

# *Lathrobium neostygium*, a new troglobiontic rove beetle from central Honshu, Japan (Coleoptera: Staphylinidae: Paederinae)

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## Abstract

A new troglobiontic species, *Lathrobium neostygium* sp.n. (Coleoptera: Staphylinidae: Paederinae), is described from Gifu Prefecture, central Honshu, Japan. Photographs of the male and female habitus, of the aedeagus and of the type locality are provided. This finding represents the easternmost record of a Japanese troglobiontic species of *Lathrobium* GRAVENHORST, 1802. The *L. nomurai* species group is redefined, and a checklist of the species of this group is provided.

**Key words:** Coleoptera, Staphylinidae, Paederinae, *Lathrobium*, subterranean biodiversity, East Asia, Japan, endemic species, new species, taxonomy.

## Introduction

In the Japanese Archipelago, the genus *Lathrobium* GRAVENHORST, 1802 is highly diverse; 140 species have been recorded so far (ASSING 2019, ASSING & KURODA 2020, NOZAKI 2020, SENDA 2020, 2022, SATO 2023a, b, SATO & MARUYAMA 2023). However, the Japanese *Lathrobium* fauna has not yet been explored satisfactorily. The Japanese species of *Lathrobium* are divided into nine species groups based mainly on male secondary sexual characters (SHIBATA et al. 2013, SENDA, 2020, 2022). The *L. nomurai* group (sensu WATANABE 2002a) consists of 28 species (SHIBATA et al. 2013, ASSING & KURODA 2020, SATO & MARUYAMA 2023), and the members of this group are generally found in subterranean habitats. All known species of this group are distributed in western Honshu (Kinki and Chûgoku regions), Shikoku and Kyushu, while no species have been found in central and eastern Honshu (Hokuriku, Chûbu, Kantô and Tôhoku regions).

Recently, I examined several specimens of *Lathrobium* collected from subterranean habitats in the Chûbu Region (central Honshu). Upon close examination, they were identified as an undescribed species belonging to the *L. nomurai* group, which has not been previously recorded from central Honshu. This species is described below.

## Material and methods

The specimens used in this study are preserved in the following collections: Hiwa Museum of Natural Science (HIWA), Institute for Agro-Environmental Sciences, NARO, Tsukuba (NIAES) and the author's private collection (pcYS). The specimens are partly preserved as described in NAKAHAMA et al. (2019).

COMPARATIVE SPECIMENS EXAMINED: *Lathrobium tanakai* WATANABE, 1998: [Wakayama Pref.] 3 ♂♂, 1 ♀, Mt. Gomadan-zan, Ryûjin-mura (now Tanabe-shi), 31.VIII.2002, leg. H. Ashida (pcYS); 3 ♂♂, same locality and collector, but 5.X.2002 (pcYS). *Lathrobium* cf. *uenoi* WATANABE, 1980: [Hyôgo Pref.] 1 ♂, Anaura-tôge Pass, Aogaki-chô, 20.IV.2002, leg. H. Ashida (pcYS).

The dissecting techniques follow HANLEY & ASHE (2003), MARUYAMA (2004) and SENDA (2020), and the terminology follows SENDA (2020). Habitus images were taken using a digital camera (Canon EOS Kiss X5, Canon Inc.) with a macro lens (Canon EF-S60 mm F2.8 MACRO, Canon Inc.) and a macro flash (Laowa KX-800 Macro Twin Lite, Venus Optics), and Combine

ZP (Alan Hadley, UK) was used for image stacking. The distribution maps were created with files downloaded from the website of GSI Tiles (<https://maps.gsi.go.jp/development/ichiran.html>) by using QGIS 3.12.3. All figures were edited and assembled using Adobe Photoshop® CS5.1.

The label data of the holotype are quoted verbatim, line breaks on the labels are indicated by a vertical line (|).

Abbreviations for morphological measurements used in this paper are as follows: AL – antennal length; BL – body length (from apex of clypeus to apex of abdominal tergite VIII); EL – elytral maximum length; EW – elytral maximum width; FBL – forebody length (HL + PL + EL); HL – head length (from apex of clypeus to posterior margin of head capsule); HW – head maximum width without eyes; PL – pronotal maximum length; PW – pronotal maximum width.

## Taxonomy

### *Lathrobium nomurai* species group

DIAGNOSIS: Body robust, large (usually BL > 12 mm), reddish brown to blackish brown; medio-apical emargination of male ventrite VIII (very) shallow; endophallus of aedeagus without sclerites, densely covered with minute hair-like setae; female abdominal tergite VIII weakly emarginate at middle; female abdominal tergite X moderately large.

COMMENTS: Individuals of this species group may occasionally be collected by sifting leaf litter, but their primary habitats are believed to be subterranean. They are frequently collected together with troglobiontic (blind) Trechinae (Coleoptera: Carabidae).

### *Lathrobium neostygium* sp.n.

TYPE LOCALITY: Japan, Gifu Prefecture, Motosu-shi, Neomidori, 35.6089°N 136.5858°E, ca. 370 m a.s.l.

TYPE MATERIAL: **Holotype** ♂ (HIWA): “岐阜県本巣市根尾水鳥 | [JAPAN; Honshu] | Neomidori (alt. 367 m) | Motosu-shi | Gifu, 11–V–2020 | Kôhei KAWAMURA leg. | 35°36'32"N 136°35'09"E" [printed on white label], “collected from | subterranean zone” [printed on white label], “HOLOTYPE | *Lathrobium neostygium* sp. nov. | Det. Y. Senda, 2021” [printed on red label with black border]. **Paratypes** 1 ♂, 1 ♀, same data as holotype, NIAES-STAPH-JPN495 (pcYS, NIAES); 1 ♀, same locality as holotype, but 35°36'41"N 136°35'53"E, ca. 250 m a.s.l., 12.IV.2020 (HIWA); 1 ♀, same data as holotype, but 26.IV.2020 (pcYS).

ADDITIONAL MATERIAL EXAMINED: 1 ♀, Neoô, Motosu-shi, Gifu, 35.6745°N 136.5210°E, ca. 540 m a.s.l., 18.VI.2022, leg. K. Kawamura, NIAES-STAPH-JPN406 (NIAES); 1 ♀, near Nukumi-tôge, Neoôkawara, Motosu-shi, Gifu, 35.7758°N 136.5233°E, 940 m a.s.l., 19.IX.2021, leg. K. Kawamura (pcYS).

DIAGNOSIS: The new species is similar to *Lathrobium tanakai* described from Kii Peninsula (WATANABE 1998) in external and aedeagal features, but differs from it in the following characteristics: 1) lateral sides of the posterior excision asymmetrically produced in the caudal margin of male abdominal ventrite VIII (feebly and symmetrically produced in *L. tanakai*); 2) apical projection of aedeagal dorsal sclerite comparatively robust, with rounded apex (slender, with pointed apex in *L. tanakai*); 3) apical projection of paramere distinctly curved dorsad at about 1/5 (slightly curved dorsad at about 1/6 in *L. tanakai*).

This new species also resembles *Lathrobium uenoi* described from the Shizushi Cave, Kyoto Prefecture (WATANABE 1980), but differs from the latter in the following characteristics: 1) aedeagal dorsal sclerite wide, with comparatively short apical projection (moderately slender, with comparatively long apical projection in *L. uenoi*); 2) apical projection of paramere robust and distinctly curved dorsad at about apical 1/5 (slender and slightly curved dorsad from the base to apex in *L. uenoi*).

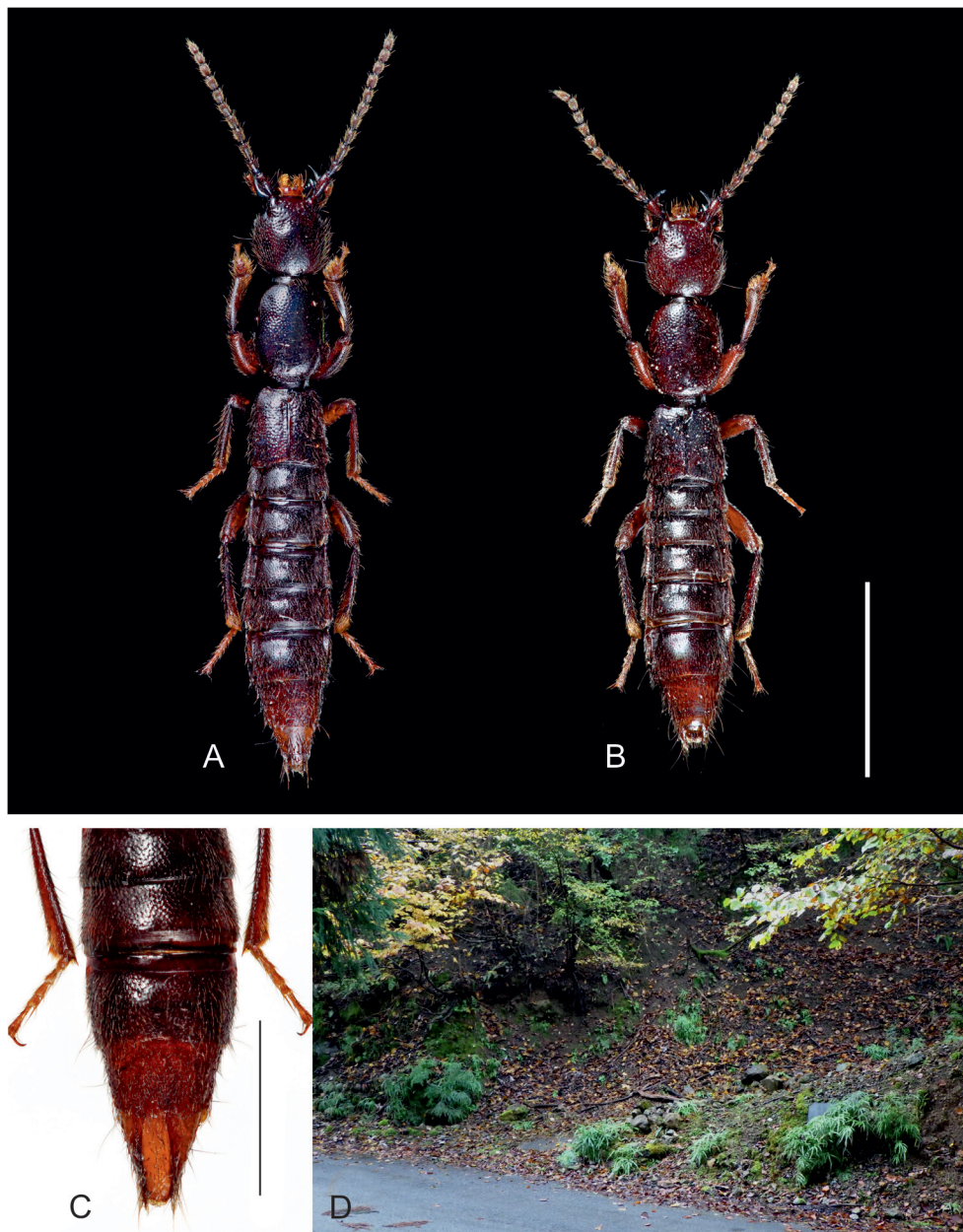


Fig. 1: *Lathrobium neostygium*: A–B) habitus of A) male, holotype and B) female, paratype, C) abdominal ventrites of male, showing secondary sexual characters, D) type locality. Scales: A–B: 5.0 mm, C: 2.0 mm. Photographs by Y. Senda (A–C) and K. Kawamura (D).

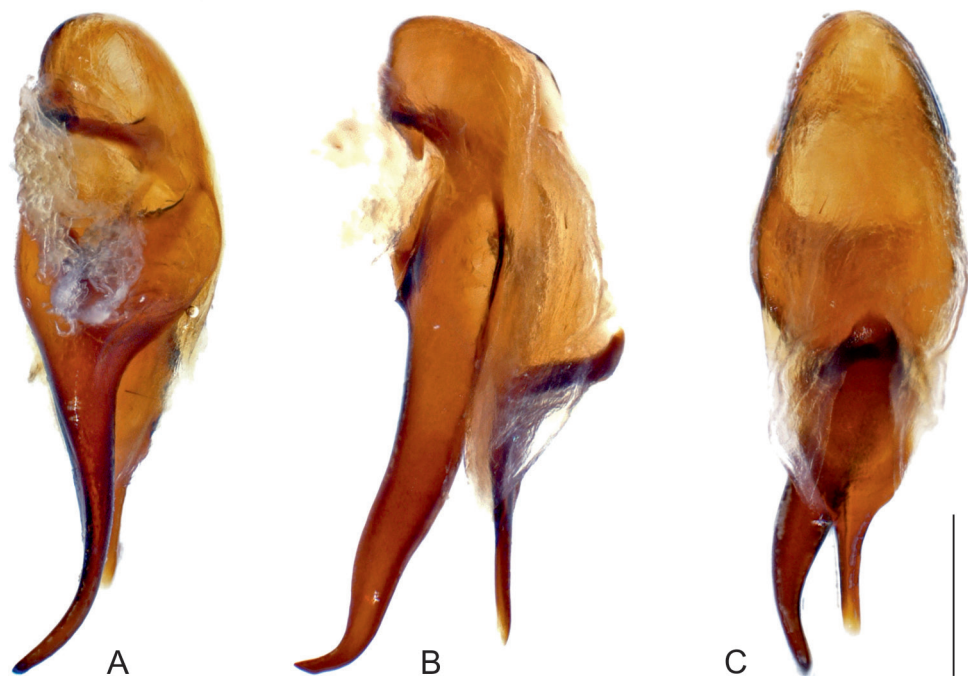


Fig. 2: *Lathrobium neostygium*, aedeagus in A) ventral, B) lateral, and C) dorsal view. Scale: 0.5 mm.

DESCRIPTION: Colouration: Body dark reddish brown, shining; labrum, maxillae, labium, and legs yellowish brown.

Male (Fig. 1A): Body elongate, subparallel-sided, slightly flattened dorsally. Head suborbicular in dorsal view, lateral sides gently arcuate, widest at 1/2 of posterior part of eyes,  $HL/HW \approx 1.1$ ; surface with coarse setiferous punctures and coriaceous microsculpture; punctures of surface becoming slightly denser and less coarse in temporal area. Eyes small, about 0.2 times as long as temple, flat. Antennae moderate in length,  $AL/FBL \approx 0.6$ ; antennomere I widest at about apical 1/2, dilated to widest point, thence weakly contracted toward apex; antennomeres II–X more or less oblong; antennomere XI fusiform, pointed at apex; length/width ratios of antennomeres I–XI: 2.4, 1.4, 2.4, 1.9, 1.7, 1.8, 1.5, 1.4, 1.4, 1.5, 2.0; relative lengths of segments from base to apex: 21.4 : 10.0 : 15.0 : 13.0 : 11.0 : 12.3 : 10.8 : 11.1 : 10.4 : 11.1 : 14.0; relative widths: 14.3 : 11.3 : 10.0 : 11.3 : 10.6 : 11.0 : 11.4 : 12.6 : 11.9 : 11.8 : 11.2.

Pronotum oblong, widest about the anterior 2/5,  $PL/PW \approx 1.4$ ,  $PL/HL \approx 1.2$ ,  $PW/HW \approx 1.0$ , lateral sides almost straight, contracted from the basal 1/3 to posterior corner; disc closely covered with coarse and setiferous punctures except median smooth area; anterior margin very feebly emarginate at the middle, broadly rounded at corners; posterior margin almost straight, rounded at corners. Scutellar shield impunctate, covered with indistinct microsculpture, sparsely clothed with fine brownish pubescence. Elytra widest at posterior 1/4,  $EL/EW \approx 1.0$ ,  $EL/PL \approx 0.8$ ,  $ELW/PW \approx 1.1$ , gently dilated to widest point, thence feebly contracted toward apex; disc closely covered with shallow punctures, clothed with fine brownish pubescence. Hind wings absent. Basisternum asetose, carinate along midline in apical half; inner coxal process short, apically pointed. Mesoventrite asetose, microsculptured, fully carinate along midline; inner coxal process short, apically pointed. Metaventricle sparsely pubescent, microsculptured; inner coxal

process absent. Legs simple, rather slender, clothed with golden pubescence; protarsomeres I–IV strongly dilated.

Abdomen (Fig. 1C) covered with minute punctures, densely clothed with dark brownish pubescence; ventrite VI without median depression; ventrite VII with a semi-elliptical median depression, which is densely clothed with short black setae, barely emarginate at the caudal margin; tergum VIII weakly arcuate at caudal margin; ventrite VIII with a distinct median depression, which is densely clothed with short black setae, with wide and triangular posterior excision, lateral side of the posterior excision asymmetrically produced in the caudal margin. Tergum IX setigerous except on the basal 1/5, posterolateral projections as long as 1/4 of tergum IX and slightly curved dorsad from apical 1/3 to pointed apex; ventrite IX elongate, widest at basal corners, narrowed apically, setigerous in apical half, with caudal margin feebly arcuate; tergum X trapezoidal, widest at basal corners, with some macrosetae and pores, with caudal margin truncate.

Aedeagus (Fig. 2A–C) nearly spindle-shaped, asymmetrical, well sclerotized except membranous dorsal side; dorsal sclerite short and somewhat slender, asymmetric, widest at basal 1/3, feebly curved ventrad at basal 1/3, strongly dilated to widest point, thence sinuately contracted toward projected acute apex in dorsal view; paramere asymmetrical, widest at apical 1/2, gently dilated to the widest point, thence strongly contracted toward acute apex in ventral view, with an apical projection, which is strongly curved to the right in apical half and distinctly curved dorsad at about 1/5.

Female (Fig. 1B): Similar to male in general appearance.  $HL/HW \approx 1.1$ ;  $AL/FBL \approx 0.6$ ;  $PL/PW \approx 1.3$ ;  $PL/HL \approx 1.2$ ;  $PW/HW \approx 1.0$ ;  $ELL/ELW \approx 1.0$ ;  $ELL/PL \approx 0.8$ ;  $ELW/PW \approx 1.0$ . Tergum VIII slightly emarginate at the caudal margin; ventrite VIII weakly projected apically, truncate at caudal margin; tergum IX setigerous except on basal 1/3, posterolateral projections as long as 1/4 of tergum IX and curved dorsad from apical 1/3 to pointed apex; tergum X moderately large, subtrapezoid, widest at the basal corners, with a few macrosetae at middle. Gonocoxites: Lateral gonocoxal plate (distal and proximal gonocoxites fused) elongate and wide, with rounded apex.

Measurements: Male ( $n = 2$ ). BL: 12.04–12.43 mm; FBL: 5.37–5.71 mm; HL: 1.74–1.79 mm; HW: 1.61–1.62 mm; AL: 3.48–3.50 mm; PL: 2.05–2.22 mm; PW: 1.57–1.59 mm; ELL: 1.58–1.70 mm; ELW: 1.67–1.76 mm. Female ( $n = 3$ ). BL: 11.29–12.13 mm ( $11.82 \pm 0.46$  mm); FBL: 5.17–5.46 mm ( $5.36 \pm 0.16$  mm); HL: 1.72–1.77 mm ( $1.75 \pm 0.03$  mm); HW: 1.55–1.68 mm ( $1.63 \pm 0.07$  mm); AL: 3.47–3.51 mm ( $3.49 \pm 0.02$  mm); PL: 1.93–2.08 mm ( $2.02 \pm 0.08$  mm); PW: 1.54–1.64 mm ( $1.58 \pm 0.05$  mm); ELL: 1.49–1.66 mm ( $1.60 \pm 0.09$  mm); ELW: 1.42–1.78 mm ( $1.60 \pm 0.18$  mm).

HABITAT NOTE: According to Y. Kawamura (pers. comm.), all specimens were collected in mixed coniferous and broadleaved forest (Fig. 1D) by digging holes in the ground.

DISTRIBUTION: Japan: central Honshu (western Gifu Prefecture).

ETYMOLOGY: The epithet is a combination of the traditional Japanese geographical name “Neo” (an area in the western part of Gifu Prefecture, where the new species was collected) and the Latin adjective “stygius” (stygian, being part of the underworld). The name is used as an adjective.



### Checklist of the species of the *L. nomurai* group

Species	Distribution	References
<i>Lathrobium aioiense</i> WATANABE, 2002	Honshu (Hyōgo Pref.)	WATANABE (2002a)
<i>Lathrobium awajishimanum</i> WATANABE, 2001	Awaji-shima Is. (Hyōgo Pref.)	WATANABE (2001, 2002b)
<i>Lathrobium daisenense</i> WATANABE, 1987	Honshu (Tottori Pref.)	WATANABE (1987, 2006)
<i>Lathrobium daisensanum</i> WATANABE, 1998	Shikoku (Kagawa Pref.)	WATANABE (1998)
<i>Lathrobium denchu</i> SATO & MARUYAMA, 2023	Kyushu (Ōita Pref.)	SATO & MARUYAMA (2023)
<i>Lathrobium fujimotoi</i> WATANABE, 2001	Kyushu (Ōita Pref.)	WATANABE (2001)
<i>Lathrobium harimanum</i> WATANABE, 1986	Honshu (Hyōgo Pref.)	WATANABE (1986)
<i>Lathrobium hikosanense</i> WATANABE, 1998	Kyushu (Fukuoka Pref.)	WATANABE (1998)
<i>Lathrobium iwamiense</i> WATANABE, 1991	Honshu (Shimane Pref.)	WATANABE (1991)
<i>Lathrobium kamezawai</i> WATANABE, 2005	Shikoku (Ehime Pref.)	WATANABE (2005)
<i>Lathrobium kanmuriense</i> WATANABE, 2002	Honshu (Hiroshima Pref.)	WATANABE (2002a)
<i>Lathrobium kasagatanum</i> WATANABE, 2002	Honshu (Hyōgo Pref.)	WATANABE (2002a)
<i>Lathrobium kasumiense</i> WATANABE, 2002	Honshu (Hyōgo Pref.)	WATANABE (2002a)
<i>Lathrobium katsumiae</i> WATANABE & YOSHIDA, 2007	Shikoku (Tokushima Pref.)	WATANABE & YOSHIDA (2007)
<i>Lathrobium kishuense</i> WATANABE, 1991	Honshu (Wakayama Pref.)	WATANABE (1991)
<i>Lathrobium konpira</i> WATANABE, 1991	Shikoku (Kagawa Pref.)	WATANABE (1991)
<i>Lathrobium morii</i> WATANABE, 2002	Honshu (Osaka Pref.)	WATANABE (2002a)
<i>Lathrobium moritai</i> WATANABE, 1998	Honshu (Yamaguchi Pref.)	WATANABE (1998)
<i>Lathrobium narutoense</i> WATANABE, 2010	Shikoku (Tokushima Pref.)	WATANABE (2010)
<i>Lathrobium neostygium</i> sp.n.	Honshu (Gifu Pref.)	Present study
<i>Lathrobium nomurai</i> NAKANE, 1955	Kyushu (Ōita Pref.)	NAKANE (1955)
<i>Lathrobium ohdaiense</i> WATANABE, 1998	Honshu (Mie Pref.; Nara Pref.)	WATANABE (1998)
<i>Lathrobium ohtakisenum</i> WATANABE, 2010	Shikoku (Tokushima Pref.)	WATANABE (2010)
<i>Lathrobium sugitense</i> ASSING & KURODA, 2020	Shikoku (Ehime Pref.)	ASSING & KURODA (2020)
<i>Lathrobium tanakai</i> WATANABE, 1998	Honshu (Nara Pref.; Wakayama Pref.)	WATANABE (1998)
<i>Lathrobium tosanum</i> WATANABE, 1987	Shikoku (Kōchi Pref.)	WATANABE (1987)
<i>Lathrobium tsurugisanum</i> WATANABE, 1991	Shikoku (Tokushima Pref.)	WATANABE (1991)
<i>Lathrobium uenoi</i> WATANABE, 1980	Honshu (Kyoto Pref.)	WATANABE (1980)
<i>Lathrobium yufuense</i> SATO & MARUYAMA, 2023	Kyushu (Ōita Pref.)	SATO & MARUYAMA (2023)

### Discussion

All known species of the *Lathrobium nomurai* species group are distributed in Kyushu, Shikoku or western Honshu (Kinki and Chûgoku regions) (see Fig. 3). The present discovery is noteworthy because: 1) it represents the first record of a troglobiontic *Lathrobium* in central Honshu; 2) the new species was collected more than 120 kilometers from the nearest localities of three related species: *L. uenoi* (Shizushi, Kyôtanba, Kyoto Prefecture), *L. morii* (Minoo, Osaka Prefecture) and *L. ohdaiense* (Mt. Ôdaigahara, Mie Prefecture). It is expected that more undescribed species may occur in the distributional gap (e.g., in the Hira, Ibuki, and Suzuka mountains).

To further clarify the biodiversity of the troglobiontic Japanese species of *Lathrobium*, it is imperative to carry out sampling in more areas. However, collecting subterranean species is often challenging. The “underground bait trap” (YOSHIDA 2012) is an effective method for collecting troglobiontic insects, including rove beetles (see also SUGAYA & HARA 2021, SENDA & HAYASHI 2022, WADA & ASHIDA 2022).

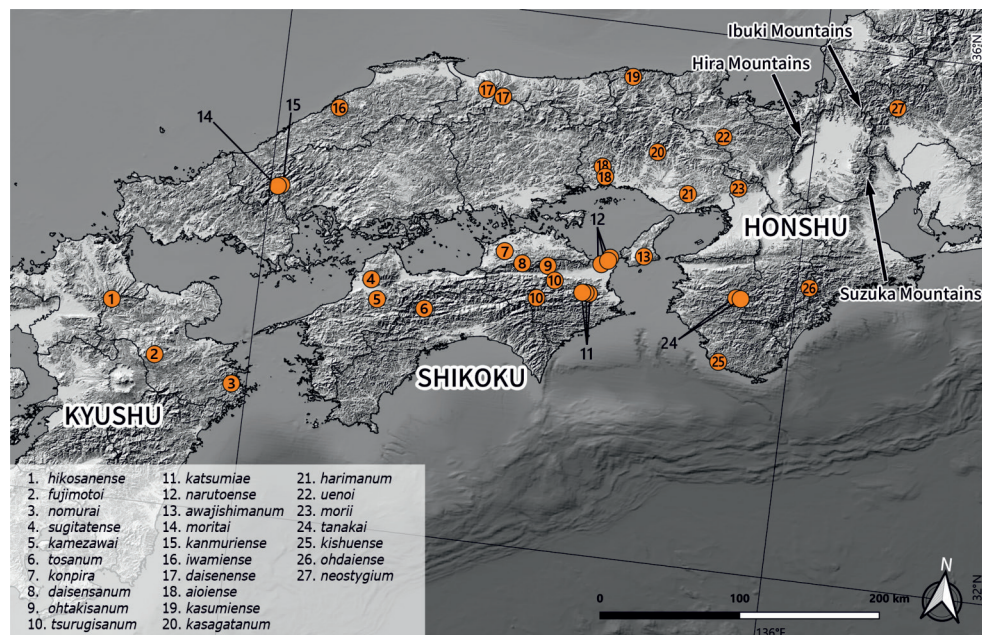


Fig. 3: Geographical distribution of the species of the *Lathrobium nomurai* group.

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