Neotype Designation and Redescription of the Centipede *Lithobius ongi* Takakuwa, 1939 (Chilopoda, Lithobiomorpha, Lithobiidae)

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**Abstract.** Takakuwa (1939, 1941a, b) described a new species of centipede, *Lithobius ongi* Takakuwa, 1939, based on three females from Taiwan. Without a designation of type specimens, the locality of the collection was ambiguous and now cannot be located. Most of his specimens were destroyed in an air attack in 1945, and others cannot be traced. In the interest of stabilizing the nomenclature, we herein designate the neotype for *L. ongi* using specimens collected from Taiwan under article 75.3.4 of the International Code of Zoological Nomenclature (ICZN 1999). As the original description is based only on female specimens, the neotype designation is based on the male sex (article 75.3.5, ICZN), and morphological characters of both sexes are redescribed. The male secondary sexual characters revealed by scanning electron microscopy are as follows: a small “tunnel” at the top of a longitudinal excavation on the dorsal surface of the 14th tibia, the tunnel and bottom of the excavation bearing numerous very small pores of flexo-canal epidermal glands; and the posterointernal ridge of the excavation bearing a tuft of long setae. Furthermore, we consider that *Lithobius kiayiensis* Wang, 1959 is a questionable species; it might be a synonym of *Lithobius ongi* Takakuwa, 1939.

**Key words:** *Lithobius ongi* Takakuwa, 1939, neotype designation, male secondary sexual character, taxonomy.

**INTRODUCTION**

Takakuwa (1939, 1941a, b) described a new species of centipede, *Lithobius ongi* Takakuwa, 1939, based on three females from Taiwan. Although he never came to Taiwan, he reported on Taiwanese centipedes based on specimens collected by his friends in Taiwan. Moreover, without a designation of type specimens for *L. ongi*, the name of the locality in Japanese spelling where the specimens were collected is ambiguous and cannot be located today. Additionally, most of his specimens were destroyed in an air attack at Matsuyama-shi on July 26, 1945, and others could not be located in Japan. Wang (1959, 1963) recorded the localities of *L. ongi* in two surveys but with no description of the species. However, he reported and described (1959) a new species, *L. kiayiensis* Wang, 1959, which is morphologically very close to *L. ongi*, but which can be distinguished by its character of thick 14th legs in the male. However, Wang’s specimens in Taiwan were also lost. As the type material of this species cannot be located and is assumed to have been lost and no original material of this species exists, we therefore, in the interest of stabilizing the nomenclature, herein designate the neotype for *L. ongi*, using specimens collected within the area of its natural distribution in Taiwan, where it is an endemic species. We have taken this
action based on article 75.3.4 of the International Code of Zoological Nomenclature (ICZN, 1999). As the original description is based only on female specimens, the neotype designation is based on the male sex (article 75.3.5, ICZN), and morphological characters of both sexes are redescribed.

**MATERIALS AND METHODS**

Twenty-four specimens of both sexes of *L. ongi* treated below were collected from Mei-Feng Farm and Huisun Forest (Nantou County, central Taiwan). Specimens were preserved in 75% alcohol and deposited in the zoological collection of the National Museum of Natural Science (Taichung, Taiwan). The material was studied and illustrated using stereo-microscopic, photographic, and drawing equipment, as well as scanning electron microscopy (SEM). Terminology for external morphological characters follows Bonato et al. (2010). The following abbreviations are used in the text and tables: a, anterior; C, coxa; F, femur; m, median; p, posterior; P, prefemur; S, SS, sternite, sternites; t, trochanter; T, TT, tergite, tergites; Ti, tibia.

**RESULTS**

**Neotype Designation and New Synonym**

*Lithobius ongi* Takakuwa, 1939

Figs. 1-5


*Takakuwa* 1941a − Fauna Nippon 9(8-3): 50-51 (description, key); Figs. 45-46. (locality: Kaminohira ??)


*Lithobius ongi*: Wang 1963 − Q. J. Taiwan Mus. 16: 95. (locality: Ta Ping Shan)


*Locality information: old name = new name; name??: location unknown.

**Type material:** Neotype: 1 ♂ (NMNS7843-011): Taiwan, Nantou County, Mei-Feng Farm, greenhouse, 24°05′N, 121°10′E, 2134 m, 15 May 2017, leg. Jui-Lung Chao.


**Redescription:** Body length: 9−13 mm. Body color dark-brown; forcipules, forcipular tergite, and T1 yellowish-brown; 14th tibia yellow (Fig. 1A).

**Antennae** with 23−28 articles; most articles markedly longer than wide; distal article much longer than wide, up to 3.0-times as long as wide; abundant setae on antennal surface, less so on basal article, gradually increasing in density, then more or less constant in number (Fig. 1B).

**Cephalic plate** smooth, convex, pentagonal-rounded; width subequal to length; posterior marginal ridge moderately broader (Fig. 1B).

Nine to eleven *ocelli* on each side, [1+2,3-5], arranged in three irregular rows; posterior ocellus largest, two dorsal seriate ocelli large, three middle seriate ocelli medium, three to five ventral seriate ocelli small; ocelli domed, translucent, usually darkly pigmented (Fig. 2A, B).

**Tömösváry’s organ** comparatively small, nearly rounded; width subequal to length; posterior marginal margin of cephalic plate, slightly equal to adjoining ocelli (Fig. 2A).

**Forcipular coxosternite** sub-trapezoidal, anterior margin narrow, external side slightly longer than internal side; coxosternal median cleft moderately deep; anterior border with 2+2 large triangular coxosternal teeth; porodonts moderately slender, setiform; porodont node
obviously large and well-chitinized, lateral to outer tooth (Fig. 2C); some setae scattered on surface of ventral side of coxosternite.

_Tergites_ smooth, without wrinkles, backside slightly hunched; T1 generally trapeziform, posterior margin narrower than anterior one, narrower than T3 and cephalic plate (Fig. 1B); posterior margin of T7 center distinctly deeply concave; posterior angles of TT7, 9, 11 and 13 with large triangular projections (Fig. 3A); posterior angles of TT10, 12, and 14 with weak projections; all tergites with lateral marginal ridges; TT1, 3 and 5 with continuous posterior ridges; TT2, 4, 6, 7, 8, 9 and 10 with posterior angles marginal ridges; other tergites lacking posterior ridge; tiny setae very sparsely scattered on surface.

_Sternites_ narrower posteriorly, generally trapeziform, comparatively smooth, setae very sparsely scattered on surface (Fig. 4A).

_Legs:_ tarsi well-defined on all legs; all legs with fairly long claws, curved ventrad; anterior and posterior accessory spines on legs 1~14, the anterior moderately slender, the posterior short and thick; legs 15 lacking anterior accessory spines; legs 14 and 15 with numerous pores of telopodal glands on inner surfaces of femur, tibia, tarsus 1, and tarsus 2. Leg plectrotaxy given in Table 1.

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Table 1. Leg plectrotaxy of _Lithobius ongi_

Fig. 1. _Lithobius ongi_ Takakuwa, 1939 from Taiwan. A. ♂ (NMNS7843-012), habitus, dorsal view. B. ♂ (NMNS7843-012), antennae, cephalic plate, and first tergite.
Fig. 2. *Lithobius ongi* Takakuwa, 1939 from Taiwan. A. ♂ (NMNSS7587-032), ventral view of head. B. ♂ (NMNS7587-025), ocelli on left side. C. ♀ (NMNS7634-058), coxosternal teeth and large porodont nodes (arrow).

Fig. 3. *Lithobius ongi* Takakuwa, 1939 from Taiwan. ♂ (NMNS7843-012). A. Posterior portion of body, dorsal view. B. Femur and tibia of 14th left leg, tibia with a “tunnel” followed by a longitudinal excavation. C. Dorsal view of anterior part of 14th tibia. D, E and F. “Tunnel” and the bottom of excavation bearing numerous very small pores of the flexo-canal epidermal glands.
Male secondary sexual character on leg 14: tibia very thick, with a longitudinal excavation on dorsal surface, and a small “tunnel” at top of excavation (Fig. 3B-D); tunnel and bottom of excavation bearing numerous very small pores (0.6~0.8 μm) of flexo-canal epidermal glands (Fig. 3D-F); a bunch of 7 or 8 long setae present at 2/3 of full length of inner ridge of tibia (Fig. 3A, B).

**Coxal pores** 444(3-5), round, coxal pore field set in a relatively shallow groove, fringe of coxal pore-field with slight eminence (Fig. 4B).

**Male first genital sternite** wider than long, usually well-chitinized; posterior margin quite deeply concave between gonopods, without a medial bulge; comparatively long setae evenly scattered on ventral surface; gonopods short and small, with 2 or 3 long setae, slightly chitinized apically (Fig. 4B).

**Female genital sternite** well-chitinized, wider than long; posterior margin of genital sternite deeply concave; short to long setae sparsely scattered on surface of genital segment (Fig. 5A).

**Female gonopod**: first article fairly broad, bearing 15~18 long setae, arranged in 3 irregular rows; 2+2 coniform gonopodal spurs, inner spur smaller (Fig. 5A); second article with 7~9 rather long setae arranged in 2 irregular rows on ventral side; third article usually with 4~6 short setae scattered sparsely on surface; gonopodal claws tripartite, 2 large denticles on tip; a small lateral denticle at base of gonopodal claw (Fig. 5B).

**Diagnosis:** This species differs from its congeners mainly by the large triangular projections on the posterior angles of TT7, 9, 11 and 13; 2 large denticles on the tip of the female gonopodal claws, and a very small lateral denticle on the base; the male secondary sexual character on leg 14 with a thick tibia, a longitudinal excavation on the dorsal surface, and a small tunnel at the top of excavation, and a bunch of 7 or 8 long setae at 2/3 of the full length of the inner ridge of the tibia.

**Remarks**

Takakuwa (1939) described and drew the characters of *L. ongi* with only female specimens, with no descriptions of male characters. He mentioned five distinct characters of *L. ongi*: posterior angles of TT7, 9, 11 and 13 with triangular projections; antennae with 24~36 articles; female gonopods with 2+2 spurs, gonopodal claw biapiculate; and 1+11 ocelli. The female specimens we examined by high-power microscopy revealed that there are two large denticles on the tip of the female gonopodal claw and a very small lateral denticle on the base of the gonopodal claw.

*Lithobius ongi* resembles the Japanese species, *L. niger* Takakuwa, 1941, with the following shared traits: 26 or 27 antennal articles; 12 ocelli; 2+2 coxosternal teeth; and a large porodont node. Also shared by both are the male secondary

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**Fig. 4. Lithobius ongi** Takakuwa, 1939 from Taiwan. ♂ (NMNS7843-012). A. Ventral view of posterior portion of body, 14th sternite (S14), 15th sternite (S15), and first genital sternite (fgs). B. Male first genital sternite, male gonopod (arrow), and coxal pores of leg 15 (CP).
sexual characters of a longitudinal excavation on the dorsal surface of the 14th tibia and a tuft of several long setae on the inner ridge of the excavation. However, *L. ongi* can be distinguished from the latter by its triangular projections on tergites TT7, 9, 11 and 13, which are not found in *L. niger*.

In some *Lithobius* species, there are male secondary sexual characters on the femur or tibia of legs 14 and 15 (Lewis, 1981). We found numerous very small pores (0.6~0.8 μm) of the flexo-canal epidermal glands on the dorsal excavation of the 14th tibia in male *L. ongi*. Numerous very small pores (0.8~1.0 μm) of the flexo-canal epidermal glands are also present on the apical region of the large ventral swelling of the 15th femur in the male *Lithobius* (*Monotarsobius*) *meifengensis* Chao, Lee and Chang, 2018. It is possible that these small pores, densely distributed on the femur or tibia of legs 14 and 15, may also be present in other species of *Lithobius* for pheromone secretion.

Wang (1959) published a new Taiwanese species, *L. kiayiensis*, which is morphologically very close to *L. ongi*. Wang considered that *L. kiayiensis* differs from *L. ongi* by its thickened male leg 14 and 3+3 coxosternal teeth. However, his description of *L. kiayiensis* provided no figures, and furthermore, he never recorded this species again in his latter publication. Since male leg 14 of *L. ongi* is also thickened and its large porodont nodes look like coxosternal teeth (Fig. 2C), *L. kiayiensis* might have incorrectly been designated a different species. Therefore, we consider that *Lithobius* *kiayiensis* Wang, 1959 is a questionable species, and it might be a synonym of *Lithobius* *ongi* Takakuwa, 1939.

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**REFERENCES**


Wang, Y.H.M. 1963. Serica 1q: Millipedes and Chilopoda of Quemoy, Fukien Province and Taiwan Island, Botel Tobago (Lan Yu), Taiwan province and of Singapore. Q. J. Taiwan Mus. 16: 89-96.

王氏石蜈蚣Lithobius ongi Takakuwa, 1939的新模標本指定與形態特徵的再描述

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Lithobius ongi Takakuwa, 1939王氏石蜈蚣是日本學者高桑良興發表的台灣新種石蜈蚣，他的標本來自他在台灣的友人王雨卿，他並未指定模式標本，且其記錄的採集地名，現今已無法確認位於台灣的何處。然而，高桑良興的多數標本毀於1945年7月26日的松山市的空襲，殘存標本多交由學生三好保德私人保管，至今下落不明。高桑良興僅描述王氏石蜈蚣的雌性特徵，雄性特徵的描述闕如。依據國際動物命名規約(ICZN)，無模式標本(ICZN75.3.4)和新種建立在不同性別(ICZN75.3.5)的基礎上，我們在此指定王氏石蜈蚣的新模標本，以現代的專有名詞與圖文，新加入雄性特徵，完整描述其兩性的形態特徵，並以SEM圖片說明其雄性第二性徵：第14對步肢的腿節背側具一縱向凹溝，凹溝前端具一小坑洞狀構造，此構造內側與凹溝底部密布微小的表皮腺孔。凹溝的後方內側脊背具有一小束長剛毛。此外，我們也提出Lithobius kiayiensis Wang, 1959是存疑的物種，可能是Lithobius ongi Takakuwa, 1939的同種異名。

關鍵詞：Lithobius ongi Takakuwa, 1939, 新模標本指定，雄性第二性徵, 分類