Cubaris iriomotensisは、汎熱帯種Cubaris murina (Crustacea: Isopoda: Oniscidea)の新参異名

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AgriKnowledge
**Cubaris iriomotensis**, a junior synonym of the pantropical species *Cubaris murina* (Crustacea: Isopoda: Oniscidea)

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**Abstract** This study was conducted to reassess the taxonomic status of *Cubaris iriomotensis* (Nunomura, 1990). Type series from Iriomotejima Island, southern Ryukyu in Japan, and new specimens collected from Iriomotejima and Ishigakijima Islands were examined. Taxonomic assessment of the specimens included detailed morphological observations using a scanning electronic microscope (SEM). Specimens from the two islands closely correspond with the morphology of *C. murina* Brandt, 1833, a species widely distributed in the tropics. Thus, *C. iriomotensis* can be regarded as a synonym of *C. murina*.

**Key words:** Armadillidae, *Cubaris iriomotensis*, *Cubaris murina*, Ryukyu Islands

**Introduction**

Terrestrial isopods are one of the most abundant macrofaunal groups found with in the litter layer of the subtropical forests of Japan, and play an important role in the decomposition of leaf litter (Karasawa, 2009). The family Armadillidae Brandt and Ratzeburg, 1831 (Isopoda: Oniscidea) is diverse and includes about 600 species distributed throughout tropical and temperate zones (Taiti et al., 1998). However, taxonomy within the Armadillidae remains unclear. Reassessment of the taxonomic status of several specific taxa in the family is important for understanding terrestrial isopod diversity and also for understanding soil ecosystems.

Nunomura (1990) described one isopod species, *Sphaerillo iriomotensis* Nunomura, 1990, from Iriomotejima Island in the southern part of the Ryukyu Archipelago, southwestern Japan. This species was later transferred to the genus *Cubaris* Brandt, 1833 by Nunomura (1999a). In the world catalogue of terrestrial isopods (Schmalfuss, 2004), *C. iriomotensis* is considered endemic to Iriomotejima Island. Although most species of *Cubaris* have limited distributions because of their low migration ability, one species, *C. murina* Brandt, 1833, is widespread throughout the tropics (Taiti et al., 1998; Schmalfuss, 2004). In the vicinity of Iriomotejima Island (i.e., south-western China, Hong Kong, and Taiwan), *C. murina* is the only *Cubaris* species that has been reported (Kwon and Jeon, 1993; Kwon and Taiti, 1993; Dai and Cai, 1998). No morphological comparisons have been made between *C. iriomotensis* and other species within the genus *Cubaris* since Nunomura (1999a) transferred *S. iriomotensis* to the genus *Cubaris*, however. The morphologies of male pleopod 1 and pereiopod 1 of *C. iriomotensis*, as described by Nunomura (1990), are similar to those of *C. murina*; hence these similarities suggest that *C. iriomotensis* may be a junior synonym of *C. murina*.

To investigate this further I collected new *Cubaris* specimens from the type-locality, Oraha in Iriomotejima Island, and Ishigakijima Island, a neighbor of Iriomotejima Island. Morphological approaches using a scanning electronic microscope (SEM) were used to identify the species collected from Ishigakijima Island and to elucidate the taxonomic status of the *C. iriomotensis* specimens from type-locality. Moreover, the morphology of the holotype of *C. iriomotensis* and the new specimens collected from Iriomotejima and Ishigakijima Islands were examined and compared.

**Materials and Methods**

**Sample collection**

Specimens were collected from leaf litter and/or under stones and decaying logs, using aspirators. Specimens were preserved in 99.5% ethanol at room temperature. Some of the specimens were deposited in the collection of the University Museum, University of the Ryukyu (RUMF-ZC). I also examined the holotype and allotype of *C. iriomotensis* deposited in the Toyama Science Museum (TOYA-Cr).
Morphological observation

Specimens were observed under a stereomicroscope (Olympus SZH, at a magnification of 7–64×) and under a biological light microscope (Nikon Eclipse E400, magnification of 40–400×). High resolution images were taken using SEM (JCM-5100, JEOL). Specimens used with the SEM were immersed in absolute ethanol and dried at room temperature or freeze-dried using t-butanol and coated with platinum.

Taxonomic Account

Cubaris murina Brandt, 1833

[Japanese name: Nettai-koshibiro-dangomushi]

(Figs 1–8)


Armadillo borellii Dollfus, 1894: 1–2; Budde-Lund 1904: 120. Synonymized with Cubaris murina Brandt, 1833 by Van Name (1936: 387).


Nesodilla (sic) murina Brandt

1833 by Ferrara and Taiti (1979: 174).


Diagnosis. Body color violet-brown mottled with yellowish color; pereonite 1 with a semicircular lobe on ventral surface; pereonite 2 with a quadrangular lobe on ventral surface; male pereiopods 1–3 each with brush of long setae on carpus and merus.

Ohara, 12 males (SK-ve-17–24, 27–30) and 6 females (SK-ve-1771–1776) from Shonei Park, 4 males (SK-ve-55–57, 60) from Manta Park, and 16 males (SK-ve-80–84, 86, 88–96, 1980) from Hamazaki Green Park are kept in a personal collection (SK-ve) of S. Karasawa.

Comparative material. Cubaris iriomotensis; TOYA-Cr-8884, holotype, male; TOYA-Cr-8885, allotype, female.

Description of specimens from Japan. Body length 0.65–1.04 cm in adult male (n = 41), 0.60–1.08 cm in adult female (n = 8) (Fig. 1). Body color violet-brown mottled with yellowish color in ethanol. Eyes each with about 20 ommatidia. Frontal lamina protruding above the vertex and marginal line continues on both sides within the frontal margin (Fig. 2). Upper edge of cephalothorax convex in the middle and frontal shield trapezoid in frontal view (Fig. 3A).

Fig. 1. Cubaris murina Brandt, 1833, collected from Ishigakijima Island (RUMF-ZC-01707, non-type, male). A, Lateral view; B, dorsal view. Scale bar: 2 mm.

Fig. 2. Cubaris murina Brandt, 1833, collected from Ishigakijima Island (SK-ve-19, non-type, male), cephalothorax, lateral view. Scale bar: 300 μm.
First antenna consisting of three articles; third article with 10–12 aesthetascs. Second antenna with five peduncular articles and two flagellum articles (Fig. 3B).

Mandible with at least five plumose setae between hairy lobe and pars molaris; lacinia mobilis of left mandible three-headed; right lacinia mobilis square (Figs. 3D, E).

First maxilla with outer endite bearing 10 tooth-like setae at the apex (Fig. 3G); inner endite with two penicils (Fig. 3C). Second maxilla apically bilobate, covered with short fine setae.

Maxilliped with rectangular endite bearing about five setae; palp consisting of two articles tapering toward apex (Fig. 3F).

Pereonite 1 with a semicircular lobe on ventral surface (Fig. 4A); pereonite 2 with rectangular epimera, bearing a quadrangular lobe on ventral surface (Fig. 4B); pereonites 3–7 each with an oblique lobe just visible on ventral surface; pleonite 3 with distinct horizontal lobe on posterior part (Figs. 4C–H).

Male pereiopods 1–3 each with brush of long setae on carpus and merus (Figs. 5A–C, left); male pereiopod 7 with more than 15 strong spines on carpus (Fig. 5G, left); male pereiopods 4–6 (Figs. 5D–F, left) and all female pereiopods (Figs. 5A–G, right) with fewer than 15 spines on carpus and merus.

Male pleopod 1 with straight endopodite and apical part bent outwards bearing a row of small short setae, with a small swelling on inner margin (Figs. 6A, B); exopodite triangular with several small spines on distal margin. Male pleopod 2 with narrow endopodite; exopodite triangular with distal half elongated, exopodite as long as endopodite (Fig. 6C). Female pleopod 1 with minute exopodite (Fig. 7A). Perispiracular area located on the outer part of exopodites, a monospiracular covered lung (Figs. 7B, C).
Pleonotelson hour-glass-shaped, with distal part shorter than basal part (Fig. 8A). Uropod with protopod enlarged; exopodite inserted on dorsal surface near the middle margin of protopod; endopodite about twice as long as the exopodite (Fig. 8B).

**Discussion**

The new specimens collected from Iriomotejima and Ishigakijima Islands are morphologically identical and show the 5 morphological characteristics regarded as diagnostic features of *S. iriomotensis* by Nunomura (1990): 1) a flatter body shape than other armadillid species in Japan; 2) a
Fig. 5. Cubaris murina Brandt, 1833, collected from Ishigakijima Island (non-type). Left row: male (A–D, SK-ve-28; E–G, SK-ve-24), right row: female (A–E, SK-ve-1771; F–G, SK-ve-1773). A, Pereiopod 1; B, pereiopod 2; C, pereiopod 3; D, pereiopod 4; E, pereiopod 5; F, pereiopod 6; G, pereiopod 7. Scale bars: 300 μm for male A–D and female A–G; 500 μm for male E–G.
pleotelson with a straight distal margin; 3) a stouter processus molaris of the mandibles; 4) a triangular exopodite of the male first pleopod; and 5) many setae on the merus and carpus of the male first pereiopod. Moreover, examination of the C. iriomotensis holotype clearly showed that it was identical to the new specimens collected in this study, although some morphological characteristics of the holotype were not able to be examined because of poor condition.

The new specimens and holotype have morphological characteristics consistent with the generic diagnosis of

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**Fig. 6. Cubaris murina** Brandt, 1833, collected from Ishigakijima Island (non-type, male). A, Pleopod 1, exopodite and endopodite, frontal view, RUMF-ZC-01708; B, pleopod 1, posterior view, SK-ve-1980; C, pleopod 2, exopodite and endopodite, frontal view, RUMF-ZC-01708. Scale bars: 300 μm for A and C; 20 μm for B.
Fig. 7. *Cubaris murina* Brandt, 1833, collected from Ishigakijima Island (non-type, female). A, Pleon, ventral view, SK-ve-1776; B, perispiracular area of pleopod 2 exopodite, dorsal view, SK-ve-1775; C, perispiracular area of pleopod 2 exopodite, SK-ve-1776. Dor: dorsal side, Ven: ventral side. Scale bars: 1 mm for A; 30 μm for B and C.

Fig. 8. *Cubaris murina* Brandt, 1833, collected from Ishigakijima Island (non-type, male). A, Pleotelson, RUMF-ZC-01701; B, uropod, SK-ve-24. Scale bars: 300 μm.
ventral surface of pereonite 1 does not connect with the epimeral border; the ventral lobe of pereonite 2 does not project beyond the epimeral border; the exopodite is inserted on the dorsal surface of the protopod and is removed from the inner border of the protopod. These observations suggest that the species belongs to the genus Cubaris. Moreover, the lobe on the dorsal surface of the protopod and is removed from type-locality and Ishigakijima Island. Thus, the specimens collected from type-locality and Ishigakijima Island, and the holotype of C. iriomotensis itself, suggest that on morphological grounds the specimens belong within the C. marina group. In summary, C. iriomotensis should be regarded as a junior synonym of C. marina, and that C. marina are distributed on Iriomotejima and Ishigakijima Islands in southwestern Japan.

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