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Three New Halictine Bees from Japan (Hymenoptera, Apoidea)[1),2)]

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Abstract. Three new halictine bees are described from Japan: ***Lasioglossum*** *(Lasioglossum)* ***nipponicola*** sp. nov.; ***L. (L.) ebmerianum*** sp. nov.; ***L. (Evylaeus) sphecodicolor*** sp. nov.

In the present paper 3 new species of the halictine bees are described from Japan. Terminology, abbreviations and style of description follow Sakagami & Tadauchi (1995). The holotypes and some paratypes are to be deposited in Entomological Institute, Hokkaido University, Sapporo and other paratypes are in Entomological Laboratory, Kyushu University, Fukuoka, A. W. Ebmer's collection in Linz, Austria, and some other institutions, or to be returned to private collection of the owners.

Lasioglossum (Lasioglossum) nipponicola sp. nov.

Although the naming was circumstantially delayed, this species is quite common in Japan and has so far been recorded from various localities under the code ***L. (L.)*** sp. 3 given by one of us (S. F. S.).

Lasioglossum (Lasioglossum) sp. 3: Sakagami & Fukuda, 1972: 3; Sakagami & Fukuda, 1973: 246; Sakagami ***et al.,*** 1974: 33; Usui ***et al.,*** 1976: 228; Yamauchi ***et al.,*** 1976: 415; Mu-

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nakata & Kikuchi, 1979: 30; Ishii & Yamane, 1981: 47; Yamauchi et al., 1982: 418; Munakata & Matsumura, 1985: 24; Haneda, 1985: 312; Okazaki *et* al., 1986: 82; Munakata, 1986: 27; Munakata *et al.,* 1987: 21; Yamada & Sakagami, 1988: 14; Yamada *et al.,* 1990: 38; Haneda, 1990: 3; Inoue *et al.,* 1990: 458; Kato *et al.,* 1990: 371; Haneda, 1991: 33.

Female. Large and robust. BL 9.1-10.8 mm, WL 8.1-9.9 mm.

Color: Black except flagella below (blackish brown), mandible apically (reddish brown), tegula (dark to blackish brown), tarsi (blackish to dark brown), sometimes legs more brown-tinted. Metasomal terga marginally slightly brown-tinted but never semitransparent. Wings slightly infuscate, veins and pterostigma brown, subcosta blackish brown.

Pilosity: Generally sparse. Tomenta hiding surface only on pronotum, metanotum and T1-3 basally. Hairs whitish, but with admixture of some dark hairs (in some specimens merely deep yellow brown but in others distinctly darker) on vertex and mesosomal dorsum. Fine, bristle-like, appressed hairs on metasomal terga dark brown as usual in many halictines. *Head:* Hairs on vertex medially 200-275μ, laterally 125-150μ, brown to dark brown. Facial and paraocular hairs grayish white to pale yellowish white. Ocellocular hairs 125-175μ. Facial and paraocular hairs 250-300μ, more plumose, especially in the latter, but not hiding surface. Supraclypeal hairs sparser, laterally ±125-250μ. Clypeal hairs to 250μ, bristle-like and dark. Genal hairs along outer orbits fine and dense but not tomental, not hiding surface, finely plumose; longer, post- and downward, attaining 250-375μ. *Mesosomu:* Pronotum frontally tomented, particularly along outer margin; dorsum anteriorly, dorsal ridge above and around lobe tomented. Mesoscutum with long (250μ) erect and short (50μ) semiappressed hairs, both yellowish white but the former admixed with some dark hairs in about 1/2 of specimens. Scutellum similar with some dark hairs, posterior hairs longer, attaining 425μ. Metanotum with pale yellow hairs (±375μ) admixed with some pale brown hairs. Mesepisternum with moderately dense, pale yellow, distinctly plumose hairs, above ±200μ, downward to 300μ. Propodeal scopa rather poor, occupying small area; propodeal side densely whitish tomented, particularly post- and downward; shield not tomented, with moderately dense, poorly plumose erect hairs (±250μ). Femoral scopa dense as in many consubgeners. *Metusomu:* T1 on slope anteriorly with dense 320μ (medially) to 500μ (laterally) plumose hairs, posteriorly with sparse, simple hairs (±175μ); disc with inconspicuous, very sparse, finest hairs, seen virtually glabrous, PMA (=postmarginal area of metasomal tergum) glabrous. T2-4 with basal tomental bands (often medially narrowed and hidden by T*n*-1), disc homogeneously covered with dark brown, semiappressed, spinous hairs (125-175μ), as usual in many halictines. T2 PMA medially with sparser, relatively short (75-100μ) hairs, being dark, fine but bristle-like, and nearly appressed. T3-4 similar but bristle-like hairs on disc postward denser and coarser; PMA with similar hairs but finer and nearly appressed. Sternal scopa issuing from apical 2/3, erect, 500-625μ, with long branches.

Structure: Head: distinctly elongate (Fig. 1), HL/HW = 1.04 ± 0.01 (1.03-1.08, n=10). Vertex medially nearly straight, laterally mildly outcurved. Lateral ocellus nearly 2 times of own short axis distant from summit. Occiput not carinate. Inner orbits slightly convergent below. UOD:MOD:LOD =1:1.15:0.98. Outer orbit mildly rounded. IOD:OOD:VOD = 1:0.92: 1.02. Ocellocular area densely punctate, Pϕ = 20-25μ, IS linear and rather shiny. On face PP slightly finer and IS dull, seen microreticulate, whereas on paraocular area coarser, 25μ or more, IS linear as on face but PP sparser downward, IS becoming ≥Pϕ smoother and shiner. Frons flat,

frontal carina above not attaining MOD-line. Supraclypeus mildly convex, finely granular and dull, with PP ±25$\mu\phi$ moderately dense and IS >ϕ. Clypeus lower > supraclypeus, above finely granular and shiner > supraclypeus with ill-defined PP (ϕ±25μ) IS > ϕ below IS somewhat longitudinally undulate with coarse, ill-defined PP; clypeal tooth distinct. Gena above not angulate as in ***L. occidens,*** granular along orbits, post- and downward distinctly striate. EW:GW = 1: 1.07. Scape nearly exceeding lateral ocellus. Mandible bidentate. Maxillary and labial palpi normally 6 and 4 segmented. ***Mesosoma:*** HW:MsW:MtW = 1: 1.16: 1.24. Lateral angle of pronotal ridge sharply pointed, though less than in ***occidens.*** Mesoscutum anteriorly truncate, but not sharply carinate as in ***occidens;*** medially with PP 20-30$\mu\phi$, IS mostly linear, ≒1.5Pϕ, finely granular and dull (Fig. 2); PP finer anteriorly (often Pϕ>20μ, IS linear), posteriorly coarser, Pϕ to 30μ, IS to 1.0, more superficially granular and dimly shining. Mesoscutellum depressed medially, PP finer on anterior and posterior areas as well on median depression, IS linear and dull, coarser on submedian convexity, to 25$\mu\phi$ and IS linear but smoother and shiner. Mesopleuron coarsely and rather transversely reticulate, areola finely granular, dimly shining. Propodeal dorsum basally moderately, apically more gently slanting, slightly to distinctly shorter than mesoscutellum. MCL:PDL = 1:0.81(0.73-0.93), with coarse longitudinal ridges; IS ±50μ, often connected with weak transverse ridges but not properly anastomosing (Fig. 5), finely granular and dimly shining; posteriorly mildly angulate but not sharply and continuously carinate; laterally ridges more parallel-sided and connected each other at the ends, forming weak oblique carina separating dorsum and coarsely granular lateral slope; dorsal ridges not descending downward beyond oblique ridge, replaced by irregular, rather weaker ridges on lateral slope. Propodeal side granular, with weak transverse carinulae. Shield granular, with weak obliquely parallel ridges, lateral carina very sharp, above attaining to dorsal end. Tegula finely granular anteriorly, smooth and shining posteriorly. Vein ***tc*** 3 weakened but ***tc*** 2 not. Number of hamuli 3-1-1-2, 3-l-l-l-2, 4-l-l-2 (most frequent), or 4-l-3. Basitibial plate distinctly encircled with carina. Hind tibia1 spur with 5-7 small teeth, each much shorter than spur's width. *Metasoma*: Elongate oval. T1 on slope with sparse, but distinct PP (15-25μ)Pϕ, IS>>->Pϕ, finely and superficially tessellate, dimly shining; disc similarly sculptured but IS smoother and shiner; lateral convexity mild, PP sparser; PMA laterally distinctly demarcated from disc by depression, PP denser (IS ≤ Pϕ) with fine striation; medially similar but not sharply demarcated from disc. T2 basally so distinctly depressed that disc seen convex, granular with dense PP (15-20$\mu\phi$), but IS ≥ Pϕ lateral convexity milder> T1, with PP ±25$\mu\phi$ and IS shiner; PMA demarcated from disc by distinct depression, very wide, nearly occupying 1/3 of the visible part of disc, with dense fine (±20$\mu\phi$) PP (IS<ϕ) merged in fine striation. T3 similar, but basal depression and lateral convexity milder, and IS on disc more granular. T4 as on T3 but PP sparser, merged in granular IS.

Male*. Smaller and more slender than in female. BL 8.0-10.0 mm, WL 7.4-8.5 mm.

Color: As in female., without pale markings. Even clypeus below black, not yellow unlike in many halictine species.

Pilosity: Generally as in female, but dark hairs exceptional. ***Head:*** Facial and especially paraocular hairs more plumose though not properly tomental, virtually without dark hairs

1 On secondary sexual differences in halictines, see Sakagami & Maeta, 1990 and Sakagami & Tadauchi, 1995.

except occasional presence on supraclypeus and clypeus. ***Mesosoma:*** Hairs slightly longer, dark hairs at most admixture of sparse pale brown hairs in some males. Scopa replaced by dense plumose hairs. Hairs on legs normally simple. *Metasoma*: Hairs generally sparser, basal patches more confined basilaterally. S1-4 with sparse, simple hairs. Apical margin of S5 submedially with moderately dense plumose hairs (Fig. 18). S6 with median tuft elliptical, lateral tuft small and narrow, located along apical 2/3 of median tuft, neither fused each other nor attaining sternal margin (Fig. 18).

Structure: Generally similar to female, except the following features and some other male specific features[1]. *Head*: Slightly longer > female. HL/HW = 1.08 ± 0.01 (1.06-1.10, n=10). UOD:MOD:LOD = 1:1.08:0.08, IOD:OOD:VOD = 1:0.95:1.21. EW:GW = 1:0.94. Flagella longer (F2L:F2W = 15.0 ± 0.8:8.8 ± 0.6, n=10), attaining propodeum. Genal surface postward smoother and shiner. ***Mesosoma:*** HW:MsW:MtW = 1: 1.07:0.96. Scutal IS narrower, smoother and shiner even medially, much more posteriorly. Scutellar submedian convexity more conspicuous, IS smoother and shiner. Mesopleural reticulation more irregular than transverse. Propodeal ratio SCL:PDL = 1:0.90, but quite variable, ranging 0.85-1.00; longitudinal ridges coarser, IS = 70μ or more. Transverse ridge on dorsal end coarser but not continuous. Vein ***tc 3*** and recurrent vein 2 weakened but less > female. Basitibial plate represented by mere triangular elevation demarcated with carina much poorer > female. Hind distitarsi basally moderately narrowed. ***Metasoma:*** Essentially = female, but more elongate. Lateral convexities and basal depressions more conspicuous. IS generally slightly smoother and shiner. Visible sterna not particularly modified. S7 with median process narrowly triangular. S8 with median process apically widely truncate (Fig. 8). ***Genitalia:*** Gonobase transverse, lateral margins slightly divergent. Gonocoxite rectangular, outer margin not outcurved, approximately continuing gonobasal contour. Gonostylus simple, flat and discoid, hairless but with sparse spots. Ventral retrose lobe absent (Figs. 9-11).

Distribution: Japan (Hokkaido: Teshio, Kamikawa, Kushiro, Tokachi, Hidaka, Ishikari, Sorachi, Shiribeshi, Iburi, Oshima Districts; Honshu: Aomori, Miyagi, Ibaraki, Tochigi, Tokyo, Gifu, Fukui, Kyoto Prefs.).

Floral records: Rhododendron sp., ***Taraxacum officinale, Hydrangea macrophylla*** f., ***Hydrangea panniculata, Lingustrum obtusifolium, Lilium cordatum v.*** *glehni, Sedum* ***kamtschaticum, Rudbeckia laciniata, Echinops*** sp., ***Cirsium kamtschaticum, Cirsium aomoriense,*** *Polygonum* ***thunbergii, Polygonum*** *longisetum, Polygonum* ***perfoliatum, Polygonum senticosum,*** *Polygonum* sp., ***Rosa multiflora, Deutzia crenata, Campanula*** sp., ***Rosa rugosa, Weigela hortensis,*** *Impatiens* ***textori,*** *Impatiens* ***noli-tangere,*** *Sorbaria* ***sorbifolia, Potentilla fruticosa v.*** *rigida,* ***Monarda fistulosa, Geranium*** *nepalense* spp. ***thunbergii, Breea setosa, Trifolium*** *repens,* ***Brassica*** *napus,* ***Erigeron philadelphicus, Hieracium*** sp., ***Aralia cordata, Achyranthes japonica, Carpesium abrotanoides, Youngia denticulata, Kalimeris yomena, Kalimeris*** *pinnatifida,* ***Stephanandra*** *incisa,* ***Acanthopanax trichondon,*** *Rubus* ***crataegifolius,*** *Rubus* ***parvifolius, Stenactis*** *annuus,* ***Astilbe odontophylla, Lysimachia clethroides, Patrinia villosa, Plectranthus*** *inflexus, Isodon inflexus,* ***Isodon trichocarpus, Lactuca denticulata, Aster ageratoides*** ssp. ***ovatum, Aster glehnii, Elshortzia*** *ciliata,* ***Picris hieracioides v. japonica, Viola verecunda,*** *Rubus* ***palmatus, Hieracium*** sp., ***Sonchus brachyotus, Zanthoxylum schinifolium, Patrinia villosa,*** *Ampelopsis* ***brevipedunculata v. heterophylla.***

Type specimens: Holotype: female, Asahiyama in Asahikawa, Hokkaido, 24. v. 1985 (T.

Inaoka). Paratypes (Females = F, Males = M): [Hokkaido]: Sapporo: Hokkaido Univ. Bot. Gardens, all 1959 (S. F. Sakagami): 1F, 20. v.; 3F, 4. vi.; 1F, 8. vii.; 1F, 14. vii.; 1F, 20. vii.; 2F, 11. viii.; 1F, 19. viii.; 1F, 25. viii.; 2F3M, 7. ix.; 1F2M, 8. ix.; 2M, 14. ix. Hokkaido Univ. Bot. Gardens, all 1979 (S. F. Sakagami): 1F, 6. vi.; IF, 5. vii.; 2F, 9. vii.; 1F, 14. vii.; 1F, 16. vii.; 5F, 23. vii.; 2F, 30. vii.; 1F, 11. viii.; 1F, 13. viii.; 1F, 23. viii.; 1F, 25. viii.; 1F, 29. viii.; 1F, 8. ix.; 1F, 14. ix.; Mt. Moiwa in Sapporo, 15. vi. 1972 (H. Kawano). Teshio: 1M, KamiOtoineppu, 7. ix. 1970 (S. F. Sakagami & H. Fukuda). Kamikawa: Yukomanbetsu, ±1000 m, 6. ix. 1967 (H. Fukuda); Asahiyama in Asahikawa, 1969 (H. Fukuda): 1F, 15. vii.; 1M, 29. viii.; 1M, 30. viii.; 1M, 2. ix.; Inosawa in Asahikawa, (H. Fukuda): 2F, 26. vii. 1967; 1M, 26. viii. 1969; 3M, 10. ix. 1969; 1M, 12. ix., 1969; 1F, 29. v. 1970; 1F, KamiDaiba in Asahikawa, 13. ix. 1986 (T. Inaoka); Nokanan, ±400 m, 1967 (H. Fukuda): 2F, 8. vi.; 1F, 21. vii; 2M, 10. viii.; 4M, 5. ix.; 2F, 8. ix.; 9M, 20. ix. Kushiro: 2F2M, Tenneru in Kushiro, 1968 (E. Ohtsuka). Sorachi: KitaMoshiri (S. F. Sakagami & H. Fukuda): 1M, 10. ix. 1969; 2M, 14. ix. 1969. Shiribeshi: 1M, Akaigawa, 1M, 26. viii. 1976 (M. Usui). [N. Honshu]: Aomori Pref. (M. Yamada): Mt. Iwaki: 2M, 5. ix. 1980; 1F, 21. ix.; 1F, 5. x. 1980; 1F, Takinosawa, 4. ix. 1982; 2F, San'yohshi in Mimmaya, 16. ix. 1985; 1M, Ichinowatari in Hirosaki, 21. ix. 1985; 2M, Kudoji in Hirosaki, 29. viii. 1984; 1M, Osaki in Hirosaki, 10. x. 1980; 1M, Sasanigawa in Takko, 22. ix. 1985; Takinomata in Tokko: 1M, 30. viii. 1987; 1M, 4. ix. 1982; 1M, 15. ix. 1986; 1M, Nagoshita in Gonohe, 29. viii. 1987; 1F, Takinomata in Takko, 13. ix. 1987; Matsusaka in Takko: 1F, 20. vii. 1986; 1M, 16. ix. 1986; 1F, 10. x. 1986; 1F, Tsukushimori, 4. x. 1986; 2F, Kaname, 8. ix. 1981; 1F, Amagamori in Misawa, 27. vii. 1986; 1F, Mt. Bonju, 13. vi. 1982. Miyagi Pref., all Rifucho (K. Goukon): 1977: 1F, 27. v.; 3F, 12. vi.; 3M, 15. viii.; 1F, 20. viii.; 2F1M, 1. ix.; 6F2M, 6. ix.; 2F5M, 8. ix.; 1M, 11. ix.; 1F, 15. ix.; 1M, 17. ix.; 1F1M, 18. ix.; 23. ix.; 1980: 2F, 4. vi.; 2F, 12. vi.; 1F, 13. vi.; 1F, 3. vii.; 3F, 13. vii.; 1M, 15. viii.; 2M, 28. viii.; 9F6M, 31. viii.; 1F, 1. ix.; 1M, 4. ix.; 2F3M, 6. ix.; 1F, 8. ix.; 4F, 9. ix.; 1F, 13. ix.; 13F1M, 14. ix.; 1F, 18. ix.; 1F, 19. ix.; 1F1M, 26. ix.; 3F, 4. x.; 2F, 18. x. [C. Honshu]: Ibaraki Pref.: 1M, Mt. Tsukuba, 28. ix. 1981 (M. Yamada). Tokyo Pref. (H. Takahashi): Mt. Mitake: 1F1M, 7. ix. 1986; 1F, 22. ix. 1986; 1M, 23. ix. 1986; 1M, Nippara in Okutama, 28. ix. 1981. Gifu Pref.: 1 gynandromorph, Nigorigo, 9. ix. 1976 (Y. Morimoto)(head and left hind leg male-like, wing veins, right hind leg and metasoma female-like). Fukui Pref. (Y. Haneda): 1F, Suwara, 19. viii. 1979; 1M, San-no-mine on Mt. Hakusan, 1. ix. 1982. Kyoto Pref: Asoga, Kibune in Kyoto: 2F, 7. v. 1986 (M. Kato) 1F, 28. vi. 1984 (M. Kato); 1F, 24. vii. 1986 (M. Kakutani); 1M, 26. viii. 1987 (T. Suka); 1M, 26. ix. 1986 (M. Kato); Ashu: 1F, 19. vii. 1984 (T. Inoue, honey bait); 24. ix. 1986 (M. Kakutani). (The following paratypes are in A. W. Ebmer's collection: 4F3M, all from Hokkaido Univ. Bot. Gardens, 1959 (S. F. Sakagami): FF: 6. vi., 11 & 25. viii, 8. ix.; MM: all 7. ix.)

Comparative notes: Within the Japanese species of the *L. (L.) zonulum* group with hair-tufts on male sternum 6, which vary species-specifically, *L. nipponicola* sp. nov. resembles *L. kansuense* (Blüthgen, 1934 = *L. esoense* Hirashima et Sakagami in Sakagami *et al.,* 1966) and *L. harmandi* (Vachal, 1903) by the elongate head (Fig. 1)[1]. Ratios HL/HW in 3 species are as follows (n=6 in *L. kansuense*, male, n=10 in other cases):

1 Although not cited by Tadauchi (1989) *L. harmandi* is recorded from northern Hokkaido (cf. Sakagami & Fukuda, 1972).

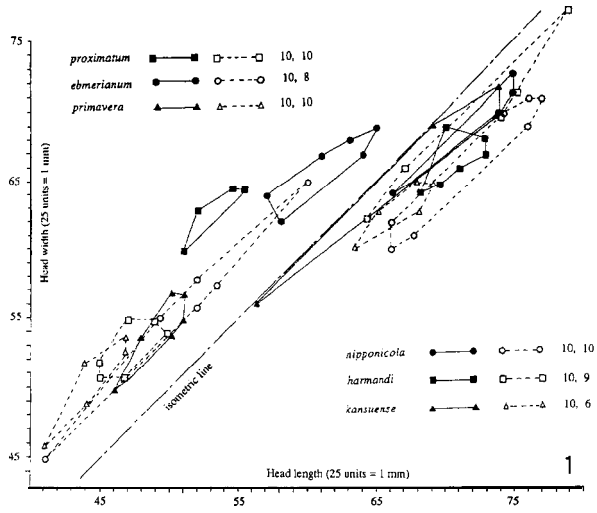


Fig. 1. Comparison of head width/length ratios in both sexes of 6 Japanese species of *Lasioglossum s.* str. Three species have elongate heads *(L. nipponicola* sp. nov., *L. harmandi* and *L. kansuense)* and 3 species have transverse heads *(L. ebmerianum* sp. nov., *L. proximatum* and *L. primavera).* Number of studied specimens are shown within the figure.

nipponicola Female 1.04 ±0.01(1.03-1.08) Male 1.08 ±0.01(1.06-1.10)
kansuense Female 1.04 ±0.01(1.03-1.08) Male 1.06 ±0.01(1.05-1.08)
harmandi Female 1.06 ±0.01(1.04-1.08) Male 1.06 ±0.01(1.02-1.08)

The 3 species are distinguished from each other by the following features:

1- Male clypeus apically transversely yellow in *kansuense* as in many halictines, but concolorously blackish in *harmandi* and *nipponicola.*

2- As in many halictines, admixture of dark hairs (dark brown, rarely blackish brown) on head (vertex and clypeus) and mesosomal dorsum, particularly on mesoscutum in females absent in *kansuense,* but fairly conspicuous in *harmandi* and intermediate in *nipponicola.* In male there is no proper admixture but some mesoscutal hairs are relatively dark in *harmandi.*

3- Upper part of head conspicuously raised in *harmandi* than in *nipponicola* and *kansuense* as seen from ratio IOD/OOD/VOD.

	Female	Male
nipponicola	*l/0.92/1.02*	*l/0.95/1.21*
harmandi	*l/1.11/1.36*	*l/1.16/1.46*
kansuense	*l/1.04/1.08*	l/1.08/0.89

4- Mesoscutal sculpture in females denser and IS granular in *nipponicolu* (Fig. 2), sparser and IS less granular in *harmandi* (Fig. 4), as dense as in *nipponicola,* but IS smoother and shiner in kansuense (Fig, 3), especially on posterior area. This and the next differences also seen in males but less conspicuous due to generally sparser PP on smoother and shiner IS.

5- In *nipponicola* mesepistemal sculpture coarsely and rather transversely reticulate with areolae finely granular and dully shining. In *harmandi* reticulation weaker and more irregular, and IS rather shiny, somewhat resembling that in *L. ebmerianum* sp. nov., described below, though less strongly. In kansuense just intermediate between the 2 species.

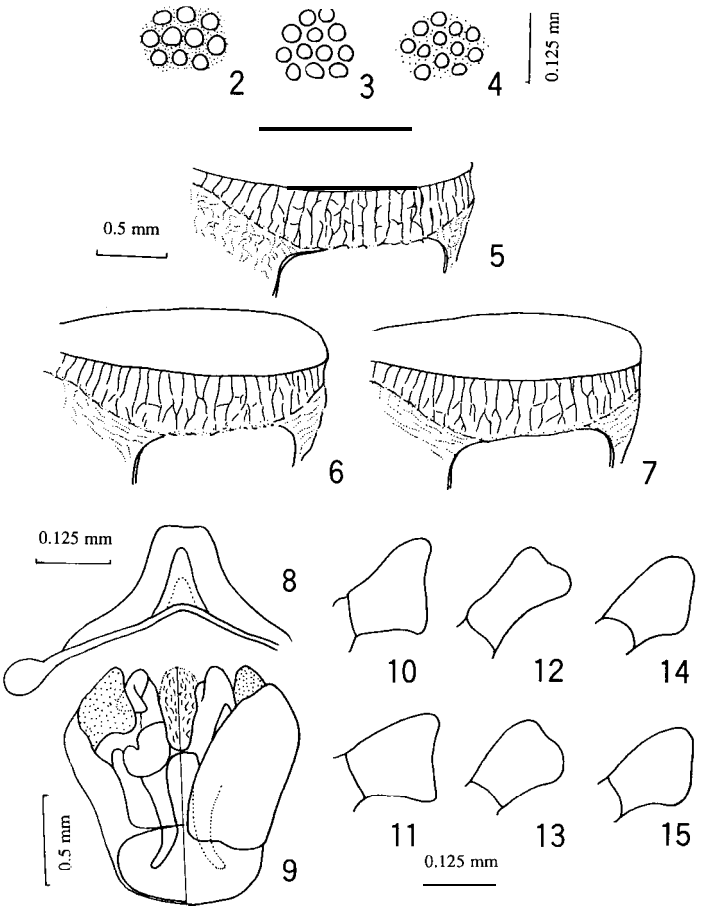
6- In *nipponicola* propodeal dorsum only weakly depressed, apically rather irregular, not neatly demarcated; lateral slope irregularly and weakly reticulate and granular (Fig. 5). In *harmandi* dorsum depressed as in *nipponicola,* apically linearly demarcated but only by flexion, not by carina. Lateral slope with weak transverse lineo-carination. In *kansuense* dorsum virtually not depressed, apically rather roundly angulate. Lateral slope as in *harmandi.*

7- Male sternum 6 with hair tufts distinctly species specific (Figs. 18-*nipponicola*, 22-*kansuense, 23-harmandi).*

8- Seen ventrally male gonostylus triangular in *nipponicola* (Figs. 10-11), lateral margins weakly divergent apically in *kansuense* (Figs. 12-13) and apically rather rounded in *harmandi* (Figs. 14-15).

The *Lasioglossum zonulum* group is characterized by the possession of peculiar hair tufts on male metasomal sternum 6 (cf. Haneda, 1990), which are more distinctive than genitalia and can be studied without dissecting specimens. This structure facilitates, in part helped by the abundance of males of this group collected on flowers, at least in Japan (Sakagami & Fukuda, 1973), distinction of males which is often difficult in other halictine groups. Figs. 16-24 present these hair tufts in all known Japanese species and a holarctic species *L. zonulum* (Smith, 1848) (not yet recorded from Japan). The hair tufts consist of 3 parts, median, and submedian tufts and lateral outskirts. The median tuft is less variable, usually oval but nearly circular in *L. occidens* (Smith, 1873) (Fig. 16) and *L. subopacum* (Smith, 1853) (Fig. 17), and very small in *L. scitulum* (Smith, 1837) (Fig. 21). Submedian tufts are most diversified, very developed and not fused in *occidens* and *subopacum,* fused in *scitulum, kansuense, harmandi,* and *mutilum* (Vachal, 1903) (Figs. 21-24), or neither developed nor fused in *nipponicola* sp. nov. (Fig. 18). Outskirts are optional, absent in *occidens* and *scitulum,* present and extending latrad in *subopacum, gorkiense* (Blüthgen, 1931), and *nipponicola* (Bliithgen, 1931), *zonulum, scitulum* and *kansuense,* further replaced by dense hairs in *mutilum* (Vachal, 1903). Further comparison of other species in the same group (about 10 more species, Ebmer, pers. comm.) should contribute to the phyletic relation within the species group.

Among the species presented in Figs. 16-24, *occidens* and *subopacum* are noteworthy by the enlarged median as well submedian tufts. Moreover, females of these species differ from others by anteriorly sharply truncate mesoscutum (Fig. 26 vs. 25), developed pronotal dorsal ridge (Fig. 28 vs. 27), possession of enlarged teeth of inner hind tibia1 spur (Fig. 30 vs. 29), and angulate temple (Fig. 31 vs. 32). The same common features are also seen in both sexes of *L. (L.) koreanum* Ebmer 1978. Some other species, e.g., *L. (L.) pseudooccidens* (Bltithgen, 1926) known by a single female from Sikkim, may also belong to the same group as this species shares all features given in Figs. 26, 28, 30, 31. These species could be placed within the *L. subopacum* subgroup of the *L. zonulum* group.



Figs. 2-15. 2-4: Mesoscutal sculptures (between median and parapsidal furrows) of females of *L. nipponicola* sp. nov. (2), *L. kansuense* (3) and *L. harmandi* (4). Scale = f0.125 mm. (m.s = median and submedian tufts, a = apical outskirt). 5&6: Propodeal sculptures of females of *L. nipponicola* sp. nov. (5), *L. kansuense* ***(6)*** and *L.* ***hurmundi (7).*** Scale = ±0.5 mm. 8-15: Male sterna 7 and 8 (8) and genitalia (9, left/right = ventral/dorsal view) of *L. nipponicola* sp. nov., and ventral views of gonostylus of *L.* ***nipponicolu*** (10&11), *L.* ***kansuense*** (12&13) and *L.* ***hurmundi*** (14&15), showing some inter- and intraspecific variations.

***Lasioglossum (Lasioglossum) ebmerianum sp.* nov.**

This species was twice recorded from Aomori Pref., N. Honshu.

Lasioglossum (Lasioglossum) sp. ***2:*** Yamada & Sakagami, 1988: 14; Yamada ***et al.***, 1990: 37.

Female. Large and robust. BL 7.3-10.3 mm, WL 7.5-8.6 mm (*n*=10).

Color: Black, except flagella below (dark brown), mandible apically (chestnut red), tegula (dark to blackish brown), tarsi (blackish to dark brown). Metasoma jet black, tergal ends rarely dark brown-tinted but never semitransparent. Wings transparent, veins and pterostigma brown to deep brown, subcosta dark brown.

Pilosity: Generally as in *nipponicola,* but dark hairs on mesosoma much sparser. Sparse, only pronotal ridge above and around lobe, basilateral patches on T2-4 (T4 often hidden by T3) distinctly tomented, hiding surface. White, often with sparse admixture of brownish hairs on mesoscutum and -scutellum. Appressed hairs on T2-5 brownish as in most halictines. *Head:* Vertex simple to poorly plumose, hairs 250-300μ medially. Hairs ±175μ on ocellocular area, 250-300μ on face and paraocular area, distinctly plumose, denser on the latter but not hiding surface, otherwise as in *nipponicola. Mesosoma:* Pronotum ≒ *nipponicola* but on dorsum not tomented. Mesoscutum with long hairs ±250μ, short ones ±125μ and, though subtly, rather more semierect than in *nipponicola;* in both types of hairs some ones darker. Scutellum with apical hairs to 375μ, in some specimens with sparse admixture of brown to dark brown hairs. Metanotum only anteriorly narrowly tomented, erect hairs to 250μ without admixture of dark hairs. Mesepisternum as in *nipponicola,* hairs 200μ above, 300μ below. Propodeum as in *nipponicola* but scopa seen poorer. *Metasoma:* T1 basally with plumose hairs, medially 250μ, laterally 375μ, disc and PMA as in *nipponicola* but laterally with simple, 25-30μ hairs. Otherwise = *nipponicola,* but short, appressed, dark hairs on PMA of T2,3 sparser, on T2 virtually absent. Sternal hairs 500-600μ.

Structure: Head distinctly transverse (Fig. 1). HL/HW = 0.92 ± 0.02 (0.89-0.95, n=10). Vertex gently outcurved. Lateral ocellus less than own short axis distant from summit. Occiput not carinate. Inner orbits ≒ *nipponicola.* UOD:MOD:LOD = 1:1.17:0.97. Outer orbit more convergent below > *nipponicola.* IOD:OOD:VOD = 1:0.88:0.65. Ocellocular area densely punctate (Pϕ 20-25μ), IS linear and granular, microreticulate as in *nipponicola,* along lateral ocellus smooth and shiny. EW:GW = 1:0.93. Otherwise as in *nipponicola. Mesosoma:* HW:MsW:MtW = 1:1.13:1.24. Lateral angle of pronotal ridge less pointed > *nipponicola.* Mesoscutum anteriorly truncate but not carinate (= *nipponicola),* median furrow anteriorly distinctly depressed. PP 20-30$\mu\phi$, IS characteristically variable (Fig. 37), rarely Pϕ > IS, but usually ≤ IS, often IS = 2.0, granular and dull, not shiny. PP smaller forward (±20$\mu\phi$), similar but denser (ϕ>IS) postward, along parapsidal furrow PP denser, ϕ15-25μ and > IS. Scutellum medially mildly depressed, convexity mild, PP fine (ϕ ±15μ) and dense (ϕ > IS) peripherally and on median depression, but irregular, often coarse (Pϕ ±25μ or more) on submedian convexity, with IS finely granular and rather shiny. Mesepisternum rather irregularly but somewhat transversely reticula-areolate, somewhat similar to *harmandi* than *nipponicola. IS* very characteristic, finely and superficially granular, seen rather smooth, and strongly shining. Propodeal dorsum (Fig. 40) slightly to distinctly shorter than mesoscutellum, PDL/MCL = 0.90 ± 0.07 (n=10), being somewhat variable (0.75-1.00), basally slanting, medially mildly but distinctly depressed and apically horizontal, apically strongly and continuously carinate, dorsum with distinct longitudinal ridges arranged in parallel, occasionally branching but never properly anastomosing, rather regularly (IS ±75μ) distant and mostly attaining apical carina, IS finely granular and rather shiny, dorsum laterally separated from lateral slope not by sharp oblique carina unlike in male, but rather by change of sculpture, *i.e.,* from regular termination of longitudinal ridges with rather shiny IS on dorsum to granular, irregularly and weakly

reticulate slope. Propodeal side principally transversely reticulate. Shield granular, with weak obliquely paralleled carinulae, lateral carina rarely attaining (though weakened) dorsal carina but usually not, ending at slightly below. Tegula, wing veins, basitibial plate and inner hind tibia1 spur as in *nipponicola*. Number of teeth of spur 8, often l-2 apical teeth weaker. Number of hamuli unusually high (9-10). *Metusoma:* Elongate oval. T1 slope smooth and shiny, impunctate, disc anteriorly similar but with sparse, fine PP, gradually denser postmedially (but IS always >> Pø) and admixed with sparse ±20$\mu\phi$ PP; lateral convexity mild, with PP sparser than on disc medially but some ones coarser, to 25$\mu\phi$; PMA demarcated from disc laterally by depression behind convexity but medially not, PP finer (to 10μ) and denser, P$\phi \fallingdotseq$ IS; IS smooth and shiny, near apical margin often with nearly imperceptible striation. T2 with convexity as mild as on T1, basally slightly depressed though far less than in *nipponicola* and allied species, with very obscure striation; disc with dense PP (ϕ to 25μ), IS >< Pϕ, smooth but postward finely striate, PP sparser on convexity, though denser than on T1 convexity; PMA very wide, occupying 2/3 of visible part, densely striate. T3 similar but convexity weaker, with PP denser (anterior slope) and with striation (posterior slope); disc posteriorly striate, admixed with moderately dense PP (±20$\mu\phi$). T4 similar but disc and PMA striate, admixed with PP. Visible sterna not modified.

Male. More slender than female, BL 6.2-8.7 mm, WL 6.7-8.0 mm (size fairly variable among 8 measured specimens, cf. p. 189).

Color: As in female, but clypeus below transversely yellow, flagella below brown to pale brown. Terga apically dark brown-tinted but not semitransparent.

Pilosity: As in female and also in male of nipponicolu. Facial and paraocular hairs denser and more appressed, more hiding surface than in female. Mesoscutum with a few brown hairs in some specimens. Propodeal side virtually not tomented. Metasomal hairs sparser and basilateral tomental patches confined laterally; disc of T2,3 medially virtually glabrous, laterally with very sparse hairs, PMA virtually glabrous.

Structure: Generally similar to female except for the following features and some other male specific features as in nipponicolu. HL/HW = 0.91 ± 0.02 (0.89-0.94, n=10). UOD:MOD:LOD = 1:1.13:0.79. IOD:OOD:VOD = 1:0.86:0.75. EW:GW = 1:0.72. F2L:F2W = 9.6 ± 0.9: 7.7 ± 0.8, n=8). Otherwise = *nipponicola* male. *Mesosomu:* HW:MsW:MtW = 1:1.05:0.96. Mesoscutal PP denser, IS < Pϕ less granular and shiner. Mesepistemal areola slightly coarsely granular, less shiner (= less characteristic) > female. Propodeal dorsum (Fig. 41) distinctly shorter than mesoscutellum PDL/MCL = 0.82 ± 0.03, n=8, less variable (0.80-0.86) than in female. Demarcation of dorsum and lateral slope more neat by the different sculpture (IS in dorsum much smoother and shiner than in female). Propodeal side irregularly reticulate. Lateral carina of shield only on lower 2/3, not attaining dorsal end. Basitibial plate rather distinctly demarcated than in many other halictines, only slightly weaker than in female (Figs. 33-36). *Metusomu:* Much more slender than in female. On T1 PP coarser, denser and more homogeneously distributed. PP on T2-3 similar, basal depression less conspicuous than in *nipponicola* and allied spp. S5 slightly incurved, otherwise visible sterna not modified. S7 medially elongate-triangular with round apex. S8 medio-apically mildly projecting, apex truncate with lateral angle rounded (Fig. 49). *Mule genitalia* (Fig. 48): Gonobase transverse, 2.5 times as wide as long, with lateral margins very slightly divergent. Gonocoxite continuing gonobasal contour, lateral margins very weakly divergent, outer-apically roundly angulate with sparse bristles. Penis valve laterally

dilated (Fig. 50). Gonostylus moderately long, apically rounded with moderately dense and long hairs. Ventral retrose lobe short and triangular, with dense, fine and homogeneously distributed hairs.

Distribution: Japan (Honshu: Aomori, Iwate, Ibaraki, Gifu, Fukui, Kyoto, Tottori, Shimane Prefs.; Kyushu: Fukuoka Pref.).

Floral records: Taraxacum sp., *Stenactis annuus, Polygonum longisetum, Aster ageratoides* ssp. *ovatum, Picris hieracioides* ssp. *japonica, Deutzia crenata.*

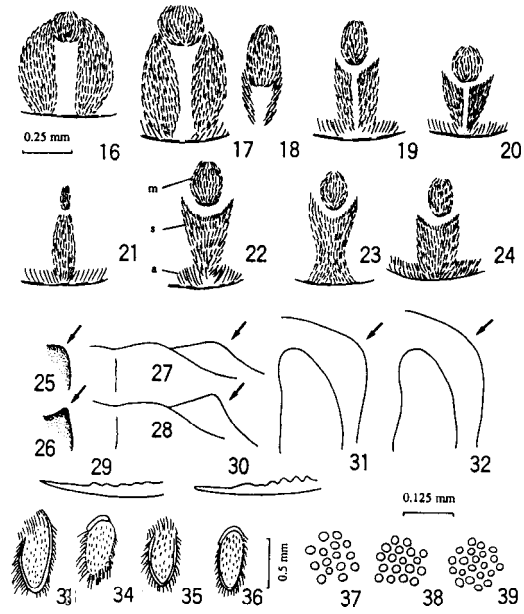
Type specimens: Holotype, female, Nagasita in Gonohe, Aomori Pref., 13. v. 1987, M. Yamada. Paratypes: [N. Honshu]: Aomori Pref. (M. Yamada): Amagamori in Misawa: 1F, 6.vi. 1988; 1F, 8. vi. 1985; 1F, 27. vii. 1986; Takinomata in Takko: 1F, 13. ix. 1987; 1F, 23. ix. 1985, 1F, 10. x. 1988; IF, Mt. Bonju in Namioka, 11. ix. 1983; 1M, Mt. Iwaki, 5. x. 1980. Iwate Pref. Takizawa Exp. Forest, 1976 (T. Maeta & T. Matsumura): 2F, 7. v.; 6F, 14. v.; 9F, 17. vi.; 1F, 26. vi.; 2F, 28. vi.; 1F, 26. ix.; 2F, 16. x.; 1F, 17. x. [C. Honshu]: Ibaraki Pref.: 1F, Mt. Yamizo, 20. vi 1978 (H. Ishii); IF, Hanazono, 15. ix. 1989 (Kitagawa). Gifu Pref:1F, Nigorigo, 23. viii. 1976 (T. Morimoto); 1F, Shirakawa, 2. vi. 1979 (K. Yamauchi); 1M, HidaHagiwara, 4. x. 1974 (K. Okumura); 2M, Hirugano in Takawashi, 7. x. 1974 (K. Yamauchi) (1M very small, cf. Fig. 1, HL 6.2 mm, WL 5.4 mm). Fukui Pref. (Y. Haneda): 1F, Kyogatake in Ohno, 17. ix. 1982; Shimouchinami in Ohno:1M, 24. viii. 1975; 1M, 25. viii. 1974; 1M, Arashiguchi in Ohno, 26. viii. 1975. Kyoto Pref.: 1F, Kamitani in Ashu, 25. v. 1986 (T. Inoue); 1F, 27. vi. 1985 (M. Kato). [S. Honshu]: Tottori Pref.: 1F, Mt. Daisen, 29. ix. 1982 (Y. Maeta). Shimane Pref:1M, Mt. Sanbe, 22. ix. 1991 (Y. Maeta). [Kyushu]: Fukuoka Pref.: 1F, Hikosan, 18. v. 1952 (Y. Hirashima); 1F, Narutakayama, 23. iv. 1950 (Y. Hirashima) (The following paratypes are in A. W. Ebmer's collection: 2F, Takinomata in Tokko, 23. ix. 1986 (M. Yamada)).

Remarks: This species is still not recorded from Hokkaido, northern Japan, but is known from various localities in Honshu and Kyushu, suggesting that it is widespread there, even though sporadically.

Etymology: This species is dedicated to P. A. W. Ebmer, who contributed much to the clarification of the halictine taxonomy in Eastern Asia.

Comparative notes: At present, 13 spp. of *L. (Lasioglossum)* species are recorded from Japan, 8 spp. of the *L. zonulum* group (cf. Fig. 16-19, 21-24) and the following 5 species: *L. laeviventre* (Perez, 1905), *L. exiliceps* (Vachal, 1903), *L. proximatum* (Smith, 1879)*, *L. primavera* Sakagami et Maeta 1990 and *L. ebmerianum* sp. nov. All these species differ from those of the *L. zonulum* group by 1- the less robust habitus, 2- propodeal dorsum rather horizontal and apically very sharply carinate (Figs. 40-45), 3- metasomal terga generally smoother and shiner, 4- male metasomal sternum 6 without peculiar hair tufts (cf. Figs. 16-24), and 5- male basitibial plate less reduced (Figs. 33-36). Moreover, at least in northern Japan, they seem to differ from the species of the *L. zonulum* group in the following 3 non-exomorphological features: 1- females appear in early spring than in late spring as in the *L. zonulum* group, 2- males are seemingly not so abundantly collected on flowers than in some *L. zonulum* group species. 3- terminal parts of developed ovaries are in the *L. zonulum* group

* = *Halictus discrepans* Perez 1905, *Lasioglossum (Lopalictus) acuticrista* Pesenko 1986 (Ebmer, pers. comm.).



Figs. 16-39. 16-24: Hair tufts on male metasomal sternum 6 (S6) of known Japansese species and a holarctic species (*L. zonulum)* of the *L. zonulum* group. 16: *L. subopacum*, 17: *L. occidens, 18: L. nipponicola* sp. nov., 19: *L. gorkiense, 20: L. zonulum, 21: L. scitulum, 22: L. kansuense, 23: L. harmandi, 24: L. mutilum. 25-32:* Some structural differences of females between *L. nipponicola* sp. nov. (25, 27, 29, 32) and *L. occidens (26, 28, 30, 31). 25 & 26:* anterior apex of mesoscutum seen laterally, 27 & 28: dorsal view of pronotal ridge, 29 & 30: teeth of inner spur of hind tibia, 31 & 32: gena above. 33-36: Basitibial plate of *L. nipponicola (33:* female, 34: male) and *L. ebmerianum (35:* female, 36: male). 37-39: mesoscutal sculpture (between median and parapsidal furrows) of female of *L. ebmerianum* (37), *L. proximatum (38)* and *L. primaveru (39).*

usually filamentous, neither including developed oocytes nor tightly fused together between left and right ovaries. At least in *laeviventre* and *proximatum,* however, terminal parts of both ovaries rather tightly fuse and this portion often contains moderately grown oocytes.

Among the 5 species mentioned, *laeviventre* and *exciliceps* have heads of moderate proportion, neither much elongate as in *nipponicola* and allied species (cf. p. 182) nor transverse as in *proximatum* and 2 other species shown below with the ratio HL/HW.

Further, in both *laeviventre* and *exilliceps,* PP on mesoscutum denser, only rarely Pϕ = IS, usually > IS and ridges of propodeal dorsum regular and denser in *laeviventre,* $\pm 50\mu$ distant from each other with IS shiner.

Below *L. ebmerianum* sp. nov. is mainly compared with *proximatum* and *primavera.* These 3 species are distinguished from each other by the following features:

species	female mean ± SD(n) (range)	male mean ± SD(n) (range)
laeviventre	1.02 ± 0.02(10) (1.00-1.04)	1.01 ± 0.01 (9) (1.00-1.04)
exilliceps	*0.98* ± 0.01(10) (0.97-1.00)	0.98 ± 0.01(10) (0.96-1.00)
proximatum	*0.86* ± 0.02(10) *(0.82-0.87)*	*0.88* ± 0.02(10) *(0.86-0.91)*
primavera	*0.90* ± 0.02(*10) (0.87-0.92)*	*0.88* ± 0.01(10) (0.86-0.90)
ebmerianum	*0.92* ± 0.02(10) *(0.89-0.95)*	*0.91* ± *0.02 (8) (0.89-0.94)*

Character	Species	Female	Male
BL(mm)	*ebmerianum*	*7.3-10.3*	(6.2)*6.7-8.4
	proximatum	*7.8-9.0*	*7.3-8.0*
	primavera	*6.9-7.5*	*6.4-7.7*
WL(mm)	*ebmerianum*	*7.5-8.6*	(5.4)*6.7-7.8
	proximatum	*7.3-9.8*	*6.2-6.6*
	primavera	*6.0-6.9*	*6.0-6.8*
H w (25=1 mm)	*ebmerianum*	*65.9* ± *1.9 (6.2-6.9)*	(45)*57.8± *6.2 (54-65)*
	proximatum	*61.1* ± *1.9 (58-65)*	*53.9* ± *1.4 (51-56)*
	primavera	*54.0* ± *2.5 (46-54)*	*50.6* ± *2.4 (46-54)*

n=7(*proximatum*, male), 8 *(ebmerianum,* male), and 10 in other cases;

* an exceptionally small male (cf. type specimens, Gifu Prefecture).

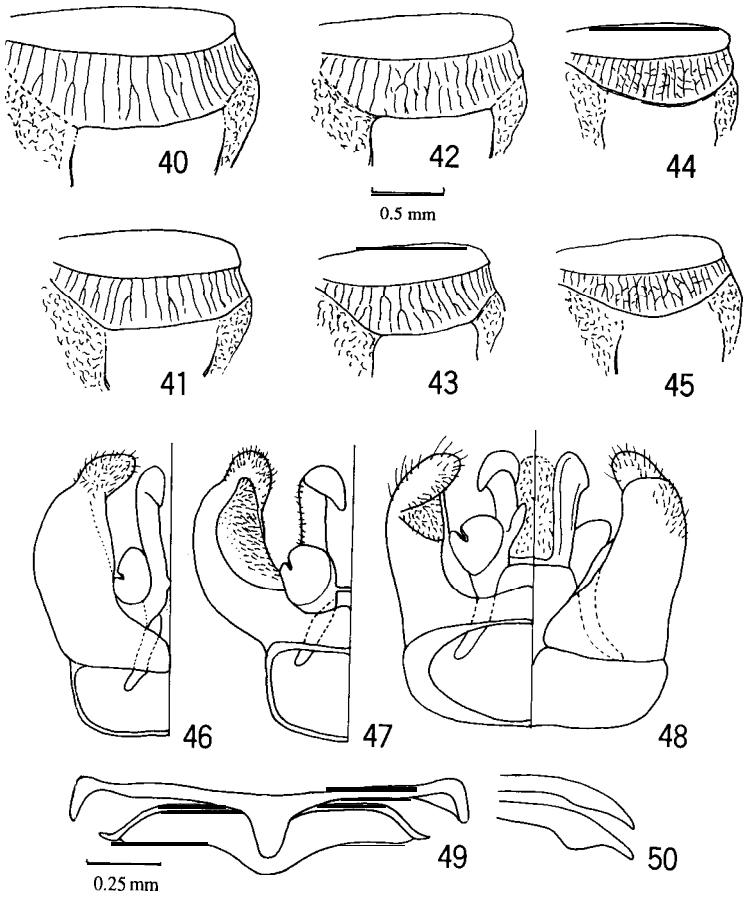
1- Body size distinctly *ebmerianum* > *proximatum* > *primavera* (cf. Fig. 1 and also Figs. 40-45). Female/male size difference is small in *primavera* of which male overwinters as female dose.

2- Coloration essentially similar among 3 species, including male clypeus apically yellow, but in *proximatum* and particularly in *primavera,* metasomal terga apically often brown-tinted though never semitransparent.

3- Admixture of brown hairs on female mesoscutum and -scutellum present in *ebmerianum* though far inconspicuously than in *nipponicola,* whereas virtually absent in *proximatum* and *primavera.*

4- In female, PP on mesoscutal center ±25$\mu\phi$ variable but only rarely <Pϕ and up to 3.0, granular and dull in *ebmerianum* (Fig. 37). PP denser, IS << Pϕ often linear and weakly granular, and rather shiny in *proximatum* (Fig. 38) and PP denser and finer, Pϕ ±15μ, and IS weakly granular and dully shining in *primavera* (Fig. 39).

5- Mesepisternal IS of *ebmerianum* is in female characteristically shiny, similar but less in male



Figs. 40-50. 40-45: Propodeal dorsum and lateral carina of shield in *L. ebmerianum (40:* female, 41: male), *L. proximatum (42:* female, 43: male) and *L. primavera (44:* female, 45: male). 46-50: 46 & 47: ventral and dorsal view of genitalia (46: *L. primavera, 47: L. proximatum), 48:* ventral and dorsal views of genitalia *(L. ebmerianum), 49:* metasomal sternum S7 (above) and S8 (below). *L. ebmerianum, 50:* penis valves of *L. ebmerianum* seen oblique-dorsally.

interestingly against a general rule in halictines, males having shiner IS than females. In *proximatum*, mesepistemal IS more coarsely granular and far less shiny, somewhat comparable to that in *nipponicola*. In *primavera* metepistemal reticulation is weaker whereas IS so more coarsely granular that seen as if homogeneously granular.

Previously *primavera* was described as somewhat deceptively similar to *L.* (carinate *Evylaeus*) *vulsum* Vachal, 1903 (Sakagami & Maeta, 1990). Actually some *vulsum* females were admixed in paratype specimens, certainly by careless mischeck of vein *tc 2*. However, the 2 species are readily distinguished by mesepisternal sculpture not mentioned previously, which is more distinctly reticulate, and IS (= areola) shiny in *vulsum*, contrasting IS of *primavera* which is seen

rather homogeneously coarsely granular and dull. The shiny mesepisternum in the Palaearctic *Lasioglossum s.* str. is very rare, found only in *L. (L.) xanthopus* (Kirby, 1802) and *L. (L.) kussariense* (Bltithgen, 1925) (Ebmer, pers. comm.), possibly appeared independently among the species, as in these species propodeal dorsum apically not sharply carinate.

6- In all 3 species (Figs. 40-45) demarcation of lateral part of propodeal dorsum and lateral slope is more acute in male. Posterior end of dorsum is obtusely angulate laterally in *ebmerianum* and *proximatum* while uniformly outcurved in *primavera.* Longitudinal ridges are typically parallel and less branched in *ebmerianum* (Figs. 40 & 41), well branched though not properly anastomosing in *primavera* (Figs. 44 & 45) and intermediate in *proximatum* (Figs. 42 & 43). Lateral carina of shield distinctly joins 'to dorsal carina in *proximatum* in both sexes, subtly joins to dorsal carina in female while not in male of *ebmerianum* and both sexes of *primavera*.

7- Male genitalia (Figs. 46-48) are more diverse among 3 species than among 3 spp. of the *zonulum* group (Figs. 8-15). Gonocoxite is not much wider than gonobase in *ebmerianum,* distinctly wider in *proximatum* and intermediate in *primavera.* Gonocoxite with sparse hairs on outer-apical angle in *ebmerianum* but not in 2 other species. Gonostylus is oval with sparse in all species, but ventral retrose lobe small and triangular in *ebmerianum,* longer and tongue-like in *proximatum* and completely absent in *primavera.* This species is also unique by the fusion of gonocoxite and gonostylus (Fig. 46, cf. Sakagami & Maeta, 1990).

Lasioglossum (Evylaeus) sphecodicolor sp. nov.

This species belongs to the *L. sexstrigatum* group s. lat. (Ebmer, Maeta & Sakagami, 1994) and so far recorded from Japan under the code *Lasioglossum* (carinaless *Evylaeus)* sp. *25* given by one of us (S. F. S.).

Lasioglossum (carinaless *Evylaeus*) sp. *25:* Yamauchi *et al.,* 1976: 416; Yamauchi *et al.,* 1982: 421; Munakata, 1984: 71; Haneda, 1985: 315; Munakata, 1986: ; Munakata *et al.,* 1987: 22; Yamada & Sakagami, 1988: 15; Yamada *et al.,* 1990: 38; Inoue *et al.,* 1990: 457; Kato *et al.,* 1990: 371; Haneda, 1990: 8, 9; Haneda, 1991: 35.

Female. Small, BL 5.5-6.2 mm, WL 4.8-5.3 mm (n=10).

Color: Head and mesosoma black, metasoma concolorously reddish brown. Flagella apically below pale brown, mandible apically chestnut red, tegula pale brown. Legs black to dark brown, tibia basally brown, sometimes legs more brown-tinted. Wings slightly infuscate, veins and pterostigma brown to pale brown, subcosta slightly deeper.

Pilosity: Pale yellow, generally sparse. Tomented parts: Pronotum frontally along outer margin medially, pronotal dorsum anteriorly, ridge above, along pronotal lobe, anterior half of metanotum, metepisternum, and propodeal side. Otherwise, hairs not much dense. *Head* (Fig. 59): Hairs on vertex to 200μ, virtually simple, sparse on face, visible only seen laterally, semierect, $\pm$125μ, on paraocular area same but slightly denser, though not hiding surface; on supraclypeus $\pm$125μ, sparse, contrasting paraocular area; clypeus above as on supraclypeus; below longer, apically to 250μ. Gena above poorly plumose, only incompletely hiding surface.

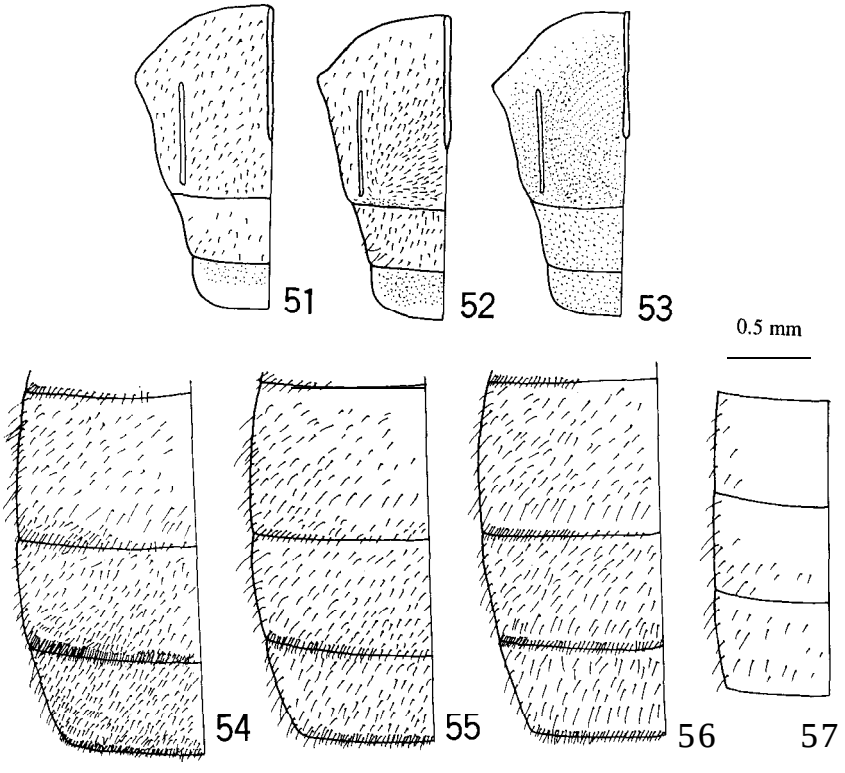


Fig. 51-57. 51-53: Pilosity on female mesosomal dorsum of *L. sexstrigatum* (51), *L. **sphecodicolor (52)*** and ***L. eidmanni (54).*** 51 & 53: drawn on the contour figure of ***L. sphecodicolor. 54-57:*** Pilosity on metasomal terga 2-4 of females of ***L. eidmanni*** (54), ***L. sphecodicolor*** (55), ***L. japonicum*** (Dalla Torre) (56), and male of ***L. sphecodicolor (57). 54 & 56:*** drawn on the contour of Fig. 55.

Mesosoma: Pronotal dorsal tomentum hiding surface. Mesoscutal long hairs 125-150μ, short hairs ±50μ, both virtually simple, distinctly denser and more appressed than in some allied species (compare Figs. 51 and 52), hairs on postlateral corner tending tomented. Mesoscutellum similar but longer hairs to 175μ, more erect and slightly plumose, apically to 300μ and plumose. Metanotal tomentum dense and completely hiding anterior 2/3. Mesepisternum above 250μ, with sparse ±30μ plumose, appressed underhairs, forming incomplete tomentum, postward slightly longer, to 300μ, plumose without underhairs. Metepisternum and propodeal side densely tomented, shield with sparse erect and branched hairs (±200μ), and tomented but less completely than on propodeal side. ***Metasoma*** (Fig. 55): T1 on slope and disc virtually glabrous, only with sparse lateral fringe. PMA only laterally with sparse, fine hairs, apical

margin only with fine moderately dense simple hairs on lateral extremity. T2 on disc medially with sparse, fine hairs, denser laterad, apical margin medially glabrous, laterally with dense, simple hairs. T3,4 similar, but hairs gradually denser, particularly on apical margin laterally, and on lateral extremity with some vestigially (possibly not rudimentarily *cf.* p. 198) plumose hairs.

Structure: ***Head*** distinctly transverse (Figs. 58 & 59). HL/HW= 0.94 ± 0.02 (0.90-0.98, n=10). Vertex medially distinctly convex. Lateral ocellus nearly attaining summit. Occiput not carinate. Inner orbits moderately convergent below. UOD:MOD:LOD = 1: 1.12:0.89 (n= 10). Outer orbit not much rounded. IOD:OOD:VOD = 1:0.99:0.83. Ocellocular area with PP ± 12$\mu\phi$, IS = 1.0-2.0, smooth and shiny, slightly wider along lateral ocellus. Frons flat, PP denser, IS linear, seen microreticulate. Paraocular area similar, but PP slightly coarser, attaining 20$\mu\phi$, IS similar but below wider and smoother as in many halictines. Frontal carina slightly exceeding MOD line. Supraclypeus slightly convex, finely granular and dull, PP 15-20$\mu\phi$, IS ≒ Pϕ or slightly wider. Clypeus above lower than supraclypeus, similarly sculptured, below PP coarser and elongate, IS smoother as in many halictines, clypeal tooth mild. Gena normal. EW:GW = 1:0.85 (n=10). Scape nearly exceeding lateral ocellus. Mandible normally bidentate. Mouthparts with maxillar and labial palpi normally 6 and 4 segmented. ***Mesosoma:*** HW:MsW:MtW = 1:1.09:1.17. Lateral angle of pronotal ridge obtuse. Mesoscutum anteriorly mildly truncate. PP ±15$\mu\phi$, IS 0.5-2.0, granular and dull. Along posterior margin IS linear and shiner. Mesoscutellum medially imperceptively depressed, PP dense and fine peripherally, medially coarser (to ±25$\mu\phi$) and sparser, IS often > Pϕ, smooth and shiny. Mesepisternum generally similar to *sexstrigatum*, finely reticulate, with areola ±25$\mu\phi$ granular and dully shiny. Propodeal dorsum (Fig. 65) slightly shorter than mesoscutellum (0.87 ± 0.06, n=10, 0.80-1.00) with longitudinal ridges 25-30μ distant each other, medially slightly winding and rarely branching, but never conspicuously anastomosing, occupying about basal 1/2 of dorsum, of which apex roundly angulate and nearly transverse, laterally ridges similar but slightly longer, some ones slightly descending down on lateral slope; dorsum distinctly convergent postward, and finely reticulate; shield laterally carinate on lower 2/3. Veins *tc* 2 and 3 very weak. Hamuli arranged 2-l-2. Basitibial plate oval, apically rather pointed, marginally sharply carinate. Hind inner spur usually with 3 slender teeth, basalmost one longer than spur's width. *Metasoma*: oval. T1,2 with mild lateral convexities, T1 with very fine and sparse PP, virtually smooth and shiny. PMA with fine and very weak striation. T2 on base and PMA finely striate, disc similar but admixed with fine PP, denser and slightly coarser laterad. T3,4 similar but both striation and PP more conspicuous.

Male. Only 3 males examined. BL 4.3, 4.8, 5.1 mm, WL 4.0, 4.1, 4.4 mm.

Color: Bicolorous as in female but metasoma darker, less reddish, rather brown-tinted. Clypeus below yellow to brownish yellow, labrum pale brown, marginally with chestnut brown tint, legs brown to pale brown.

Pilosity: Facial hairs denser. Pronotal dorsum tomented as in female, pronotal ridge and around lobe, metanoturn, metepistemum and propodeal side tomented but less than in female. ***Head:*** Distinctly sparser than in female, particularly on supraclypeus and clypeus, but face above not sparser as in large males of *L. ohei*. Paraocular hairs semitomented but not much hiding surface. Gena slightly denser, but not particularly more than in female. ***Mesosoma:*** Far sparser. Tomentum on pronotal dorsum virtually absent. Mesoscutum with little short, semiap-

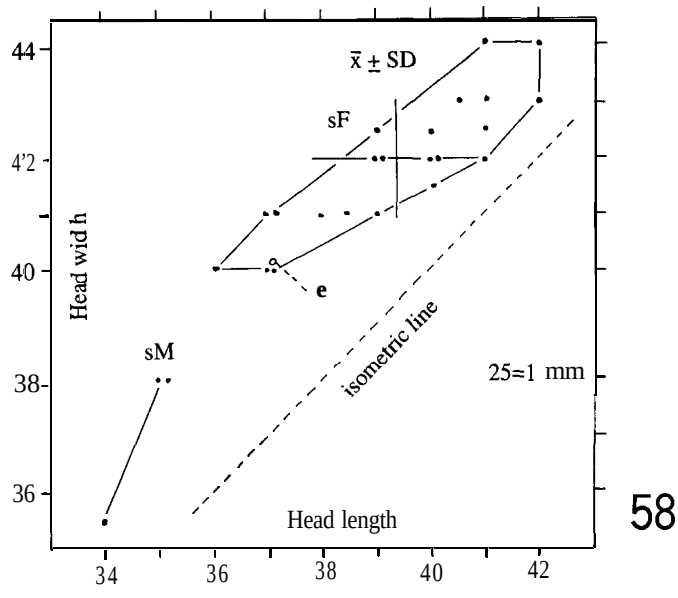


Fig. 58. Head length/width of *L. sphecodicolor* females (*s*F) and males (*s*M), and a female of *L. eidmanni* (e). x̄ ± SD in *sphecodicolor* females based on 22 specimens.

pressed hairs, postlateral tomental patch, and metanotal and mesepisternal tomenta weaker. *Metasoma:* Hairs very sparse. T1 only laterally with sparse fringe, disc and PMA virtually glabrous. T2 similar but disc laterally with very sparse hairs (Fig. 57). T3 disc laterally and PMA sparsely haired but apically glabrous. T4 same though hair slightly dense.

Structure: Head (Figs. 62-64): Some ratios in 3 males studied (nos. l-3): HL/HW, 38/35, 38/35, 35.5/34; UOD/MOD/LOD = 24/27/20, 24/27/20, 22/23/17, IOD/OOD/VOD = 6.5/6.5/6, 6.5/6.5/7, 6/6/5.5, EW/GW (with process) = 10/13,10/13, 9.5110; MdL/MdW = 22/6, 22/7, 19/5. Two large males are nearly isometric from each other, but between them and a small male (no. 3, Fig. 58), a distinct cephalic polymorphism is recognized, particularly in development of genal process and mandible (Figs. 63 & 64). Although the entire variation range is unknown, the smallest male may have normal head as in many other species of the *L. sexstrigatum* group (e.g., *L. ohei,* Sakagami et *al.,* 1966). Flagellomeres short. F_2L/F_2W = 4/3.5, $F_1L/F_2L/F_3L$ = 2.5/4/3.5 (40 units = 1 mm). *Mesosoma:* As in female but PP sparser and IS much smoother and shiner as in mainly halictines, particularly of the *L. sexstrigatum* group, PDL/MCL = 0.94 ± 0.03 (n=3). Veins *tc 2, 3* less reduced than in female as in many *Evylaeus* species. Hind leg normal, tibia slender, basitarsus parallel-sided and distitarsus 1 not conspicuously narrowed basally. *Metasoma:* Elongate. T1 virtually smooth and shiny. T2 with very fine and sparse PP on disc and fine striation on PMA. T3,4 with PP and striation slightly denser but still seen virtually

smooth and shiny. Visible sterna not modified, S7,8 medially triangularly projecting, S7 mildly and S8 more conspicuously, both with rounded apices (Fig. 68). *Genitalia:* As in Fig. 67. Gonobase robust, about 2 times wider than long and longer than 1/2 gonocoxite length, lateral margin mildly outcurved. Gonocoxite only slightly wider than gonobase, lateral margin not continuing gonobasal contour, distinctly outcurved, outer apical angle roundly obtuse, innerapically mildly and roundly projecting. Gonostylus oval with sparse hairs. Ventral retrose lobe slender, tongue-like, about 4.3 times as long as wide, apically tapering, with sparse, moderately long hairs.

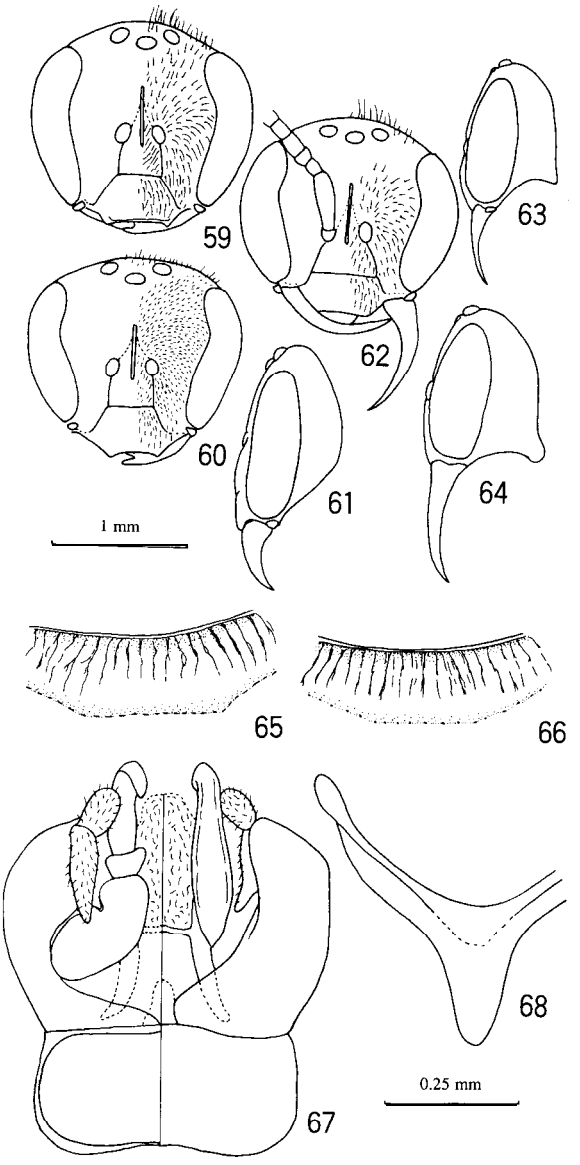
Distribution: Japan (Hokkaido: Oshima District; Honshu: Aomori, Iwate, Gifu, Fukui, Kyoto Prefs.).

This species is recorded from Oshima Peninsula, southmost Hokkaido, and sporadically from northernmost to central Honshu, possibly widespread in Japan, even if not very common.

Floral records: Polygonum longisetum, Deutzia crenata, Hydrangea serrata, Taraxacum officinale.

Type specimens: Holotype female, Takizawa Experim. Forest, Iwate Pref., N. Honshu, 17. ix. 1976, Y. Maeta & T. Matsumura. Paratypes: [Hokkaido]: Oshima: 1M, Fukushima, 19. x. 1965 (M. Munakata). [N. Honshu]: Aomori Pref. (M. Yamada): 2F, Amagamori in Misawa, 17. vi. 1988; 2F, Yasumiya, Towadako, 12. vii. 1987; Fukutami in Kuroishi, 4. vi. 1985. Iwate Pref., all from Takizawa Experim. Forest, 1976 (Y. Maeta & T. Matsumura): 1F, 17. vi.; 2F, 27. vii.; 1F, 17. ix.; IF, 26. ix. [C. Honshu]: Gifu Pref.: 1M, Wara-mura, 18. viii. 1980 (K. Kinomura). Fukui Pref. (Y. Haneda): 1F1M, Arashi in Ohno, 27. viii. 1976; 1F, Ohno, 5. vi. 1977. Kyoto Pref., 1984: 1F, Asoga, Kibune, 26. vi.(M. Kato); 1F, Ashu, 19. vii. (T. Inoue *et al.)* (The following paratypes are in A. W. Ebmer's collection: 1F, Hakodateyama, 2. vi. 1961; 1M, Shirikishinai, 11. x. 1964, both from Oshima, Hokkaido by M. Munakata).

Comparative notes: Among various groups of the carinaless *Evylaeus,* the *L. sexstrigatum* group is remarkable by male head gigantism in all male-known species, and in most though not all species, female metasomal terga with apical fimbriae consisting of plumose hairs, just as in *Halictus* (with *Halictus* s. str., *Seladonia* and *Vestitohalictus).* Recently Ebmer *et al.* (1994) tentatively divided the group in 5 possibly in part conventional subgroups. According to this classification, *sphecodicolor* is placed in the *L. sexstrigatum* subgroup by the possession of male gigantism, the absence of distinct striation on metasomal tergum 1 and the possession of apical fimbriae on metasomal terga 3,4. However, it is noteworthy that in *sphecodicolor,* the fimbriae are much sparser than other allied species and the plumosity of these hairs is very poor. It may be a matter of opinion whether to regard these hairs as plumose or not. Below this species is compared with another bicolorous species, *L. eidmanni* and its taxonomic position is inferred. A single female of *L. eidmanni* (Blüthgen, 1926) (Blüthgen, 1926b) gifted by P. A. W. Ebmer (from Shanghai, China as in the type specimens) well coincides with the original description except: 1- Mandibular base above blackish brown, not black. 2- Veins and pterostigma brownish yellow, not yellow. 3- Basitibial hair patches on T2 very poor and on T3 absent (probably hidden by T2). 4- Head distinctly wider than long (HWML = 40/38, 25 mm, cf. Figs. 58 & 60), not "etwas länger als breit". The differences 1-3 could be regarded as within the range of individual variation. The difference 4 is important but Bltithgen did not give the ratio HW/HL, numerically. In view of the coincidence of most other features between the examined female (= *e*S) and the Bliithgen's description (= *e*B), particularly of the peculiar pilosity (see below), the



Figs. 59-68. 59-64: Heads of *L. eidmanni* (60: female frontal view) and of *L. **sphecodicolor*** (others), 59 & 62 (others, frontal views of female and large male), 61, 63 & 64 (profile views of female, large and small males). 65 & 66: Sculpture of female propodeal dorsum of ***L. sphecodicolor (65)*** and ***L. eidmanni (66). 67 & 68:*** Male genitalia (67) and sterna 7 and 8 of ***L. sphecodicolor.***

difference in head proportion between *e*S and *e*B is tentatively ignored*.

L. eidmanni (= eid) differs from *L. sphecodicolor (= sph)* in the following features. 1- Size: No difference. BL = 5.8 mm in eS and 6 mm in *e*B, and 5.2-6.2 mm in *sph.* (5.8 ± 2.2 mm, *n*=10). In Fig. 58, HW and HL of *e*S lie near the smallest extremes in the variation range of *sph.* It is likely that *eid* is on the average smaller than *sph.* 2- Proportions: In *e*S, HL:HW = 1:0.95, UOD:MOD:LOD = 1:*1.08*:*0.81*, IOD:OOD:VOD = 1:*1.00*:*0.82*. EW:GW = 1:0.76. Some values (italicized) are more different than others in relative to the corresponding values in *sph (see* below) but not remarkably, seemingly within the similar variation ranges. 3- Color: Both species are exceptional among the *L. sexstrigatum* group as being bicolorous, but *e*S (and also *e*B) is distinctly paler: Clypeus below pale chestnut, mandible basally and apically pale chestnut while medially broadly pale yellow brown, and legs entirely brown to pale brown. 4- Pilosity: *eid* most conspicuously differs from *sph* by dense and widespread tomental hairs. *Head* (Fig. 60 vs. 59): Hairs on vertex and face only 75μ and 50μ respectively. Facial and paraocular hairs densely tomented, hiding surface completely, whereas supraclypeus and clypeus sparser, and very contrasting. Genal hairs densely and widely tomented, completely hiding surface. *Mesosoma:* Pronotal tomenta, both frontal and dorsal, more developed. Mesoscutum nearly entirely, mesoscutellum peripherally and metanotum entirely tomented (Fig. 53 vs. 52). Mesosomal side and propodeal shield densely tomented, hiding surface nearly completely. *Metasoma:* Tergal fimbriae much denser and more conspicuously plumose (Fig. 54 vs. 55). 5- Structure: Outer orbits more convergent downward (Fig. 60 vs. 59). Propodeal ridges slightly longer medially and lateral corner of dorsal end more acutely angulate (Figs. 66 vs. 65). Striation on PMA of metasomal tergum 1 almost imperceptible though present.

Summarizing, both species, *eidmanni* and *sphecodicolor,* are very similar in size, color and structure, only differing in pilosity which is more specialized in *eidmanni.* It is possible that they evolved as sister species in Eastern Asia. Figures 51-53 show the pilosity on female mesosomal dorsum of 3 species synoptically. *L. sexstrigatum* (Schenck) (Fig. 51) is the only known European representative of the *L. sexstrigatum* group and widespread from Europe to Japan (with possible subspeciation). Its mesosomal hairs are simple and sparse, sharply contrasting to those of *L. eidmanni* (Fig. 53). However, the 2 species are linked by *L. sphecodicolor* (Fig. 52), whose pilosity is intermediate between the 2 species in both density and distributional pattern. Because many species of the *L. sexstrigatum* group have the simple mesosomal pilosity as *sexstrigatum* has, the differentiation of the *eidmanni* type via the *sphecodicolor* type is assumed. Possibly one lineage has continued to retain the intermediate type, even after isolated in Japan, whereas another lineage developed the tomental pilosity in the continent and produced *eidmanni.*

However, the situation seems more complicated, Figs. 54-56 show the metasomal pilosity of females of 3 species, *eidmanni* (54), *sphecodicolor (55) andjaponicum* (Dalla Torre). As for tergal fimbriae, more or less dense and well plumose state in *eidmanni* is shared by most species of the *L. sexstrigatum* group, while the state as seen in *sphecodicolor* is exceptional, suggesting its secondary degeneration. Thus, one lineage possibly developed the tomental pilosity on head

* According to our request, P. Ebmer kindly informed us the HW/HL of another female from Shanghai in his collection. The ratio was 1.64/1.54, *i. e.,* wider than long as in our female.

and mesosoma, while kept the developed tergal fimbriae (*eidmanni*) and another lineage kept the tomental pilosity at an intermediate state, while experienced partial degeneration of tergal fimbriae (*sphecodicolor*). Such complication seems to be amplified by diverse other cases in the *L. sexstrigatum* group. Here are cited only 2 cases. 1- In *juponicum,* tergal fimbriae are never plumose (Fig. 56), *i.e.,* not seemingly degenerated as in *sphecodicolor* (Fig. 55), nevertheless *japonicum* can be placed within the *sexstrigatum* group s. lat. by the general habitus and the male mandible gigantic in a way different from the other species. 2- Blüthgen (1926b) mentioned the occurrence of a species deceptively similar to *eidmanni (Hulictus sanguineus* Friese nom. nudum, Type in Zool. Mus., Berlin), but different by the occurrence of dense striation on T1, a feature which divide many (but not all) species of the *L. sexstrigutum* group into 2 major divisions, the *sexstrigutum* and *fimbriutellum* subgroups (Ebmer *et al.,* 1994). Further critical descriptions and redescriptions of the species of this taxonomically difficult but interesting group are necessary.

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