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Lasioglossum (*Lasioglossum*) *primavera* Sp. Nov., a Japanese Halictine Bee Which Overwinters in Both Female and Male Adults

(Hymenoptera, Halictidae)

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雌雄成虫越冬性コハナバチの一新種，ハルノツヤコハナバチ
Lasioglossum (*Lasioglossum*) *primavera* sp. nov. (膜翅目，コハナバチ科)
坂上　昭一・前田　泰生

Lasioglossum (*Lasioglossum*) *primavera* sp. nov. is similar to *L.* (*L.*) *pallens* BRULLÉ in S. W. Palaearctics and *L.* (*L.*) *proximatum* SMITH in Japan, but distinguished by smooth or weakly sculptured mesosomal dorsum and metasomal terga, and in male by gonostylus fused with gonocoxite and devoid of the ventral retrose lobe. This is the first record from E. Palaearctics of the halictine bees of which male adults survive to the next spring.

Except for some limited cases, in most halictine bees males which emerged in the autumn die before the winter, leaving females which survive to the next spring. We describe below *Lasioglossum* (*Lasioglossum*) *primavera* sp. nov. as the first record of male-overwintering halictines from the eastern Palaearctics.

***Lasioglossum* (*Lasioglossum*) *primavera* sp. nov.**

Lasioglossum (*Lasioglossum*) sp. 8, YAMADA and SAKAGAMI, 1988 : 14.

Both sexes similar in size and habitus, especially by relatively short antennae and rather oval metasoma in male. Similar to *L.* (*L.*) *pallens* (BRULLÉ, 1832) in S. W. Palaearctics and *L.* (*L.*) *proximatum* (SMITH, 1879) (= *Halictus discrepans* PÉREZ, 1905 ; EBMER, pers. comm.) in Japan by transverse head (Figs. 1, 22) and propodeal dorsum separated from propodeal declivity by abruptly angulate and carinate boundary. Distinguished from the both species by mesosomal dorsum and terga rather smoothly sculptured (Figs. 5-7, 13-15) and in male by relatively long scape, short flagella (Figs. 2-4), and aberrant genitalia described below (Figs. 19-21). In female carina encircling propodeal declivity complete (Fig. 8) as in *L. proximatum*, not interrupted or weakened laterally above as in *L. pallens* (cf. Fig. 9), and posterior margin of terga broadly brownish as in *L. pallens*, not black and well sclerotized as in *L.*

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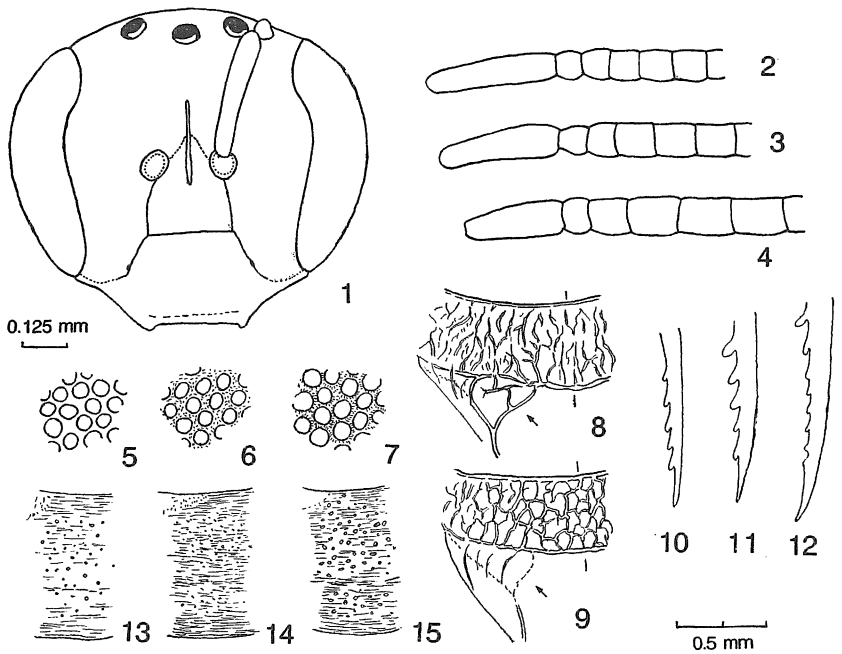
proximatum. The female is also deceptively similar to *L.* (*Evylaeus*) *vulsum* (VACHAL) in Japan but, besides the subgeneric difference in venation, mesoscutum anteriorly more shagreen and apical carina of propodeal dorsum stronger and not zig-zag-wise.

Body 6.9–7.7 mm (♀) and 6.4–7.7 mm (♂), fore wing including tegula 6.0–6.9 mm (♀) and 6.0–6.8 mm (♂).

Coloration Black. Flagella frontally, legs partly, tegula dark brown; mandible apically chestnut brown. Marginal areas of metasomal terga 1–4 broadly brownish and semitransparent. Wings transparent, veins pale brown. In male clypeus below narrowly yellow but tibiae and tarsi dark, not pale-tinted.

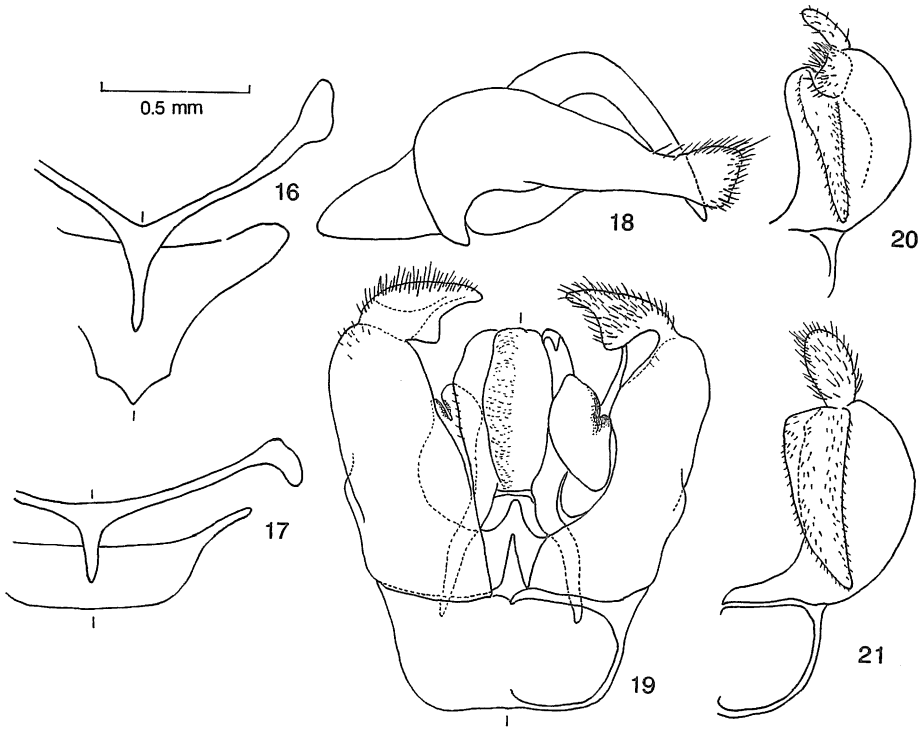


Figs. 1–15. Some non-genital characteristics of *Lasioglossum primavera* sp. nov (Figs. 1. 2. 5, 8–10, 13), *L. pallens* (Figs. 3, 6, 11, 14) and *L. proximatum* (Figs. 4, 7, 12, 15). 1, Head seen frontally (♀); 2–4, Basal parts of antenna (♂); 5–7, Sculpture of mesoscutal center (♀); 8–9, Propodeal dorsum (♀, ♂, arrow = upper-lateral boundary of declivity); 10–12, Inner hind tibial spur (♀); 13–15, Sculpture of metasomal tergum 3 (♀). Scale = 0. 125 mm in Figs. 5–7, 0. 5 mm in others.

Pilosity Excluding dark, appressed ones on terga, hairs pale and sparse, not hiding surface except on pronotum, metanotum and tergal basal fasciae. Hairs more or less plumose if unmentioned, rather whitish in male while tending pale yellow in female.

Hairs 175μ (max.) on vertex; 250 (♀) or 375μ (♂) on face and paraocular area; in male denser on paraocular area, incompletely hiding surface and contrasting rather sparsely haired supraclypeus and clypeus (250–275μ). Gena without tomentum.

Mesoscutum with longer (♀ 225μ, ♂ 250μ), erect hairs and shorter (100–125μ) semiappressed hairs; mesoscutellum similar, longer on posterior margin (♀ 225, ♂ 275μ). Mesopleuron above 250 (♀) or 300μ (♂), below 350 (♀) or 450μ (♂). Femoral scopa (♀) of the usual *Lasioglossum* type.



Figs. 16–21. Male terminalia of *Lasioglossum primavera* sp. nov. (Figs. 16, 18, 19), *L. pallens* (Fig. 20) and *L. proximatum* (Figs. 17, 21). 16, 17, Metasomal sterna 7 and 8; 18, Genitalia seen right-laterally; 19, Genitalia seen dorsally (left) and ventrally (right); 20, 21, Genitalia seen ventrally. Scale = 0.5 mm.

Metasomal terga 2–4 with basal fasciae interrupted medially, less developed in male. T_1 on anterior slope with sparse, erect hairs, medially 225μ, laterally 325μ long; the latter continuous postward though gradually shortened; disc with finest (25–50μ), very sparse setae, seen as if glabrous; lateral tomental patch absent; postmarginal area medially with sparse, short hairs as on disc, gradually longer laterad (to 220μ). T_2 basimedially very sparsely haired, virtually glabrous; postmarginal area medially glabrous, laterally with sparse hairs (100–125μ) being appressed, arranged in parallel and not exceeding tergal margin. T_3 as on T_2 but fascia narrowly interrupted; hairs on disc denser and longer (to 200μ); postmarginal area narrowly glabrous medially. T_4 (and T_5 in male) similar but basal fascia usually hidden and hairs denser and longer; lateral fringe in female attaining 450μ. Sternal scopa (♀) poorly plumose, 350–375μ on $S_{3,4}$. In male hairs on S_2 basically sparse, erect, simple ($\pm$75μ); apically denser, semierect, poorly plumose (350–375μ), shorter postmarginally. S_3 similar but basal hairs denser. $S_{4,5}$ with moderately dense, appressed hairs (125–150μ); hairs on postmarginal area of S_5 homogeneously dense as in *L. proximatum*; medially not leaving triangular glabrous area, i. e., posterior margin of S_5 not seen as if medially incised as in *L. pallens*.

Metric values (L = length, W = width, D = minimum distance): n = 10 (or 5 if

asterisked) both in female and male; values given as ♂/♀, with $\bar{x}\pm$SD. Characters arranged in the descending order in male.

A (25 units = 1 mm) Wing diagonal (= D between *M-cu* bifurcation and inner tip of marginal cell) 74.8±4.1/69.5±3.1; metasomal W 54.0±2.8*/60.6±5.2* mesosomal W 50.6±3.8*/55.8±4.7*; head W 50.6±2.4/54.0±2.5; flagella L 49.8±2.5*/37.5±1.9*; head L 44.7±1.9/48.6±1.9; maximum interorbital D 35.4±1.7/38.5±1.5; upper i. o. D 31.5±1.5/32.3±1.3; lower i. o. D 25.7±1.9/31.0±1.6; scape L 18.9±1.9/23.0±1.1; mesoscutellum L 10.0±0.0*/11.3±1.2*; L of propodeal dorsum 9.6±0.5*/9.2±0.8*; metanotum L 6.6±0.5*/8.3±0.4*.

B (40 units = 1 mm) Clypealveolar L 30.9±1.3/33.3±2.7; lateral eye W 20.6±1.5*/18.2±0.4*; clypeus L 18.9±1.8/19.4±1.2; gena W 15.2±1.2*/18.2±2.7*; interocellar D 13.7±1.3/14.7±0.7; ocellocular D 12.6±0.7/13.0±0.9; verticorbital L (=tangential L between summit of vertex and supraorbital line) 9.9±0.5/8.5±0.9; L of apical part of clypeus below suborbital line 9.6±0.8/11.4±2.2; ocelloccipital D 9.6±0.8*/10.8±1.3*. Flagellomere 2 (F_2) W 6.9±0.4/6.7±0.4; F_3 L 6.9±0.4*/4.8±0.3*; F_2 L 6.8±0.4/4.2±0.3; F_1 L 5.2±0.6/4.9±0.3.

Structure Head transverse (Figs. 1, 22), W : L = 1 : 0.88 (♂) and 1 : 0.90 (♀). Vertex flat, ratio verticorbital, interocellar and ocellocular D = 1 : 0.92 : 0.72 (♂) and 1 : 1.73 : 1.53 (♀). Inner orbit not much convergent below, ratio maximum, upper, and lower interorbital D = 1 : 0.89 : 0.72 (♂) and 1 : 0.84 : 0.81 (♀). Ocellar area and face densely reticulopunctate, diameter of punctures (= Pϕ) 25μ or less, interspaces (= IS) linear; frontal carina distinct; Pϕ attaining 38μ on paraocular area. Supraclypeus medially Pϕ 20–25μ, IS = 0.5–2.0 Pϕ; laterally P$\phi\pm$20μ, IS≥Pϕ. Ratio clypeus L : Clypealveolar L : apical L of clypeus = 1 : 1.63 : 0.51 (♂) and 1 : 1.72 : 0.59 (♀). Clypeus transversely raised, smooth and shining except weak basal tessellation, above P$\phi\pm$20μ or less, IS≥Pϕ, below P$\phi\pm$25μ, IS≫Pϕ. Malar space linear. Gena narrow, eye W : gena W = 1 : 0.74 (♂) and 1 : 1 (♀). Antenna short in male, not exceeding mesoscutum; scape exceeding mid ocellus, male : female = 1 : 1.15, in male not much shorter as in many other halictines; flagellomeres short in male, $F_1L : F_2L : F_2W$ = 1 : 1.31 : 1.33 (Fig. 2). Maxillary and labial palpi normal.

Lateral angle of pronotum obtuse. Mesoscutum roundly declivous anteriorly; P$\phi\pm$20μ, rarely to 25μ, anteriorly PP not sharp; IS coriaceous, 1.0–2.0>Pϕ; centrally and posteriorly IS weakly etched to smooth (Fig. 5 vs. 6, 7), along posterior margin, IS coriaceous, <Pϕ. Mesoscutellum with similar Pϕ and IS medially (♂) or submedially (♀) very weakly etched, partly smooth. Mesopleuron distinctly reticuloareolate, posteriorly forming transverse rows; areolae ±20μ wide, coriaceous, dimly shining.

Ratio of mesoscutellum, metanotum and propodeal dorsum L = 1 : 0.66 : 0.96 (♂) and 1 : 0.73 : 0.81 (♀). Propodeal dorsum (Figs. 8–9) flat and slightly inclined postward, postero-medially abruptly angulate with declivity and strongly carinate, postero-laterally obtusely angulate, not strongly and continuously carinate; dorsum with ridges arranged longitudinally and radially in female, but often irregularly or anastomosing in male; lateral carina of declivity above continuous in female, interrupted

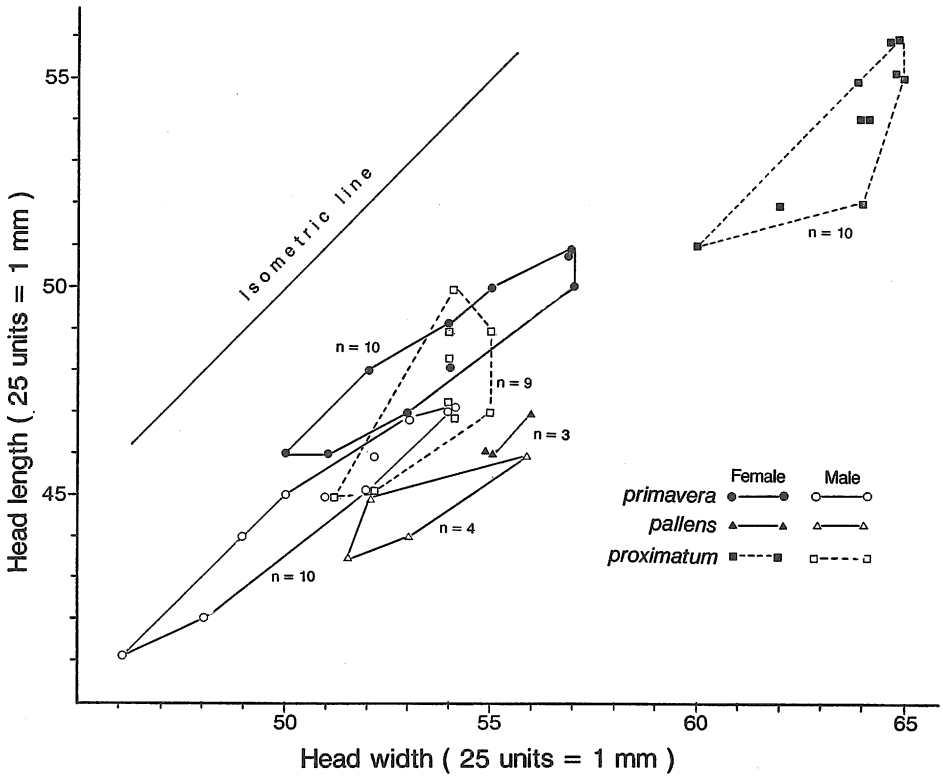


Fig. 22. Distribution of ratio "head length/width" in *Lasioglossum primavera* sp. nov., *L. pallens* and *L. proximatum*.

in male (in *L. pallens* obsolete in male and female; in *proximatum* as in *primavera* but somtimes very weak in male).

Vein Tc-3 thinner than Tc-2 but not much reduced. No. of hamuli 6-9 (3-1-2 to 4-1-1-3) in male, 6-7 (3-1-2 and rarely 4-1-2) in female. Basitarsal comb of female foreleg complete. Basitibial plate well demarcated in both sexes, surface glabrous in male, with fine setae in female. Inner hind tibial spur (♀) with 5-6 small teeth (Fig. 10; in *pallens* teeth large, Fig. 11; in *proximatum* basal tooth large, Fig. 12). Hind tibia and basitarsi of male normally slender.

Metasoma elongate oval, in male not cylindrical as in many other halictines (Fig. 23). Ratio head, mesosoma and metasoma W = 1 : 1 : 1.07 (♂) and 1 : 1.03 : 1.12 (♀). Terga generally smooth with superficial punctures and sculpture. Lateral convexities very weak though more distinct in male. Postmarginal area little depressed. T_1 anteriorly smooth and shining, disc similar with very sparse, finest PP; postmarginal area impunctate, weakly lineolate. T_2 basally with sparse, fine PP, (IS>Pϕ, obsoletely lineolate), postward gradually sparser and convexity smoother; postmarginal area with PP slightly denser, IS obscurely lineolate, T_3 (Fig. 13) and $T_{4,5}$ with sculpture gradually coarser and denser but generally distinctly more superficial than in *L.*

pallens (Fig. 14) and *L. proximatum* (Fig. 15). Male visible sterna unmodified. S_7 with apical process much longer than in *L. proximatum* and S_8 postero-medially elongate with triangular apex not transverse as in *L. proximatum* (Fig. 17 vs. 16).

Male genitalia (Figs. 18, 19) quite different from those in *L. pallens* (Fig. 20) and *L. proximatum* (Fig. 21). Gonocoxite rather long, outer-apically with sparse setae (20–30 μ); outer margin obliquely straight, not rounded as in *pallens* and *proximatum*; with weak median convexity and, unlike in many *Lasioglossum* (s. str.) species, approximately following gonobasal contour. Gonostylus fused with gonocoxite, apically widened and densely haired ($\pm$100μ), ventral retrose lobe completely absent.

Specimens examined (all from Honshu, Japan) Holotype 1♂, Mori (370 m) Koshoku, Nagano Pref., 21–23 IV 1963. Y. MAETA. Paratypes 50♀ 50♂, data as in holotype, all males collected on rape and females on rape or apricot; 1♂ Hayaseno, Ohwani, Aomori Pref., 18 V 1985, Y. YAMADA, (in YAMADA and SAKAGAMI, 1988, shown erroneously as 16 VI); 3♀, 1♂ Kanazawa (2♀ on Univ. Campus, 1♀ 1♂ in Yuwaku), Ishikawa Pref., 28 IV (♂) and 28 IV–19 V 1987, (*Anthriscus nemorosa*, ♀ *Ranunculus acris* var. *japonicus*), K. UTSUMI; 1♂ Oyato, Ohno, Fukui Pref., 11 V 1981, Y. HANEDA; 2♀ Yokohama, Kanagawa Pref., 28 V 1951 and 1 VI 1951, M. AZUMA (Ebmer *in lit.*); 1♂ Mt. Makuragi (350 m), Shimane Pref., 24 IV 1982, Y. MAETA.

Type depository. Holotype and 2♀ 2♂ paratypes in Entomological Laboratory, Kyushu University, Fukuoka. Other paratypes in Entomological Institute, Hokkaido University, Sapporo and in EBMER, MAETA and SAKAGAMI collections. Probably this species is widespread in Honshu, even though sporadically.

L. primavera is remarkable in three features: 1 - Aberrant male genitalia which are "incomparable with those of any other Palaearctic *Lasioglossum* (s. str.) species, having the shape somewhat resembling those of *Andrena*" (EBMER, *in lit.*), 2 - Appearence of males in early spring, and 3 - Similarity of both sexes in size and habitus.

Among three tribes of the subfamily Halictinae, the small Old World xerophilous tribe Nomioidini seems to overwinter regularly in both female and male adults (BLÜTHGEN, 1925). In the New World tribe Augochlorini most temperate and subtropical species may overwinter in female adult alone, but one of us (S. F. S.) confirmed overwintering of both sexes in *Paroxystoglossa jocasta* (SCHROTTKY) and *Caenohalictus implexus* MOURE among 20 most abundant halictine species collected by a year-round periodical sampling in S. Brazil under a warm subtropical climate (SAKAGAMI *et al.*, 1969). Most species of the cosmopolitan tribe Halictini also seem to overwinter in female adult alone but there are some species of which males overwinter in adult: *Lasioglossum* (*Lasioglossum*) *clavipes* (DOURS) (BLÜTHGEN, 1925), *L.* (*L.*) *pallens* (BRULLÉ) (BLÜTHGEN, 1925; STÖCKHERT, 1933; QUÉNU 1954; WESTRICH, 1989), *L.* (*L.*) *bicallosum* (F. MORAWITZ) (PESENKO, 1972), *L.* (*L.*) *caspicum* (F. MORAWITZ) (EBMER, 1980), and facultatively *L.* (*L.*) *xanthopus* (KIRBY) (BLÜTHGEN, 1925; STÖCKHERT, 1933; KNERER, 1987; WESTRICH, 1989), all belonging to *Lasioglossum* s. str. and *L. pallens*, *bicallosum* and *caspicum* closely allied. *L. primavera* is also close to *L. pallens* in many features. On the other hand, nine males of *L. proximatum* used in Fig. 22 were collected all

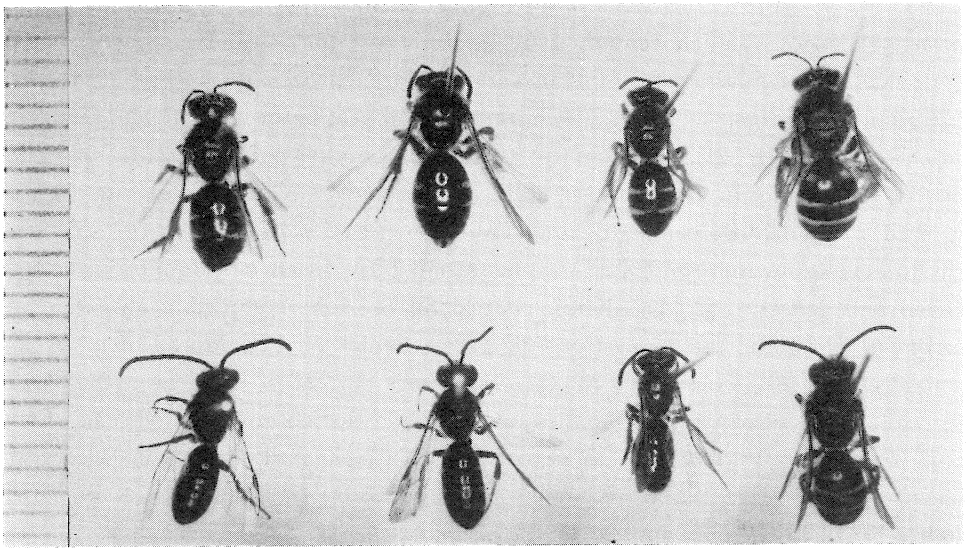


Fig. 23. Comparison of the morphological differences between female (top) and male (bottom) in four species of *Lasioglossum* from left to right; *baleicum*, *proximatum*, *primavera* sp. nov. and *scitulum*. One unit in scale = 1 mm.

between August 10 and October 10.

Interestingly, mandibles of some males of *L. primavera* were more or less worn: 10♂ = degree 1 (intact), 10♂ = deg. 2 (slightly worn), 7♂ = deg. 3 (worn), 2♂ = deg. 4 (distinctly worn), 1♂ = deg. 5 (both mandibles not contact). The conditions in the last three specimens have never seen in all halictine males examined by us. Supposedly males excavate often shallow burrows for an overnight pass as well known in some andrenid bees or possibly even own hibernacula. The collection data clearly show that *L. primavera* is a spring species, hence probably having the solitary life cycle.

Sexual differences in external characters, except for metasomal terminalia, mandibles and pollen foraging characters in females, are diverse in halictine bees as arranged more or less below in the descending order of relative occurrence: 1 - Larger size in female; 2 - Robust habitus in female; 3 - Larger eye in male; 4 - Reduced basitibial plate in male; 5 - Slender and cylindrical metasoma in male; 6 - Longer flagella and shorter scape in male; 7 - Pale marking on clypeus below and paler tibiae and tarsi in male; 8 - Coarser punctures and smoother interspaces in male; 9 - More conspicuous tergal convexities; 10 - Cephalic gigantism in male (in only limited groups, SAKAGAMI akagami *et al.*, 1966); 11 - Sparser setae of submarginal cells in male; 12 - Reduction of basal tergal fasciae in male. Although the criteria for these character states are still not well standardized, many of these differences are also found in other bee groups, appearing often but not necessarily in combination. In *L. primavera* only items 7, 9, 11 are distinct, representing, just as *L.* (*Evylaeus*) *marginatum* (BRELLÉ) (PLATEAUX-QUÉNU, 1959), the species exhibiting weak external sexual differences. Figure 23 shows four examples of such differences in size and habitus, particularly in antennae and metasoma.

Two remarkable features in the male of *L. primavera*, aberrant genitalia and survival to the next spring, are probably derived character states, which evolved within the *L. pallens-bimaculatum* complex, judging from the general resemblance of *L. primavera* with the species of this complex. Although it is less certain, the male-female similarity of *L. primavera* may also be a derived condition in view of the well accentuated sexual differences prevailing in many halictine groups. It may be difficult but interesting to explain why and how *L. primavera* developed these peculiar character states.

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