yellow brownish with dark brown rounded spots above scutellum. Fore wings yellowish brown with dense dark brown and black spots which may be fused (Fig. 3). Longitudinal veins brown or dark brown. Transverse veins light brown or light yellow. Hind wings dark brown. Abdominal tergites, pygofer, and gonopods dark brown. Abdominal sternites II–VI dark brown with yellow hind margins, except sternites V–VI which are black medially. Abdominal sternite VII completely dark brown. Female anal tube dark brown basally and apically and yellow medially. Legs brown yellowish to dark brown. Fore and middle coxae and trochanters yellow brownish. Fore and middle femora, tibiae, and tarsi dark brown to black. Hind tarsi brown yellowish. Apices of fore and middle femora and basal parts of tibiae light yellow. Hind legs brown.

Male genitalia (Figs 12–18). Pygofer wide (in lateral view), with almost straight hind margin except step like concavity basally (Fig. 14). Anal tube long, enlarged apically (in dorsal view) (Fig. 13), apical angles turned down (in lateral view) (Fig. 12). Anal column about 0.25 as long as whole anal tube (Figs 12, 13). Phallobase weakly curved (in lateral view) (Fig. 17), with large and wide collar bearing two long and narrow median processes turned laterally (Fig. 18), two short lateral marginal horn-shaped processes and two furcated spine-shaped basal processes (Figs 17, 18). Lateral margin of the collar with a row of marginal denticles (7) subapically (Fig. 17). Phallobase weakly sclerotized dorsally (Fig. 17). Aedeagus not visible from outside, without ventral hooks. Style massive, with deep concavity before the capitulum (in lateral view) (Fig. 15); hind margin slightly convex; caudo-dorsal angle almost straight. Capitulum wide (in dorsal view) (Fig. 16), with apical tooth turned laterally (left and right on different styles), lateral tooth wide (Fig. 15). Margin of style convex below the capitulum (Fig. 15).

Female genitalia (Figs. 19, 20). Sternite VII with highly convex hind margin (Fig. 20). Anal tube long, narrowly oval (Fig. 19). Anal column short.

Total length. Males: 5.4–6.5 mm (mean 5.7 mm). Females: 5.4–6.7 mm (mean 6.1 mm).

Distribution. Ryukyus; Ishigaki, Iriomote and Yonaguni Islands.

Etymology. Species name derived from the name of the island group “Yaeyama” of the Southern Ryukyus.

Biology. On Iriomote Is., the second author observed several adults walking on the trunks and limbs of *Ficus superba* (Miq.) var. *japonica* Miq. (Moraceae) which is probably a host plant.

Key to *Neokodaiana* species

1. Metope more wide above the clypeus – twice as wide as long at midline (Fig. 6). Horse-shoe sublateral carina well developed, complete. Coryphe 3.2 times as wide as long at midline (Fig. 5). Coryphe and metope joined at almost 160° (in lateral view) (Fig. 7). Postclypeus brown to dark brown except light patch below the metopoclypeal suture (Fig. 1)..... *N. chihpenensis* Yang, 1994
2. Metope more narrow above the clypeus – 1.7 times as wide as long at midline (Fig. 9). Horse-shoe sublateral carina with weak lateral parts, incomplete. Coryphe twice as wide as long at midline (Fig. 8). Coryphe and metope joined at almost 120° (in lateral view) (Fig. 10). Postclypeus brown to dark brown with wide light band below the metopoclypeal suture (Fig. 2)..... *N. yaeyamana* sp. nov.

Genus *Sinesarima* Yang, 1994

Sinesarima Yang, 1994: 99 (in Chan & Yang, 1994). Type species: *Sinesarima pannosa* Yang, 1994.

Sinesarima ryukyuna (Hori, 1970), comb. nov.

Sarima ryukyuna Hori, 1970: 82.

Note. Transferred according to the original description: radius of fore wing with anterior branch short, media and cubitus anterior each with two branches; ventral aedeagal hooks each with two branches, capitulum of style with apex turned to the left in view from above.

Discussion

Currently known Ryukyuan fauna of the family Issidae including the species described above comprises nine species in seven genera from the tribes Issini and Hemisphaeriini Melichar, 1906 (Hori, 1969, 1970; Hayashi, 2002; present data). Among them the tribe Issini comprises four species in four genera: *Sarima amagisana* Melichar, 1906, *Eusarima satsumana* (Matsumura, 1916), *Sinesarima ryukyuna* (Hori, 1970), comb. nov., *Neokodaiana yaeyamana* sp. nov. The genus *Eusarima*, comprising currently 35 species, is Indo-Malayan taxon with most part of the species known recorded from Taiwan and just two species are known from the Palearctic (Gnezdilov, 2013a). The genera *Neokodaiana* and *Sinesarima* have been recorded only from Taiwan and the Ryukyus up to the present. The last genus was known before after three species (Chan & Yang, 1994). Thus the presence of these three genera in Japan shows close relationships of the Ryukyuan and Taiwanese issid faunas.

For correct identification of taxonomic position of *Sarima amagisana* the examination of type series is necessary. According to Melichar (1906) the species description is based on the specimen from Sumatra, and in the same description, however, L. Melichar refers to the record of this species from Japan (Kyushu) suggested by S. Matsumura. In this situation it is unclear which species was figured and recorded by Hori (1970) from Ryukyus as *S. amagisana*. Hori's drawings of

male genitalia of the species collected in the Ryukyus are very similar to the members of the genus *Eusarima*; for example, aedeagus with pair of narrow subapical processes directed apically (Hori, 1970; fig. 5). For final decision on this problem, therefore, the lectotype designation is necessary for *S. amagisana* and accordingly the comparison of the lectotype with Ryukyuan material will conclude that they both are independent or conspecific.

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