

# Review of the plant bug genus *Dortus* Distant, 1910, with a unique taxonomic character observed for the subfamily Deraeocorinae (Hemiptera: Heteroptera: Miridae)

T. YASUNAGA

Research Associate; American Museum of Natural History; New York 10024; USA;  
c/o Nameshi 2-33; Nagasaki 852-8061; Japan; E-mail: yasunagat.amnh@gmail.com

## Abstract

The deraeocorine plant bug genus *Dortus* Distant, 1910 is revised (Hemiptera: Heteroptera: Miridae: Deraeocorinae). A new species uniquely inhabiting coastal zones in Nagasaki Prefecture, southwestern Japan, *Dortus ikimarinus n. sp.* (associated with a halophilic herb, *Vitex rotundifolia*, as a breeding host) is herein described, with information on the bionomics and immature forms. *Papuacoris* Carvalho, 1985 is synonymized with *Dortus*, which results in the following nomenclatorial changes: *Dortus colocasiae* (Poppius, 1915) **n. comb.**, *Do. papuanus* (Poppius, 1915) **n. comb.**, *Do. vittatus* (Reuter, 1908) **n. comb.** (= *Do. primarius* Distant, 1910 **n. syn.**), *Deraeocoris ottoensis* (Carvalho, 1985) **n. comb.** and *De. pallidiceps* Poppius, 1915 **comb. rev.**. A key is provided to facilitate identification of all known congeners of *Dortus*, and a unique taxonomic character, namely «mesoscutal-scutellar fovea», is also posited to support the monophyly of the subfamily Deraeocorinae. The Oriental genus *Angerianus* Distant, 1904 is proposed to be reinstated in the tribe Hyaliodini.

**Key words:** Miridae, Deraeocorinae, *Dortus*, new species, new synonymy, taxonomic character, SEM documentation.

## Resumen

### Revisión del género de míridos *Dortus* Distant, 1910, y observación de un carácter taxonómico singular en la subfamilia Deraeocorinae (Hemiptera: Heteroptera: Miridae)

Se revisa el género de míridos deraeocorinos *Dortus* Distant, 1910 (Hemiptera: Heteroptera: Miridae: Deraeocorinae). Se describe *Dortus ikimarinus n. sp.*, una nueva especie que habita exclusivamente en zonas costeras (asociada con una herbácea halófila, *Vitex rotundifolia*, como hospedador reproductivo o verdadero) de la prefectura de Nagasaki, suroeste de Japón, junto con información sobre su bionomía y estadios inmaduros. Se sinonimiza *Papuacoris* Carvalho, 1985 con *Dortus*, de donde se derivan los siguientes cambios nomenclaturales: *Dortus colocasiae* (Poppius, 1915) **n. comb.**, *Do. papuanus* (Poppius, 1915) **n. comb.**, *Do. vittatus* (Reuter, 1908) **n. comb.** (= *Do. primarius* Distant, 1910 **n. syn.**), *Deraeocoris ottoensis* (Carvalho, 1985) **n. comb.** y *De. pallidiceps* Poppius, 1915 **comb. rev.**. Se proporciona una clave para facilitar la identificación de todos los miembros conocidos de *Dortus*, y se plantea un singular carácter taxonómico, nombrado «fóvea mesoscutelar-escutelar», como apoyo a la monofilia de la subfamilia Deraeocorinae. Se propone reubicar el género oriental *Angerianus* Distant, 1904 dentro de la tribu Hyaliodini.

**Palabras clave:** Miridae, Deraeocorinae, *Dortus*, nueva especie, nueva sinonimia, carácter taxonómico, documentación MEB.

## Laburpena

### *Dortus* Distant, 1910 mirido-generoaren berrazterketa eta Deraeocorinae subfamiliaren karkatera taxonomiko berezi batzen behaketa (Hemiptera: Heteroptera: Miridae)

Mirido deraeokorinoen *Dortus* Distant, 1910 generoa berrazterzen da (Hemiptera: Heteroptera: Miridae: Deraeocorinae). *Dortus ikimarinus n. sp.* deskribatzen da, kostaldeko eremuetan (eta ugaltze- edo egiazko ostalaritzat

*Vitex rotundifolia* belarkara halofiloari lotuta) bizi den espezie berria hain zuzen, Japoniako hegomeñebaldeko Nagasaki prefekturakoan; bere bionomia eta estadio heldugabean buruzko informazioarekin batera. *Papuacoris* Carvalho, 1985 *Dortusekin* sinonimizatzen da, nondik ondoko aldaketa nomenklaturalak eratortzen baitira: *Dortus colocasiae* (Poppius, 1915) **n. comb.**, *Do. papuanus* (Poppius, 1915) **n. comb.**, *Do. vittatus* (Reuter, 1908) **n. comb.** (= *Do. primarius* Distant, 1910 **n. syn.**), *Deraeocoris ottoensis* (Carvalho, 1985) **n. comb.** eta *De. pallidiceps* Poppius, 1915 **comb. rev.**. Klabe bat ematen da *Dortus* espezie ezagun guztien identifikazioa ahalbidetzeko, eta karaktere taxonomiko berezi bat, «fobea mesoscutelar-eskutellarra» deitua, Deraeocorinae subfamiliaren monofiliaren aldeko euskarritzat planteatzen da. Ekiadeko generoa den *Angerianus* Distant, 1904 Hyalioidini tribuan berkokatzea proposatzen da.

**Gako-hitzak:** Miridae, Deraeocorinae, *Dortus*, espezie berria, sinonimia berria, karaktere taxonomikoa, EME dokumentazioa.

## Introduction

The deraeocorine plant bug genus *Dortus* was proposed by Distant (1910) to accommodate *D. primarius* Distant, 1910 from southern Myanmar. Subsequently, Miyamoto (1965) added *D. chinai* from the subtropical Ryukyu Islands, southern Japan, and this Japanese species was also recorded from Kyushu, warm temperate climate zone (Yasunaga *et al.*, 2001). Recently, some coastal populations restricted to a halophyte breeding host, *Vitex rotundifolia* L.f. (Lamiaceae) in Nagasaki Prefecture, Japan, was confirmed as an undescribed species closely related to *D. chinai*, and it is herein described as new to science. Carvalho (1985) proposed a new genus *Papuacoris* and included five species from Papua New Guinea in the genus. However, *Papuacoris* is evidently congeneric with *Dortus*, based on Carvalho's description and illustrations of the type species (*Deraeocoris colocasiae* Poppius, 1915) and the former is regarded as a junior synonym of the latter. In addition, *Dortus primarius* Distant, 1910 and *Papuacoris vittatus* (Reuter, 1908) was found to represent a single species distributed broadly over the Indo-Pacific across the Wallacea.

The present work describes *Dortus ikimarinus* **n. sp.** from southwestern Japan as well as proposes the following taxonomic changes: (1) *Papuacoris* (Carvalho, 1985) is synonymized with *Dortus* (Distant, 1910); (2) Four new combinations and a revised combination are accordingly established; and (3) *Dortus primarius* Distant, 1910 is synonymized with *D. vittatus* (Reuter, 1908). The genus *Dortus* is rediagnosed, and a checklist and key are provided to aid in identification of all known congeners. A unique morphological structure, namely «mesoscutal-scutellar fovea», is also assumed as apomorphic state of character that may posit the monophyly of the subfamily Deraeo-

corinae. The Oriental genus *Angerianus* Distant, 1904 is proposed to be reinstated in the tribe Hyalioidini.

## Material and methods

Field investigation to sample and observe the undescribed species was performed by the author, Biology Club members of Nagasaki West High School (NWHS, in southern mainland of Nagasaki Prefecture) and Mr. T. Nozaki (on Iki Island) from late March, 2021 to late April, 2022. The rearing method followed was mainly by Miyazaki *et al.* (2020), Tamada *et al.* (2020) and Yasunaga *et al.* (2018) (for *Dortus chinai* and *D. ikimarinus* **n. sp.**); frozen aphids and dried brine-shrimp eggs placed on a folded tissue paper immersed in a diluted fermented milk beverage (e.g. Fig. 4c, h) were used as diet, which enabled to rear the multiple generations.

The specimens examined in this study are deposited in the following collections:

AMNH: American Museum of Natural History, New York, USA.

CNC: Canadian National Collection, Ottawa, Ontario, Canada.

NWHS: Nagasaki West High School, SSH Biology Section, Nagasaki, Japan.

TYCN: T. Yasunaga collection, Nagasaki, Japan.

WCF: Wesco Co., Fukuoka, Japan.

Matrix code labels, which uniquely identify each specimen and are referred to as «unique specimen identifier» (USI), are attached to the holotypes and some representative specimens. The USI codes [e.g., AMNH\_PBI 0012345] comprise an institution and project code (AMNH\_PBI) and a unique number



**FIGURE 1.** Typical habitats of three Oriental *Dortus* spp.: (a) Seashore habitat of *D. ikimarinus* n. sp. with *Vitex rotundifolia* vegetation partly mixed with *Calystegia soldanella* (L.) Roem. & Schult. (Convolvulaceae) and *Onagra biennis* (L.) Scop. (Onagraceae), Nagasaki, Japan; (b) Engine vacuum netting method to collect *D. ikimarinus* n. sp.; (c) Habitat of *D. chinai*, open field predominated by graminoid weeds, Okinawa, Japan; (d) School campus garden harboring *D. chinai*, Nagasaki, Japan; (e)-(f) Habitats of *D. rittatus*, dry vegetable field, Siem Reap, Cambodia, and open grassland, Nakhon Nayok, Thailand.

(0012345). These data were digitized on the Arthropod Easy Capture (formerly the Planetary Biodiversity Inventory) database maintained by the American Museum of Natural History, New York, USA (<http://research.amnh.org/pbi/>).

and are also searchable (by species name) on «Heteroptera Species Pages» (<http://research.amnh.org/pbi/heteropteraspecies-page/>).

Only selected references are cited for known taxa, as several comprehensive catalogs are now available (e.g., Schuh, 1995; Kerzhner and Josifov, 1999; Schuh, 2002–2013; Aukema, 2018). Some terms are provisionally used to indicate the male genitalic structure both in text and figures, such as apical sclerite (abbreviated as AS), gonoporal sclerite (GP) and lateral sclerite (LS). A new term, «mesoscutal-scutellar fovea (MSF)», is proposed for a replacement name of the posterolateral fovea of mesonotum (*sensu* Chan and Cassis, 2020). Terminology of egg structure follows Cobben (1978). Key characters for two Papua New Guinean species were based on descriptions and illustrations provided by Carvalho (1985).

Scanning Electron Micrographs (SEM) were taken with Hitachi Miniscope® (TM3030 and TM4000II); the genitalic structures were also observed using a Nikon Eclipse Ci upright microscope, with a photophase unit. All measurements are given in millimeters; for some of the SEM images, scale bars are shown in micrometers (μm). For taking genitalic SEM images, the following method was used. After dissection and observation using a binocular stereoscopic microscope (Olympus SZX12), the delicate, fragile organs were dipped and washed in 50–60% ethyl alcohol, placed on filter paper until dry, carefully attached to cards using water soluble wood glue, and finally placed in the SEM vacuum-chamber for examination (without vapor deposition of metals).

## Taxonomy

### Subfamily Deraeocorinae

#### Tribe Deraeocorini

##### Genus *Dortus* Distant, 1910

*Dortus* Distant, 1910: 13 (n. gen.), type species by original designation: *Dortus primarius* Distant, 1910 (= junior synonym of *Camptobrochis vittatus* Reuter, 1908) from Myitta, Tenasserium, Burma (= current Dawei District, Tanintharyi, Myanmar, 14°10'N 98°31'E); Distant, 1911: 179 (diag.); Yasunaga *et al.*, 2001: 200 (diag.); Schuh, 2002–2013 (online cat.); Aukema, 2018 (online cat.).

*Papuacoris* Carvalho, 1985 (n. gen.), type species by original designation: *Deraeocoris colocasiae* Poppius, 1915 from Papua New Guinea; Schuh, 2002–2013 (online cat.); Chérot *et al.*, 2017: 29 (faunal list). **N. syn.**

#### Revised diagnosis:

Distinguished from the most closely related (and at first sight very similar) genus *Deraeocoris* (in broad sense) by the following combination of characters: small to moderate size (3.9–4.5 mm in total length; 1.8–2.2 in maximum width); generally pale orange or stramineous brown basic coloration; dorsum with uniformly distributed, visible, pale, simple setae; head rather vertical, not porrect; eyes almost contiguous to anterior margin of pronotum; uniformly distributed punctures on pronotum and hemelytron; smooth, impunctate scutellum; mesoscutal-scutellar fovea comma-shaped, rather extending inward; comparatively small basal process of claw; flattened, roundly expanded sensory lobe and apically hooked hypophysis of left paramere; small-sized, weakly sigmoid right paramere tapered towards apex; vesica (endosoma) furnished with apical-, gonoporal- and lateral-sclerites as well as two spinulate sclerotized areas; small, thick-rimmed female sclerotized ring; and interramal sclerite on posterior wall densely covered with comb-like scaly microstructures.

#### Distribution:

Now confirmed to be distributed over Oriental and Australian regions across Wallacea, north to Taiwan and southwestern Japan including Ryukyu Islands; the northernmost population currently known from Iki Island, Nagasaki, Japan (33°47'N 129°43'E).

#### Discussion:

The genus *Deraeocoris* Kirschbaum is currently composed of more than 220 species worldwide (Schuh, 2002–2013). As evidenced by its contained species, it is interpreted as a polyphyletic (or garbage) genus, since a variety of members (sometimes those of other subfamilies, such as mirines of the *Lygus*-complex) have been placed solely in it. As *Deraeocoris* was established for the Eurosiberian *Cimex olivaceus* Fabricius, 1777, genuine members of this genus group could be limited to *olivaceus* and its close relatives (e.g. *D. ater* (Jakovlev, 1889), *D. erythromelas* Yasunaga & Nakatani, 1998, *D. ruber* (Linnaeus, 1758)) that are primarily characterized by their remarkably large bodies and known to occur in temperate and cold temperate climatic zones of the Palaearctic Region (*cf.* Yasunaga and Nakatani, 1998). Although several subgenera were suggested to improve classification system of *Deraeocoris*, hundreds of congeners (particularly, tropical and subtropical species) still require more plausible generic status.

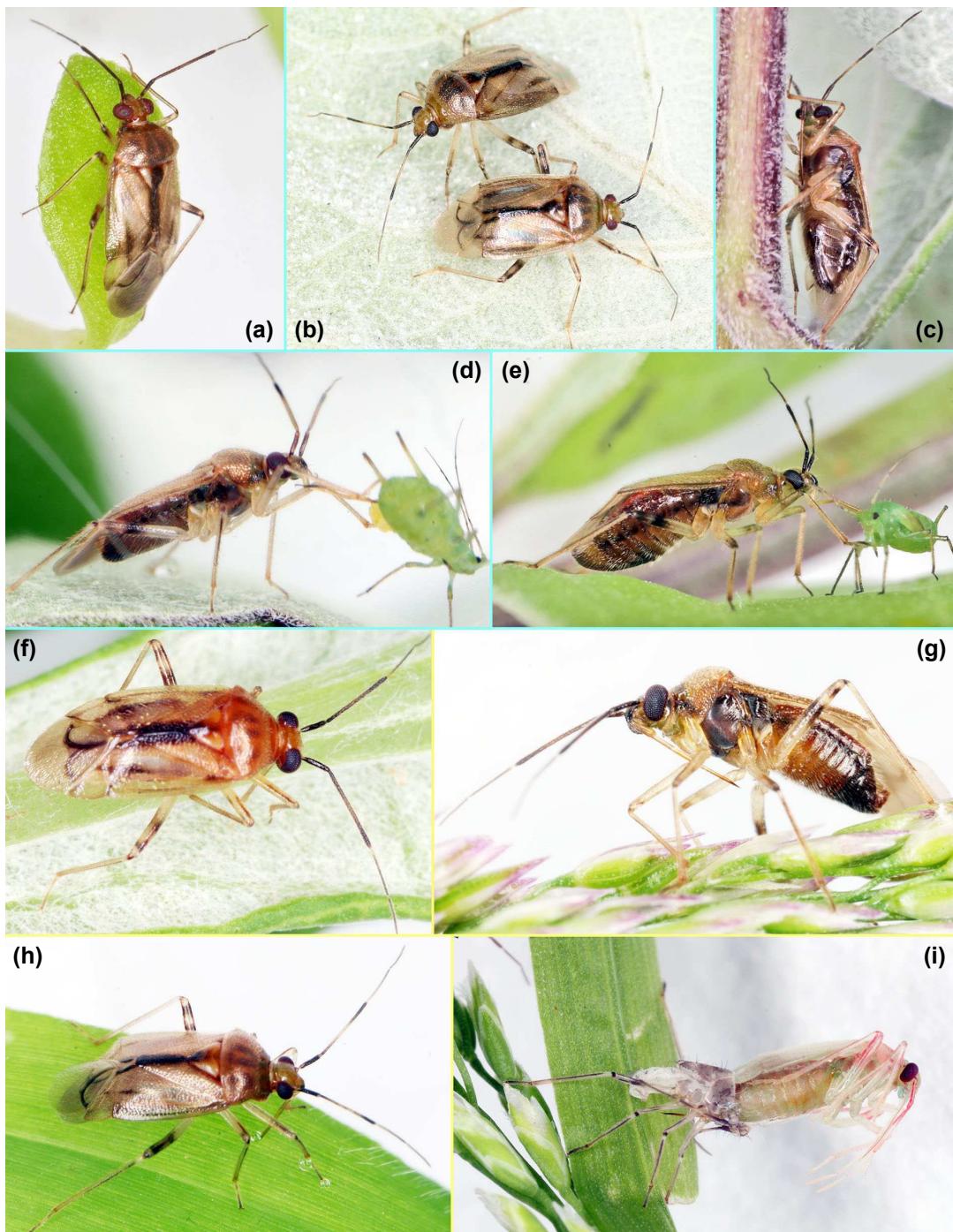


FIGURE 2. Habitus images of live adult individuals of: (a)-(e) *D. ikimarinus* n. sp.; (f)-(i) *D. chinai* / (a), (d), (f), (g), (i) Males; (b), (c), (e), (h) Females; (i) Final eclosion (emergence).

The species of *Dortus* are similar to several members of *Deraeocoris* (e.g. *D. kimotoi* species group, *sensu* Nakatani, 1995) both in external appearance (Fig. 3e-f) and male genitalic structures (Fig. 13a-c); some sclerites on the vesica (endosoma) of these taxa are evidently homologous (Fig. 13b). The common Australian *Deraeocoris signatus* (Distant, 1904) also exhibits great similarity to *Dortus* species and apparently is not a true member of *Deraeocoris*.

The present close examination with tabletop SEMs revealed that a small pit, or mesoscutal-scutellar fovea (MSF), was present not only in *Dortus* congeners (Fig. 8b-c, e-f, h-i) but also in representatives of all known tribes (Figs. 11-12). Chan and Cassis (2020) mentioned that this character is a synapomorphy for the tribe Saturniomirini; the authors called it as «posterior-lateral fovea of mesoscutum». However, the fovea is now considered to be possessed by many members of the subfamily Deraeocorinae. The paired, pit-like structures are situated laterally across the posterior mesoscutum and anterior scutellum, and, therefore, an alternative term «mesoscutal-scutellar fovea (MSF)» is used herein. The MSF is furnished with micro-pilosity (e.g. Figs. 8c, f, i) and currently assumed as a sense organ or gland, like the medio-pronotal pit shared by Eccritotarsine mirids (Bryocorinae: Eccritotarsini) (Ikeda *et al.*, 2019). Further physiological challenge, which is beyond the scope of the present work, is required to verify the function. In typical large-sized *Deraeocoris* species (*D. olivaceus* and its allies), the MSF is obviously reduced (or may obliterate the original function) (Fig. 11g-i).

During my recent observation, the MSF was also found to exist in some members of the tribe Mirini of the subfamily Mirinae (e.g. available species of *Charagochilus* Fieber, 1858, *Eurystylus* Stål, 1871, *Polymerus* Hahn, 1831 and *Proboscidocoris* Reuter, 1882, which are related to each other, *cf.* Fig. 14). Currently, the Mirini is considered to comprise several lineages (Yasunaga *et al.*, 2001; Oh *et al.*, 2018), and these mirines equipped with the recognizable MSF may imply their closer relationships to members of the Deraeocorinae (Deraeocorini in particular). However, a doubtless elucidation will depend upon further closer investigations on such unique characters.

In addition to the MSF, dorsal punctures of deraeocorine bugs are not setal sockets (*cf.* Figs. 8b, e, 11c, 12e); each simple seta bears anteriorly to each puncture. So far as I have observed using a SEM, a similar structure was confirmed only in the Isometopinae (Fig. 13l) and several taxa of the Mirinae (Fig. 13n). The dorsal punctuation in most of other plant bugs,

if any, usually represents the setal-socket (Fig. 13m, o). Applying this character status (puncture ≠ setal socket) and presence of the MSF will more or less improve further phylogenetic analyses of the Miridae.

Incidentally, suprageneric placement of the Oriental genus *Angerianus* Distant, 1904 has been ambiguous. Stonedahl (1991) and Stonedahl and Cassis (1991) presumed that *Angerianus* is most closely related to *Fingulus* Distant, 1904 (*cf.* Fig. 3g-i). As argued by Yasunaga *et al.* (2016), however, *Angerianus* is distinct in having the anteriorly flattened, vertical (non-porrect) head reminiscent of the Hyalioidini (particularly, *Stethoconus* Flor, 1861, *cf.* Fig. 3j-k), matte or less-shining surface of pronotum (Fig. 12a, d), rows of hemelytral punctures along the claval and corial margins (Fig. 12a), and ovoid immature forms that are similar to aphids. In *Fingulus*, the nymphs strikingly mimic their prey thrips (Fig. 3 h-i; Yasunaga *et al.*, 2001, 2016). Based on available evidence, *Angerianus* seems to be best placed in the tribe Hyalioidini.

#### Checklist of *Dortus* species:

(new distributional record indicated by asterisk\*)

*Dortus* Distant, 1910 (= *Papuacoris* Carvalho, 1985  
n. syn.).

*Dortus chinai* Miyamoto, 1965 – Japan (Shikoku, Kyushu, Ryukyu: Tokara, Amami-Oshima, Toku-noshima, Okino'erabu, Okinawa, Miyako, Ishigaki and Iriomote Islands).

*Dortus colocasiae* (Poppius, 1915) n. comb. – Indonesia (Irian Jaya), Papua New Guinea (including New Britain and New Ireland).

*Dortus ikimarinus* n. sp. – Japan (western coastal zones of Kyushu, Iki Island).

*Dortus papuanus* (Poppius, 1915) n. comb. – Indonesia (Biak), Papua New Guinea (Madang).

*Dortus vittatus* (Reuter, 1908) n. comb. (= *D. primarius* Distant, 1910 n. syn.) – Cambodia\* (Siem Reap), India (Karnataka), Indonesia (Java, Lombok\*, Sumatra), Myanmar (Taninthayi), Nepal\* (Kathmandu), Papua New Guinea (Madang, Morobe, Port Moresby), Philippines (Luzon), Sri Lanka (Peradeniya), Taiwan? (Kaohsiung), Thailand (Chiang Mai\*, Mae Hong Son, Nakhon Nayok\*, Nakhon Ratchasima\*).

Species excluded from *Dortus* (= *Papuacoris*):

*Deraeocoris ottoensis* (Carvalho, 1985) n. comb. – Papua New Guinea (northeast region).

*Deraeocoris pallidiceps* Poppius, 1915 (comb. rev.) – Papua New Guinea (Morobe).



**FIGURE 3.** Various Asian species of Deraeocorinae (with indication of tribes), live individuals: (a)-(c) *Dortus vittatus* (Deraeocorini) (a, c, from Nakhon Nayok, Thailand; b, from Kathmandu, Nepal); (d) *Bothynotus morimotoi* Miyamoto, 1966 (Clivinemini) (Nagasaki, Japan); (e)-(f) *Deraeocoris castaneae* Josifov, 1983 (Deraeocorini) (Nagasaki); (g)-(i) *Fingulus rubricatus* Yasunaga & Yamada, 2016 (Deraeocorini) (Trat, Thailand); (j) *Angerianus* sp. (Hyaliodini) (Nepal); (k) *Stethoconus japonicus* Schumacher, 1917 (Hyaliodini) (Nagasaki); (l) *Nicostratus* sp. (Surinamellini) (Nakhon Ratchasima, Thailand); (m) *Saturniomirini* sp. (Nakhon Ratchasima); (n) *Termatophylum aeneum* Nakatani, 1997 (Termatophylini) (Okinawa, Japan) / (a), (c)-(e), (g), (j)-(n) Adults; (b) (f), (h)-(i) 5<sup>th</sup> instar nymphs.

**Key to species of *Dortus*:**

- (1) Antennal segment II longer than basal width of pronotum ..... *D. colocasiae*
  - Antennal segment II shorter than basal width of pronotum ..... 2
- (2) All femora yellowish brown ..... *D. papuanus*
  - Femora (at least metafemur) with dark stripes or maculae ..... 3
- (3) In male, exocorium longer than metatibia; in female length of outer margin of cuneus as long as antennal segment III; meso- and metalegs in male generally longer than those of females; restricted to (mostly sandy) seashore or beach grown with a coastal halophilic herb, *Vitex rotundifolia* L.f. (Fig. 1a-b) ..... *D. ikimarinus* n. sp.
  - In male, exocorium about as long as or slightly shorter than metatibia; length of outer margin of cuneus shorter than antennal segment III; male meso- and metalegs generally shorter than those of females ..... 4
- (4) Ostial peritreme rather small; apical parts of pro- and mesofemora with two pairs of dark stripes; known from southwestern Japan including Ryukyus ..... *D. chinai*
  - Ostial peritreme rather elongate; apical parts of pro- and mesofemora usually pale, sometimes with faint stripes ..... *D. vittatus*

***Dortus chinai* Miyamoto, 1965**

(Figs. 1c-d, 2f-i, 4i-n, 5a-d, 6a-c, 7a-f, 8a-c, j-l, 9a-e, 10a-b, g-i)

*Dortus chinai* Miyamoto, 1965: 156 (n. sp.); Yasunaga et al., 2001: 200 (diag.); Schuh, 2002-2013 (online cat.); Aukema, 2018 (online cat.).

**Material examined:**

33 ♂♂ + 30 ♀♀ (all TYCN):

3 ♂♂ + 1 ♀: JAPAN: Kyushu, Kagoshima Pref., Osumi, Kami-Fukumoto, sweeping weeds (graminoid and asterid) at Agricultural Experimental Farm, 26 Aug 1992, T. Yasunaga.

1 ♂: Kyushu, Nagasaki Pref., Nagasaki City, Kabashima Island, UV lighting, 6 Jul 2019, T. Yasunaga.

1 ♂: Nagasaki City, Mieda, UV lighting, 20 Jun 2020, T. Yasunaga.

10 ♂♂ + 12 ♀♀: Nagasaki City, Takenokubo, Nagasaki West High School Garden, 32.766240, 129.859220, engine-vacuum-netting, *Artemisia* and graminoid weeds, 2 & 10 Aug 2019 and 6 & 14 May 2021, T. Yasunaga.

1 ♂: Shikoku: Kochi Pref., Cape Ashizuri, UV lighting, 5 Oct 2001, M. Takai.

1 ♂ + 1 ♀: Ryukyus, Amami-Oshima Is., Tatsugo Town, Ankiyaba, 1 Jun 1993, T. Yasunaga.

2 ♂♂: Amami-Oshima Is., Ohama Beach, UV lighting, 13 May 1987, T. Yasunaga.

12 ♂♂ + 12 ♀♀: Ryukyus, Okinawa Is., Kunigami Village, Yona, UV lighting, 20-25 May 1993, T. Yasunaga.

2 ♂♂ + 2 ♀♀: Okinawa Is., Naha City, Shurisakiyama, sweeping graminoid weeds, 19 May 1993, T. Yasunaga.

2 ♀♀: Ryukyus, Ishigaki Is., Kabira, sweeping graminoid weeds, 10 Apr 1986, T. Yasunaga.

**Biology and immature stages:**

This species is currently known from subtropical and warm temperate zones of southwestern Japan and prefers to inhabit grassland and open environment (Fig. 1c) around agro-ecosystem (sometimes narrow space or garden within urbanized areas, Fig. 1d). Aphids were predominantly observed as prey (Fig. 4k) but dried blood-worms (larvae of chironomid midges) and brine-shrimp eggs (both commercially available) were also utilized as diets in laboratory tests (Fig. 4n). A multivoltine life cycle (possibly 3-4 generations per year) is assumed for the population of Kyushu, whereas in the subtropical Ryukyus the adults are found throughout the year.

Although the breeding host of *Dortus chinai* is yet to be confirmed, graminoid grasses or Asteraceae weeds commonly found at the habitats appear to be utilized for oviposition. The eggs were observed to be laid into the sections of fresh bean pods (*Phaseolus vul-*



**FIGURE 4.** Immature stages of Japanese individuals of: (a)-(h) *Dortus ikimarinus* n. sp.; (i)-(n) *D. chinai* / (a)-(b), (i)-(j) Eggs (exposed opercula); (c), (k) 1<sup>st</sup> instar nymphs; (d) 2<sup>nd</sup> instar; (e), (l) 3<sup>rd</sup> instar; (f) 4<sup>th</sup> instar; (g)-(h), (m)-(n) 5<sup>th</sup> instar. All from Nagasaki City, Japan (reared individuals).

*garis* L., Fig. 4i) in laboratory tests. The operculum has the roughly ordered aeropylar outer openings (*sensu* Cobben, 1978, Fig. 8k) with long fibrous struc-

tures (Figs. 4j, 8j). The aphid-mimetic nymphs (Fig. 4k-n) developed into adult stage within 30 days (between June and July, 2021) after eclosion.

***Dortus ikimarinus* n. sp.**

(Figs. 1a-b, 2a-e, 4a-h, 5i-o, 6d-f, 7g-l, 8d-f, m-o, 9f-j, 10c-d, j-l)

**Type material:**

HOLOTYPE: ♂, JAPAN: Kyushu, Nagasaki Pref., Iki Island, Katsumoto Town, Higashifure, Kushiyama Beach, 33.859911, 129.699928, 8 Apr 2021, T. Nozaki [5<sup>th</sup> instar nymph when collected, emerging on 10 Apr] (AMNH) (AMNH\_PBI 00380713).

PARATYPES: 29 ♂♂ + 38 ♀♀:

1 ♂ + 3 ♀♀: JAPAN: Same data as for holotype (TYCN).

4 ♂♂ + 4 ♀♀: Same data [collected as adult stage] (TYCN).

1 ♂ + 3 ♀♀: Same data, except for date 25 Mar 2021 (TYCN, WCF).

1 ♂: Same data, except for date 11 Apr 2021 (TYCN).

2 ♂♂ + 3 ♀♀: F1 progenies of Iki population [emerging on 25-27 Jun] (TYCN).

7 ♂♂ + 10 ♀♀: JAPAN: Kyushu, Nagasaki Pref., Nagasaki City, Aikawa Town, 32.792696, 129.782515, engine vacuum netting *Vitex rotundifolia*, 25 & 30 Apr & 2 May 2021, T. Yasunaga (NWHS, TYCN).

2 ♂♂ + 2 ♀♀: Same locality, hand-collecting under *Oenothera laciniata*, 20 Apr 2022, T. Yasunaga [5<sup>th</sup> instar immatures when collected, emerging on 2-3 May 2022] (TYCN).

2 ♂♂ + 2 ♀♀: F1 progenies of Aikawa-population [incubating on 14 May and emerging on 5 Jun] (TYCN).

3 ♂♂ + 4 ♀♀: Nagasaki City, Konoura Port, 32.881808, 129.679080, engine vacuum netting *Vitex rotundifolia*, 2 May–22 Jul 2021, T. Yasunaga (TYCN).

1 ♂ + 1 ♀: Same locality, sweeping *Vitex rotundifolia*, 21 May 2022, T. Yasunaga (TYCN).

1 ♂ + 1 ♀: F1 progenies of above ♀ [eggs laid on May 22 and developing into adults on Jun 23; the female dead on Jul 5 after ovipositing approx. 30 eggs] (TYCN).

3 ♂♂ + 3 ♀♀: Nagasaki Pref., Saikai City, Sakito Town, Kaki'ura, 33.027977, 129.576888, *Vitex rotundifolia*, 5 Jun 2021, T. Yasunaga [5<sup>th</sup> instar nymphs when collected, emerging on 7-10 Jun] (TYCN).

1 ♂ + 2 ♀♀: F1 progenies of Sakito population [emerging on 4-8 Jul] (TYCN).

Additional specimens examined:

2 ♂♂: F2 progenies of ♀ collected at Konoura Port, 21 May 2022 [hatching on Jul 10 and developing into adults on Jul 22 and Jul 25] (TYCN).

**Diagnosis:**

Closely related and very similar to *Dortus chinai* Miyamoto, 1965 and *D. vitatus* (Reuter, 1908), from which the present new species can be distinguished by the above key (couplet 3) and the following characters in

the genitalia: narrower subapical part of left paramere (Fig. 5j-k); elongate apical sclerite (Figs. 5n, 9j), and shorter gonoporal and lateral sclerites (Figs. 5m, o, 9i) on vesica (endosoma); thicker rim of sclerotized ring (Fig. 6e); and broader comb-shaped scaly microstructures on interramal sclerite (Fig. 10k). Unique habitat preference and host association of *D. ikimarinus* n. sp. also differ from those of the two related species.

**Description:**

**Male:** Macropterous. Body ovoid, moderate in size; basic coloration pale stramineous brown; dorsal surface shining, with uniformly distributed, pale, simple setae and with punctures on pronotum and hemelytron. Head pale brown, sometimes weakly suffused with red; apical part of clypeus more or less darkened. Antenna dark brown; median part of antennal segment II sometimes pale. Labium pale reddish brown, reaching apex of metacoxa; apical part of segment IV darkened. Pronotum shiny pale brown, uniformly punctate and pilose except for narrow, continuous calli; scutellum shiny pale brown, broadly darkened mesally (often continuing to hemelytral mesal stripe as in Fig. 2a-b), smooth, impunctate, with sparsely distributed, simple setae; mesoscutal-scutellar fovea C- or comma-shaped, rather extending inward; thoracic pleura widely darkened; propleuron uniformly punctate as in pronotum; metathoracic scent efferent system creamy yellow, with relatively enlarged peritreme (Fig. 7j). Forewing comparatively long (Table 2); hemelytron pale brown, with a dark mesal stripe along inner margins of clavus and corium, uniformly punctate and pilose; apical part of corium usually with a short stripe; inner margin and apex of cuneus usually darkened; membrane pale smoky brown, with dark veins. Legs pale brown; apical half of each femur with a few dark stripes; metafemur usually with two dark rings (or bands) partly fused with the stripes; each tibia with a narrow, dark stripe; metatarsus rather thick, with tarsomere III slightly longer than II; pretarsal structure as in Fig. 7l; basal process of claw triangular. Abdomen widely chocolate brown, sometimes partly pale brown.

**Male genitalia** (Figs. 5i-o, 9f-j): Left paramere with rounded sensory lobe (SB) and relatively narrow hypophysis (HP); vesica (endosoma) with elongate apical sclerite, and short gonoporal sclerite and lateral sclerite.

**Female:** As in male, but body somewhat shorter and wider than male (Table 1). Eyes smaller; vertex wider. Antennal segment II slightly longer than mesofemur.

*Female genitalia* (Figs. 6d-f, 10c-d, j-l): sclerotized ring thick-rimmed (Fig. 6e); interramal sclerite densely covered with broad comb-shaped scaly microstructures (Fig. 10k).

*Measurements:* See Tables 1-2.

#### Etymology:

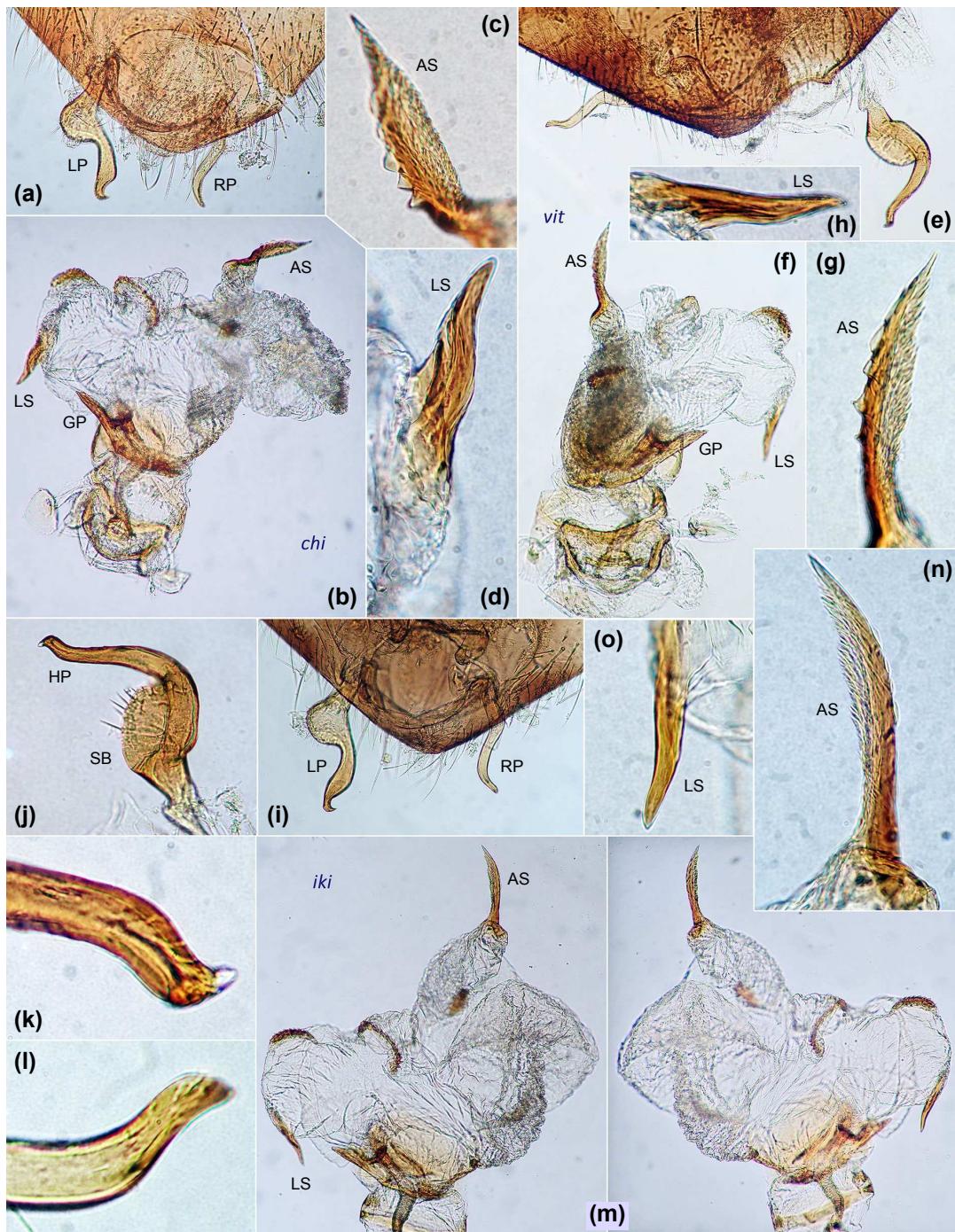
Named for the type locality in Nagasaki Prefecture, SW Japan, Iki Island, combined with «*marinus*» («sea» in Latin); an adjective.

#### Biology and immature stages:

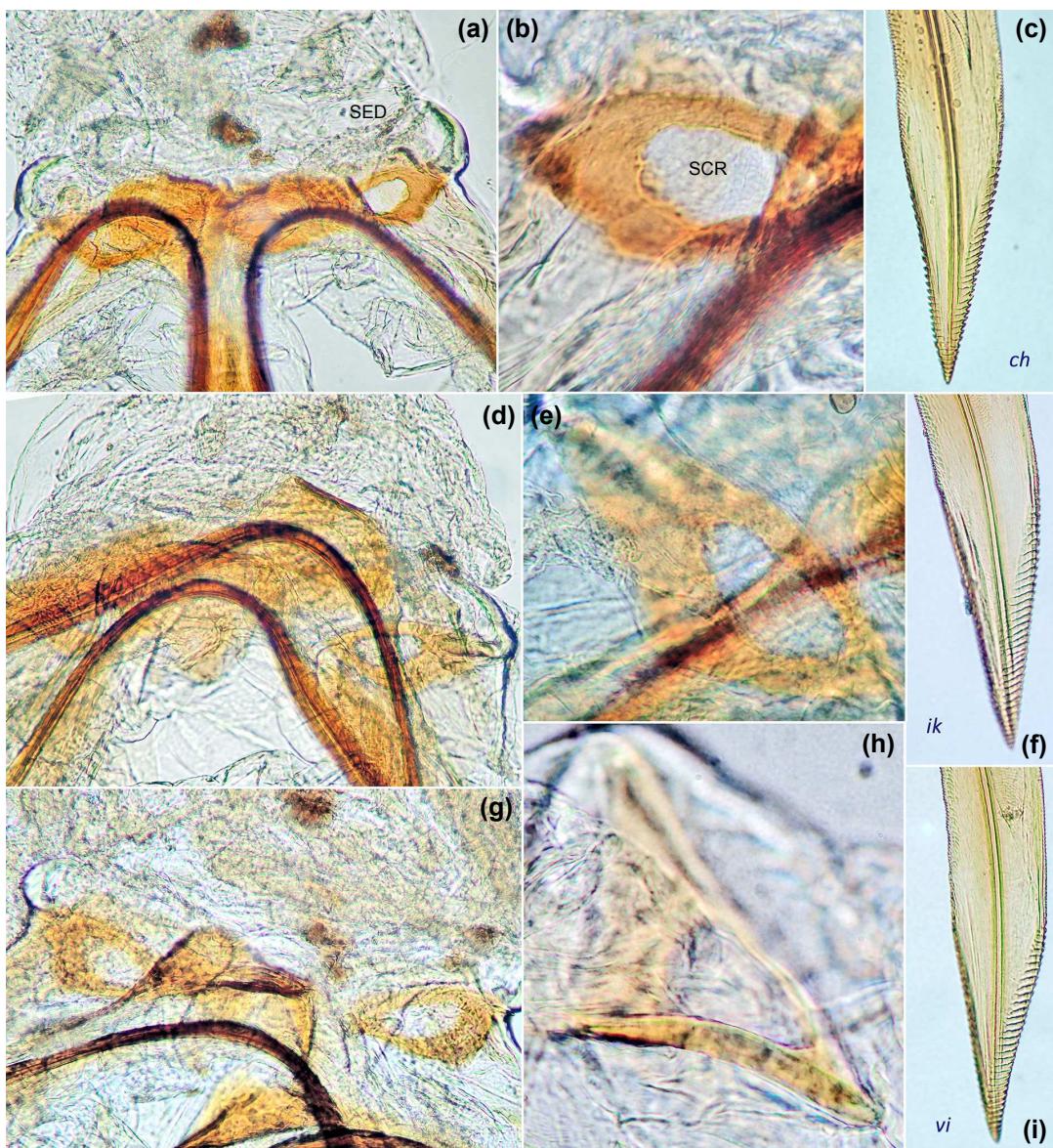
This unique new species was found to occur at sea-shores with the vegetation of its breeding host, *Vitex rotundifolia* L.f. (Lamiaceae) (Fig. 1a). Both adults and immature forms preferably inhabit ground surface covered with low shrubs of the halophytes and prey on aphids or tiny arthropods. The engine-vacuum-netting (Fig. 1b) seems the best method for field sampling (*cf.* Tamada *et al.*, 2020). The eggs are assumed to hibernate and the nymphs of the first

	Body	Head	VTX	PRN	Max	Antennomere L				LBM	Mesoleg L		Metaleg L	
	L	W	W	W	W	I	II	III	IV	L	FM	TB	FM	TB
<b><i>Dortus ikimarinus</i> n. sp. ♂♂ (n = 6)</b>														
Mean	4.28	0.93	0.32	1.59	1.94	0.44	1.38	0.64	0.54	1.74	1.21	1.41	1.56	2.04
Max	4.50	0.98	0.35	1.73	2.05	0.46	1.52	0.71	0.58	1.86	1.31	1.52	1.67	2.15
Min	3.99	0.88	0.29	1.54	1.79	0.42	1.31	0.60	0.44	1.67	1.13	1.34	1.48	1.94
<b><i>Dortus ikimarinus</i> n. sp. ♀♀ (n = 6)</b>														
Mean	4.15	0.86	0.37	1.60	1.98	0.43	1.20	0.66	0.55	1.75	1.16	1.35	1.55	1.96
Max	4.35	0.96	0.42	1.67	2.09	0.44	1.23	0.75	0.58	1.79	1.19	1.38	1.61	2.11
Min	3.99	0.81	0.29	1.56	1.92	0.40	1.15	0.60	0.52	1.67	1.13	1.31	1.48	1.86
<b><i>Dortus chinai</i> ♂♂ (n = 8)</b>														
Mean	3.99	0.92	0.31	1.48	1.81	0.43	1.35	0.65	0.54	1.70	1.13	1.34	1.48	1.97
Max	4.50	0.96	0.33	1.61	2.04	0.46	1.48	0.71	0.58	1.77	1.17	1.40	1.54	2.09
Min	3.66	0.90	0.27	1.36	1.73	0.40	1.25	0.58	0.46	1.63	1.09	1.29	1.40	1.86
<b><i>Dortus chinai</i> ♀♀ (n = 6)</b>														
Mean	4.06	0.86	0.41	1.65	1.99	0.43	1.26	0.71	0.54	1.74	1.20	1.42	1.54	2.04
Max	4.23	0.90	0.42	1.75	2.11	0.44	1.32	0.75	0.58	1.77	1.27	1.54	1.65	2.17
Min	3.69	0.79	0.38	1.42	1.67	0.42	1.17	0.67	0.52	1.65	1.13	1.34	1.48	1.92
<b><i>Dortus vittatus</i> ♂♂ (n = 5)</b>														
Mean	4.16	0.90	0.31	1.49	1.83	0.42	1.32	0.66	0.52	1.68	1.19	1.37	1.51	2.01
Max	4.41	0.92	0.33	1.52	1.90	0.44	1.36	0.75	0.56	1.73	1.27	1.42	1.57	2.11
Min	3.90	0.86	0.29	1.46	1.69	0.40	1.21	0.61	0.48	1.61	1.15	1.34	1.48	1.92
<b><i>Dortus vittatus</i> ♀♀ (n = 3)</b>														
Mean	4.28	0.83	0.40	1.56	1.88	0.47	1.27	0.72	0.56	1.73	1.18	1.45	1.54	2.07
Max	4.44	0.86	0.42	1.57	1.90	0.50	1.34	0.77	0.61	1.77	1.21	1.54	1.57	2.15
Min	4.14	0.81	0.38	1.56	1.86	0.42	1.17	0.61	0.52	1.71	1.13	1.32	1.46	1.96

TABLE 1. Measurements for *Dortus* spp. (Abbreviations: FM = femur; L = length; LBM = labium; PRN = pronotum; TB = tibia; VTX = vertex (interocular space); W = width).



**FIGURE 5.** Male genitalia of: (a)-(d) *Dortus chinai*; (e)-(h) *D. vittatus*; (i)-(o) *D. ikimarinus* n. sp. / (a), (e), (i) Apical part of pygophore with parameres; (b), (f), (m) Vesica (endosoma); (c), (g), (n) Vesical apical sclerite; (d), (h), (o) Lateral sclerite; (j)-(k) Left paramere; (l) Right paramere (Abbreviations: AS = apical sclerite; GP = gonoporal sclerite; HP = hypophysis; LP = left paramere; LS = lateral sclerite; RP = right paramere; SB = sensory lobe).



**FIGURE 6.** Female genitalia of: (a)-(c) *Dortus chinai*; (d)-(f) *D. ikimarinus n. sp.*; (g)-(i) *D. vittatus* / (a), (d), (g) Genital chamber, dorsal view; (b), (e), (h) Sclerotized ring; (c), (f), (i) Ovipositor (gonapophysis I) (Abbreviations: SCR = sclerotized ring ; SED = seminal depository).

generation appear in late March, when the coastal herbs begin to sprout. At least four generations per year are assumed for *Dortus ikimarinus n. sp.*, as the third generation (F2 progeny of the first vernal generation) emerged by August, and the adults (presumed

to be 4<sup>th</sup> or 5<sup>th</sup> generation) were confirmed to survive in late October (Yasunaga, pers. obs.). When 4-5 nymphs were reared in a same container, cannibalism (usually attack by the larger individual) was observed occasionally.

The matured females were observed to oviposit into the stems of *Vitex rotundifolia* and the opercula are always exposed (Fig. 4a). No other coastal plants coexisting at the confirmed habitats (e.g., *Oenothera lacinata* Hill of Onagraceae, *Calystegia soldanella* (L.) Roem. & Schult. of Convolvulaceae) were selected for oviposition in laboratory tests. The aeropylar outer openings (Fig. 8m-n) of the eggs are nearly hexagonally ordered and lacking fibrous structure (Fig. 4b), differing from those of *D. chinai*.

The nymphs of the present new species are externally very similar to those of *D. chinai* (Fig. 4). I have not preserved sufficient number of nymphal specimens, as almost of all reared individuals developed into adults for making primal accurate identification. Further effort is required to investigate detailed morphometry of every instars for the two closely related taxa.

#### ***Dortus vittatus* (Reuter, 1908) n. comb.**

(Figs. 1e-f, 2f-i, 5e-h, 6g-i, 7m-r, 8g-i, 9k-o, 10e-f, m-o)

*Camptobrochis vittatus* Reuter, 1908: 88 (n. sp.).

*Deraeocoris vittatus*: Poppius, 1913: 240 (n. comb., dist.); Poppius, 1915a: 39 (dist.); Poppius, 1915b: 73 (diag., dist.).

*Papuacoris vittatus*: Carvalho, 1985: 470 (n. comb., redesc.); Schuh, 2002-2013 (online cat.); Chérot et al., 2017: 29, pl. 3, fig. 3 (faunal list); Aukema, 2018 (online cat.).

*Dortus primarius* Distant, 1910: 13; Distant, 1911: 180 (diag.); Schuh, 2002-2013 (online cat.); Varshney et al., 2018: 225-229 (diag., biol., immature forms). **N. syn.**

#### **Material examined:**

17 ♂♂ + 14 ♀♀:

1 ♂ + 1 ♀: CAMBODIA: Siem Reap, NE of Angkor Wat, N13°29' E103°58', sweeping weeds at dry vegetable field, 12 Feb 2014, T. Yasunaga (TYCN).

12 ♂♂ + 10 ♀♀: NEPAL: Kathmandu, Gongabu-Samakhosi, N27°43'59.5" E85°18'49", 1,300 m alt., UV lighting, 15-30 Jun 2005, T. Yasunaga (TYCN).

1 ♀: THAILAND: Chiang Mai, Chang Khian, Doi Suthep, 800-900 m alt., 16 Aug 2001, T. Ishikawa (TUAK).

3 ♂♂ + 1 ♀: THAILAND: Nakhon Nayok, Sarika, N14°18'07" E101°18'09", lodge garden at FL light, 20 Dec 2010, T. Yasunaga (DOAT, TYCN).

1 ♀: THAILAND: Nakhon Ratchasima, Wan Nam Khieo, Sakaerat Environmental Research Station, N14°30'27" E101°55'39", 410 m alt., Mercury light trap, 27 Feb 2009, T. Yasunaga (TYCN).

1 ♂: Same locality and collecting method, 2-4 Jun 2009, T. Yasunaga & K. Yamada (TYCN).

#### **Biology:**

During my field investigations in southeast Asia, *Dortus vittatus* was collected at dry open environment around cultivated lands or local farms dominated by low graminoid vegetation (Fig. 1e-f). The adults are frequently attracted to UV light. Further detailed information on biology and immature forms was documented (as *D. primarius*) by Varshney et al. (2018) and Varshney and Budhlakoti (2022). In Kathmandu Valley, Nepal (27.714456, 85.288110; Apr 2007), some final instar nymphs were found on a nettle, *Urtica dioica* L. (Urticaceae) (Fig. 3c).

#### **Remarks:**

This species was described from Java, Indonesia (Reuter, 1908) and subsequently recorded from Myanmar (Distant, 1910, as *D. primarius*), Sri Lanka (Poppius, 1913), Taiwan (Poppius, 1915a), Papua New Guinea (Biro), Philippines (Luzon) and Indonesia (Poppius, 1915b). Varshney et al. (2018) documented the biology based on an Indian population. Carvalho (1985) incorrectly showed the specimen data (locality), or Muang Mae Hong Son (northern Thailand) as part of Papua New Guinea. I have also found several specimens from Thailand as well as Cambodia and Nepal. Therefore, *Dortus vittatus* is considered to be widespread over the Oriental Region and Papua New Guinea across the Wallacea and obviously matching the taxon described as *D. primarius*.

Poppius (1915a) recorded *D. vittatus* from Taiwan, neighboring to the Japanese Ryukyus or type locality of *D. chinai*. Judging from the distribution patterns of the congeners, Taiwanese population of *Dortus* species most probably represents the latter and needs verification by dissecting the genitalia.

#### **Acknowledgements**

Special thanks are due to the following individuals or institutions for offering valuable specimens, useful information and/or supporting my field investigation: Dr. R.K. Duwal (Visiting Researcher, CNC); Dr. F. Chérot (Service Public de Wallonie, Gembloux, Belgium); Drs. T. Artchawakom and C. Phuvasa (Sakaerat Environmental Research Station, Thailand Ministry of Science & Technology, Nakhon Ratchasima); Ms. B.N. Rungrueang and her relatives (Bangkok, Thailand); Mr. H.M. Yeshwanth (University of Agricultural Sciences, Bangalore, Karnataka, India);

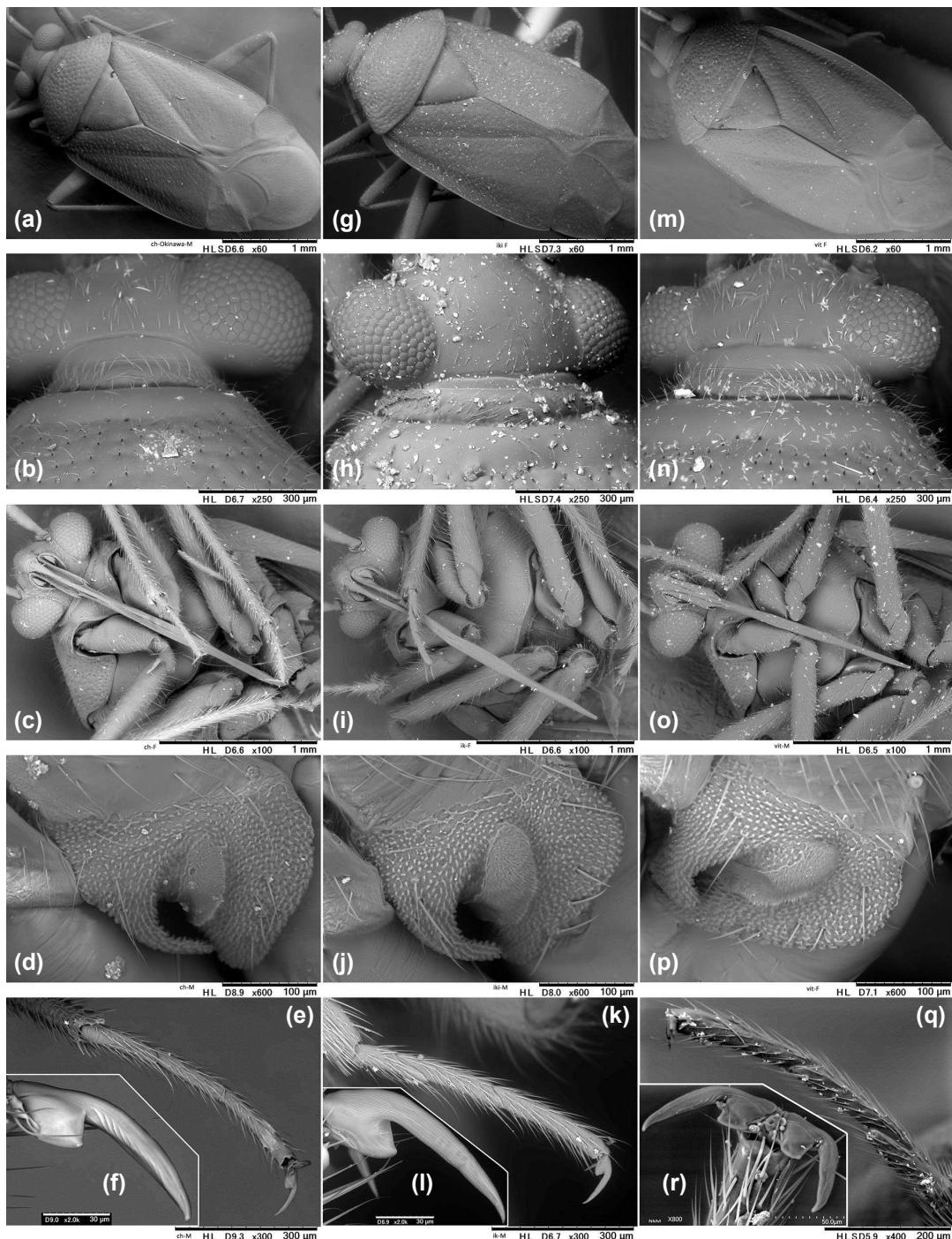
Mr. M. Takai (Kochi Pref., Japan); Mr. T. and Mrs. Y. Nozaki (Wesco Co., Fukuoka, Japan); Dr. T. Ishikawa (Tokyo University of Agriculture, Kanagawa, Japan); Dr. K. Yamada (Tokushima Prefectural Museum, Tokushima, Japan); and Ms. H. Asanabe (The University of Tokyo, Komaba). I am also indebted to NWHS (Super Science High School program, biology, Mr. K. Tanaka, Mr. T. Nagashima and Biology Club students) for sharing specimens and information, and to Mr. D. Terada (CSR Division, Hitachi High-Tech Corporation, Tokyo) for generously allowing to use tabletop scanning electron microscopes (demo units). Thanks are extended to Dr. F. Chérot (Belgium) and editors of *Heteropterus Rev. Entomol.* (Basque Country, Spain) for improving the manuscript with helpful comments and suggestions.

## References

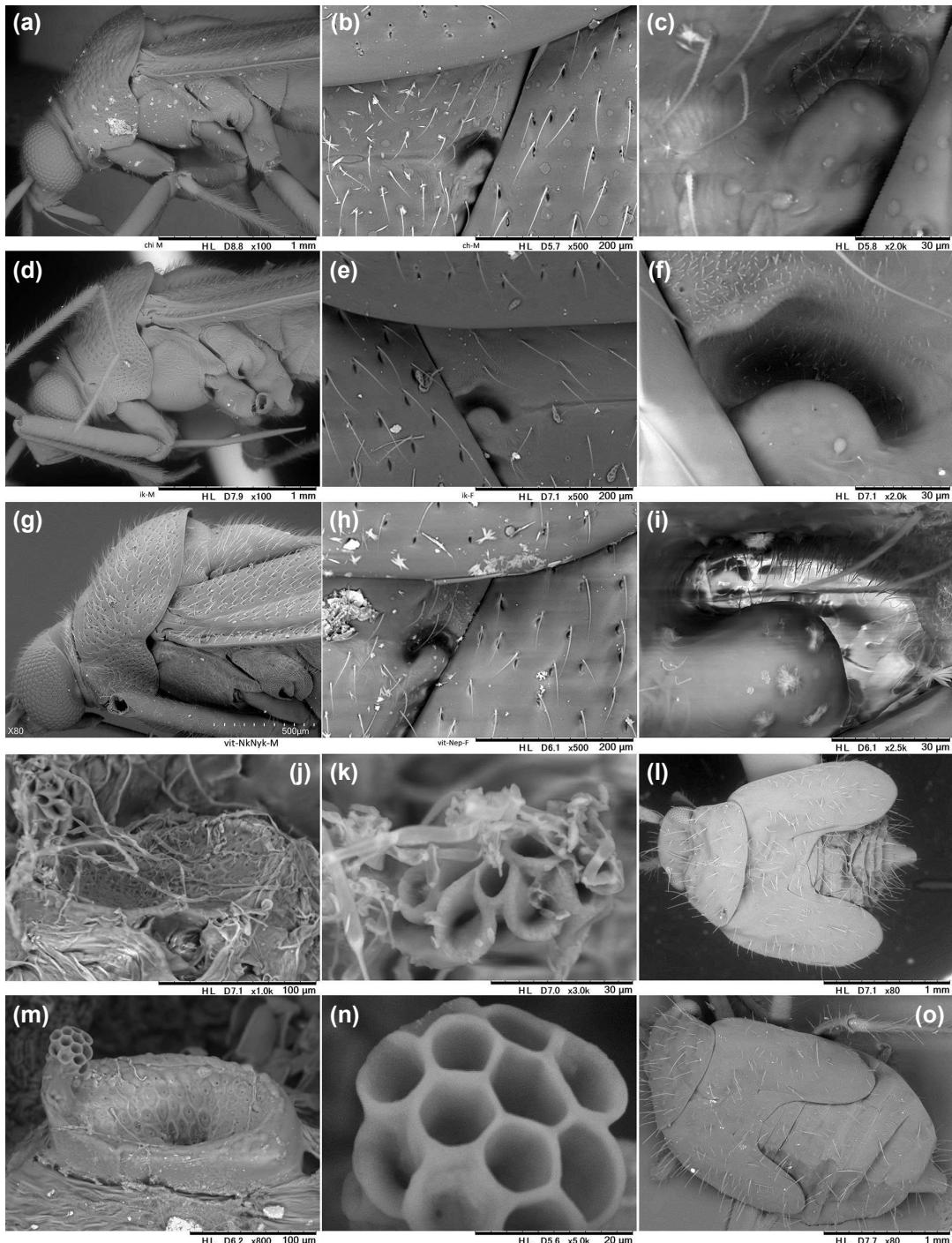
- AUKEMA B. 2018. *Catalogue of the Palaearctic Heteroptera (searchable database)*. Available from: <https://catpalhet.linnaeus.naturalis.nl/>. Last accessed: 1 May 2022.
- CARVALHO JCM. 1985. On some species of the tribe Deraeocorini Douglas & Scott from Papua New Guinea (Hemiptera: Miridae). *Revista Brasileira de Biologia* **45**: 447-470.
- CHAN C, CASSIS G. 2020. Taxonomy of the plant bug tribe Saturniomirini (Insecta: Heteroptera: Miridae) from Australia and Papua New Guinea: a phylogenetic analysis, and the description of one new genus and ten new species. *Insect Systematics & Evolution* **51**: 889-999.
- CHÉROT F, GORCZYCA J, SCHWARTZ MD, DEMOL T, TELNOV D, BARCLAY MVL, PAUWELS OSG. 2017. The Bryocorinae, Cylapinae, Deraeocorinae and Mirinae (Insecta: Heteroptera: Miridae) from Baiteta Forest, Papua New Guinea, with a discussion of their feeding habits and a list of species of the country (pp.: 55-139). In: Telnov D (Ed.). *Biodiversity, biogeography and Nature conservation in Wallacea and New Guinea. Vol. 3*. The Entomological Society of Latvia. Riga.
- COBBEN RH. 1978. *Evolutionary trends in Heteroptera: Part I. Eggs, architecture of the shell, gross embryology and eclosion*. Centre for Agricultural Publishing and Documentation. Wageningen.
- DISTANT WL. 1910. Descriptions of Oriental Capsideae. *Annals and Magazine of Natural History, Ser. 8*, **5**: 10-22.
- DISTANT WL. 1911. *The fauna of British India, including Ceylon and Burma. Rhynchota Volume 5. Heteroptera: Appendix*. Taylor & Francis. London.
- IKEDA N, MOTOMURA K, TAGAWA A, NAGASHIMA T, YASUNAGA T. 2019. Novel ecological and morphological findings for a Japanese eccritotarsine plant bug, *Ernestinus kasumi* (Heteroptera: Miridae: Bryocorinae). *Rostria* **63**: 49-58. [in Japanese with English summary]
- KERZHNER IM, JOSIFOV M. 1999. Miridae Hahn, 1833. In: Aukema B, Rieger Ch (Eds.). *Catalogue of the Heteroptera of the Palaearctic Region, vol. 3, Cimicomorpha II*. The Netherlands Entomological Society. Amsterdam.
- MIYAMOTO S. 1965. Isometopinae, Deraeocorinae and Bryocorinae of the South-west Islands, lying between Kyushu and Formosa (Hemiptera: Miridae). *Kontyu, Tokyo* **33**: 147-169.
- MIYAZAKI A, NISHIDA M, UESUGI R, YAMADA, U, YASUNAGA, T, SERRANO LEON S, KAWASHITA S, NAGASHIMA T. 2020. Utilizing a synthetic diet containing a fermented milk beverage for rearing terrestrial heteropterans, with new distributional records of four

	<i>Exocor. Cun. Membr.</i>			<i>Exocor. Cun. Membr.</i>								
<b><i>Dortus ikimarinus</i> n. sp.</b>												
	<b>♂♂ (n = 14)</b>			<b>♀♀ (n = 14)</b>								
Max	2.205	0.855	1.911	2.205	0.750	1.715						
Min	1.960	0.615	1.250	1.789	0.600	1.446						
Mean	<b>2.114</b>	<b>0.736</b>	<b>1.594</b>	<b>2.020</b>	<b>0.663</b>	<b>1.542</b>						
SD	0.090	0.059	0.184	0.138	0.047	0.100						
<b><i>Dortus chinai</i></b>												
	<b>♂♂ (n = 12)</b>			<b>♀♀ (n = 10)</b>								
Max	2.205	0.750	1.740	2.205	0.750	1.715						
Min	1.715	0.480	1.250	1.764	0.525	1.250						
Mean	<b>1.938</b>	<b>0.629</b>	<b>1.501</b>	<b>2.048</b>	<b>0.632</b>	<b>1.504</b>						
SD	0.149	0.078	0.149	0.132	0.064	0.138						
<b><i>Dortus vittatus</i></b>												
	<b>♂♂ (n = 9)</b>			<b>♀♀ (n = 9)</b>								
Max	2.058	0.735	1.715	2.132	0.660	1.617						
Min	1.838	0.600	1.470	1.960	0.570	1.348						
Mean	<b>1.965</b>	<b>0.650</b>	<b>1.579</b>	<b>2.028</b>	<b>0.615</b>	<b>1.497</b>						
SD	0.063	0.053	0.093	0.057	0.025	0.085						

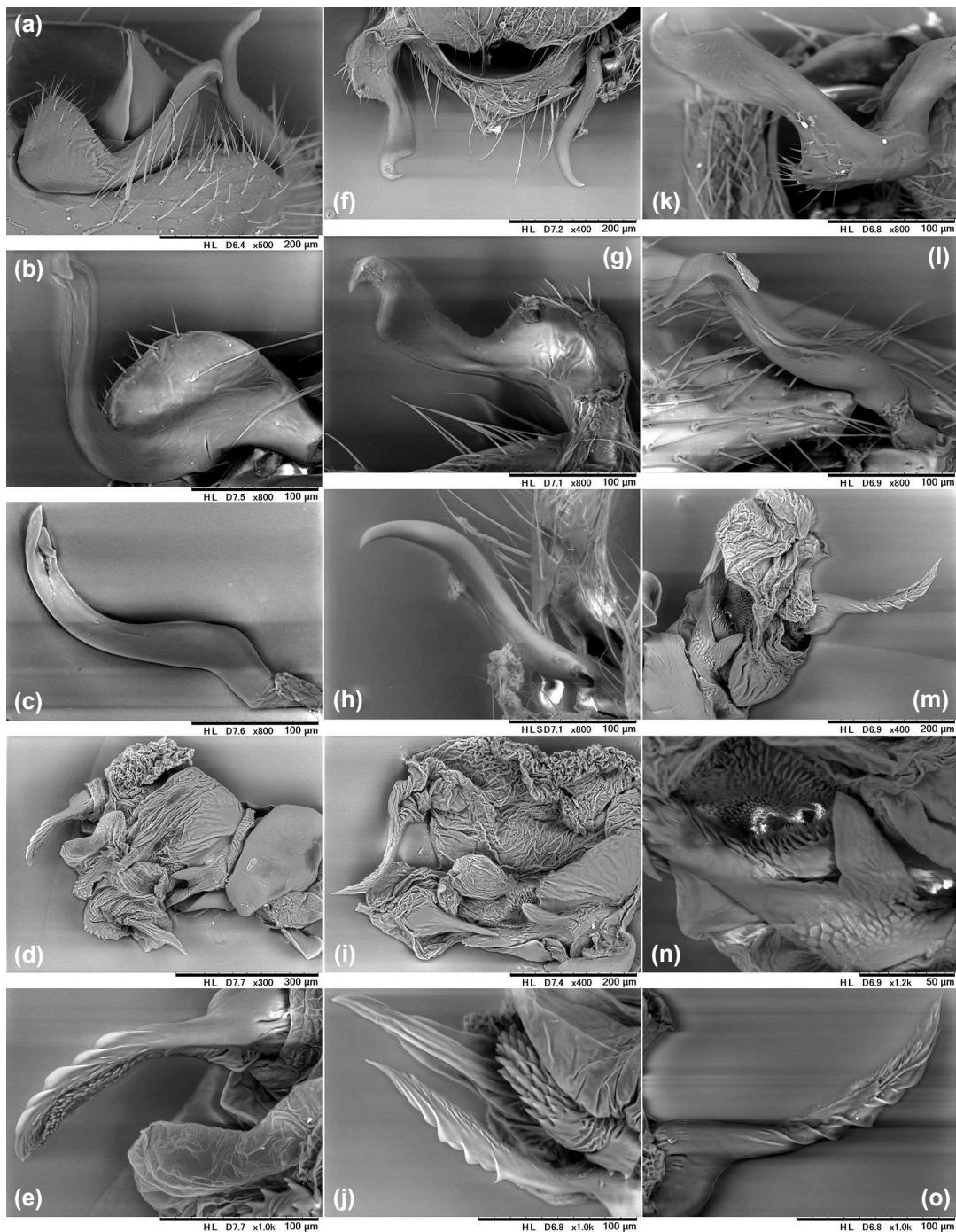
TABLE 2. Three measurements for forewings of *Dortus* spp. (Abbreviations: Cun. = cuneus length; Exocor. = exocorium length; Membr. = membrane median length).



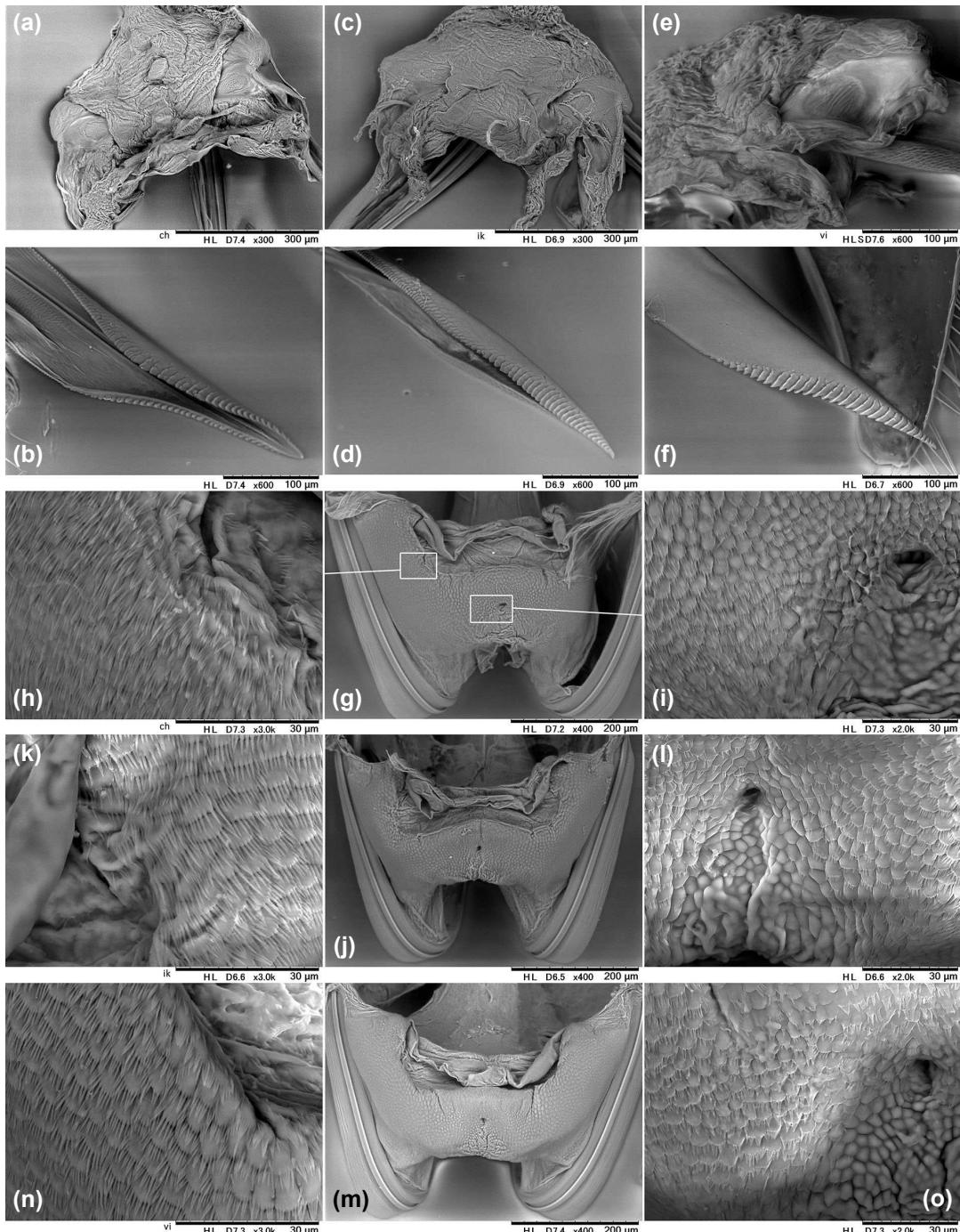
**FIGURE 7.** Scanning electron micrographs for: (a)-(f) *Dortus chinai*; (g)-(l) *D. ikimarinus* n. sp.; (m)-(r) *D. vittatus* / (a), (g), (m) Dorsal habitus; (b), (h), (n) Head and anterior pronotum in dorsal view; (c), (i), (o) Anterior body in ventral view; (d), (j), (p) Scent efferent system (left); (e), (k), (q) Metatarsus; (f), (l), (r) Pretarsal structure of metaleg / (a)-(b), (d)-(f), (j)-(l), (o), (r) Males; (c), (g)-(i), (m)-(n), (p)-(q) Females.



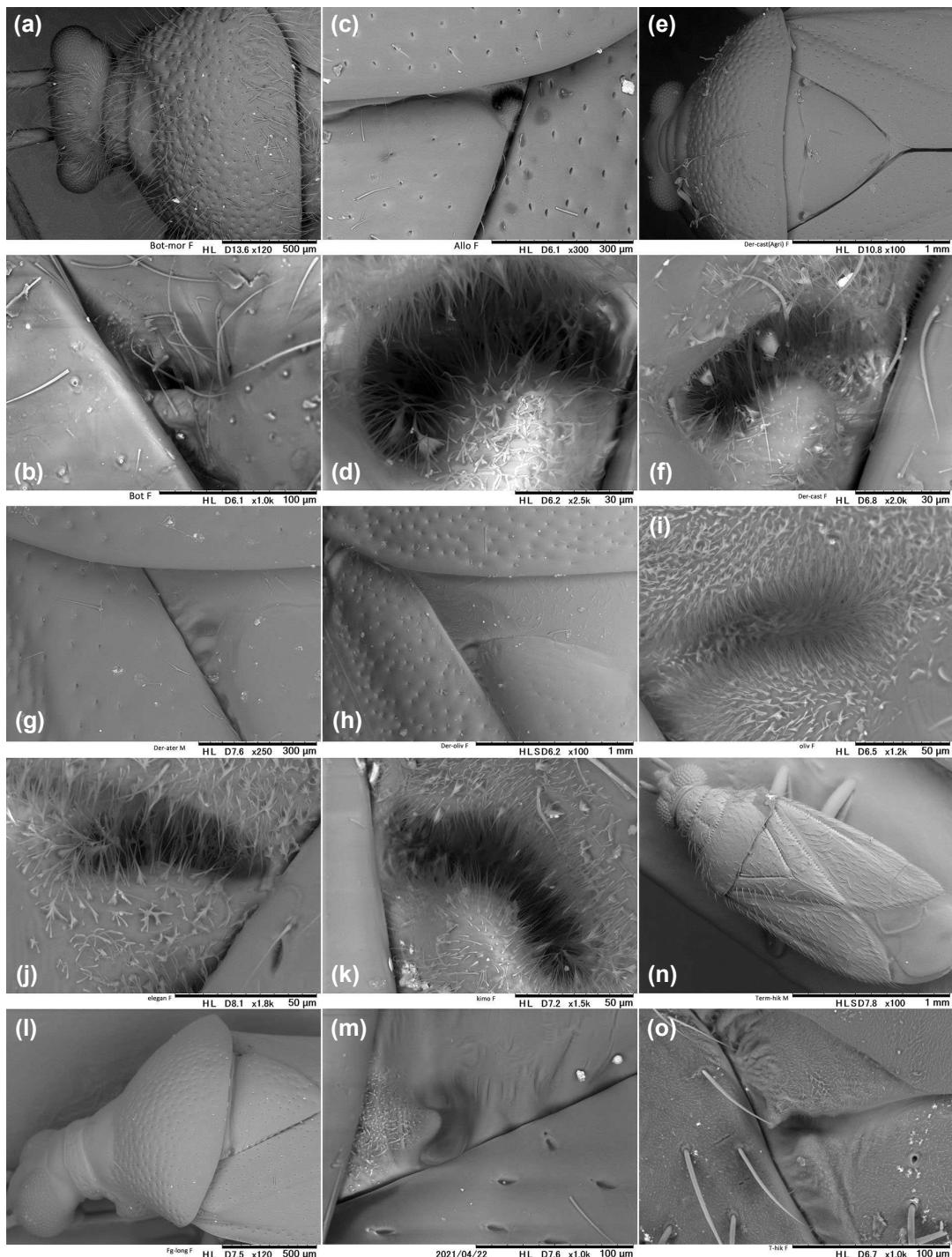
**FIGURE 8.** Scanning electron micrographs for: (a)-(c), (j)-(l) *Dortus chinai*; (d)-(f), (m)-(o) *D. ikimarinus n. sp.*; (g)-(i) *D. rittatus* / (a), (d), (g) Anterior body in left lateral view; (b), (e), (h) Pronotum, mesoscutum, scutellum and clavus in dorsal view; (c), (f), (i) Mesoscutal-scutellar pit, observed by high magnification; (j), (m) Egg (operculum); (k), (n) Same, aeropylar outer openings; (l), (o) Dorsal habitus of final instar nymph.



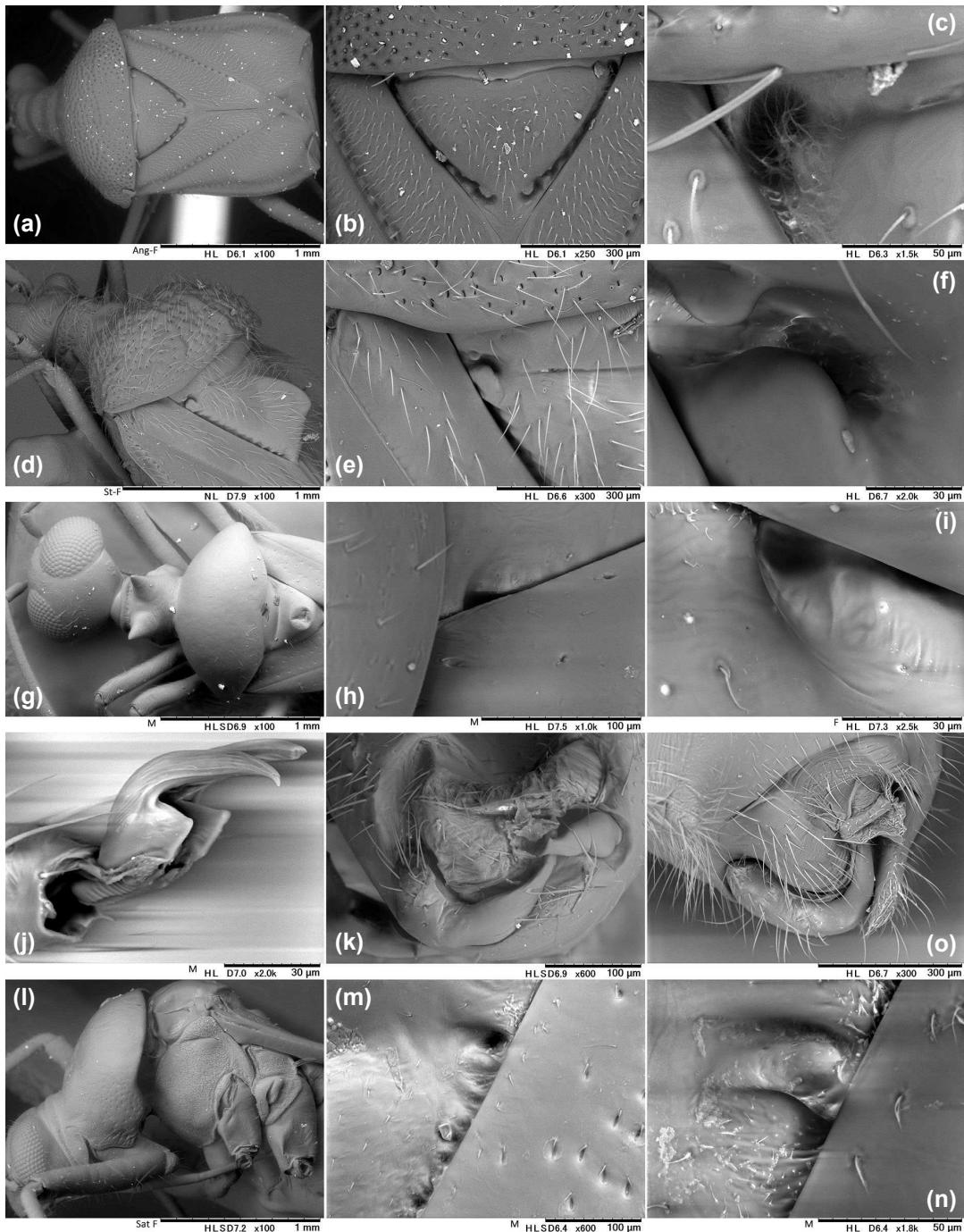
**FIGURE 9.** Scanning electron micrographs of male genitalia for: (a)-(e) *Dortus chinai*; (f)-(j) *D. ikimarinus* n. sp.; (k)-(o) *D. vittatus* / (a), (f) Apex of pygophore with both parameres; (b), (g), (k) Left paramere; (c), (h), (l) Right paramere; (d), (i), (m) Vesica (endosoma); (e), (j), (o) Apical sclerite; (n) Secondary gonopore opening



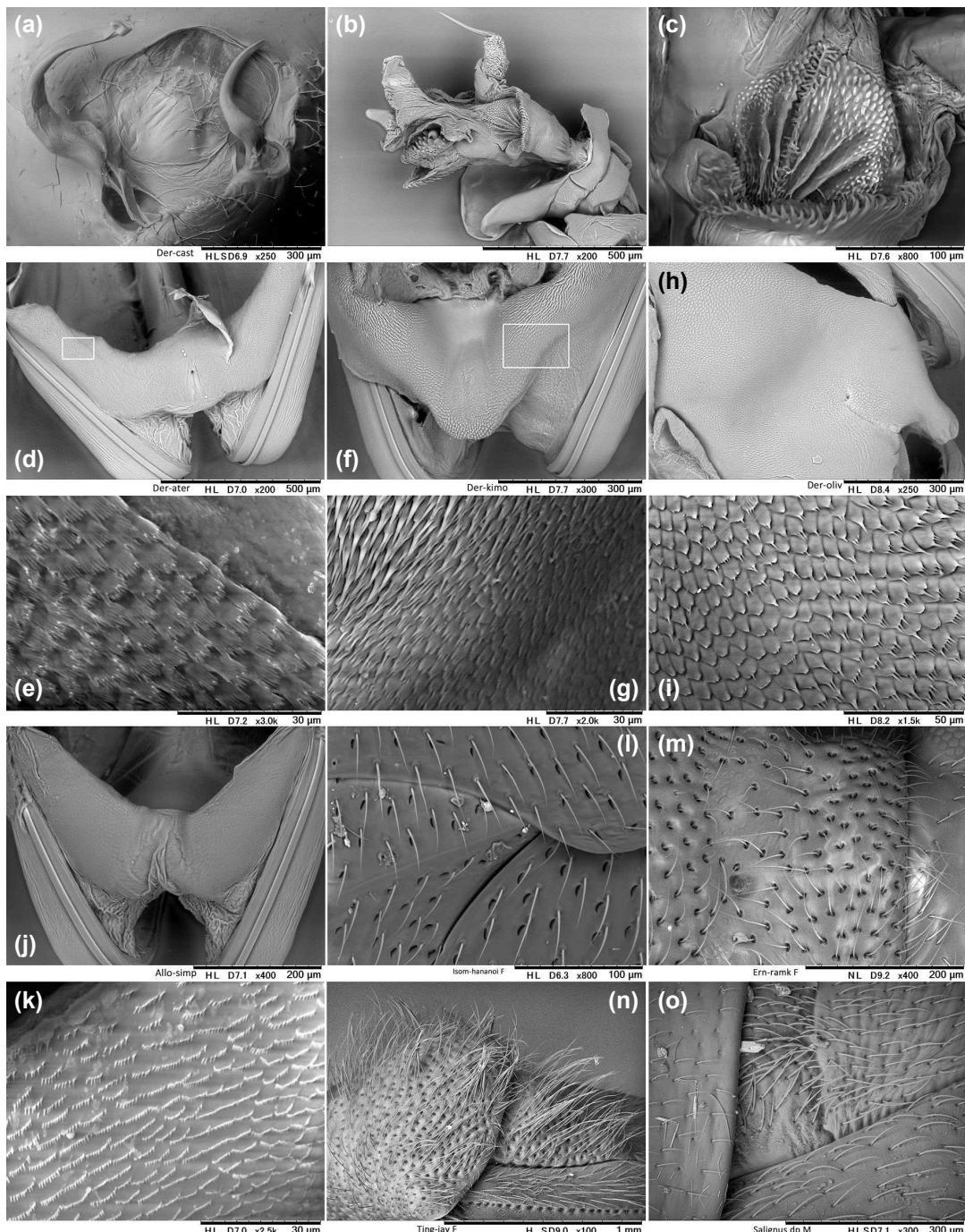
**FIGURE 10.** Scanning electron micrographs of female genitalia for: (a)-(b), (g)-(i) *Dortus chinai*; (c)-(d), (j)-(l) *D. ikimarinus* n. sp.; (e)-(f), (m)-(o) *D. rittatus* / (a), (c), (e) Genital chamber, dorsal view; (b), (d), (f) Apex of ovipositor (gonapophysis I); (g)-(o) Posterior wall; (h), (k), (n) Anterior part; (i), (l), (o) Median part.



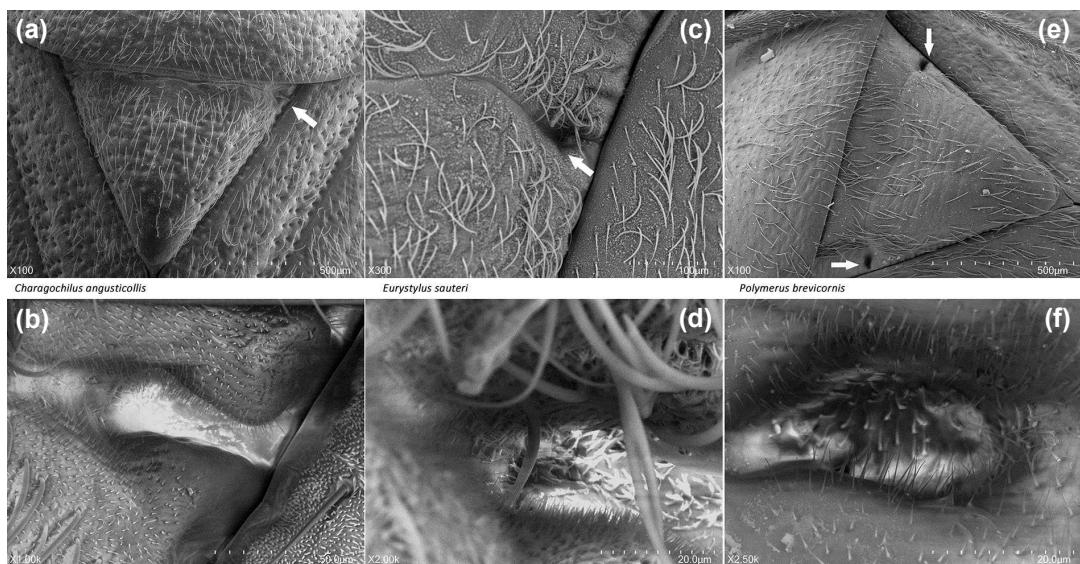
**FIGURE 11.** Scanning electron micrographs of surface structures and presence of mesoscutal-scutellar fovea for various deraeocorines (of tribe *Deraeocorini* if not otherwise stated): (a)-(b) *Bothynotus morimotoi* Miyamoto, 1966 (tribe *Clivinemini*); (c)-(d) *Alloetomus simplus* (Uhler, 1897); (e)-(f) *Deraeocoris castaneae* Josifov, 1983; (g) *Deraeocoris ater* (Jakovlev, 1889); (h)-(i) *D. olivaceus* (Fabricius, 1777); (j) *D. elegantulus* Horváth, 1905; (k) *D. kimotoi* Miyamoto, 1965; (l)-(m) *Fingulus longicornis* Miyamoto, 1965; (n)-(o) *Termatophyllum hikosanum* Miyamoto, 1965 (tribe *Termatophylini*).



**FIGURE 12.** Scanning electron micrographs of surface structures and presence of mesoscutal-scutellar fovea for various deraeocorines (of tribe Deraeocorini if not otherwise stated): (a)-(c) *Angerianus* sp. (tribe Hyaliodini); (d)-(f) *Stethoconus japonicus* Schumacher, 1917 (tribe Hyaliodini); (g)-(i) *Nicostratus* sp. (tribe Surinamellini); (l)-(o) *Deraeocoris olivaceus* (Fabricius, 1777); (j) *D. elegans* Horváth, 1905; (k) *D. kimotoi* Miyamoto, 1965; (l)-(m) *Saturniomirini* sp. / (j) Pretarsal structure of metaleg; (k), (o) Apex of male pygophore with parameres; (l) Anterior body in left lateral view.



**FIGURE 13.** Scanning electron micrographs of surface structures of various mirid bugs, and male (a-c) and female (d-k) genitalia for deraeocorines: (a)-(c) *Deraeocoris castaneae* Josifov, 1983; (d)-(e) *D. ater* (Jakovlev, 1889); (f)-(g) *D. kimotoi* Miyamoto, 1965; (h)-(i) *D. olivaceus* (Fabricius, 1777); (j)-(k) *Alloeotomus simplicipes* (Uhler, 1897); (l) Pronotum, scutellum and clavus of *Isometopus hananoi* Hasegawa, 1946 (Isometopinae); (m) Anterior pronotum of *Ernestinus ramkeshariae* Yasunaga & Ishikawa, 2016 (Bryocorinae); (n) Pronotum, scutellum and clavus of *Tinginotum javanum* Kirkaldy, 1902 (Mirinae); (o) Same, *Salignus duplicatus* (Reuter, 1906) (Mirinae).



**FIGURE 14.** Scanning electron micrographs of surface structures of mirines equipped with mesoscutal-scutellar foveae for: (a)-(b) *Charagochilus angusticollis* Linnnavuori, 1961; (c)-(d) *Eurystylus sauteri* Poppius, 1915; (e)-(f) *Polymerus (Poeciloscytus) brevicornis* (Reuter, 1879) (high magnification for b, d, f).

species in Nagasaki Prefecture, Japan. *Rostria* **64**: 63-69. [in Japanese with English summary]

NAKATANI Y. 1995. *Deraeocoris kimotoi* Miyamoto and its allies of Japan, with description of a new species (Heteroptera: Miridae). *Japanese Journal of Entomology* **63**: 399-411.

OH M, YASUNAGA T, DUWAL RK, LEE S. 2018. Annotated checklist of the plant bug tribe Mirini (Heteroptera: Miridae: Mirinae) recorded on the Korean Peninsula, with descriptions of three new species. *European Journal of Entomology* **115**: 467-492.

POPPIUS B. 1913. Zur Kenntnis der Miriden, Isometopiden, Anthocoriden, Nabiden und Schizopteriden Ceylon's. *Entomologisk Tidskrift* **34**: 239-260.

POPPIUS B. 1915a. H. Sauter's Formosa-Ausbeute: Nabidae, Anthocoridae, Termatophylidae, Miridae, Isometopidae und Ceratocombidae (Hemiptera). *Archiv für Naturgeschichte* **80A(8)**[1914]: 1-80. [published March 1915]

POPPIUS B. 1915b. Zur Kenntnis der Indo-Australischen Capsarien. I. *Annales Historico-Naturales Musei Nationalis Hungarici* **13**: 1-89.

REUTER OM. 1908. Capsidae Javanicae novae vel minus cognitae. *Annalen des Naturhistorisches Hofmuseums Wien* **22**[1907]: 187-189.

SCHUH RT. 1995. *Plant bugs of the world (Insecta: Heteroptera: Miridae). Systematic catalog, distributions, host list and bibliography.* The New York Entomological Society. New York.

SCHUH RT. 2002-2013. *On-line systematic catalog of plant bugs (Insecta: Heteroptera: Miridae).* Available from: <http://research.amnh.org/pbi/catalog/>. Last accessed: 14 May 2022.

STONEDAHL GM. 1991. Review of the Oriental genus *Angerianus* Distant (Heteroptera: Miridae). *Tijdschrift voor Entomologie* **134**: 269-277.

STONEDAHL GM, CASSIS G. 1991. Revision and cladistic analysis of the plant bug genus *Fingulus* Distant (Heteroptera: Miridae: Deraeocorinae). *American Museum Novitates* **3028**: 1-55.

TAMADA Y, HINAMI H, MIYAZAKI A, YASUNAGA T, NAGASHIMA T, SERRANO LEON S. 2020. Elucidation of cryptic ecology of «runner plant bugs» (Miridae: Phylinae: Hallopapini), with emphasis on stridulatory mechanism. *Rostria* **65**: 1-14.

- VARSHNEY R, BUDHLAKOTI N. 2022. Biology and functional response of the predator, *Dortus primarius* (Distant) (Hemiptera: Miridae) preying on *Frankliniella schultzei* (Trybom) (Thysanoptera: Thripidae). *Egyptian Journal of Biological Pest Control* **32**: article number 31.
- VARSHNEY R, YESHWANTH HM, BALLAL CR. 2018. Biology and rearing protocol for *Dortus primarius* Distant, a predatory mirid (Hemiptera: Miridae). *Journal of Biological Control* **32**: 224-229.
- YASUNAGA T, NAKATANI Y. 1998. The eastern Palearctic relatives of European *Deraeocoris olivaceus* (Fabricius) (Heteroptera: Miridae). *Tijdschrift voor Entomologie* **140**: 237-247.
- YASUNAGA T, TAKAI M, KAWASAWA T (Eds.). 2001. *A field guide to Japanese bugs II*. Zenkoku Noson Kyoiku Kyokai Publ. Co. Ltd. Tokyo. [in Japanese]
- YASUNAGA T, YAMADA K, DUANGTHISAN J, ARTCHAWAKOM T. 2016. Review of the plant bug genus *Fingulus* Distant in Indochina (Hemiptera: Heteroptera: Miridae: Deraeocorini), with descriptions of two new species. *Zootaxa* **4154(5)**: 581-588.
- YASUNAGA T, MAEHARA S, ISHIKAWA T, TAKAI M. 2018. *Guidebook to the heteropteran world – Basic ecology, morphology, classification and research methodology*. Zenkoku Noson Kyoiku Kyokai Publ. Co. Ltd. Tokyo. [in Japanese]

---

*Received / Recibido / Hartua: 5/08/2022*

*Accepted / Aceptado / Onartua: 25/09/2022*

*Published / Publicado / Argitaratua: 31/12/2022*