The Genus *Leiobunum* C. L. Koch of Japan and Adjacent Countries
(Leiobunidae, Opiliones, Arachnida)

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The Genus *Leiobunum* C. L. Koch of Japan and Adjacent Countries
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ABSTRACT

The genus *Leiobunum* of Japan and adjacent countries is examined. Two genera, *Pseudoleiobunum* and *Metaleiobunum* are relegated to the synonyms of *Leiobunum*. Six species are revised. Two species are newly synonymized. One species is transferred to the *Netima*. Seven species and eight subspecies are newly described. These are: *L. maximum formosum*, *L. maximum yushan*, *L. montanum sebosanum*, *L. virgaevir germ*, *L. virgaevir otakense*, *L. globosum*, *L. simplum*, *L. hiasai*, *L. tohokuense*, *L. tsuimense*, *L. hiraiwai izumense*, *L. hiraiwai fujis*, *L. hiraiwai shirotense*, *L. hiraiwai longum*, and *L. escense*. Eighteen species, eleven subspecies and one unidentifiable species are known to occur in these regions. These species are combined into four species groups: *maximum*, *japonicum*, *rubrum*, and *curvipalpe*-group. The *curvipalpe*-group may be arbitrarily subdivided into eight subgroups. For the separation of species emphasis is laid on the genitalia structure. The labrum, a new character is useful in many cases. Also, chromosomes are important in the classification of some closely related forms.

INTRODUCTION

In Japan, the first species of *Leiobunum* to be described was *L. giganteum* Loman, 1902, which has proven to be incorrectly placed in this genus. In 1910, Roewer described *L. curvipalpe* from Tokyo, and in 1914, Müller described *Pseudoleiobunum japonense* from Hakone, which is corrected as *Leiobunum japonense japonense* in this paper, and *L. japonicum* (detailed locality is unknown). In 1939, Sato and Suzuki recorded *L. hiraiwai* from Kyushu, and in 1940, Suzuki, *Metaleiobunum japonicum* from Shikoku and Kyushu, which is corrected as *Leiobunum japonense japonicum* in this article. In 1953, Suzuki published that five Japanese species of *Leiobunum* are distinguished by their penises, and described three species: *L. montanum* (Shikoku and Hōkidaisen), *L. kohyai* (Kōyasan) and *L. platypenis* (Nagano pref.). Later, he found that three species, *L. curvipalpe*, *L. hiraiwai* and *L. tamanum*, differ in chromosomes (Suzuki, 1957). Following this paper, he published just recently that *L. kohyai* has a unique karyotype, and that two populations of *L. montanum*: Ishizuchi-yama and Hōkidaisen, are completely different in chromosomes; the difference is distinct enough to separate both populations (Suzuki, 1976). In recent years the following four species were

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described: L. uenoi (amended as L. japonicum uenoi in this paper; the Ryukyus), L. hikocola (Kyushu and Amami-ōshima Is.), L. rubrum (Korea and Japan), L. maximum distinctum (the Ryukyus) (Suzuki, 1964, 1966, 1973a).

In this paper all these species were reexamined; also, a lot of specimens in my collection, most of which were from Japan and in part from Korea and Taiwan, were studied. One species, Leiobunum giganteum was transferred to the Nelima. Two genera, Pseudoleiobunum and Metaleiobunum were synonymized with the Leiobunum. Six species were revised, and two new synonyms were recognized. As a result, 19 species including one unidentifiable species, and 11 subspecies, of which 7 species and 8 subspecies are newly described, were known to occur in Japan and adjacent countries. The holotypes and paratypes of all new species and subspecies are deposited in the collection of Hiroshima University.

**TAXONOMIC CHARACTERS**

Of the material studied such species as L. maximum, L. japonense, L. japonicum, and L. rubrum are distinctly identified by external morphology. The remaining species which constitute the greater part of this work, however, are difficult species, because they show similarities in external characters. Females are particularly difficult to distinguish; usually females which not associated with males are impossible to identify. In these material the male genitalic structure is most important for the separation of species. All species treated here are distinguished by their penises. Usually, the size and shape of the penis shaft, the structure of alate part, and the shape of glans are considerably different among species. The
female genitalic structure, especially seminal receptacles are less useful (see Figs. 95–126). Also, the palpus of male is useful, but rather less so than the male genitalia. The size and structure of the male palpi, especially those of the tibia are very important for some species. The teeth found on the distomesial area and on the ventral surface of the tibia are often useful. The labrum, a new character, appears to be useful for specific or subspecific separation. The shape, structure and armaments of the male labrum differ greatly in many forms (see Figs. 1–94). The chromosomal characters, although studied only in limited species, seem to be effective for the taxonomy of very closely related forms. As already stated, L. virgeum virgeum is separated from L. montanum montanum on the basis of their karyotypes in this paper.

SPECIES GROUPS OF LEIOBUNUM

The 18 species of Leiobunum reported from Japan and adjacent countries in this paper can be combined into four species groups. These species groups are based mainly upon the size or shape of body, color pattern, structure of palpi, labrum, and male and female genitalic structure.

Maximum Group. Includes two species, L. maximum recorded from China, Taiwan, and Japan, and L. japonense recorded from Japan. The species of this group show similarity in color pattern and male and female genitalic structure (compare Fig. 131 to Figs. 146, 160).

Japonicum Group. L. japonicum has no close relatives in these areas, which would constitute distinct monotypic species group. This species is recorded from Japan, Korea, and Taiwan (see Map 2).

Rubrum Group. L. rubrum is also different from all other species found in this region, which would constitute distinct monotypic species group.

Curvipalpe Group. This species group consists of 14 species found in Japan and one unidentifiable species from Ullung-do Is., Korea. All the species of this group show similarities in general appearance. This species group may be arbitrarily subdivided into the following eight subgroups:

(1) L. montanum and L. virgeum (2 species). Both species are similar in
the penis (compare Figs. 177–178 to Figs. 184–185), male palpi (compare Fig. 169 to Fig. 173), and labrum (compare Figs. 34–35 to Figs. 38–39).

(2) *L. platypenis* and *L. globosum* (2 species). Both are much similar in the penis shaft (compare Figs. 199–201 to Figs. 203–204), male palpal tibia (compare Fig. 189 to Figs. 194–195), and labrum (compare Figs. 80–83 to Figs. 84–88).

(3) *L. kobayai* (1 species). The penis of this species is distinct from that of other species of this species group (Figs. 213, 216). Since the male palpal tibia resembles that of *L. platypenis* and *L. globosum*, this subgroup seems to be rather closely related to the foregoing subgroup (compare Fig. 209 to Figs. 189, 194).

(4) *L. simplum* and *L. hiasai* (2 species). These two elements are more or less similar in the male palpi (compare Fig. 217 with Fig. 221) and penis (compare Figs. 219–220 with Figs. 223–224).

(5) *L. hikocola* (1 species). Differs from other species of this species group in the penis (see Fig. 2A–E, in Suzuki, 1966). The male palpus is much similar to *L. hiraiwai* (compare Fig. 1D–H, in Suzuki, 1966 to Fig. 252).

(6) *L. carpotalpe* and *L. tohokuense* (2 species). Both elements are somewhat resembled in penis (compare Figs. 228–230 to Figs. 234–237) and labrum (compare Figs. 70–71 to Figs. 74–79).

(7) *L. tamanum* and *L. tsushimaense* (2 species). Both are much alike in the male palpi, and more or less similar in the penis (compare Figs. 239–240 with Figs. 248–251).

(8) *L. hiraiwai* (1 species). Highly differentiated in the penis, especially in the alate part.

*L. esoense* is provisionally named for the females taken from Hokkaido, and the relationship to other species is obscure. In the labrum and seminal receptacles it shows some resemblance to *L. tohokuense* or *L. globosum* (compare Figs. 90–93 to Figs. 77–79 and Figs. 87–88, also Fig. 126 to Figs. 118, 120).

*L. sp.* is known only from Ullung-do Is. The labrum is somewhat similar to that of *L. esoense* (compare Fig. 94 to Figs. 90–93).

**Leioibunum** C. L. Koch, 1839


Body generally soft or dorsally roughened and hardened. Anterior margin of carapace smooth or in some with a few small tubercles anteriorly. Eye tubercle usually as long as wide and high, rarely very low; armed with small teeth on the carinae. Abdomen unarmed dorsally, but very rarely first and second tergites (rarely third tergite, also) with a median, low, conical hump or short spine.
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Coxae of legs with marginal row of tubercles anteriorly and posteriorly, rarely first coxa anteriorly and fourth coxa posteriorly. First segment of chelicera usually smooth dorsally, rarely with small denticles. Patella and tibia of palpus with or without distomesal apophysis; tarsus of male with a longitudinal band of small tubercles mesoventrally, very rarely lacking tubercles. Legs very long and slender but rarely robust; first femur usually longer than body, rarely as long as or shorter than body.

Type species: *Leiobunum rotundum* (Latreille)

Notes. *Pseudoliobunum* was separated from *Leiobunum* by having the first femur shorter than body and the palpal patella and tibia armed with strong apophysis. However, the genus was established basing upon only one female. Examination of numerous specimens reveals that the relative length of the first femur of the male differs in different localities; in some, it is longer than body, while in others nearly as long as or shorter than body. Thus, the relative length of the first femur can not be a generic character. Also, patellal and tibial apophysis of the palpus can not be a generic character because almost all Japanese species of the *Leiobunum* possess such apophysis. For this reason, *Pseudoliobunum* should be synonymized with *Leiobunum*.

Main difference between *Metalioibunum* and *Pseudoliobunum* was in the arrangement of the marginal tubercles on the coxae of legs. At the present standard, generic separation on the basis of such a minor difference is not proper. Accordingly, *Metalioibunum* together with *Pseudoliobunum* should be relegated to the synonyms of *Leiobunum*.

Key to species and subspecies

1. Body large, mostly 6.0–10.0 mm, rarely 5.0 mm in males; legs robust; eye tubercle lower than usual ........................................ 2
   - Body not so large, mostly less than 5.0 mm in males; legs slender; eye tubercle normal in height .................................. 7
2. Trochanters and femora of legs toothed; femur to tarsus of male palpus armed with teeth .............................................. 3
   - Trochanters and femora of legs not toothed; femur to tarsus of male palpus without any armaments ............................... 6
3. Femora I and III swollen distally, club-shaped (the Ryukyus) .............................................. *L. maximum distinctum*
   - Femora I and III not so swollen distally .................................. 4
4. Trochanters of legs strongly toothed; anterior half of carapace milky-white (China: Fokien) .............................................. *L. maximum maximum*
   - Trochanters of legs less strongly toothed; anterior half of carapace rusty brown, spotted with whitish markings .................. 5
5. Glans of normal width; alate part of penis truncated distally (North Taiwan) .............................................. *L. maximum formosum*
Glans stout; alate part of penis tapered distally (South Taiwan) ..........  L. maximum yushan

6. Trochanters of all legs with a blunt or distinct distal process on each side (West Japan) ..................................................  L. japanense japonicum

   Trochanters of all legs without such process, nearly smooth distally (East Japan) ..................................................  L. japanense japanense

7. Body very small, mostly less than 3.0 mm in males; femur I of males 2.5 to 3.7 times as long as body ..................................................  8

   Body of moderate size, mostly more than 3.0 mm in males; femur I of males at most 2 times as long as body, rarely shorter than body ....................  9

8. Body length, ♂ less than 3.0 mm; leg length, ♂ I 32-48, II 64-94 mm (Japan, Korea, Taiwan) ..................................................  L. japonicum japonicum

   Body length, ♂ 3.4 mm; leg length, ♂ I 63, II 113 mm (the Ryukyus) ..................................................  L. japonicum uenoi

9. Marginal tubercles of coxae of all legs very distinct, with three points at distal margin (Korea, Japan) ..................................................  L. rubrum

   Marginal tubercles of coxae of all legs very small, apex pointed, rarely invisible ..................................................  10

10. Penis shaft very narrow, rod-shaped except for basal swelling ..........  11

   Penis shaft not rod-shaped, moderately or considerably widened ..........  14

11. Alate part of penis relatively short ..................................................  12

   Alate part of penis relatively long ..................................................  13

12. Alate part of penis narrowed; male palpal tibia with but few distomesal teeth (Shikoku) ..................................................  L. montanum montanum

   Alate part of penis much widened; male palpal tibia with numerous teeth (Kyushu: Mt. Sobo-san) ..................................................  L. montanum sobosanum

13. Male palpal tibia with numerous ventral teeth (Mt. Hōkidaisen) ..................................................  L. virgatum virgatum

   Male palpal tibia with a ventral row of teeth (Mt. Kisoontake) ...............  L. virgatum ontakense

14. Male palpal tibia extremely swollen; penis shaft fairly elongated, with sides nearly parallel; alate part poorly developed .....................  15

   Male palpal tibia not extremely swollen; penis shaft variable in size, with sides not parallel; usually alate part well developed ....................  17

15. Penis shaft markedly swollen basally, rounded (South Kinki District) ..................................................  L. kohyai

   Penis shaft not markedly widened basally ..................................................  16

16. Male palpal tibia thickened at middle; glans enlarged, symmetrical; male labrum L-shaped (Central and North Japan) ..................................................  L. platypenis

   Male palpal tibia fairly thickened at middle; glans not so enlarged, asymmetrical at apex; male labrum T-shaped (North Japan) ..................................................  L. globosum

17. Penis rather small in size ..................................................  18

   Penis moderately to extremely enlarged in size ..................................................  20

18. Body very small, 2.9 mm long in male; glans with a small rounded swelling
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at apex (Kyushu, Amami-ōshima Is.) ........................................ L. hikocola
  Body not so small, 3.0–4.2 mm long in male; glans normal .......... 19
19. Male palpal tibia with numerous ventral teeth; male labrum small, square-
  shaped in side view (Central Japan) ........................................... L. simplum
  Male palpal tibia with but few distomesal teeth; male labrum enlarged,
  with apex pointed (Central Japan) ............................................ L. hiasai
20. Alate part of penis relatively simple ........................................ 21
  Alate part of penis well differentiated ....................................... 22
21. Penis shaft markedly enlarged; male palpus considerably thickened, dark
  brown (North Kanto District) .................................................. L. curvipalpe
  Penis shaft not so markedly enlarged; male palpus somewhat thickened,
  light rusty yellow (North Japan) ............................................. L. tohokuense
22. Alate part of penis not armed with spines ................................... 23
  Alate part of penis armed with one or two spines on both sides .......... 24
23. Penis shaft rather slender and very long; alate part more or less funnel-
  shaped (Tokyo, Nikko) .......................................................... L. tamanum
  Penis shaft moderately widened but not so elongated; alate part typical
  funnel-shaped (Tsushima Is., Utuskushiga-hara) ........................ L. tsushimense
24. Male labrum very stout, with numerous teeth ............................... 26
  Male labrum not so stout, with but few teeth ................................ 25
25. Alate part of penis relatively short (Noth Kyushu, Hiroshima) ........ 26
  Alate part of penis relatively long (Izu pen.) .............................. L. hiraiwai hiraiwai
26. Lateral spines of alate part of penis reduced to a very small process (Yama-
  nashi pref.) ................................................................. L. hiraiwai shiranense
  Lateral spines of alate part of penis well developed ..................... 27
27. Penis shaft moderately widened; alate part of penis with one distinct spine;
  male labrum stout, apex blunted, with numerous teeth (Central Japan)
  ................................................................. L. hiraiwai fuji
  Penis shaft relatively narrow and long; alate part of penis with two sharp
  pointed spines; male labrum widened distally, apex pointed, with less
  numerous teeth (Tottori, Kyoto, Shiga pref.) ............................ L. hiraiwai longum

Leiobunum maximum maximum Roewer, 1910

(Map 1)


Distribution. Seems to be confined to China (Map 1).

Note. In 1923 Roewer recorded one female of this species from Nagasaki,
Kyushu, Japan. His specimen which is preserved in the Budapest Museum
was not available for this study. However, almost certainly it is not real Leiobunum
maximum maximum but Leiobunum japonense japonicum described in this paper, because
the Kyushu specimens so far collected are all placed in the latter species. Also, he recorded this species from North Formosa (Roewer, 1957). The species proved to be *Leiobunum maximum formosum* as will be mentioned later (see p. 197).

*Leiobunum maximum distinctum* Suzuki, 1973

(Jap. nam.: Amamiōhirata-zatōmushi)

(Figs. 6–8, 95; Map 1)


**Diagnosis.** Distinct from *Leiobunum maximum maximum* in having much stronger legs and more heavily armed chelicerae and palpi.

Labri first illustrated in Figs. 6–8; simple, long rod-shaped, slightly curved, apex tapering, especially so in female, unarmed; no prominent sexual dimorphism; labrum shown in Fig. 8 seems to be an individual variation.

**Distribution.** Limited to the Ryukyus (Map 1).


*Leiobunum maximum formosum* Suzuki, n. subsp.

(Figs. 1–3, 127–131, 287; Map 1)


**Material.** Taiwan: Mt. Hsuehshan, at about 950 m (male holotype and 1 ♂, 2 ♀ paratypes, S. Iwamasa leg., ?–VII–1941).

**Diagnosis.** *Leiobunum maximum formosum* is most closely related to *L. maximum distinctum*, from which it differs in having less numerous armaments in the palpus and legs and in the shape of labrum of male.

**Description.** Male. — Cephalothorax 1.81 mm long, 4.0 mm wide; abdomen 3.90 mm wide; total body length 5.81 mm. Femora: I 9.3, II 15.2 mm. Palpus: Tr. 0.48 mm long, 0.35 mm wide; Fe 1.42 long, 0.40 wide; Pa 0.84 long, 0.40 wide; Ti 1.00 long, 0.38 wide; Ta 1.98 long, 0.21 wide; total length 5.72 mm.

General appearance (Fig. 287) similar to *L. maximum distinctum*. Eye tubercle very shallowly canaliculated, smooth or armed with a few small denticles above. Tergites I and 2 usually armed with a very low, blunt median hump. Surface of coxae I–IV clothed with scattered coarse granules. Marginal row of tubercles present anteriorly and posteriorly on coxa I and IV, and anteriorly on coxa II and III. Genital operculum with coarse granules, and marginal row of small tubercles along the lateral margins. Free sternites smooth. Labrum as in Figs. 1–2; distal portion enlarged, giving an appearance of triangular shape in the ventral view.

Chelicera (Fig. 129): First segment armed above with denticles, second segment with a mesal row of very small teeth. Supracheliceral lamellae as in Fig. 128.

Palpus as illustrated in Fig. 127. Patella widened distally, and distomesal
angle produced into a small but distinct lobe which is set with fine hairs. Femur and patella not produced at distomesal angle.

Trochanters of legs smooth distally, toothed laterally; femora toothed throughout, patellae and tibiae with but few small teeth. Tibiae II with false articulations.

Coloration. Ground color above rusty to dark brown with golden-yellow and blackish markings. Marking pattern generally similar to that of *L. maximum distinctum*. Venter concolorous with dorsum.

Penis as shown in Fig. 131; much similar to that of *L. maximum distinctum*. Alate part of penis elongated, extending nearly on the entire length of penis shaft, truncated distally.

Female. — Similar to male but with larger body. Tarsus of palpus unarmed ventrally. Labrum small, simple rod-shaped, apex tapering (Fig. 3).

*Distribution.* North Taiwan (Map 1).

*Notes.* One male and one female North Formosan specimens which were identified as *Leiobunum maximum* by Roewer (1957) and deposited in the Sencken-


berg Museum, Frankfurt/Main (SMF 65–5890) were available for this study. In almost all characters these specimens agree well with the present subspecies.

Leiobunum maximum yushan Suzuki, n. subsp.

(Figs. 4–5, 132–138, 288–289; Map 1)


Diagnosis. Leiobunum maximum yushan differs from L. maximum formosum in the penis which has a short but stout glans and the alate part tapered distally.

Description. Male. — Cephalothorax 1.35 mm long, 3.10 mm wide; abdomen 3.91 mm wide; total body length 4.45 mm. Palpus: Tr 0.36 mm long, 0.35 mm wide; Fe 1.20 long, 0.43 wide; Pa 0.66 long, 0.43 wide; Ti 1.05 long, 0.41 wide; Ta 1.63 long, 0.20 wide; total length 4.90 mm. Femora: I 5.1, II 9.8 mm. Legs: I 26.9, II 47.3 mm.

General appearance (Fig. 288) somewhat similar to L. maximum formosum, but with smaller body and much shorter legs. Dorsum of body very finely granular, eye tubercle relatively low, longer than high, rounded above, very shallowly canaliculated, armed with a few obsolete denticles on the carinae. Surface of coxae and genital operculum as in L. maximum formosum (Fig. 289). Labrum (Figs. 4–5) enlarged distally, giving an outline of typical elongated triangle in the ventral view.

Chelicera: proximal segment with a few small teeth above; distal segment with small distomesal teeth. Supracheliceral lamellae as in Fig. 132.

Palpus as in Figs. 134–136; patella has a small but distinct apophysis; tarsus armed ventromesally with a row of very small teeth; ventrolaterally a second row of more sparse teeth.

Legs short but strong. Trochanters with but few small denticles on both sides. Femora with numerous denticles throughout, patellae and tibiae with few denticles. Tibiae II with false articulations.

Coloration. Body above yellowish to dark brown with silvery-white to golden-yellow blotches or dots. Marking pattern as shown in Fig. 288. Venter concolorous with dorsum, coxae darker distally. Chelicerae light whitish yellow, proximal segment with dark brown markings above. Femur, patella and tibia of palpus dark brown, proximal part of femur and tarsus lighter. Trochanters and base of all femora of legs pale, contrasting to dark brown femora.

Penis. Shaft 2.43 mm long, 0.42 mm wide at base, 0.13 mm wide at middle; glans 0.25 mm long, 0.13 mm wide; stylus 0.08 mm. Shaft widened proximally, glans short but stout; alate part elongated, extending on the distal two thirds of the length of shaft, tapered into the shaft distally.

Female. — Not known.

Distribution. Known from only type locality (Map 1).
Leiobunum japonense japonense (Müller, 1914)

(Jap. nam.: Azumaōhirata-zatōmushī)
(Figs. 9-16, 97, 139-146, 290-292; Map 1)

Other references are not required here.

This species was originally described as Pseudoliobunum japonense by Müller (1914a). However, for the reason mentioned before (see p. 193), it must be synonymized with the genus Leiobunum.


Diagnosis. Distinct from L. maximum by having very low eye tubercle. Also, the male palpus and trochanters and femora of legs completely unarmed. Those of L. maximum are strongly toothed.

Description. Measurements: ♀ (in parentheses ♀) (Nishitanzawa exs.): cephalothorax 2.4 (3.0) mm long, 4.2 (5.2) mm wide; abdomen 4.7 (5.7) mm wide; total body length 6.3 (9.2) mm.

Palpus: Tr 0.5 (0.5) mm long, 0.54 (0.51) mm wide; Fe 1.68 (1.68) long, 0.63 (0.65) wide; Pa 1.03 (1.05) long, 0.63 (0.69) wide; Ti 1.12 (1.13) long, 0.55 (0.58) wide; Ta 2.00 (2.10) long, 0.27 (0.27) wide; total length 6.33 (6.46) mm.

Femora: I 7.5 (7.8), II 14.5 (14.9) mm. Legs: I 28.1 (29.2), II 55.8 (58.3) mm.

Male. — Body more or less flattened dorsoventrally; dorsal integument rather hardened, very finely granular throughout. Carapace with but few small black-tipped granules at mid-frontal area. Eye tubercle very low (0.40 mm high, 0.53 mm long), not or very shallowly canaliculate, without any armaments. First and second tergites, sometimes third also with a very low median hump; in some, median humps invisible. Coxae I-IV with black-tipped granules,
granules more numerous and coarse on coxa I; coxae I and IV armed with a marginal row of small tubercles anteriorly and posteriorly; coxae II and III anteriorly, sometimes incomplete row of tubercles posteriorly. Genital operculum with scattered coarse granules. Abdominal sternites unarmed. Labrum (Figs. 9–12) wedge-shaped, slightly curved upward; Saijōji specimen has smaller labrum (Fig. 13).

Chelicera normal; first segment unarmed above. Supracheliceral lamellae as in Fig. 143.

Palpus thickened; trochanter armed below with a small distal elevation and a few black teeth. Femur from above swollen distally, with a very small rounded distomesal process, from the side curved ventrally, unarmed. Patella short, arched above, thickened distally and the distomesal angle produced into a fairly enlarged lobe which is set with dense short hairs; otherwise unarmed. Tibia as in Fig. 140, with a distinct distomesal apophysis, unarmed. Tarsus strongly curved below, without the definite row of tubercles ventrally. Tarsal claw with teeth, mostly worn out, below at base (Fig. 141).

Legs comparatively short but strong. Femur I as long as body or only slightly longer than body. All leg-segments very finely granular, but without any distinct armaments. Tibia II with false articulations.

Coloration. Ground color dark brown with golden-yellow markings on carapace and abdomen. Eye tubercle dark brown, rings of eyes black, with golden-yellow spots on the dark brown median furrow. Central figure of abdomen not developed. Markings as shown in Figs. 290–292. Venter dark brown, coxae darker distally and so all free sternites. Chelicera yellowish, with dark brown blotches on the dorsal surface of both segments. Palpus mostly dark brown; femur, patella and tibia with small golden yellow spots at apex. Legs: trochanters dark brown with a large golden yellow blotch on each side. Other leg-segments dark brown, caput of femora yellow, with small yellowish blotches above; tibiae with a broad golden yellow or silvery-white distal ring.

Penis (Fig. 146) elongated, widened proximally; basal aperture deeply indented. Alate part elongated, extending on nearly entire length of the shaft, truncated distally.

Female. — Similar in general appearance to the male but body much larger. Femur of palpus armed ventrally with numerous sharp-pointed black teeth; patella armed laterally and tibia ventrally with teeth as shown in Fig. 139. First femur slightly shorter than body.

Seminal receptacles and labrum as in Fig. 97 and Figs. 14–16, respectively.

Distribution. Central and East Japan: Shizuoka, Yamanashi, Nagano, Kansai, Tokyo, and Saitama prefectures (Map 1).

Relationships. This nominate subspecies together with the following one is very closely related to L. maximum, especially to L. maximum distinctum from the Ryukyus. In the male and female genitalic structure no marked difference is found between them. Main differences are in the palpi and legs. In L. japonense japonense the male palpus is completely unarmed except for trochanter, while in

L. maximum distinctum all palpal segments are set with numerous teeth. Also, the patellal and tibial apophyses are more well developed in the former than in the latter. Trochanters and femora of all legs have no armaments in L. japanense japanense, while those of L. maximum distinctum are strongly armed with teeth. Morphological comparison indicates that the present species has originated from L. maximum.

Leiobunum japanense japonicum (Suzuki, 1940)
(Jap. nam.: Ōhirata-zatōmushi)
(Figs. 17–22, 96, 147–160, 293–301, 338–359; Map 1)

Leiobunum suzukii Roewer, 1957, Senck. biol. 38: 343, pl. 26 f. 12–13 [type: Yokohama, Japan; Senckenberg Mus., Frankfurt (SMF No. 11217–118), examined]. NEW SYNONYM.
Leiobunum bifrons Roewer, 1957, Senck. biol. 38: 343–344, pl. 26 f. 14 [type: Nagasaki, Japan; Senckenberg Mus., Frankfurt (SMF No. 2870–47), examined]. NEW SYNONYM.

Notes. After examining the type-specimen (1 ♂) of Leiobunum japonense japonense (=Pseudolobunum japonense Müller) preserved in the Senckenberg Museum, Frankfurt/Main, it became evident that the specimens so far identified as Metalobunum japonicum agree well with the former species in general structure, and therefore they are considered conspecific. However, they differ in the leg length, in the shape of trochanters of legs and in the size of palpal apophysis. From this it is preferable to give a subspecific rank for the specimens hitherto treated as Metalobunum japonicum.

The type-specimens of Leiobunum suzukii Roewer deposited in the Senckenberg Museum (1 ♂, 1 ♀, SMF No. 11217–118) were examined. In all characters these specimens are much similar to Leiobunum japonense japonicum, and therefore, L. suzukii is synonymized with the latter form. The locality: Yokohama indicated for Roewer specimens is almost certainly in error, because according to my study L. japonense japonicum can not occur in Yokohama and adjacent territories (Map 1).

Roewer (1957) described Leiobunum bifrons basing upon a single female taken from Nagasaki, Kyushu. The holotype (SMF No. 2870–47) deposited in the Senckenberg Museum was available for this study. The examination revealed that it is an immature female, which is much similar to Leiobunum japonense japonicum, especially to the Kyushu population in many characters. From this L. bifrons is safely synonymized with L. japonense japonicum.


1 Wrongly labelled 2 ♀.
Genus Leiodunum of Japan


Diagnosis. *Leiodunum japonense japonicum* differs from *L. japonense japonense* by the shape of trochanters of legs and in the smaller size of patellal and tibial apophysis of the palpus.

Description. Measurements (in mm) as shown in Table 1.

General appearance similar to the nominate subspecies (Figs. 293–301). Femur, patella, and tibia of palpus have a distomesal apophysis, which is much smaller than in the nominate form (compare Figs. 147–148 with Figs. 139–140). Trochanters of all legs have a low blunt process distally on each side; process becoming smaller posteriorly, and usually indistinct on the posterior side of the fourth trochanter. Also, there is much geographical variation in the size of the process. Kyushu population tends to have smaller process, while Kinki population larger process; on the other hand, Chugoku and Shikoku populations are intermediate in this size (Figs. 152–155 and Figs. 293–301). The process, thus, varies roughly in size westeasterly. Labrum (Figs. 17–22) alike to that of the nominate subspecies, but distinctly smaller in size, especially so in the male. Penis and seminal receptacles as shown in Fig. 160 and Fig. 96, respectively.

Chromosomes. The chromosomes were studied in the material taken from Taishaku, Hiroshima prefecture. The chromosome slides were made by the temporary squash method using testes. For staining acetic-orcein was employed.

At spermatogonial metaphase diploid set of 16 chromosomes was observed. The complement consisted of both acrocentric and metacentric elements. How-
TABLE 1

Measurements of L. japonense japonicum from four localities

<table>
<thead>
<tr>
<th>Localities</th>
<th>Mt. Hikosan</th>
<th>Mt. Ishizuchi</th>
<th>Hiroshima</th>
<th>Minō</th>
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<tbody>
<tr>
<td></td>
<td>δ</td>
<td>ζ</td>
<td>δ</td>
<td>ζ</td>
</tr>
<tr>
<td>Body length</td>
<td>L</td>
<td>7.6</td>
<td>6.2</td>
<td>9.3</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>4.5</td>
<td>2.3</td>
<td>3.0</td>
</tr>
<tr>
<td>Cephalothorax</td>
<td>L</td>
<td>2.8</td>
<td>4.2</td>
<td>5.1</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>4.5</td>
<td>4.2</td>
<td>5.1</td>
</tr>
<tr>
<td>Abdomen</td>
<td>L</td>
<td>4.9</td>
<td>4.9</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>4.9</td>
<td>4.9</td>
<td>5.8</td>
</tr>
<tr>
<td>Tr</td>
<td>L</td>
<td>0.50</td>
<td>0.39</td>
<td>0.53</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>0.55</td>
<td>0.43</td>
<td>0.48</td>
</tr>
<tr>
<td>Fe</td>
<td>L</td>
<td>1.61</td>
<td>1.39</td>
<td>1.75</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>0.68</td>
<td>0.53</td>
<td>0.60</td>
</tr>
<tr>
<td>Pa</td>
<td>L</td>
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<td>0.93</td>
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<td></td>
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<td>0.63</td>
<td>0.58</td>
<td>0.60</td>
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<tr>
<td>Ti</td>
<td>L</td>
<td>1.10</td>
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<td></td>
<td>W</td>
<td>0.60</td>
<td>0.48</td>
<td>0.50</td>
</tr>
<tr>
<td>Ta</td>
<td>L</td>
<td>2.08</td>
<td>1.80</td>
<td>2.05</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>0.31</td>
<td>0.28</td>
<td>0.30</td>
</tr>
<tr>
<td>Total</td>
<td>L</td>
<td>6.32</td>
<td>5.41</td>
<td>6.24</td>
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<tr>
<td>Femur I</td>
<td>I</td>
<td>5.0</td>
<td>6.1</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>10.2</td>
<td>12.8</td>
<td>10.6</td>
</tr>
<tr>
<td>Leg I</td>
<td>I</td>
<td>25.5</td>
<td>23.4</td>
<td>20.9</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>41.2</td>
<td>51.2</td>
<td>41.9</td>
</tr>
</tbody>
</table>

ever, on account of the smallness, identification of individual elements was not always easy. In the metaphase plate shown in Fig. 358, at least 10 metacentric elements were distinguished. At first metaphase 8 bivalents were counted without exception (Fig. 359). No X-chromosome or chromosomes showing special behavior or structure could be detected throughout the entire spermatogenetic cycle.

The chromosome number (2N=16) of the present form clearly differs from those (2N=18–24) hitherto reported for several species of the genus Leio bun um. As stated above, within this genus the maximum-group to which the present form belongs, is isolated phylogenetically from other species groups. The chromosomal result seems to support this phylogenetic relationship.

Distribution. West Japan: Kyushu, Shikoku, Chugoku, and Kinki districts (Map 1); from lowland to about 1,400 m.

Leio bun um japonicum japonium Müller, 1914

(Jap. nam.: Moegi-zatômushi)
(Figs. 28–31, 98–100, 161–167, 302–307; Map 2)
Leio bun um japonicum Müller, 1914, Zool. Anz. 44: 627 [type: Japan (detailed locality unknown); Senckenberg Mus., Frankfurt (SMF No. 2047), examined].——Roemer, 1923, Die Weberknechte der


Taiwan: Arishan, at about 2,280 m (1 ♂, S. Suzuki leg., 24–VII–1968);
Genus Leiobum of Japan


Diagnosis. Characterized by very small body and very slender and elongated legs. Also, the penis and seminal receptacles are distinct from those of all related species.

Description. Measurements: ♀ (in parentheses ♀) (Suishōchi, Izu exs.): cephalothorax 0.86 (1.18) mm long, 1.80 (2.60) mm wide; abdomen 1.74 (3.00) mm wide; total body length 2.50 (4.60) mm. Femora: I 6.7 (7.9), II 12.3 (14.6) mm. Legs: I 32.2 (36.1), II 64.1 (74.5) mm.

Male.—Dorsum uniformly and finely granular (Fig. 302). Eye tubercle nearly at posterior margin of carapace, rounded above, constricted at base, from above wider than long, canalicated, unarmed, smooth. Coxae I–IV and genital operculum finely granular; coxae I and IV with a row of small tubercles anteriorly and posteriorly, II and III anteriorly. Genital operculum with a row of tubercles along both lateral margins. Tubercles as in Fig. 163. Free sternites smooth. Labrum as in Figs. 28, 30, 31; wedge-shaped, tipped with one or two very short spines.

Chelicera normal in structure, with only sparse hairs. Proximal segment unarmed above. Supracheliceral lamellae slightly produced medially, armed with two or three black denticles.

Palpus narrow (Fig. 161). Femur armed ventrally with sparse denticles. Patella widened distally, distomesal angle only slightly produced, armed dorsomesally with numerous pointed denticles. Tibia more or less thickened, from the side widened at base, curved below, armed ventrally with long hairs, dorsally with short soft under-hairs. Tarsus somewhat curved below, with a ventromesal row of small denticles, denticles confined to proximal two thirds of the length.

Legs slender and very long. Trochanters with a few small denticles on both sides. Femora with numerous scattered denticles throughout.

Coloration. Ground color above light yellow to yellowish brown. Two transverse ridges behind the eye tubercle with dark brown band. First four abdominal segments and three free tergites each with a central marking of dark brown as shown in Fig. 302. Lateral and hind margins of abdominal scutum dark brown. Eye tubercle black, median furrow reddish brown, lighter at base. Venter light yellow, so the chelicera and palpus, but apical portion of femur and entire patella dark brown, tibia slightly darkened. Trochanters of legs dark brown, contrasting to light yellow coxae; remaining leg-segments yellowish to dark brown; entire patellae darker, so the distal portion of tibiae. Tibiae with a wide silvery-white distal band; tarsi with a broad pale proximal band.

Penis. Shaft elongated, widened proximally; ventral side of the basal opening deeply indented. Alate part distinct, much wider than the shaft, elongated, extending on more than distal half of the shaft (Fig. 167).

Chromosomes. 2N ♀ = 20, N (I, II) = 10 (Suzuki, 1941).

Female.—Generally similar to the male but with much larger body and longer legs (Fig. 303). The tibia of palpus (Fig. 162) is not swollen, tarsus lacking the
definite row of denticles. Labrum much alike to that of the male (Figs. 29, 31). Seminal receptacles elongated, as in Figs. 98–100.

Variation. As is well known, members of the genus *Leiobunum* are characterized by having no median spines on the abdominal scutum. Of course, this species has no dorsal spines. However, among numerous specimens taken from different localities some had a reduced spine on the second tergite (Fig. 164), some others a distinct spine (Fig. 165), and still others two spines, one on the first tergite and one on the second tergite (Fig. 166).

Specimens from Korea and Taiwan agreed well with Japanese specimens in many characters except for a minor difference (compare Figs. 304–307 with Figs. 302–303).

Distribution. Hokkaido, Honshu, Shikoku, Kyushu; Korea; Taiwan (Map 2).


Fig. 168. *Leiobunum japonicum uenoii*. Ventral view of penis (Amami-ōshima Is.), ×45.
Leiobunum japonicum uenoii Suzuki, 1964
(Jap. nam.: Uénosube-zatômushi)
(Figs. 32–33, 101, 168; Map 2)


**Diagnosis.** Differs from *Leiobunum japonicum japonicum* in having much longer legs and in the markings of abdomen.

**Notes.** In the original report (Suzuki, 1964) the present from was separated from the nominate subspecies without a comparative study of the genitalic structure. However, this study reveals that the penis and seminal receptacles are much alike in both the forms, and accordingly, the specimens described as *Leiobunum uenoii* are treated here as a separate subspecies of *Leiobunum japonicum*.

Labrum first illustrated in Figs. 32–33.

**Distribution.** The Ryukyus.


Leiobunum rubrum Suzuki, 1966
(Jap. nam.: Akasube-zatômushi)
(Figs. 23–24, 102, 308–309; Map 2)


Other references are not required here.


**Diagnosis.** Characterized by the denticulated eye tubercle, three-pointed marginal tubercles on the coxae of legs, and the short robust penis with stout glans.

Labrum first illustrated in Figs. 23–24; rod-shaped; no remarkable sexual dimorphism.

**Distribution.** Korea; Japan: Yakushima Is., Tsushima Is., and Wajima (Map 2).


Leiobunum montanum montanum Suzuki, 1953
(Jap. nam.: Yamasube-zatômushi)
(Figs. 34–35, 103, 169–171, 177–180, 310–312; Map 3)


Diagnosis. The shape of the alate part of penis and the armament of the male palpal tibia will serve to separate this species from Leiobunum virgatum. Also, the karyotype is distinct from that of the latter.

Description. Measurements: ♂ (in parentheses ♀) (Mt. Ishizuchi-yama exs.): Total body length 4.04–4.84 (4.57–6.44), mean 4.40 (5.59) mm. Width of body at widest portion 2.04–2.76 (2.80–3.99), mean 2.40 (3.30) mm. Length of femora: I 5.0–7.3 (3.9–4.8), mean 5.9 (5.0) mm; II 8.6–13.2 (4.5–7.0), mean 10.8 (9.5) mm. Length of legs: I 25.1–39.4 (20.0–29.3), mean 30.9 (26.1) mm; II 47.6–76.8 (38.4–59.8), mean 59.7 (51.2) mm.

Male. — Dorsum very finely granular; eye tubercle rounded above, shallowly canaliculated, the carinae armed with a few very small, pointed teeth. Coxae nearly smooth except sparse very short hairs; I, II, III with a row of small pointed tubercles posteriorly, tubercles mostly limited to the distal half of the segment; in some, very few tubercles anteriorly on the distal portion of coxae I–III, rarely IV with a few anteriorly and posteriorly. Genital operculum and sternites smooth. Labrum widened distally, apex bent upward, armed with a few black teeth on both sides (Fig. 34).

Chelicera normal in structure, distal segment with a few small tubercles at distomesal area.

Palpus narrow (Figs. 169, 170); femur moderately widened distally, from laterally strongly curved below, armed with a few black-tipped denticles at distal end above and distolaterally. Patella from above widened distally and with the distomesal angle slightly produced into blunt lobe, armed laterally with a few denticles. Tibia, from above, thickened proximally and distomesal angle slightly produced, armed with a short row or a small group of black denticles near distomesal angle; rarely with an incomplete row of denticles on the ventral surface. Tarsus slender, curved, armed ventromesally with a row of small tubercles, tubercles extending the full length of the segment, and a second row of tubercles parallel to and just laterad of the first row; tubercles less numerous in the second row.

Legs long and slender; trochanters with a few small denticles, femora with
scattered denticles throughout, patellae with but few denticles above, remaining leg-segments unarmed.

Coloration. Ground color above pinkish to reddish yellow with reddish brown blotches on the carapace; abdomen with a wide central figure of reddish brown, limited laterally with golden yellow to whitish yellow spots and crossed by light transverse lines; abdominal segments each with a rounded median spot of golden yellow, sides of abdomen somewhat mottled and with a row of reddish brown dots on the light transverse line (Fig. 310). Venter concolorous with dorsum, slightly lighter; chelicera, palpus and trochanters of legs reddish yellow, remaining leg-segments brown to dark brown, caput of femora blackish.

Penis. Shaft 3.31 mm long, 0.44 mm wide at base, 0.08 mm wide at middle; glans 0.08 mm wide at widest portion, 0.20 mm long, stylus 0.14 mm long. Shaft very narrow, cylindrical rod with fairly broadened basal portion. Alate part relatively small (Figs. 177–180).

Chromosomes. 2N=24 (12 acrocentrics+12 metacentrics), N (I, II)=12 (Suzuki, 1976).

Female. — The female (Fig. 312) is a little larger than the male but with shorter legs; distal segment of chelicera unarmored distomesally; femur of palpus not so strongly curved as in the male, distomesal angle of patella produced into enlarged lobe (Fig. 171), which is clothed with dense short hairs; tibia not swollen at base, widened distally and with the distomesal angle bluntly produced, no armaments; tarsus lacking the definite rows of tubercles. Ground color above silvery-white with deep brown markings or blotches, and the central figure is more distinctly developed than in the male (Fig. 312); some specimens almost similar to the male in coloration. Labrum small, simple in structure (Fig. 35). Seminal receptacles as in Fig. 103.

Variation. In Mt. Ishizuchi (1,982 m), body and legs vary in size with elevations. Specimens from higher elevations have smaller body and shorter legs as shown in Table 2.

<table>
<thead>
<tr>
<th>Altitude</th>
<th>Sex</th>
<th>No. of specimens</th>
<th>Body length</th>
<th>Length of leg II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min Max</td>
<td>Min Max</td>
</tr>
<tr>
<td>1,800–1,982 m</td>
<td>♂</td>
<td>8</td>
<td>4.12–4.76</td>
<td>47.6–54.9 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean 4.37</td>
<td>Mean 50.6</td>
</tr>
<tr>
<td>1,200 m</td>
<td>♂</td>
<td>7</td>
<td>4.04–4.90</td>
<td>57.0–67.6</td>
</tr>
<tr>
<td>1,800–1,982 m</td>
<td>♀</td>
<td>5</td>
<td>4.57–5.85</td>
<td>38.4–55.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.24</td>
<td>46.1</td>
</tr>
<tr>
<td>1,200 m</td>
<td>♀</td>
<td>10</td>
<td>5.12–6.44</td>
<td>44.0–59.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.85</td>
<td>54.5</td>
</tr>
</tbody>
</table>
Distribution. Seems to be limited to Shikoku (Map 3). Ranges from about 800 m to 1,982 m, abundant in forested areas.

Leiobunum montanum montanum Suzuki, n. subsp.

(Jap. nam.: Sobosube-zatōmushi)
(Figs. 36–37, 104, 172, 181–183, 313–314; Map 3)


Diagnosis. Distinct from Leiobunum montanum montanum by the shape of the alate part of penis.

Description. Measurements: ♀ — Body 4.20 mm long, 2.50 mm wide at widest portion. Palpus: Tr 0.36 mm long, 0.35 mm wide; Fe 1.40 long 0.35 wide; Pa 0.85 long, 0.38 wide; Ti 0.98 long, 0.38 wide; Ta 1.52 long, 0.15 wide. Femora: I 6.6, II 12.5 mm. Legs: I 33.9, II 67.2 mm.

Male. — General structure and coloration (Fig. 313) much similar to the nominate subspecies. Palpus (Fig. 172): trochanter armed with a few small denticles distally below; femur, patella and tibia armed with more numerous


lateral teeth than in the nominate form. Labrum as shown in Fig. 36.

Penis. Shaft 3.33 mm long, 0.49 mm wide at base, 0.08 mm wide at middle; glans 0.21 mm long, 0.05 mm wide at widest portion. Penis shaft much alike to that of the nominate form but alate part much more enlarged and rounded posteriorly (compare Figs. 181–183 with Figs. 177–180).

Chromosomes. Not examined.

Female. — As in Fig. 314. Labrum (Fig. 37) very small, simple. Seminal receptacles as in Fig. 104.

Distribution. So far known from only type locality (Map 3).

*Leiobunum virgatum virgatum* Suzuki, n. sp.

(Jap. nam.: Daisensube-zatōmushi)

(Figs. 38–39, 105, 173–175, 184–186, 315–316; Map 3)


Other references are not required here.


Diagnosis. Most closely related to *L. montanum montanum*, but is distinct from it in the following respects: (1) The male palpal tibia is armed with numerous teeth on the ventromesal surface. (2) The alate part of the penis shaft is much elongated. (3) The diploid chromosome complement consists of 18 metacentrics.

Description. Measurements (in mm): ♂ (in parentheses ♀): Total body length 3.7–4.6 (4.7–5.7), mean 4.1 (5.2). Width of carapace 2.2–2.6 (2.3–3.0), mean 2.4 (2.5). Width of abdomen 2.0–2.5 (2.5–3.1), mean 2.2 (2.9).

Femora: I 5.6–7.2 (4.8–5.7), mean 6.2 (5.2); II 10.1–12.1 (9.2–9.9), mean 11.2 (9.6); III 5.0–6.6 (4.6–5.4), mean 6.0 (5.1); IV 7.3–9.0 (7.0–7.7), mean 8.4 (7.4).

Total length of legs: I 27.9–33.5 (24.4–27.7), mean 30.6 (26.1); II 54.9–67.0 (49.8–55.7), mean 61.0 (53.1); III 28.6–34.8 (25.6–29.1), mean 31.8 (27.2); IV 40.0–48.0 (36.3–41.1), mean 44.3 (38.6).

Male. — In structure and coloration much similar to *L. montanum montanum* (Fig. 315). Eye tubercle rounded above, shallowly canaliculated, the carinae armed with some sharp pointed teeth. Marginal rows of tubercles present but small on both anterior and posterior sides of coxae I and II and on the posterior side of III, usually lacking on anterior side of coxae II and on both sides of coxae IV. Labrum much alike to that of *L. montanum montanum* (compare Fig. 38 with Fig. 34).

Palpus narrow (Figs. 173–174); femur strongly curved, widened distally, with some sharp pointed teeth at distal end above and on the distolateral surface. Patella has a small distomesal process which is set with dense short hairs. Tibia,
from above, as in Fig. 174, armed ventromesally with a number of small black teeth. Tarsus with a well-developed row of small tubercles on the ventromesal side and a second row of sparse tubercles parallel to and lateral of the first row.

Penis. Shaft 3.24 mm long, 0.47 mm wide at base, 0.07 mm wide at middle; glans 0.21 mm long, 0.05 mm wide at widest portion, stylus 0.10 mm long. Shaft almost alike to that of *L. montanum montanum*; alate part very narrow and elongated, extending nearly on distal third of the penis shaft (Figs. 184–186).

Chromosomes. 2N=18 (all metacentrics), N=9 (Suzuki, 1976).

Female. — General appearance much as in *L. montanum montanum* female (Fig. 316). Seminal receptacles and labrum as shown in Fig. 105 and Fig. 39, respectively.

*Distribution.* So far known from Mt. Hōkidaisen (Map 3). Abundant in beech forest.

*Notes.* Due to much similarity the specimens from Mt. Hōkidaisen were first included in *L. montanum montanum* (type locality: Mt. Ishizuchi-yama) (Suzuki, 1953). Recent chromosome study, however, revealed that the karyotype differs between the two populations of Hōkidaisen and Ishizuchi-yama. Namely, the former population shows 2N ♂=18 (all metacentrics), while the latter population 2N ♂=24 (12 acrocentrics plus 12 metacentrics) (Suzuki, 1976). The difference suggests that both the populations are separated at specific level. For this reason, Hōkidaisen population is described here as a new species.

*Leiobunum virgeum ontakense* Suzuki, n. subsp.

(Jap. nam.: Ontakesube-zatōmushi)

(Figs. 40–41, 106, 176, 187–188, 317–318; Map 3)

*Material.* Nagano pref.: Mt. Kisoontake, from 1,800 to 2,100 m (male holotype and 1 ♂ paratype, S. Suzuki leg., 23–VIII–1938; 4 ♂, 3 ♀ paratypes, Y. Nishikawa leg., 17/19–VII–1968); Mt. Shirouma-dake, at about 2,200 m (1 ♂, 2 ♀, H. Sako and N. Nakamura leg., 7–VIII–1968).

*Diagnosis.* Distinguished from *L. virgeum virgeum* by the armament of the male palpal tibia.

*Description.* Measurements (in mm): ♂ (in parentheses ♀) (Kisoontake exs.): Body length 4.4 (5.0); carapace 1.2 (1.2) long, 2.5 (2.5) wide; abdomen 2.5 (2.6) wide. Femora: I 6.5 (5.1), II 10.8 (9.7). Total length of legs: I 33.4 (31.1), II 61.8 (56.3).

Male. — As shown in Fig. 317; much similar to the nominate subspecies. Palpus (Fig. 176) narrow; tibia, from the side, swollen proximally, armed with a short row of teeth at distomesal angle and a longitudinal series of sparse teeth on the ventral surface. Tarsus armed as in Fig. 176. Labrum more enlarged than in the nominate form, acutely bent upward, unarmed (Fig. 40).

Penis. Shaft 3.14 mm long, 0.41 mm wide at base, 0.07 mm wide at middle; glans 0.21 mm long, 0.07 mm wide at widest portion, stylus 0.08 mm long. Much as in the nominate form; ventral side of basal opening very deeply indented.
Female. — Generally similar to the nominate form (Fig. 318). Labrum as in Fig. 41. Seminal receptacle (Fig. 106) of very thick wall.

*Note.* Concerning the subspecific status of this material there is some doubt because of lacking chromosomal study. It must be proven by future study.

*Distribution.* Known from the high elevations of the Japan Alps (Map 3).

*Leiobunum platypenis* Suzuki, 1953

(Jap. nam.: Hirashite-zatômushi)

(Figs. 80–83, 119, 189–190, 199–202, 319–320; Map 3)


Other references are not required here.


*Diagnosis.* Characterized by the much swollen and strongly armed male palpal tibia and the elongated, flattened penis with enlarged glans. Also, the male L-shaped labrum is unique.

*Description.* Measurements: ♀ (Nenokuchi ex.): Body 3.9 mm long, 2.4 mm wide at widest portion. Palpus: Tr 0.34 mm long, 0.28 mm wide; Fe 1.23 L, 0.35 W; Pa 0.78 L, 0.40 W; Ti 1.03 L, 0.51 W; Ta 1.84 L, 0.13 W; total length 5.22 mm.

<table>
<thead>
<tr>
<th>Length of legs</th>
<th>Fe</th>
<th>Pa</th>
<th>Ti</th>
<th>Mt</th>
<th>Ta</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg I</td>
<td>6.8</td>
<td>1.3</td>
<td>6.2</td>
<td>9.2</td>
<td>10.5</td>
<td>34.0 mm</td>
</tr>
<tr>
<td>Leg II</td>
<td>12.7</td>
<td>1.4</td>
<td>13.1</td>
<td>15.2</td>
<td>26.1</td>
<td>68.5</td>
</tr>
<tr>
<td>Leg III</td>
<td>6.8</td>
<td>1.3</td>
<td>6.4</td>
<td>10.5</td>
<td>10.6</td>
<td>35.6</td>
</tr>
<tr>
<td>Leg IV</td>
<td>9.7</td>
<td>1.3</td>
<td>8.6</td>
<td>13.7</td>
<td>16.7</td>
<td>50.0</td>
</tr>
</tbody>
</table>

Male. — As in Figs. 319–320. Eye tubercle, in some, distinctly canaliculated, armed with some pointed teeth, mostly in front. Marginal row of small pointed tubercles present on both anterior and posterior sides of coxae I, II and III and on the posterior side of coxa IV. Labrum L-shaped in profile, studded with black teeth on both sides of the terminal bar (Figs. 80, 83).

Chelicera normal in structure. Supracheliceral lamellae unarmed or with one or two black pointed teeth.

Palpus moderately or considerably widened (Fig. 189 and Fig. 9D–E in Suzuki, 1953b). Femur widened distally, in profile, strongly curved ventrally, armed distolaterally with scattered teeth. Patella thickened distally, with a short but distinct distomesal apophysis which clothed with dense short hairs (Fig. 190), armed laterally with some teeth. Tibia much swollen, from the side widest at middle of the length, from above slightly produced at distomesal angle;
Genus Leiobunum of Japan

armed ventromesally with numerous distinct black teeth, teeth mostly confined
to distal half or distal two thirds of the length of the segment. Tarsus elongated,
curved, with the definite row of black-tipped teeth on the ventromesal surface,
teeth more coarse than usual, without accessory row of teeth (Fig. 189).

Coloration. Ground color above rusty to orange yellow with silvery-white
blotches. Markings as in Fig. 319. Venter concolorous with dorsum, and so
the chelicera, palpus and trochanters of legs. Other leg-segments yellowish
brown to dark brown. Tibiae II and IV with a wide silvery-white distal band.

Penis. Kamikōchi ex.: shaft 3.32–3.72 mm long; 0.21–0.26 mm wide at base,

Figs. 189–190. Leiobunum platypenis. 189) Lateral view of left palpus, ♂ (Nenokuchi, Towada),
×20. 190) Dorsal view of patella and tibia of left palpus, ♀ (Nenokuchi), ×20.

Figs. 191–198. Leiobunum globosum. 191–192) Left male palpus, 191) mesal, 192) dorsal (Sukayu
Spa, Hakkoda), ×20. 193) Left female palpus, mesal, ♀ (Nenokuchi), ×20. 194–195) Mesal and
196) Dorsal view of palpal patella and tibia, ♂, and 197) ventral view of palpal tibia, (Hakka-tōge
camping ground), ×20. 198) Lateral view of aberrant, right palpus, ♂ (Sukayu Spa), ×20.
0.20–0.26 mm wide at middle; glans 0.32–0.35 mm long, 0.08–0.10 mm wide; stylus 0.09–0.12 mm long. Nenokuchi ex.: shaft 2.96 mm long, 0.37 mm wide at base, 0.32 mm wide at middle; glans 0.34 mm long, 0.09 mm wide; stylus 0.10 mm long. Shaft flattened dorsoventrally, very long with sides nearly parallel; alate part small, not wider than the shaft; glans larger than usual (Fig. 199). The penis shaft of Nenokuchi specimen (Figs. 200–201) is shorter than that of Kamikōchi specimen and the alate part is a little wider than the shaft; stylus beset with two short setae at base above (Fig. 202).


Figs. 203–208. *Leiobunum globosum*. 203–204) Ventral and lateral views of penis (Ōnuma Spa, Hachimantai), ×35. 205) Ventral view of glans (Ōnuma Spa), ×150. 206–207) Ventral and lateral views of penis (Sukayu Spa), ×35. 208) Ventral view of glans (Sukayu Spa), ×150.
Female. — The female is a little larger than the male but with shorter legs; the palpus is not swollen as in the male but slender; patella has an enlarged apophysis, tibia small but distinct distomesal lobe, tarsus lacking the definite row of teeth. Labrum as in Figs. 81–82. Coloration generally similar to the male. Seminal receptacles as shown in Fig. 119.


**Leiobunum globosum** Suzuki, n. sp.

(Jap. nam.: Tamahige-zatōmushi)

(Figs. 84–89, 120, 191–198, 203–208, 321–324; Map 3)


Diagnosis. This species is most closely related to *L. platypenis*, differing from it by having smaller asymmetrical glans and the enormously enlarged male palpal tibia. Also, T-shaped male labrum is unique.

Description. Measurements: ♂ (in parentheses ♀): Nenokuchi exs.: cephalothorax 1.2 (1.3) mm long, 2.8 (2.5) mm wide; abdomen 2.5 (2.8) mm wide; total body length 4.5 (5.4) mm. Ōnuma ex.: cephalothorax 1.1 mm long, 2.1 mm wide; abdomen 1.5 mm wide; total body length 4.3 mm.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Palpus</th>
<th>Nenokuchi</th>
<th>Ōnuma</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length</td>
<td>Width</td>
<td>Length</td>
</tr>
<tr>
<td>♂</td>
<td>0.48</td>
<td>0.48</td>
<td>0.30</td>
</tr>
<tr>
<td>♀</td>
<td>1.55</td>
<td>1.18</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>0.83</td>
<td>0.55</td>
<td>0.53</td>
</tr>
<tr>
<td></td>
<td>1.28</td>
<td>0.82</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>2.20</td>
<td>1.71</td>
<td>1.4</td>
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<tr>
<td></td>
<td>6.34</td>
<td>4.56</td>
<td>5.62</td>
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<tr>
<td>♀</td>
<td>7.7</td>
<td>6.4</td>
<td>7.0</td>
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<td></td>
<td>13.5</td>
<td>11.5</td>
<td>12.4</td>
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<tr>
<td></td>
<td>39.0</td>
<td>32.5</td>
<td>35.5</td>
</tr>
<tr>
<td></td>
<td>76.9</td>
<td>67.1</td>
<td>68.5</td>
</tr>
</tbody>
</table>
Male. — Body from above as in Fig. 321; dorsum very finely granular; eye tubercle canaliculated, armed with a few denticles in front. Coxae and genital operculum smooth, with scattered short hairs. Marginal rows of small pointed teeth present on both anterior and posterior surfaces of coxae I, II and III, and on posterior surface of coxa IV, usually invisible on anterior surface of coxa IV. Labrum as shown in Figs. 84–86; elongated T-shaped in profile, on each side of the terminal bar with a row of black teeth.

Chelicera as in the related species, distal segment with a few black denticles at mesodistal portion. Supracheliceral lamellae with one small black tubercle at tip.

Palpus very well-developed (Figs. 194–197); all segments but tarsus markedly swollen. Trochanter with one or two hair-tipped tubercles distally below. Femur widened distally, from the side strongly curved below, armed with a few black teeth on the distolateral surface and at distal margin above. Patella fairly thickened, strongly arched, distomesal angle only slightly produced, armed laterally with scattered teeth. Tibia extremely distended, from laterally arched above; produced ventrally to form an enlarged spherical median process which armed with a group of black teeth on the top; in some, a few teeth at or near distomesal angle. Tarsus slender, a ventromesal row of coarse tubercles well-developed, a second row of small tubercles extending on the distal half of the length; tarsal claw with about nine comb teeth at base below.

Legs slender and long, armaments much as in the related species.

Coloration. Ground color above orange yellow to greyish yellow; marking pattern as in Fig. 321. Chelicera and palpus uniformly orange yellow, never darkened. Legs brown to dark brown.

Penis. Shaft 3.33–3.75 mm long, 0.25–0.37 mm wide at base, 0.25–0.28 mm wide at middle; glans 0.20 mm long, 0.08–0.10 mm wide, stylus 0.10–0.13 mm long. Penis very long, flattened dorsoventrally, slightly expanded about midway and then gradually narower toward apex (Figs. 203–204). Alate part very small, not wider than the shaft. Glans of normal size, asymmetrical at distal portion, left antimeres always extends beyond right antimer (Fig. 205).

Female. — The female is somewhat larger than the male but with shorter legs. Palpus not swollen as in the male; patella has a distinct distomesal apophysis (Fig. 193), tibia and tarsus without armaments. Labrum as in Figs. 87–88. Ground color above greyish white; dark brown central figure of abdomen is distinctly developed as shown in Fig. 323. Seminal receptacles more or less elongated (Fig. 120).

Variation. One male had a malformed palpus on right side of the body. Such a palpus consisted of but three segments: two proximal segments (coxa and trochanter of normal appearance) and a third aberrant segment which apparently corresponds to femur. This femur was not so thickened as in the normal one, having a deformed claw at apex (Fig. 198). This type of abnormality may have resulted from some accidental injury in larval stage.

Among numerous specimens two typical gynanders were found. One was
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taken from Ōnuma, Hachimantai area and the other from Nenokuchi, Towada area. The details of these specimens will be published by separate paper.

Notes. Formerly one male of this species taken from Mt. Gassan was assigned to Leiobunum platypenis because of resemblance in the structure of the male palpus (Suzuki, 1953b). However, the present study based upon numerous newly collected material revealed that the Gassan specimen clearly differs from L. platypenis in the male palpus (compare Fig. 9L in Suzuki, 1953b and Figs. 194–197 with Fig. 9D, E in Suzuki, 1953b and Fig. 189) and the structure of penis (compare Figs. 203–205 with Figs. 199–201). These differences serve to separate the Gassan and the present specimens from L. platypenis.

Distribution. North Japan: Aomori, Akita and Yamagata prefectures (Map 3).

Among a lot of specimens collected in Sukayu Spa one unusual male (Fig. 324) was detected. In general appearance the specimen is much similar to both L. globosum and L. platypenis, with which it is sympatric, but differs in the palpus, labrum and penis. In the palpus it is more alike to platypenis than to globosum (compare Figs. 191–192 to Figs. 189–190 and Figs. 194–196). On the other hand, in the penis it much more resembles globosum than platypenis (compare Figs. 206–208 to Figs. 200–202 and Figs. 203–205). In the labrum it seems to be intermediate between globosum and platypenis (compare Fig. 89 to Figs. 84–85 and Figs. 80, 83). The specimen, thus shares some characters with globosum and some other characters with platypenis. From this it is likely that the specimen may be a separate taxon or else a hybrid between globosum and platypenis. Presently I hesitate to draw a conclusion on this point because of lacking sufficient material.

Leiobunum kohyai Suzuki, 1953
(Jap. nam.: Kōyasube-zatōmushi)
(Figs. 67–69, 121, 209–216, 323–329; Map 3)


Other references are not required here.


Diagnosis. Structure of the male palpus and penis serves to separate this species from other related species. Also, the karyotype is unique.

Description. Male.—As in Figs. 325–326. Eye tubercle rounded, unarmed or with a few small teeth in front. Coxae I and II with marginal row of small pointed teeth on both anterior and posterior sides, III on the posterior side,
usually invisible on the posterior side of coxa III and on both sides of coxa IV. Labrum highly sclerotized, rod-shaped, a little bent upward, no armaments (Figs. 67–68).

Chelicera. Distal segment armed with a small group of black teeth at distomesal area (Fig. 212). Supracheliceral lamellae unarmed.

Palpus thickened (Figs. 209–210). Femur widened distally, from the side, strongly curved ventrally, armed distolaterally with some teeth; in Ōdaiga-hara

specimens femur ventrally with ten or more black teeth arranged in a longitudinal series. Patella thickened distally, with a small but distinct distomesal lobe which is clothed with short hairs, armed laterally with some teeth. Tibia, from the side, characteristically swollen proximally and with distomesal angle slightly produced; armed ventrally and distomesally with a number of blackish teeth. Tarsus armed as shown in Fig. 209.

Coloration. Body rusty to orange yellow in ground color, with yellowish brown spots. Marking pattern as shown in Fig. 325. Eye tubercle dark brown to black, paler at base. Venter concolorous with dorsum, and so chelicera and palp. Legs yellowish brown to dark brown, bases of femora blackish. Tibiae II with broad silvery-white distal band.

Penis. Measurements of penis as shown in the following table.

<table>
<thead>
<tr>
<th>Localities</th>
<th>Shaft</th>
<th>Glans L</th>
<th>Stylus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length</td>
<td>Width at base</td>
<td>Width at middle</td>
</tr>
<tr>
<td>Kōyasan</td>
<td>4.3-4.6</td>
<td>0.7</td>
<td>0.25-0.30</td>
</tr>
<tr>
<td>Ōdaiga-hara</td>
<td>3.8-4.2</td>
<td>0.56-0.60</td>
<td>0.27-0.28</td>
</tr>
</tbody>
</table>

Very long flat shaft with sides nearly parallel; much swollen basally, rounded; abruptly narrowed distally and extending to a spear-shaped glans. Alate part relatively small, as wide as the shaft, tapered distally into the shaft (Figs. 213–216).

Chromosomes. 2N ♂=20 (4 acrocentrics+16 metacentrics), N=10 (Suzuki, 1976).

Female. — First described. Body 5.3 mm long, 2.9 mm wide at widest portion. Femora: I 5.0, II 8.8 mm. Legs: I 25.1, II 46.2 mm. Generally similar to the male but body larger and legs shorter. Palpus not swollen as in the male; patella and tibia have more enlarged apophysis, unarmed (Fig. 211). Labrum much smaller than that of the male (Fig. 69). Coloration, in some much as in the male (Fig. 327), in others dorsum silvery-white with dark brown markings, marking pattern is as shown in Figs. 328–329. Seminal receptacles as in Fig. 121.

Distribution. Wakayama and Nara prefectures (Map 3).
Detailed description is in Suzuki, 1953.

*Leiobunum simplum* Suzuki, n. sp.
(Jap. nam.: Shiroumasube-zatōmushi)
(Figs. 42-45, 108, 217–220, 330–333; Map 3)

Material. Nagano pref.: Yokoo Hütte, at 1,650 m in altitude (1 ♂, 1 ♀, M. Makihara leg., 21/22–VII–1958); Mt. Shirouma-dake; from 1,250 m to 1,600 m (male holotype and 34 ♂, 21 ♀ paratypes, H. Sako and N. Nakamura
Diagnosis. In the male palpus this species is similar to *L. virgem virgem*, differing from it by the structure of penis. Also, male labrum is unique.

Description. Measurements: ♀ (in parentheses ♂): cephalothorax 0.97 (1.41) mm long, 1.10 (2.30) mm wide; abdomen 1.18 (2.80) mm wide; total body length 3.10 (5.0) mm.

<table>
<thead>
<tr>
<th>Palpus and legs:</th>
<th>Tr</th>
<th>Fe</th>
<th>Pa</th>
<th>Ti</th>
<th>Mt</th>
<th>Ta</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palpus W</td>
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<td>0.27</td>
<td>0.27</td>
<td>0.27</td>
<td>0.15 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palpus L</td>
<td>0.29</td>
<td>1.10</td>
<td>0.64</td>
<td>0.77</td>
<td>1.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leg I</td>
<td>0.4</td>
<td>7.0</td>
<td>1.2</td>
<td>6.9</td>
<td>9.1</td>
<td>9.5</td>
<td>34.1</td>
</tr>
<tr>
<td>(5.7–6.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(29.0–32.3)</td>
</tr>
<tr>
<td>Leg II</td>
<td>0.4</td>
<td>11.3</td>
<td>1.3</td>
<td>13.5</td>
<td>15.2</td>
<td>21.4</td>
<td>63.1</td>
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<td>(10.9–12.4)</td>
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<td></td>
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<td>(58.2–68.5)</td>
</tr>
</tbody>
</table>

Male. — Dorsum very finely granular, no marked tubercles. Eye tubercle as long as broad, shallowly canalicated above, the carinae armed with a few small teeth, in profile, longer than high. Abdomen somewhat elongated, tapering to a blunt point behind (Fig. 330). Coxae and genital operculum smooth, sometimes with a few fine granulations. All coxae armed with a row of small pointed tubercles anteriorly and posteriorly; tubercles mostly confined to the distal half of coxae, sometimes tubercles invisible, particularly so on the anterior side of coxae III and IV. Labrum very small, from the side, truncated distally (Fig. 42). Free sternites smooth.

Chelicera normal. Supracheliceral lamellae bluntly produced medially, armed with two or three small teeth.

Palpus slender (Figs. 217–218); femur slightly widened distally, from laterally curved ventrally, armed distolaterally and at distal end above with some small teeth. Patella half as long as femur, arched above, from above thickened distally and distomesal angle produced into a small lobe, which set with dense hairs, armed laterally and above with small teeth. Tibia a little longer than patella, from above with sides nearly straight, from the side somewhat swollen proximally, armed ventrally with a large number of small blackish teeth. Tarsus slender, curved below, a ventromesal row of small tubercles is developed; claw with a few teeth at base below.

Legs slender and very long. Trochanters armed with denticles on both sides, femora and patellae with sparse denticles throughout, remaining leg-segments unarmed.

Coloration. Ground color of dorsum silvery or golden yellow, sometimes pinkish-yellow, with greyish blotches or spots on the carapace. Central figure of abdomen faintly developed, greyish yellow, limited laterally with silvery-white blotches and crossed by the same colored lines; segments of abdomen within the central figure with enlarged silvery-white spot; a transverse row of
small brownish yellow dots on each side of central figure of abdomen between segments. Eye tubercle yellowish, median furrow somewhat shaded. Venter concolorous with dorsum. Chelicerae and palpi pale yellow. Legs brown to dark brown; patellae darker, and so tibiae I, III and IV distally; tibiae II with a broad band of silvery-white.

Penis. Shaft 1.72–2.05 mm long, 0.21–0.27 mm wide at base, 0.14–0.15 mm wide at middle of length; glans 0.21–0.25 mm long, 0.06–0.07 mm wide at widest portion, stylus 0.06–0.08 mm long. Shaft relatively short and slender (Figs. 219–220); widest at base, gradually narrower toward tip; alate part simple in structure, extending on the distal quarter of the shaft.

Female. — Larger than the male and with the abdomen broader and more bluntly pointed or rounded posteriorly. Palpal patella has enlarged distomesal lobe which clothed with dense fine hairs (Figs. 332–333); tibia not swollen proximally, with a short but distinct apophysis, unarmed ventrally; tarsus lacking the definite row of tubercles. Labrum as shown in Figs. 43–45. In coloration two types are distinguished. One is male-type coloration and the other female-type coloration. The former is much alike as in the male (Fig. 332), while the latter is typical to the female, in which dark brown markings are well-developed


on the carapace and abdomen (Fig. 333). Seminal receptacles as in Fig. 108.

**Distribution.** Known from only Nagano prefecture (Map 3).

*Leiobunum hiasai* Suzuki, n. sp.

(Jap. nam.: Kaisube-zatōmushī)
(Figs. 46-47, 109, 221-224; Map 3)

**Material.** Yamanashi pref.: Kitazawa-tōge Pass, at about 2,000 m in altitude (male holotype and 1 ♂, 3 ♀ paratypes, N. Hiasa leg., 19–VIII–1973); Nakakoma-gun, Ōmonzawa Hütte, about 2,000 m (1 ♀, N. Hiasa leg., 22–VIII–1973).

**Diagnosis.** This species is closely related to *L. simplum* but differs in the male palpal tibia and tarsus. The tibia has but few distomesal teeth and the tarsus has two ventral rows of tubercles, while in *L. simplum* the tibia has numerous ventral teeth and the tarsus only one ventral row of tubercles. Also, the penis and male labrum are distinct enough to separate the both species.

**Description.** Measurements: ♂ (in parentheses ♀): cephalothorax 1.31 (1.64) mm long, 2.19 (2.74) mm wide; abdomen 2.32 (3.44) mm wide; total body length 4.20 (5.76) mm.

<table>
<thead>
<tr>
<th>Palpus and legs:</th>
<th>Tr</th>
<th>Fe</th>
<th>Pa</th>
<th>Ti</th>
<th>Mt</th>
<th>Ta</th>
<th>Total</th>
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<tr>
<td>Palpus</td>
<td>W</td>
<td>0.32</td>
<td>0.32</td>
<td>0.32</td>
<td>0.32</td>
<td>0.15 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>0.47</td>
<td>1.23</td>
<td>0.83</td>
<td>0.91</td>
<td>1.37</td>
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</tr>
<tr>
<td>Leg I</td>
<td></td>
<td>0.5</td>
<td>5.4</td>
<td>1.4</td>
<td>5.6</td>
<td>6.4</td>
<td>10.3</td>
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<td></td>
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<td></td>
<td>(4.8)</td>
<td></td>
<td></td>
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<td>29.6</td>
</tr>
<tr>
<td>Leg II</td>
<td></td>
<td>0.5</td>
<td>9.5</td>
<td>1.5</td>
<td>9.7</td>
<td>11.6</td>
<td>25.0</td>
</tr>
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<td></td>
<td>(9.1)</td>
<td></td>
<td></td>
<td></td>
<td>57.8</td>
</tr>
</tbody>
</table>

Male. — Body nearly oval in shape, front margin of carapace recurved and abdomen bluntly pointed posteriorly. Dorsum very finely granular, without any armaments. Eye tubercle rounded, constricted at base, canaliculated; as long as wide, in profile wider than high. The carinae armed with 1–2 pointed denticles. Coxae I–IV and genital operculum smooth with scattered short brown bristles, free sternites smooth except for microscopic hairs. Coxae I–IV armed with a row of very small pointed tubercles on both anterior and posterior margins, sometimes tubercles invisible. Labrum, in profile, widened distally, curved upward, armed with numerous black teeth on both lateral surfaces (Fig. 46).

Chelicera normal in structure, distal segment armed with a few small distomesal teeth. Supracheliceral lamellae small, with 1–2 obsolete teeth.

Palpus slender (Fig. 221); femur from above slightly narrowed at base, from the side strongly arched above; unarmed throughout, only hairy. Patella arched above, widened distally, distomesal angle slightly produced. Tibia, in profile, somewhat thickened proximally, curved below, armed with a short row of very
small black teeth at distomesal angle (in some, completely unarmed there). Tarsus slender, lightly curved ventrally, armed ventromesally with a row of small black denticles extending nearly full length of the segment and a second row of sparse denticles just laterad of the first row; tarsal claw with a few slender teeth at base below.

Legs. Long and slender; trochanters with small denticles on both sides; femora with scattered denticles throughout, patellae smooth except for a few denticles; remaining leg-segments unarmed.

Coloration nearly similar to the foregoing species.

Penis. Shaft 2.42 mm long, 0.23 mm wide at base, 0.21 mm wide at middle; glans 0.27 mm long, 0.08 mm wide, stylus 0.11 mm long. Shaft of moderate length, flattened dorsoventrally, with sides nearly parallel; somewhat narrowed distally. Alate part elongated, extending on the distal half of the shaft.

Female. — Slightly larger than the male and with the abdomen broader and more bluntly pointed behind. Patella of palpus widened distally, with enlarged distomesal apophysis (Fig. 222); tibia has a short lobe at distomesal angle; tarsus without the definite row of teeth. Labrum small, apex pointed, no armaments. Seminal receptacles considerably large, as in Fig. 109.

Distribution. Known from only Yamanashi prefecture (Map 3).

*Leiobunum hikocola* Suzuki, 1966
(Jap. nam.: Hikosube-zatōmushi)
(Figs. 25–27, 107; Map 2)


Diagnosis. Characterized by the male and female genitalic structure. Labri first illustrated in Figs. 25–27; secondary sexual difference indistinct except for size difference.

Distribution. So far known from Mt. Hikosan and Amami-ōshima Is. (Map 2).

*Leiobunum curvipalpe* Roewer, 1910
(Jap. nam.: Yumihiçe-zatōmushi)
(Figs. 70–71, 122–123, 225–230, 334–337; Map 4)


Material. Nagano pref.: Kitakaruiwaza (1 ♂, 2 ♀, K. Sekiguchi leg., 15–
IX–1940); Mt. Tadeshina, the seventh station (1 ♂, I. Ishii leg., 9–VIII–1973).
— Gunma pref.: Osega-hara to Mt. Shibutsu (1 ♂, 1 ♀, 1 juv., H. Suzuki leg.,
15/18–VII–1950); Tsukiyono-chō, Mt. Ōmine-san (1 ♂, 1 ♀, H. Akama leg.,
15–VIII–1969); Nagano-hara (1 juv., K. Sasaki leg., 20–VI–1970); Fujimi-
mura, Akagi-yama, Daidō, ca 1,400 m (9 ♂, 1 ♀, H. Sato leg., 2–IX–1972).
— Tochigi pref.: Nikko, Shōbuga-hara to Senjōga-hara (2 ♂, 1 ♀, H. Suzuki
leg., 31–VIII–1948); Nikko, Shōbuga-hara (1 ♂, H. Suzuki leg., 22–VII–1950);

Figs. 225–230. Leiobunum curvipes. 225–226) Mesal and dorsal views of male palpus (Akagi-
yama), × 20. 227–230) Penis, 227) ventral (Chuzenji, Nikko), 228) ventral, 229) lateral (Akagi-
yama), 230) ventral (Kitakaruiwaza), × 35.

**Diagnosis.** Characterized by the very well-developed male palpus and by the fairly enlarged, stout penis.

**Description.** Measurements (in mm): ♂ (Nikko ex.): body length 4.7–5.8 (M=5.1), width of cephalothorax 2.7–3.3 (M=2.9), width of abdomen 2.3–2.8 (M=2.5). Femur II 10.0–13.2 (M=11.2); leg II 53.2–71.5 (M=61.6). ♀ (Akagi-yama ex.): Body length 5.8, cephalothorax 1.44 long, 2.70 wide; abdomen 2.74 wide. Femur: I 4.9, II 8.8; leg: I 26.8, II 55.6. Palpus: Tr 0.44 long, 0.48 wide; Fe 1.32 L, 0.51 W; Pa 0.90 L, 0.43 W; Ti 1.07 L, 0.54 W; Ta 1.61 L, 0.20 W; total length 5.34.

Male. — Eye tubercle relatively low, wider than long, shallowly canaliculated, armed with pointed teeth above. Marginal rows of small pointed tubercles present on anterior and posterior sides of coxae I and II and on posterior sides of coxae III and IV. Labrum as in Fig. 70; thickened and apex pointed, armed with numerous black teeth on both sides.

Chelicera: distal segment armed with blackish teeth at distomesal area.

Palpus very well-developed (Figs. 225–226 and Figs. 334–336); every segment fairly thickened and dark brown. Femur from above considerably widened distally, from laterally arched above, distolateral surface armed with sharp pointed teeth. Patella acutely bent, thickened distally and with the distomesal angle slightly produced, armed laterally with a few teeth. Tibia, from the side, markedly swollen proximally, ventral surface thickly armed with numerous teeth. Tarsus more widened than usual, strongly curved, armed ventromesally with a row of small, black, evenly spaced tubercles, and ventrolaterally, just laterad of the first row, with a second row of small tubercles.

Penis. Shaft very long and stout, especially fairly distended proximally; basal aperture deeply indented. Alate part slightly wider than the shaft, with sides nearly parallel, tapered into the shaft proximally. Glans usually short, but in Akagiyama specimens it is considerably long, broadened proximally and the apex recurved (Figs. 228–229). Shaft varies in size between localities as shown in Table 3. Also, the shape of alate part and basal aperture somewhat

---

**TABLE 3**

*Comparison of the measurements of penis in Leiobunum curvipalpe*

<table>
<thead>
<tr>
<th>Localities</th>
<th>Penis shaft</th>
<th>Glans</th>
<th>Stylus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length</td>
<td>Width at base</td>
<td>Width at middle</td>
</tr>
<tr>
<td>Kitakaruizawa</td>
<td>4.16</td>
<td>0.84 0.48</td>
<td></td>
</tr>
<tr>
<td>Nikko: Yoshino Shrine</td>
<td>4.40</td>
<td>0.83 0.40</td>
<td></td>
</tr>
<tr>
<td>Nikko: Chuzenji</td>
<td>3.33</td>
<td>0.55 0.33</td>
<td></td>
</tr>
<tr>
<td>Gunma: Ōmine-san</td>
<td>3.76</td>
<td>0.77 0.53</td>
<td></td>
</tr>
<tr>
<td>Gunma: Akagi-yama</td>
<td>3.35</td>
<td>0.72 0.44</td>
<td></td>
</tr>
</tbody>
</table>

---
differs geographically. Some of such variation is depicted in Figs. 227–230.


Female. — Similar to male but with body larger; palpus not stout, patella has enlarged distomesal apophysis (Fig. 337), tarsus lacks the definite rows of tubercles. Labrum (Fig. 71) not widened, small, unarmed. Seminal receptacles as shown in Figs. 122–123.

Distribution. North Kanto District (Map 4).

*Leiobunum tohokuense* Suzuki, n. sp.

(Jap. nam.: Tōhokusube-zatōmushī)
(Figs. 74–79, 118, 231–238, 338–339; Map 4)


Diagnosis. The coloration and size of the male palpus and the armaments of the palpal tibia will serve to separate this species from *Leiobunum curvipalpe*. The penis is not so enlarged as in the latter.

Description. Measurements (in mm): ♀ (in parentheses ♀): body length 4.2 (6.2); cephalothorax 1.1 (1.5) long, 2.4 (3.1) wide; abdomen 2.1 (3.8) wide. Palpus: Tr 0.38 (0.28) long, 0.38 (0.29) wide; Fe 1.30 (1.27) L, 0.35 (0.30) W; Pa 0.78 (0.67) L, 0.35 (0.31) W; Ti 0.90 (0.85) L, 0.35 (0.27) W; Ta 1.45 (1.51) L, 0.15 (0.15) W. Femora: I 7.0 (6.1), II 12.3 (11.6). Legs: I 36.1 (32.3), II 67.2 (64.1).

Male. — Body from above as in Fig. 338; dorsum very finely granular, with sparse short hairs on carapace and abdomen, hairs roughly forming a transverse series on the ridge posterior to the eye tubercle, last toracic segment and anterior segments of abdomen. Two or three obsolete tubercles at mid-frontal area before the eye tubercle. Eye tubercle rounded above, wider than long, canaliculated,
the carinae with some small teeth. Coxae and genital operculum smooth, with scattered hairs. Marginal rows of small pointed teeth present on anterior and posterior sides of coxae I, II and III and on the posterior side of coxa IV, usually lacking on anterior side of IV. Labrum club-shaped, armed with small teeth on both lateral sides (Figs. 74–76).

Chelicera as in the related species; distal segment with some black-tipped denticles at distomesal area. Supracheliceral lamellae with a few very small denticles (Fig. 233).

Palpus moderately developed (Figs. 231–232); femur thickened; distally, strongly curved below, armed with a few sharp pointed denticles at distal end.

above and some scattered teeth on the distolateral surface. Patella thickened distally, and distomesal angle a little swollen, set with dense short hairs, lateral surface armed with scattered teeth. Tibia, in profile, thickened proximally and slightly curved, armed distomesally with a cluster of teeth, number of teeth varies in specimens; sometimes scattered teeth on the ventral surface. Tarsus curved, beset with a well-developed ventromesal series of small black tubercles, rarely with a few sparse tubercles ventrolaterally.

Legs long and slender, trochanters with small denticles on both sides, femora with numerous denticles throughout.

Coloration. Ground color in life orange yellow to greyish yellow with yellowish brown spots (Fig. 338). Markings as in the closely related species. Eye tubercle dark brown to black, paler at base. Venter lighter than dorsum, yellowish grey to greyish white. Chelicera and palpus pale orange yellow. Legs brown to dark brown, trochanters and base of femora lighter, patellae and distal portions of tibiae dark brown; a white band at distal ends of tibiae.

Penis. Shaft considerably differs in size between localities as shown in the following table.

<table>
<thead>
<tr>
<th>Localities</th>
<th>Length</th>
<th>Width at base</th>
<th>Width at middle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Towada: Yasumiya</td>
<td>3.48-3.92</td>
<td>0.59</td>
<td>0.34 mm</td>
</tr>
<tr>
<td>Yamagata: Mt. Yô-zan</td>
<td>3.14</td>
<td>0.48</td>
<td>0.27</td>
</tr>
<tr>
<td>Tochigi: Nasu Spa</td>
<td>2.78</td>
<td>0.44</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Penis considerably enlarged in Towada specimens; shaft widest at base, gradually narrower toward tip; alate part well-developed, much wider than shaft, sides broadly rounded.

Female. — The female larger than the male but with shorter legs. Palpus slender, patella has distinct apophysis, tibia less distinct apophysis, unarmed distomesally; tarsus without the definite row of tubercles. In some, palpal femur armed with rather numerous black denticles distally above and laterally. Labrum smaller than that of the male, varies in shape as illustrated in Figs. 77-79. Coloration varies by specimens. In some, ground color above greyish white to whitish yellow with dark brown markings; dark brown central figure well developed on the abdomen, sides of abdomen spotted with dark brown (Fig. 339). In some others sides of abdomen not spotted, so abdomen uniformly greyish white except for dark brown central figure. Still in others, although rarely, coloration almost similar to that of the male. Venter usually greyish white. Seminal receptacles as shown in Fig. 118.

Distribution. North Japan (Map 4).

*Leiobunum tamanum* Suzuki, 1957

(Jap. nam.: Tamasube-zatômushi)
(Figs. 72-73, 124, 239-244, 340-341; Map 3)


Diagnosis. Characterized by the slender male palpus and the structure of penis. Also, the karyotype is unique.

Description. Measurements of body and legs in male as in the following table.

<table>
<thead>
<tr>
<th>Localities</th>
<th>Body L</th>
<th>Cephalothorax W</th>
<th>Abdomen W</th>
<th>Femur II</th>
<th>Leg II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bushu-mitake</td>
<td>4.2–5.2</td>
<td>2.3–2.8</td>
<td>2.1–2.4</td>
<td>11.1–14.5</td>
<td>62.0–77.0 mm</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.5</td>
<td>2.6</td>
<td>2.3</td>
<td>12.9</td>
<td>70.3</td>
</tr>
<tr>
<td>Nikko: Yumoto</td>
<td>4.0–5.0</td>
<td>2.2–2.9</td>
<td>2.1–2.5</td>
<td>10.0–12.1</td>
<td>56.3–68.8</td>
</tr>
<tr>
<td>Spa</td>
<td>4.6</td>
<td>2.6</td>
<td>2.3</td>
<td>11.6</td>
<td>65.4</td>
</tr>
</tbody>
</table>

Male. — As in Figs. 340–341. Palpus slender (Figs. 243–244); femur slightly widened distally, strongly curved below, unarmed excepting but few small denticles near distal end above. Patella widened distally, with a small lobe at distomesal angle, unarmed laterally. Tibia not stout, from laterally a little widened at base, lightly curved, from above anterior angle only slightly produced, armed distomesally with a short row of small black teeth, number of teeth varies from one to about ten; in some, completely unarmed there. Tarsus slender, curved, armed with the definite row of small tubercles. Chelicerae and palpus rusty yellow, not dark brown. Labrum as in Fig. 72, considerably swollen distally, armed with numerous teeth on both lateral surfaces.

Penis. Shaft 3.24–3.47 mm long, 0.35–0.44 mm wide at base, 0.17–0.21 mm wide at middle; glans 0.27–0.28 mm long, 0.06–0.08 mm wide; stylus 0.06–0.07 mm. Shaft very long, relatively narrow; widest at base and decreasing the width toward apex (Figs. 239–242). Basal opening shallowly indented. Alate part wider than shaft.

Chromosomes. 2N ♂ = 22 (8 acrocentrics + 14 metacentrics), N = 11 (Suzuki, 1957).

Female. — Labrum small, apex bluntly pointed (Fig. 73). Seminal receptacles as in Fig. 124.

Distribution. Kanto District (Map 3).

Detailed description is in Suzuki, 1957.

*Leiobunum tsushimense* Suzuki, n. sp.

(Jap. nam.: Tsushima-yama-zatōmushi)
(Figs. 65–66, 245–251, 342–344; Map 3)


*Diagnosis.* Distinguishable by the relatively slender palpus and the penis having typical funnel-shaped alate part.
Description. Measurements: holotype male: body length 4.13 mm; carapace 1.13 mm long, 2.44 mm wide; abdomen 2.50 mm wide. Palpus: 0.30 mm long, 0.27 mm wide; Fe 1.05 L, 0.27 W; Pa 0.65 L, 0.31 W; Ti 0.78 L, 0.27 W; Ta 1.26 L, 0.14 W. Femora: I 6.0, II 10.6 mm. Legs: I 28.3, II 58.2 mm.

♀ (Utsukushiga-hara): body length 4.00 mm; carapace 1.12 mm long, 2.44 mm wide; abdomen 2.00 mm wide. Palpus: Tr 0.39 mm long, 0.32 mm wide; Fe 1.24 L, 0.28 W; Pa 0.81 L, 0.29 W; Ti 0.85 L, 0.26 W; Ta 1.41 L, 0.15 W. Femora: I 6.6, II 11.1 mm. Legs: I 31.3, II 58.1 mm.

Male. — Body from above as in Figs. 342, 344; surface very finely granular; unarmed but rarely with one or two very small teeth at mid-frontal area before the eye tubercle. Eye tubercle rounded, slightly constricted at base, shallowly canaliculated, the carinae armed with a few small teeth. Coxae and genital

operculum with short hairs. Marginal row of denticles present but very small on both anterior and posterior sides of coxae I and II and on the posterior row of coxa III, usually invisible on anterior side of coxa III and on both anterior and posterior sides of coxa IV. Labrum differs in some degree between the two localities. That of Tsushima small, rod-shaped, armed with a row of teeth on both lateral sides (Fig. 65), while that of Utsukushiga-hara more or less club-shaped, enlarged, armed with a group of numerous teeth on both sides (Fig. 66).

Chelicera normal in structure, distal segment armed with a few black-tipped denticles on the distomesal area. Supracheliceral lamellae nearly smooth.

Palpus slender (Figs. 245–247); femur somewhat widened distally, strongly curved, almost unarmed; patella thickened distally, and with a short distomesal apophysis, in some, but few small teeth laterally; tibia in profile lightly curved below, armed distomesally with several (4–10) black-tipped teeth, in some, a few small teeth on the ventral surface; tarsus slender, curved below, with a ventromesal row of denticles, rarely two or three accessory denticles on the ventrolateral surface.

Legs long and slender, armaments much as in the related species.

Coloration. Ground color above in life pinkish-yellow to orange or rusty yellow; markings much similar to the allied species (Figs. 342, 344). Venter concolorous with dorsum, slightly lighter. Chelicera and palpus pale rusty yellow; in Utsukushiga-hara specimens palpus brown to dark brown, especially femur and entire patella blackish brown. Legs, except for trochanters which are pale rusty yellow, brown to dark brown, caputs of femora paler, tibiae III and IV with a broad white distal band.

Penis. Measurements of penis from two localities are as follows:

<table>
<thead>
<tr>
<th>Localities</th>
<th>Penis shaft</th>
<th>Glans</th>
<th>Stylus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length</td>
<td>Width at base</td>
<td>Width at middle</td>
</tr>
<tr>
<td>Tsushima Is</td>
<td>2.70</td>
<td>0.38</td>
<td>0.25</td>
</tr>
<tr>
<td>Utsukushiga-hara</td>
<td>2.60–2.79</td>
<td>0.37–0.42</td>
<td>0.23–0.27</td>
</tr>
</tbody>
</table>

Shaft widened at base, decreasing the width distally; basal aperture, especially ventral side deeply indented: alate part much wider than shaft, giving an appearance of typical funnel-shape.

Female. — Not known.

Notes. It is surprising that this species occurs in two widely separated localities (see Map 3). Tsushima Is. lies in the Sea of Genkai, about 100 km north of Kyushu, while Utsukushiga-hara in the Central Mountain District of Honshu. No specimens have been collected from the intermediate localities. Both Tsushima and Utsukushiga-hara specimens are much similar in the penis. This indicates the conspecificity of the two specimens. However, there exist some differences between them. Namely, the palpus is light rusty yellow in the
Tsushima specimen but dark brown in the Utsukushiga-hara specimen. Also, the labrum differs clearly between them as mentioned already. The differences hint that they may be classified into two different subspecies. However, it seems to be premature to draw a conclusion on this point.

Distribution. Tsushima Is. and Utsukushiga-hara (Map 3).

**Leiobunum hiraiwai hiraiwai** (Sato et Suzuki, 1939)
(Jap. nam.: Hiraiwasube-zatōmushi)
(Figs. 48-50, 110-111, 252-254, 264-269, 345-347; Map 4)


Other references are not required here.


Diagnosis. Characterized by slender male palpus and the structure of penis.

Description. Measurements (in mm): ♀ (Mt. Hikosan): body length 3.9-5.0 (M=4.2); width of abdomen 2.0-2.8 (M=2.3); femora: I 5.7-6.8 (M=6.0), II 10.0-12.0 (M=10.7); legs: I 28.7-33.2 (M=29.3), II 56.0-65.8 (M=59.4).

♂ (Mt. Hikosan): body length 4.6-5.7 (M=5.1); femur II 10.1-10.5 (M=10.3); legs: I 25.2-26.8 (M=26.1), II 56.1-57.1 (M=56.5).

♀ (Sandankyo): body length 3.8-4.6 (M=4.4); width of abdomen 2.3; femora: I 7.1, II 15.1; legs: I 37.5, II 74.7-84.0 (M=79.8).

Palpus (♀: Mt. Hikosan): Tr 0.33 L, 0.33 W; Fe 1.24 L, 0.32 W; Pa 0.73 L, 0.30 W; Ti 0.83 L, 0.30 W; Ta 1.41 L, 0.13 W; total length 4.53.

Male. — Palpus slender (Figs. 252-254); uniformly rusty yellow to orange yellow. Femur strongly curved, from above widened distally. Patella thickened distally, the distomesal angle slightly produced (Fig. 345), armed laterally at base with a few small teeth. Tibia: ventral side at base a little swollen, armed at distomesal angle with a group of small teeth, ventral surface unarmed, rarely with but few scattered teeth. Tarsus slender, curved, armed ventromesally with a row of small black teeth. Labrum short rod shaped, apex swollen, slightly bent upward, with two or three blackish teeth on each lateral side (Figs. 48, 50).

Penis. Hikosan ex.: Shaft 3.40-3.52 mm long, 0.58-0.62 mm wide at base, 0.25-0.29 mm wide at middle; glans 0.23 mm long, 0.08 mm wide, stylius 0.08-0.10 mm. Sandankyo ex.: Shaft 2.96 mm long, 0.54 mm wide at base, 0.29 mm wide at middle; glans 0.22 mm long, 0.27 mm wide, stylius 0.07 mm. Shaft long, much widened at base, then gradually reducing the width toward apex; basal opening deeply indented, especially so the ventral side (Figs. 264-267). Alate part well developed, much wider than the shaft; armed laterally with a
sharp-pointed spine which is directed downward (Figs. 268–269).

Chromosomes. 2n ♂ = 18 (all metacentrics), N = 9 (Suzuki, 1957).

Female. — As in Fig. 347. Labrum very small, simple rod-shaped (Fig. 49).
Seminal receptacles as in Figs. 110–111.

Distribution. So far known from Mt. Hikosan and Hiroshima prefecture (Map 4).

Detailed descriptions are in Sato and Suzuki, 1939 and Suzuki, 1953.


Fig. 255. *Leobunum hiraiwai shiranense*. Male left palpus, mesal (Shirane-sanzan), × 20.


Leiobunum hiraiwai hiraiwai. 264–265) Ventral and lateral views of penis (Hikosan), ×35. 266–267) The same (Snadankyo, Hiroshima), ×35. 268–269) Ventral and lateral views of distal portion of penis (Hikosan), ×55.

Leiobunum hiraiwai izuense Suzuki, n. subsp.

(Jap. nam.: Izusube-zatōmushi)

(Figs. 51–52, 112, 256–257, 270–274, 349–350; Map 4)


1974); Mt. Yahazu-yama, in cryptomeria forest at the foot, 550 m (male holotype, 16 ♂, 2 ♀ paratypes, M. Ohru leg., 24–VIII–1975); Amagi Tunnel, 650 m (1 ♂, 1 ♀, M. Ohru leg., 31–VIII–1975).

**Diagnosis.** Characterized by the light colored palpus and the structure of the alate part of penis.

**Description.** Measurements: ♂ (Mt. Yahazu-yama): cephalothorax 1.50 mm long, 2.90 mm wide; abdomen 2.70 mm wide; total body length 4.40 mm. Palpus: Tr 0.38 mm long; 0.34 mm wide; Fe 1.29 L, 0.35 W; Pa 0.78 L, 0.34 W; Ti 0.94 L, 0.35 W; Ta 1.41 L, 0.15 W; total length 4.80. Femur II 10.2 mm, leg II 53.5 mm.

Male. — Eye tubercle relatively low, wider than long, canaliculated above, nearly smooth or with but few denticles. Marginal row of small pointed teeth present on both anterior and posterior sides of coxae I and II and on posterior sides of coxae III and IV.

Palpus of moderate size (Fig. 256), not darkened but pale, rusty to orange yellow; femur strongly curved, patella widened distally and with the distomesal angle produced into a small apophysis which is set with dense short hairs; tibia somewhat thickened, in profile, swollen proximally, armed distomesally with a cluster of black denticles, number of denticles varies from three to ten or so, rarely some scattered denticles on the ventral surface (Fig. 257). Trasus slender, curved, ventromesally with a single row of small black denticles. Labrum (Fig. 51) much similar to that of *L. hiraiwai hiraiwai*.

Coloration. Ground color above rusty to orange yellow with greyish markings, marking pattern as in Fig. 348.

Penis (Figs. 270–274). Shaft 3.32–3.84 mm long, 0.55–0.70 mm wide at base, 0.30–0.32 mm wide at middle; glans 0.21–0.22 mm long, 0.08–0.10 mm wide; stylus 0.09–0.10 mm. Penis varies in length between localities; that of Tōgasayama is much shorter than that of other localities (compare Fig. 273 with Fig. 270). The structure of penis is much alike to that of the nominate subspecies, differing in the alate part which is more elongated than in the latter (compare Fig. 270 to Fig. 264).

Female. — Much larger than the male (Figs. 349–350). Palpal patella has elongated apophysis; tibia not swollen proximally, with short but distinct distomesal lobe, unarmed distomesally. Labrum as in Fig. 52. Concerning the coloration both male and female color types are distinguished. Of twelve females examined one half shows male type (Fig. 349) and another one half female type (Fig. 350). Seminal receptacles as shown in Fig. 112.

**Malformation.** Among 17 males taken from Mt. Yahazu-yama one male had abnormal penis (Fig. 274). Except for penis the specimen was completely normal in appearance.

**Distribution.** Izu pen. (Map 4).

Figs. 275–276. *Leiobunum hiraiwai shiranense*. Dorsal views of penis (Shirane-sanzan), ×35 and ×90, respectively.

*Leiobunum hiraiwai fuji* Suzuki, n. subsp.

(Jap. nam.: Fujisube-zatōmushi)

(Figs. 53–58, 113–115, 258–260, 277–280, 351–352; Map 4)


Other references are not required here.

*Material.* Mt. Fuji-san: the first station (1♂, Kurosawa leg., 30–VII–1936);

**Diagnosis.** Characterized by moderately enlarged dark brown male palpus and the structure of the alate part of penis.

**Description.** Measurements of males from four different localities are as follows:

<table>
<thead>
<tr>
<th>Localities</th>
<th>Body L</th>
<th>Femur II</th>
<th>Leg II</th>
<th>Penis shaft</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Length</td>
</tr>
<tr>
<td>L. Yamanaka</td>
<td>5.3</td>
<td>12.7</td>
<td>75.9</td>
<td>4.73</td>
</tr>
<tr>
<td>Mt. Tanzawa</td>
<td>4.4</td>
<td>12.6–13.7</td>
<td>70.2–75.3</td>
<td>4.43</td>
</tr>
<tr>
<td>Hakone</td>
<td>3.5–5.0</td>
<td>10.1–12.2</td>
<td>56.2–66.9</td>
<td>3.73–3.85</td>
</tr>
<tr>
<td>Kamikōchi</td>
<td>4.9</td>
<td>10.8</td>
<td>59.8</td>
<td>3.45</td>
</tr>
</tbody>
</table>

**Male.** — As in Fig. 351. Palpus moderately or considerably widened. Femur, patella and tibia brown, tarsus lighter. Kamikōchi specimen tends to have less strong palpus than that from other localities (Fig. 258). Inner side views of palpus are as shown in Figs. 258–259; lateral surface armed as follows: femur with a few small teeth distally, patella with scattered teeth at base, tibia with numerous teeth ventrolaterally (Fig. 260). Labrum enlarged, swollen distally, set with numerous teeth (Figs. 53, 55, 57).

**Penis.** Fairly enlarged and widened, alated (Figs. 277–280). General structure similar to that of *L. hiraiwai hiraiwai*. Basal opening deeply indented. The penis size shows considerable geographical variation as shown in the above table (see also, Figs. 277–279).

**Female.** — As in Fig. 352. Labrum and seminal receptacles as in Figs. 54, 56, 58 and Figs. 113–115, respectively.

**Notes.** Formerly, these specimens were treated as *Leiobunum hiraiwai* (Suzuki, 1953b) or *L. curtispalpe* (Suzuki, 1973b). However, due to the enlarged penis, well-developed male palpus, and very stout male labrum, they are treated here as a new taxon.

**Distribution.** Central Japan (Map 4).

Leiobunum hiraiwai shiranense Suzuki, n. subsp.
(Jap. nam.: Shiranesub-e-zatōmushi)
(Figs. 59–60, 116, 255, 275–276; Map 4)

Material. Yamanashi pref.: Nakakoma-gun, Shirane-sanzan, from Mt. Aino-

Diagnosis. Characterized by rather normal male palpus and the penis having
comparatively simple alate part.

Description. Measurements: ♀: cephalothorax 1.20 mm long, 2.40 mm wide;
abdomen 2.65 mm wide; total body length 4.82 mm. Femora: I 6.7, II 12.0 mm.
Legs: I 35.5, II 71.3 mm. Palpus: Tr 0.33 mm long, 0.35 mm wide; Fe
1.23 L, 0.34 W; Pa 0.76 L, 0.33 W; Ti 0.92 L, 0.33 W; Ta 1.40 L, 0.13 W;
total length 4.64 mm.

Male. — In general appearance similar to L. hiraiwai hiraiwai. Palpus (Fig. 255)
of rather normal size, light rusty yellow. Femur with only a few denticles laterally
near distal margin; patella widened distally, and with a very small distomesal
apophysis, armed laterally at base with a few small denticles. Tibia from the
side a little swollen at base, armed at distomesal angle with a small group of black
denticles, ventral surface unarmed or with only a few scattered denticles. Tarsus
armed with only one distomesal row of denticles. Labrum more or less club-
shaped, apex rounded, armed with numerous teeth on the lateral sides (Fig. 59).

Penis. Shaft 3.15 mm long, 0.55 mm wide at base, 0.28 mm wide at middle;
glans 0.25 mm long, 0.08 mm wide; stylus 0.10 mm. Shaft widened at base,
gradually narrower toward apex; basal aperture, especially ventral side deeply
indented. Alate part somewhat elongated, armed with a very small blunt process
which is directed below on each side at base (Figs. 275–276).

Female. — As in the related forms. Seminal receptacles and labrum as shown
in Fig. 116 and Fig. 60, respectively.

Distribution. Known from only type locality (Map 4).

Leiobunum hiraiwai longum Suzuki, n. subsp.
(Jap. nam.: Nagasesub-e-zatōmushi)
(Figs. 61–64, 117, 261–263, 281–284, 353–355; Map 4)

Material. Shiga pref.: Mt. Hira-san, Yakumoga-hara, at about 1,000 m
pref.: Hyōnosen (male holotype and 3 ♀, 3 ♀ paratypes, S. Kuramoto leg.,

Diagnosis. Characterized by the well-developed dark brown male palpus and
very elongated, relatively narrow penis.

Description. Measurements: ♀ (Hyōnosen ex.): cephalothorax 1.38–1.60 mm
long, 2.50–2.68 mm wide; abdomen 2.63–2.85 mm wide; total body length 4.68–
5.39 mm. Femora: I 6.1, II 11.4 mm. Legs: I 30.2, II 66.1 mm. Palpus: Tr 0.39 mm long, 0.32 mm wide; Fe 1.52 L, 0.45 w; Pa 0.74 L, 0.38 W; Ti 1.00 L, 0.40 W; Ta 1.52 L, 0.16 W; total length 5.17 mm.

Male. — Body from above as in Fig. 353. Palpus well developed (Figs. 261–263); femur, patella and tibia dark brown, tarsus paler. Femur considerably swollen, widened distally, from the side strongly curved. Patella arched above, widened distally, and with a distomesal angle slightly produced (Fig. 262); femur distolaterally and patella laterally with scattered teeth. Tibia from above as shown in Fig. 262, in profile, thickened proximally, armed distomesally with a group of black denticles, and ventrally, especially ventrolaterally with numerous denticles (Fig. 263), number of denticles differs by specimens. Tarsus slender, curved, armed with a ventromesal row of small black teeth.

Larvum (Figs. 61, 63) thickened at middle, apex pointed, lightly bent upward, armed with some black teeth on both sides.

Penis (Figs. 281–284). Shaft 4.21–4.34 mm long, 0.60–0.61 mm wide at base, 0.20–0.21 mm wide at middle; glans 0.22–0.25 mm long, 0.08 mm wide at widest portion, stylus 0.08 mm. Shaft fairly elongated, relatively slender, with sides nearly parallel, abruptly widened at base, pigmented. Basal opening, especially ventral side very deeply indented. Alate part well developed but shorter than in the related forms. Wings heavily sclerotized, armed with one pair of lateral sharp-pointed curved spines which are directed downward, and further one spine on each side of the ventral side.

Female. — As in Fig. 355. Labrum (Figs. 62, 64) simple, pointed at apex, unarmed. Seminal receptacles as in Fig. 117.

Distribution. Known from eastern part of Tottori pref., Kyoto and Shiga prefectures (Map 4).

_Leiobunum esoense_ Suzuki, n. sp.

(Jap. nam.: Ezosube-zatômrushi)

(Figs. 90–93, 126, 285–286, 356; Map 4)


**Notes.** Hokkaido specimens of the _curvipalpe_-group were so far treated as _Leiobunum curvipalpe_ Roewer on account of much similarity in general structure and coloration. However, the present study reveals that the species of this group can not be correctly identified unless males are available. Of more than forty specimens hitherto taken from Hokkaido, not a single male was found, and therefore, their specific identification is difficult. At any rate, it is apparent that they show close affinity with such species as _L. lohokuense_ or _L. globosum_ of this group. With the present state of informations I hesitate to identify the Hokkaido specimens. However, for the practical reason they are treated here as a separate species.

**Material.** Hokkaido: Maruyama Park, Sapporo (female holotype and 4 ♀ paratypes, S. Suzuki leg., 27–VIII–1957); Akkeshi, near Akkeshi Marine Bio-

Description. Measurements: ♀ (Sapporo ex.): cephalothorax 1.61 mm long, 2.75 mm wide; abdomen 2.70 mm wide; total body length 5.90 mm. Femora: I 7.9, II 14.1 mm. Legs: I 35.1, II 74.1 mm.

Female. — As in Fig. 356. In general structure and coloration much similar to the related species of the curvipalpe-group. Eye tubercle rounded, canaliculated, armed with pointed teeth at frontal region (Fig. 286). Marginal row of tubercles present on both anterior and posterior sides of coxae I, II and III, and on posterior side of coxa IV, sometimes tubercles invisible on the anterior side of coxa III and posterior side of coxa IV.

Chelicera normal; supracheliceral lamellae produced medially, small, with a pointed teeth at apex.

Palpus as shown in Fig. 285; tarsus unarmed but in one specimen from Sapporo, the segment armed with a ventromesal row of about six blackish teeth. This is considered individual variation.


Labrum shows some variation even within the same one population as illustrated in Figs. 90–93.

Seminal receptacles as in Fig. 126, main ampulla somewhat elongated.

Distribution. Hokkaido (Map 4).

Leiobunum sp.

(Figs. 94, 125, 357; Map 4)


The examined specimens were females. In general structure they are much alike to the members of the curvipalpe-group. However, they are unidentifiable,
because no male was available for the study. Brief description is given below.

Female. — As in Fig. 357. Member of the curvipes-group. Cephalothorax 1.50 mm long, 2.50 mm wide; abdomen 3.00 mm wide; total body length 5.20 mm. Femora: I 5.7, II 10.2 mm. Legs: I 28.2, II 51.5 mm.

Labrum (Fig. 94) much alike to that of L. esoense.

Seminal receptacles as shown in Fig. 125.

Distribution. Ullung-do Is. (Map 4).

*Neima gigantea* (Loman, 1902)

(Jap. nam.: Onami-zatōmushi)


*Leiobunum giganteum* has long been obscure for Japanese workers. I have been able to examine two female syntypes preserved in the Zoological Museum, Hamburg and one male and one female paratypes deposited in the Senckenberg Museum (SMF No. 65-54). After examination it became evident that all the specimens have no marginal row of small tubercles on anterior and posterior sides of all coxae. The surfaces of all coxae are roughly granular, and accordingly, it is very likely that the granules arising near sides might have been mistaken for marginal tubercles by Loman and Roewer. For this reason, the specimens originally described as *Leiobunum giganteum* must be placed under the genus *Neima*.

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Map 2. Distribution of four species and subspecies of Leiobunum. ○ L. japonicum japonicum, ● L. japonicum uenoii, ▲ L. rubrum,
◆ L. hikocola.