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TAXONOMIC NOTES ON ORIENTAL HALICTINE BEES OF THE GENUS *HALICTUS* (SUBGEN. *SELADONIA*) (HYMENOPTERA APOIDEA)[1)]

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A b s t r a c t : The following 4 genuine Oriental species of the halictine bees of the genus *Halictus* (the subgenus *Seladonia*) are redescribed, together with new distributional records and some life cycle data: *H. lucidipennis* SMITH (♀, ♂), *H. propinquus* VACHAL (♀ ♂), *H. vicinus* VACHAL (♀, ♂) and *H. subauratoides* BLÜTHGEN (♀).

The subgenus *Seladonia* includes about 90 known species of dark green metallic, medium to small halictine bees, and most widespread among the three subgenera of the principally Palaearctic genus *Halictus*, although represented by rather a scarce number of species outside the Palaearctics (MICHENER 1978).

Concerning the Indomalayan species BLÜTHGEN (1926) enumerated under the name of *H. tumulorum* group the following 9 species: 1. *H. propinquus* SMITH (with var. *silvatica* BLÜTHGEN, var. *abuensis* (CAMERON), 2. *H. grandiceps* CAMERON, 3. *H. lucidipennis* SMITH, 4. *H. vernalis* SMITH (= a paler leg specimen of *lucidipen-*

1) Research Trips for Forest and Agricultural Insects in the Subcontinent of India JICT: (Hokkaido University, University of Calcutta and Zoological Survey of India Joint Project) Scientific Report Nr. 29, and a part of "Biosystematic studies of the Insects of Sri Lanka" directed by Dr.Karl V. KROMBEIN, Smithsonian Institution, Washington, D.C. (The halictine bees of Sri Lanka and the vicinity. I. *Seladonia*).

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nis?), 5. *H. varipes* MORAWITZ, 6. *H. subauratus* ROSSI, 7. *H. subauratoides* newly described, 8. *H. geminatus* PÉREZ, 9. *H. tibetanus* newly described. Among these, no. 5 is now synonymous with *H. lucidipennis* as shown later, and nos. 6, 8, 9 are basically Palaearctic, with only a slight invasion in northern areas of the Indian subcontinent. Next, COCKERELL (1929) newly described *H. daturae* (with var. *laosina*), *H. speculiferus* , and *H. umbrosus* , all from Nan, N Thailand and considered *H. vernalis* a *Chloralictus* . Later BLÜTHGEN (1930) synonymized *H. grandiceps* with *H. propinquus* , *H. propinquues* varr. *abuensis* and *silvatica* with *H. vicinus* VACHAL. Contrary to COCKERELL, BLÜTHGEN (1931) regarded *H. vernalis* as a *Seladonia* , and did not interpret the taxonomic status of 3 COCKERELL's species because of insufficient descriptions. As mentioned below all the 3 species are synonymous with *H. vicinus*, and *H. vernalis* with *H. lucidipennis* so that only the 4 species treated in this paper, *H. lucidipennis* , *H. propinquus*, *H. vicinus* and *H. subauratoides*, are genuine Indomalayan representatives.

Here are given brief comments on the marginally Oriental species enumerated by BLÜTHGEN (1926, Nos. 6, 8, 9 mentioned above. Details see EBMER 1987).

H. subauratus (ROSSI 1792). A principally warm temperate species with a wide transcontinental distribution from Portugal and Morocco to E. Siberia, being neither typical Mediterranean nor confined to Steppes, southward reaching Kashmir (Inshan-Morgan-Pass, 3200-3500 m, 33.30 N, 75.30 E, 1 ♀, vii 20 1980, Rausch) and according to BLÜTHGEN (1926) also Pakistan (Quetta). See also *H. subauratoides*.

H. seladonius (FABRICIUS 1794) (syn. *H. geminatus* PÉREZ 1903). The type species of the subgenus *Seladonia* and is regarded as a representative of Eurasian steppes rather than a Mediterranean species. Southward it reaches Afganistan (EBMER 1980: 473) but not yet recorded from the Indian Subcontinent, although BLÜTHGEN (1926) assumed its occurrence in Kashmir, Quetta (N. Pakistan) and

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even Matheran (n. Bombay).

H. tibetanus (BLÜTHGEN 1926). Only known by the holotype (♀, Gyangste, Tibet, 13000 ft). BLÜTHGEN (1926) cited this species for its possible occurrence in northern areas of the Indian Subcontinent. This species, being close to *H. dissidens* PÉREZ 1903 from Central Asia, belongs to the *H. tumulorum* -group.

By their extremely rich life cycle spectrum, the halictine bees are one of the most promising groups for the study of comparative ethological studies. All 9 so far bionomically know *Seladonia* species are social (SAKAGAMI 1974; SAKAGAMI and OKAZAWA 1985). On the bionomics of the Indomalayan species, there are only 2 papers by BATRA (1966, 1967, *H. lucidipennis*, *H. vicinus*). Closer studies by residential researchers are indispensable.

The taxonomic characteristics of *Seladonia* were given by MICHENER (1978) and the species groups (mainly of the W. Palaearctics) were distinguished by EBMER (1978). Some features common to the 4 species are compiled below. All 4 species differ from the species of the *H.* (*S.*) *tumulorum* -group by male metasomal sterum 6 (= S_6) flat, not peculiarly depressed (Figs. 87-90) and ventral process of gonostylus slender, not massive and triangular (Figs. 100-103). Further, *H. lucidipennis* belongs to the *H.* (*S.*) *gemmeus* -group with rather sparse mesoscutal punctures and longer propodeal dorsum and all the other 3 species to the *H.* (*S.*) *seladonius*-group with mesoscutum densely punctate and propodeal dorsum relatively short (Figs. 33-44) (Details see EBMER 1987).

Female Coloration Dull metallic grass to olive green, metasomal dorsum darker and less metallic. Clypeus and sometimes supraclypeus more blackish and less metallic. Antenna dark brown, flagella below apically chestnut brown. Mandible dark to blackish brown, apically paler. Tergal margins only narrowly brownish, neither metallic nor semitransparent; venter dark to blackish brown. Legs nonmetallic,

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blackish to chestnut brown. Wings transparent, veins and stigma brownish, subcosta darker.

Pilosity: Generally pale yellow ocker; paler on venter, mesosomal side and legs; whitish and tomentose, completely covering the surface on paraocular area along inner orbit (Figs. 1, 4, 5), gena (Figs. 6, 9, 10), pronotal lobe and metanotum; otherwise moderately dense. Eye with very sparse and minute setae, virtually glabrous. Tergum 1 (= T_1) basilaterally, besides long hairs, with small, inconspicuous tomental patch. Basal tomental band usually broadly visible on $T_{2,3}$. Apical fimbria interrupted on T_1 and mostly so on T_2, but on $T_{3,4}$ though narrower on the latter. Minute surface setae very short and inconspicuous on T_1; medially broadly glabrous, short but denser and more conspicuous on T_2; longer on $T_{3,4}$, especially on marginal depressions. Sternal scopal hairs simple and erect but some ones on S_2 sparsely branched and apically curved. Fore basitarsal comb present.

Metric characters: Mean ± SD and parenthetically the number of measured specimens (= 10 if unmentioned) are given for each character of each species (abbreviations: *H. lucidipennis* = *l*, *H. propinquus* = *p*, *H. vicinus* = *v*, *H. subauratoides* = *s*), arranged according to the descending order obtained for *lucidipennis* (L, W = maximum length and width, D = minimum distance).

A (25 units = 1 mm): HW (Head W) *l* = 49.9 ± 4.4, *p* = 61.3 ± 6.7, *v* = 53.0 ± 3.2, *s* = 58.8 ± 2.4 (8); M_tW (Metasoma W) *l* = 49.1 ± 4.4, *p* = 63.6 ± 6.4, *v* = 56.6 ± 3.6 (5), *s* = 63.4 ± 2.5 (8); WD (Wing diagonal = D between *M-Cu* bifurcation and inner tip of marginal cell) *l* = 48.5 ± 3.5, *p* = 69.5 ± 5.7, *v* = 58.8 ± 5.1 (10), *s* = 70.0 ± 2.2 (6); M_sW (Mesosoma W = D between outer rins of tegulae) *l* = 46.2 ± 3.8, *p* = 59.9 ± 5.4, *v* = 53.0 ± 3.8 (5), *s* = 59.4 ± 1.7 (8); HL (Head L excl. apical clypeal tooth) *l* = 45.0 ± 4.0, *p* = 57.9 ± 6.7, *v* = 49.1 ± 2.3, *s* = 53.8 ± 2.0 (8); MOD (Maximum interorbital D) *l* = 36.6 + 3.6, *p* = 46.3 ± 6.3, *v* = 38.0 ± 2.1 (5), *s* = 43.0 ± 1.4 (8); UOD (Upper interorbital D) *l* = 33.5 ± 3.1, *p* = 40.0 ± 4.8, *v* = 34.0 ± 1.7

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(5), *s* = 40.1 ± 1.5 (8); LOD (Lower interorbital D) *l* = 32.9 ± 3.6, *p* = 39.7 ± 4.9, *v* = 31.4 ± 2.0 (5), *s* = 36.8 ± 2.0 (8); EL (Eye L) *l* = 29.0 ± 2.9, *p* = 36.1 ± 3.8, *v* = 32.8 ± 1.7 (5), *s* = 33.8 ± 2.0 (8).

B (40 units = 1 mm) CAL (Clypealveolar D = D between level of lower rims onf antennal sockets and lower margin of clypeus) *l* = 27.0 ± 2.7, *p* = 35.0 ± 3.6, *v* = 30.2 ± 1.8 (5), *s* = 33.9 ± 1.7 (8); GW (Gena W, seen laterally) *l* = 21.7 ± 2.5, *p* = 28.3 ± 4.0, *v* = 20.3 ± 1.3, *s* = 25.4 ± 1.3 (8); EW (Eye W, seen laterally) *l* = 18.0 ± 1.6, *p* = 20.9 ± 1.5, *v* = 19.4 ± 1.6, *s* = 20.8 ± 0.7 (8); SCL (Mesoscutellum L) *l* = 15.4 ± 1.5 (5), *p* = 19.9 ± 2.5, *v* = 16.6 ± 1.8 (5), *s* = 20.2 ± 1.0 (8), OOD (Ocellocular D) *l* = 14.7 ± 1.8, *p* = 21.2 ± 2.6, *v* = 15.6 ± 1.2, *s* = 20.9 ± 0.6 (8); IOD (Interocellar D) *l* = 14.6 ± 1.3, *p* = 14.7 ± 1.1, *v* = 13.8 ± 1.0, *s* = 13.8 ± 0.7 (8): CPL (Clypeus L excl. apical tooth) *l* = 14.4 ± 1.3, *p* = 21.3 ± 3.3, *v* = 16.6 ± 0.5 (5), *s* = 19.8 ± 0.8 (8); PDL (Propodeal dorsum L) *l* = 13.6 ± 1.5 (5), *p* = 16.9 ± 1.6, *v* = 14.8 ± 0.7 (5), *s* = 15.8 ± 1.0 (8); O_CO_CD (Ocelloccipital D) *l* = 12.3 ± 2.4, *p* = 18.9. ± 3.1., *v* = 11.9 ± 1.8, *s* = 14.2 ± 1.2 (8); VOL (Verticorbital L = tangential L between summit of vertex and supraorbital line) *l* = 12.2 ± 1.3, *p* = 17.5 ± 2.0, *v* = 14.2 ± 1.5 (5), 15.4. ± 1.4 (8); APL (Apical part of clypeus L = L of part exceeding lower orbital line) *l* = 10.6 ± 1.7, *p* = 13.0 ± 1.7, *v* = 9.8 ± 0.7 (5), *v* = 13.6 ± 1.2 (8); MNL (= Metanotum L) *l* = 9.2 ± 0.7 (5), *p* = 12.6 ± 1.8, *v* = 10.4 ± 1.0 (5), *s* = 12.4 ± 1.2 (8).

Structure: Head (Figs. 1-10) as wide as to wider than meso- and metasoma, seen frontally a little wider than long. Vertex flat, particularly in larger ♀, and ocelloccipital distance (O_CO_CD) more or less longer relative to interocellar distance (IOD) in larger ♀ (Fig. 104). Inner and outer orbits gently outcurved, not much more convergent below than above. Ocellocular area flat, with dense and distinct punctures (= PP) of 20 - 30 μ ϕ with interspaces (= IS) much narrower, often linear and weakly etched; postocellar area with PP

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slightly larger and arranged somewhat areolately, often forming transverse rows; interocellar area not conspicuously elevated. Frons flat to mildly convex, more in smaller ♀; PP 20 μ to medially 15 μ ♂ with IS linear; frontal carina distinct. Paraocular area above with PP and IS as on frons, below with PP coarser. Supraclypeus gently convex with dense PP. Clypeus rather flat, laterapical tooth normal, PP acute and IS smooth and shining. Seen laterally gena not angulate but swollen, wider to much wider than eye (Figs. 6-10); seen dorsally distinctly swollen postward though not outward (Figs. 11-13).

Mesosoma: Pronotum seen laterally concave; seen dorsally with lateral angle obtuse; lateral ridge more or less developed but neither carinate nor lamellate (Figs. 19-23), seen dorsally gently concave; lateral lobe apically rounded. Mesoscutum anteriomedially gently protruded and roundly truncate; lip not particularly differentiated. Mesoscutum and -scutellum densely and rather homogeneously punctured with IS smooth and shining (Figs. 41-48). Pleura coarsely granulo-coriaceous; mesepisternum below slightly less coriaceous; metepisternum above transversely carinostriate. Propodeal dorsum slightly inclined, posteriorly not carinate; enclosure slightly depressed, not attaining the posterior margin of propodeal dorsum, with strong longitudinal ridges often anastomosing (Figs. 33-40). Propodeal declivity with heart-shaped median depression of W:L = 25:20, laterally carinate at lower 1/2 to 2/3, above finely punctured, IS smooth and shining. Wing venation of usual *Halictus* type without reduction of t-c veins; hamuli 7-8, mostly clustered as 3112 or 4112. Strigilis and scopa normal; fore basitarsal comb present; inner tibial spur pectinate with several relatively large teeth (Figs. 27-32).

Figs. 1 - 10. Frontal (1 - 5) and lateral (6 - 10) views of heads (♀♀). 1, 6 = *H. lucidipennis* (L, large ♀); 2, 7 = ditto (small ♀); 3, 8 = *H. propinquus* (P, large ♀); 4, 9 = ditto (small ♀); 5, 10 = *H. subauratoides* (S). Symbols L, P, S and V (= *H. vicinus*) are used in the subsequent figures. (Scale = 0.5 mm).

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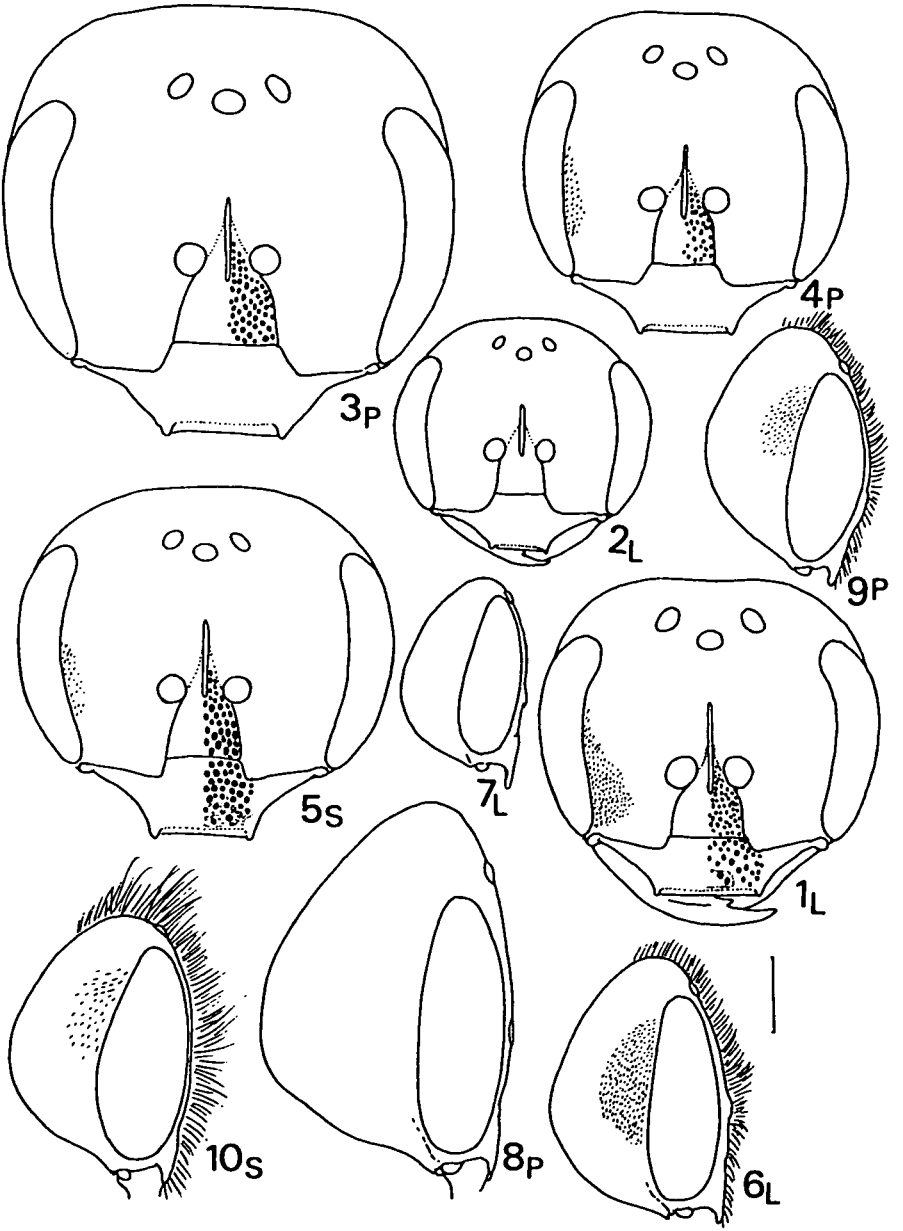

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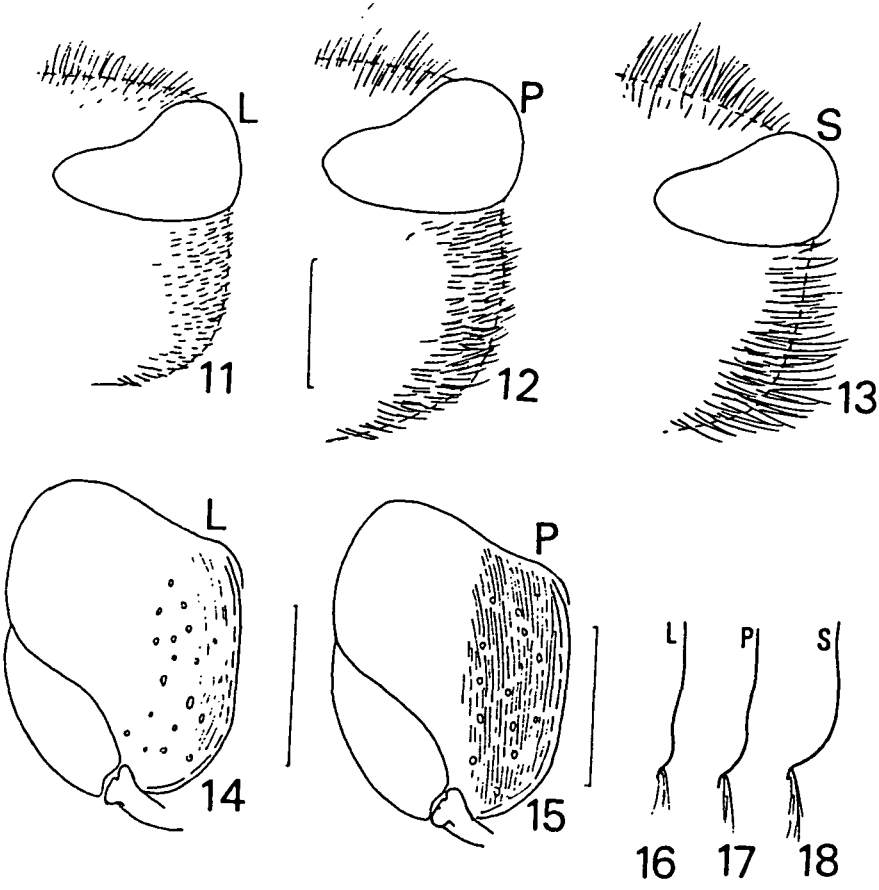
Metasoma oval, dorsoventrally not much depressed, venter not concave. T_1 with lateral carina acute; declivous area not sulcate, medially smooth with very sparse and fine PP; boss mildly elevated, posteriorly not well demarcated; postmarginal area not much depressed, particularly in *H. subauratoides*, though more distinct on $T_{2,3}$. Disc



Figs. 11 - 18: Some cephalic characters in L, P, and S ($\frac{oo}{++}$). 11 - 13 = Pilosity on frons and gena. 14 - 15 = Striation on hypostoma (Scales = 0.5 mm). 16 - 18 = Curvature of clypeus seen laterally (semischematic).

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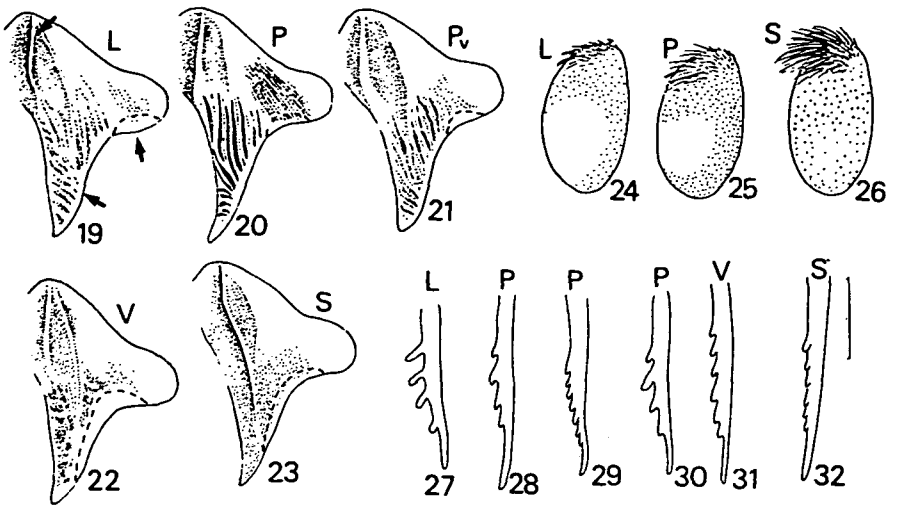

Figs. 19 - 32: Some mesosomal characters in L, P, V and S ($\underset{++}{oo}$). 19 - 23 = Pronotal side, lateral ridge (above), lower parallel ridges and extent of marginal tomentum (broken contour) are arrowed. 21 = P in Thailand (semischematic).
24 - 25 = Tegula, anterior hairs and punctation (semischematic).
27 - 32 = Inner hind tibial spur; (28, 29 = from Nepal, 30 = from Thailand, scale = 0.25 mm).

smooth and shining on T_1, slightly shagreened on T_2 and more on T_3, seen rather coriaceous.

Male: Coloration and pilosity as in $\underset{+}{o}$. Flagella below paler, orange brown. Apical parts of legs more or less extensively yellow. Hairs generally longer. Basal tomental band uninterrupted on $T_{2,3}$. Apical fimbria interrupted on $T_{1,2}$, either interrupted or not on $T_{3,4}$.

Metric characters: Presented as in $\underset{+}{o}$. Unless parenthetically specified, characters are as in $\underset{+}{o}$ and the number of measured specimens is *l* = 10, *p* = 5, *v* = 4.

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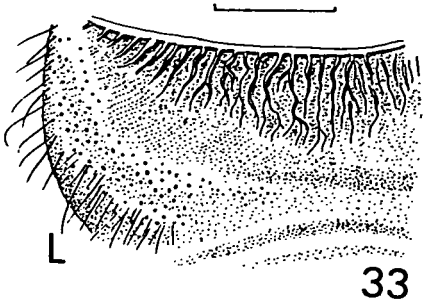

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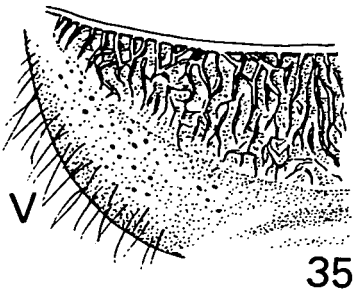

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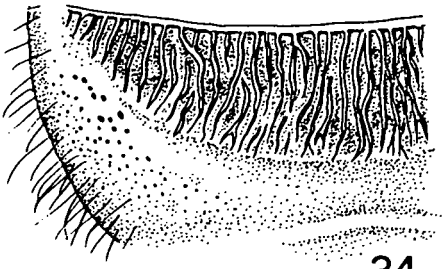

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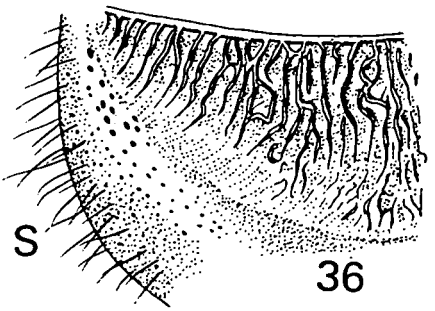

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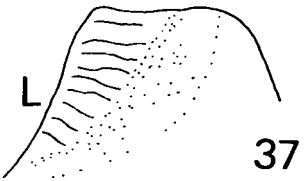

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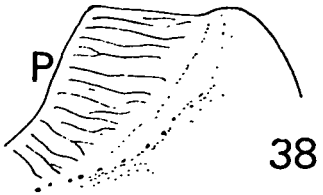

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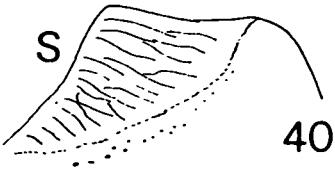

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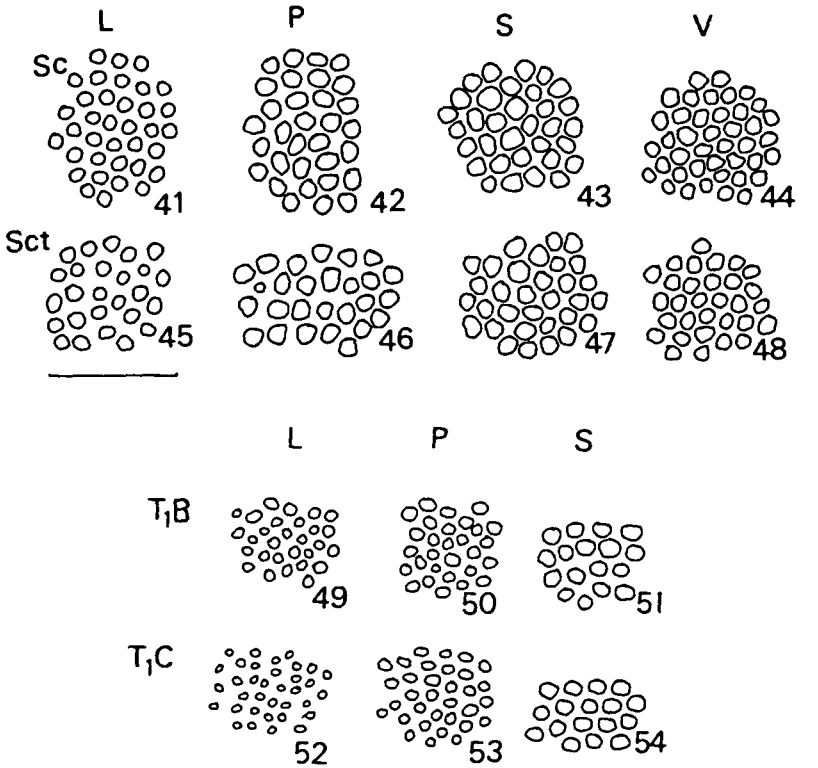

Figs. 33 -40: Dorsal (33 - 36) and lateral (37 - 40) views of propodeal dorsum ($\underset{++}{oo}$) in L, P, V and S. (Scale = 0.25 mm).

Figs. 41 - 54: Mesosomal and tergal punctation ($\underset{++}{oo}$) in L, P, V and S. 41 - 44 (Sc) = mesoscutum; 45 - 48 (Sct) = mesoscutellum; 49 - 51 (T_1B) = tergum 1, boss; 52 - 54 (T_1C) = tergum 1, center. (Scale = 0.125 mm).

A (25 units = 1 mm): WD *l* = 45.4 ± 3.0 (9), *p* = 75.5 ± 4.3 (4), *v* = 57.5 ± 2.6; M_sW *l* = 41.7 ± 3.2, *p* = 59.2 ± 3.9, *v* = 48.8 ± 3.1; HL *l* = 41.6 ± 3.4, *p* = 64.2 ± 3.5, *v* = 52.0 ± 3.4; HW *l* = 40.9 ± 3.4, *p* = 59.5 ± 3.3, *v* = 49.0 ± 2.8; M_tW *l* = 37.8 ± 3.7, *p* = 56.8 ±

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4.4, *v* = 48.0 ± 1.9; MOD *1* = 28.8 ± 2.4, *p* = 42.4 ± 3.1, *v* = 35.0 ± 1.4; VOD *1* = 28.1 ± 2.3, *p* = 40.4 ± 2.5, *v* = 33.0 ± 1.4; EL *1* = 26.4 ± 2.4, *p* = 36.6 ± 2.2, *v* = 31.5 ± 1.8; LOD *1* = 22.2 ± 2.2, *p* = 34.2 ± 2.5, *v* = 26.2 ± 1.3.

B (40 units = 1 mm): CAL *1* = 28.6 ± 2.4, *p* = 43.6 ± 2.4, *v* = 36.5 ± 2.7; EW *1* = 17.3 ± 1.1, *p* = 23.6 ± 1.7, *v* = 20.8 ± 1.5; CPL *1* = 16.3 ± 1.8, *p* = 22.8 ± 1.3, *v* = 19.5 ± 1.1; SPL (Scape L) *1* = 15.4 ± 1.4, *p* = 25.8 ± 1.9, *v* = 19.8 ± 0.8; GW *1* = 15.3 ± 2.7, *p* = 25.0 ± 2.3, *v* = 20.2 ± 1.1; SCL *1* = 14.7 ± 0.9, *p* = 20.6 ± 1.2, *v* = 18.2 ± 0.8; IOD *1* = 13.5 ± 1.6, *p* = 15.8 ± 0.7, *v* = 15.5 ± 0.5; OOD *1* = 12.9 ± 1.4, *p* = 20.2 ± 1.6, *v* = 15.5 ± 1.1; PDL *1* = 12.8 ± 1.2, *p* = 15.4 ± 0.8, *v* = 14.5 ± 0.9; VOL *1* = 12.6 ± 1.8, *p* = 22.6 ± 2.2, *v* = 16.8 ± 0.4; APL *1* = 11.3 ± 1.6, *p* = 20.2 ± 1.9, *v* = 15.8 ± 1.5; O_cO_cD *1* = 10.2 ± 1.5, *p* = 19.8 ± 1.5, *v* = 12.8 ± 1.9; MNL *1* = 8.1 ± 0.7, *p* = 12.0 ± 0.6, *v* = 10.5 ± 0.5; F_2L (Flagellomere 2 L) *1* = 8.5 ± 1.0, *p* = 12.0 ± 0.6, *v* = 10.0 ± 0.7; $F_{10}L$ *1* = 8.4 ± 0.7, *p* = 12.1 ± 0.2 (4), *v* = 10.0 ± 0.7; F_3L *1* = 7.8 ± 1.0, *p* = 12.0 ± 0.7 (4), *v* = 10.0 ± 0.7; F_2W *1* = 6.0 ± 0.4, *p* = 8.0 ± 0.6, *v* = 6.9 ± 0.2; F_1L *1* = 5.5 ± 0.4, *p* = 8.7 ± 0.6, *v* = 7.2 ± 0.4; ML (Malar L) *1* = 1.8 ± 0.4, *p* = 3.4 ± 0.5, *v* = 3.0 ± 0.0.

Structure: Head (Figs. 55-60) generally as in ♀, allometric trends in vertex (IOD: O_cO_cD, IOD : OOD) and gena (EW : GW) present, particularly in *propinquus*, but less conspicuous than in ♀; head nearly as wide as long, correspondingly interorbital and alveorbital distances, and supraclypeus and clypeus widths shorter than in ♀; epistomal angle roundly obtuse but nearly rectangular; clypeus below gently curved postward, laterapically not projecting. Mandible normally slender (Fig. 59). Antenna attaining mesoscutellum; scape short, above not exceeding level of upper minimum interorbital line; F_2 - F_{11} distinctly longer than wide, seen laterally above gently concave and below convex (Figs. 81-83).

Mesosoma as in ♀. Propodeal side upward to outer margin of lateral

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field with PP coarser and denser than in ♀; propodeal dorsum slightly shorter; enclosure posteriorly more curved and sculpture often more variable (Figs. 61-65); heart-shaped median depression of declivity taller and laterally more outcurved. Legs without anomalies, neither particularly swollen nor dilated; strigilis as in ♀. Inner hind tibial spur microserrate with ± 10 denticules. Hind basitarsus normally articulated with distitarsi.

Metasoma elongate oval, with cross section as in ♀ but taller. Terga generally densely punctured, with IS narrow, smooth to microtessellate, at least dully shining (Figs. 72-80). T_1 sessile, L : W = 1 : 1.62 - 1.72; declivity not sulcate, boss mild but distinct. $T_{2,3}$ basally depressed, bosses prominent, and PP stronger. Apical terga with bosses and marginal areas weaker and PP less distinct. Sterna normal, S_1 medially slightly notched. Apically S_2 virtually straight, S_3 to S_5 slightly but increasingly incurved. $S_{4,5}$ apicolaterally dully angulate. S_6 with pregradular area narrow but not obsolete as in *H. tumulorum*, postgradular area medially not depressed as in the *H. (S.) tumulorum*-group, apically nearly straight without particularly arranged hairs (Figs. 87-90). S_7 medially triangular, apex slightly exceeding S_8. S_8 medially mildly projecting, apex not sharply pointed, usually with long hairs (Figs. 91-93).

Genitalia: (Figs. 94-99). Gonobase short, continuing gonocoxal outline. Gonocoxite gently outcurved, longitudinally striated dorsally. Gonostylus (Figs. 100-103) rather elongate, apically dilated inward with rounded apex; outer contour gently outcurved without angulation; ventrally with a dense tuft of short hairs and another tuft of several long filamentlike modified hairs; dorsal process slender, much exceeding main body, with short and sparse hairs, apically more or less clavate; ventral process slender, shorter than main body, with sparse hairs. Penis valve dorsally rather sparsely haired.

Variability: Table 1 presents frequency distributions of head widths (♀♀) of the 4 *Seladonia* species. Wide size range seen in *H. lucidi-*

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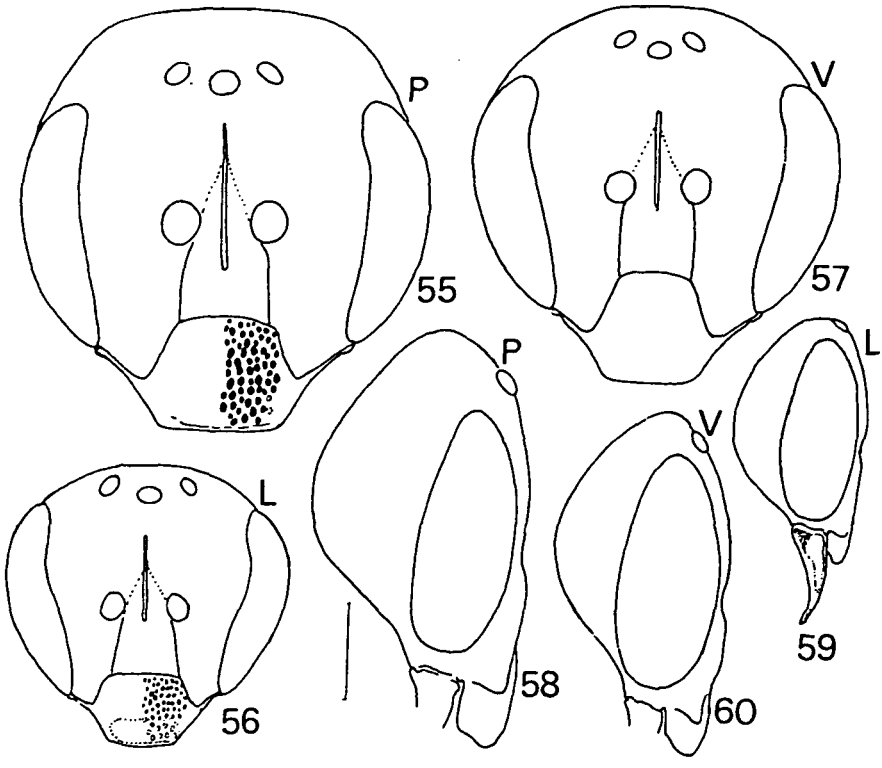

Figs. 55 - 60: Frontal (55 - 57) and lateral views of heads (♂♂) of L, P and V. (Scale = 0.5 mm).

pennis and *H. propinquus* may correspond to the caste differentiation. Some *Seladonia* species exhibit a conspicuous size-linked cephalic allometry (SAKAGAMI & FUKUSHIMA 1961; SAKAGAMI & MOURE 1965; BROOKS & ROUBIK 1983). Fig. 104 shows the occurrence of a similar allometry in the Indomalayan congeners. The tendency varies among species, being most conspicuous in *H. propinquus* (Figs. 3, 4, 8, 9) while rather weak in *H. lucidipennis* (Figs. 1, 2, 6, 7). Evidently *H. grandiceps* was named for the large macrocephalic ♀♀ of *H. propinquus*. The number of teeth in the inner hind tibial spur of ♀♀ was counted for some specimens as follows (x = small tooth):

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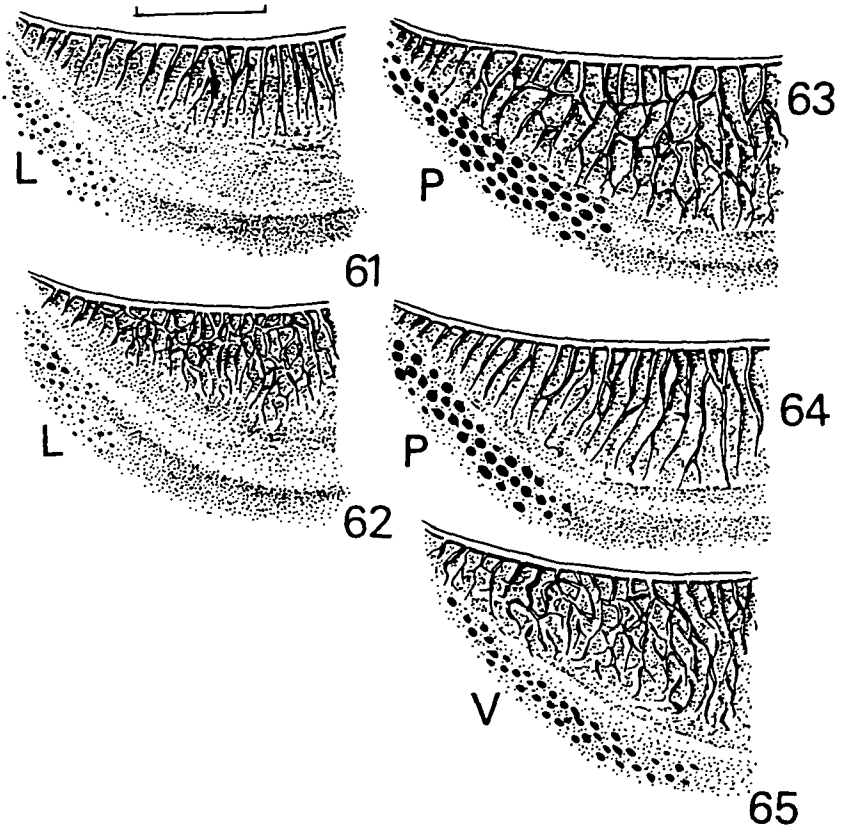

Figs. 61 - 65: Dorsal views of propodeal dorsum (♂♂) in L, P and V, with variations in L and P. (Scale = 0.25 mm).

Number	2x	3	3x	4	4x	5	4xx	x4x	5x	6	5xx	6x	7	8x
lucidipennis	2	24	18	16	6									
vicinus		2		4	1	3	1			2				
propinquus		1		16	4	34	1	1	6	2	2	3		1
subauratoides									1	2			1	

Geographical distribution: Fig. 105 (see also Figs. 107, 108) presents the localities recorded in this study (numbered) and those previously recorded (alphabetized) for each country separately, accompanied with

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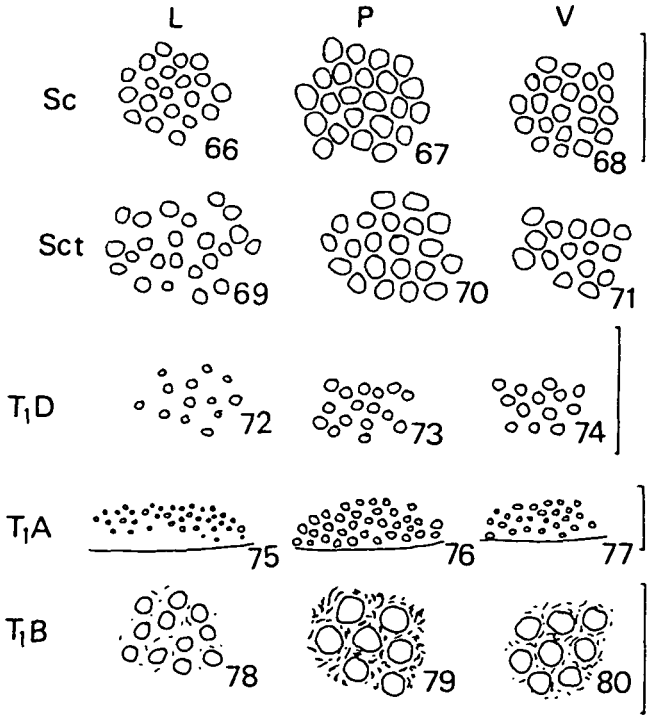

Figs. 66 - 80: Mesosomal and tergal punctation (♂♂) in L, P and V. 66 - 68 (Sc) = mesoscutum (anterior half). 69 - 71 (Sct) = mesoscutellum submedially. 72 - 74 (T_1D) = tergum 1, declivity (Scale = 0.125 mm in Sc, Sct, T_1D). 75 - 77 (T_1A) = tergum 1, apical margin (Scale = 0.5 mm). 78 - 80 (T_1B) = tergum 1, boss (Scale = 0.0625 mm).

Figs. 81 - 90: Male antenna and terminalia in L, P and V (Scale = 0.25 mm). 81 - 83 = Left pedicel and basal flagellomeres. 84 - 86 = Tergum 7. 87 - 90 = Sternum 6 (T = *H. tumulorum*).

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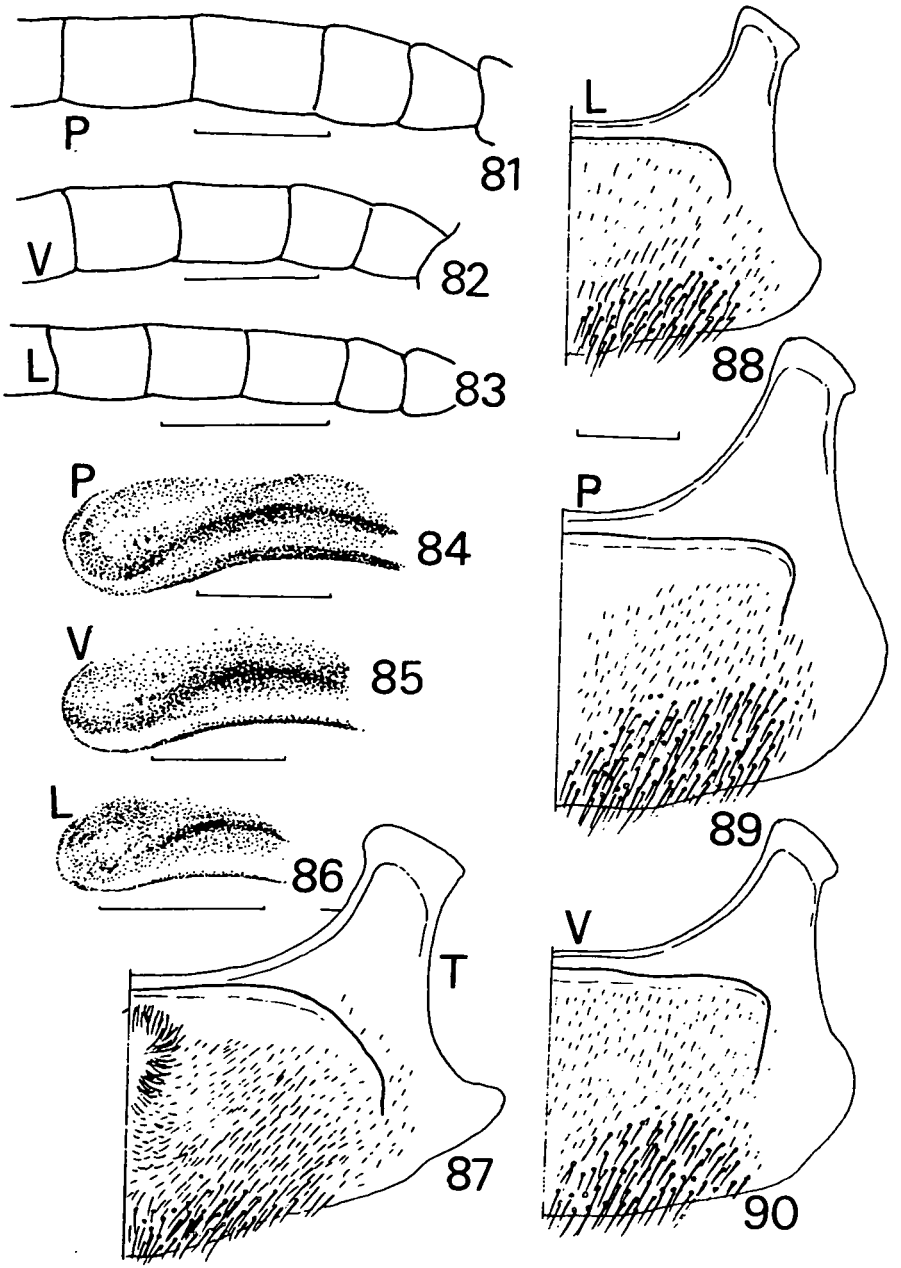

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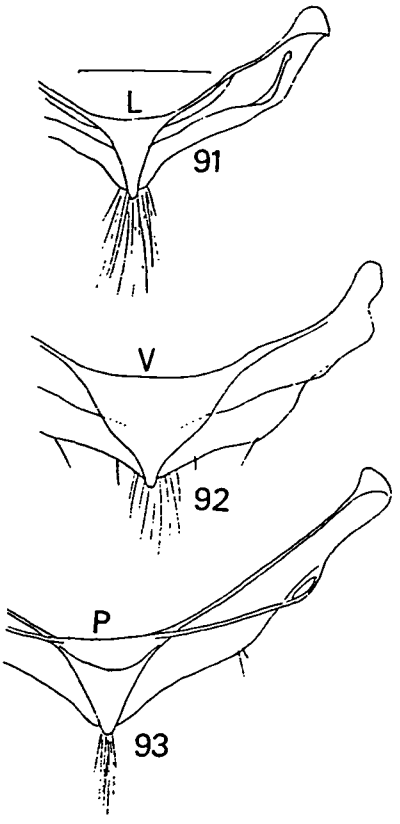

distributional map of each species. *H. subauratoides* is confined to the southern slope of the Himalaya and related ridges while *H. vicinus*, *H. propinquus* and *H. lucidipennis* attain more southerly. Only the last species reaches Sri Lanka. Up to the present no *Seladonia* species have been recorded from the genuine Malesian Subregion.

Figs. 91 - 93: Sterna 7 and 8.

Key to the species (for both sexes)

1. Posterior area of propodeal dorsum widely free from longitudinal ridges (Figs. 33, 37, 61, 62). Tomental patches on gena and paraocular area dense, completely covering the surface (Figs. 1, 6). Tegula with postouter area broadly impunctate (Fig. 24). Small species, wing 3.5 - 5.1 mm. . . . . *H. lucidipennis* SMITH 1853.

- Posterior area of propodeal dorsum only narrowly free from ridges (Figs. 34, 35, 36, 38, 39, 40, 63, 64, 65). Tomental patches

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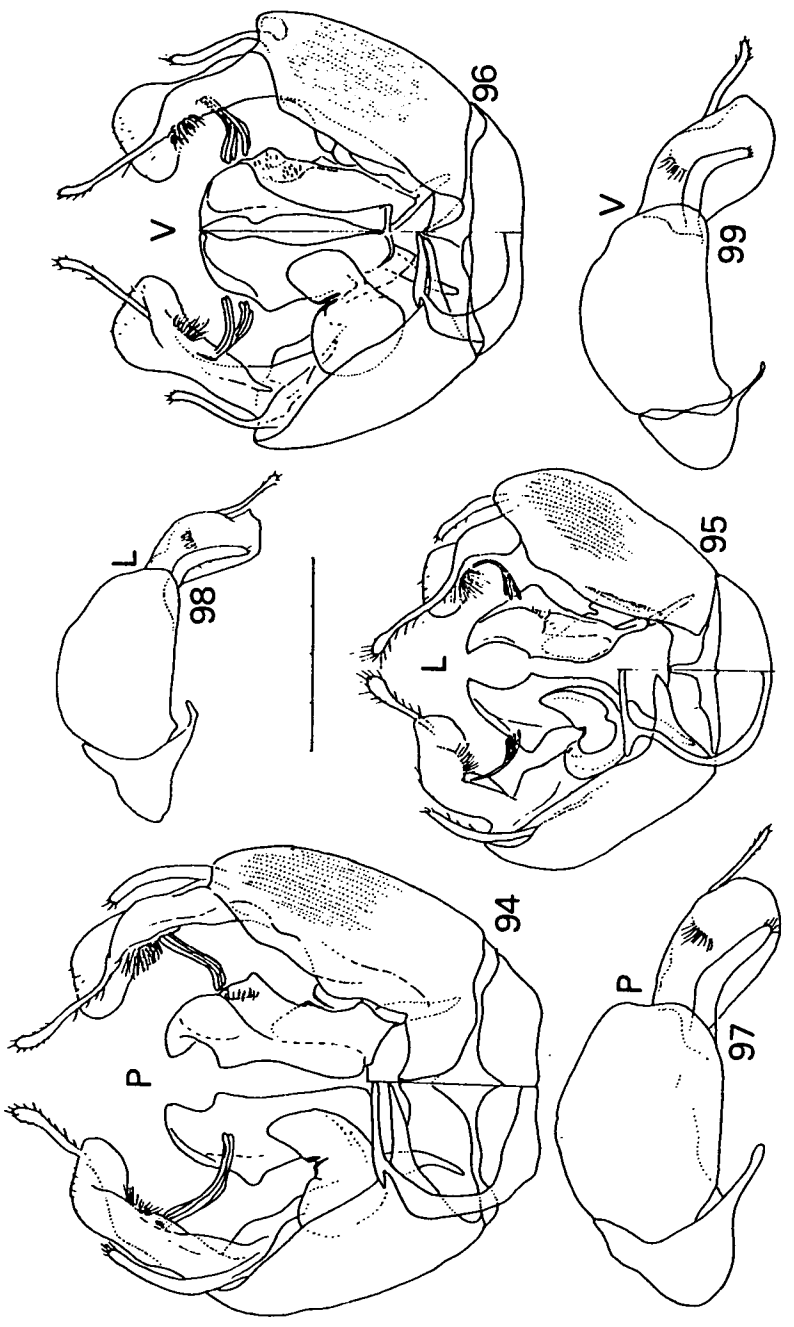

Figs. 94 - 99: Male genitalia in L, P and V (Scale = 0.5 mm). 94 - 96 = Ventral (left) and dorsal (right) views. 97 - 99 = Right lateral views.

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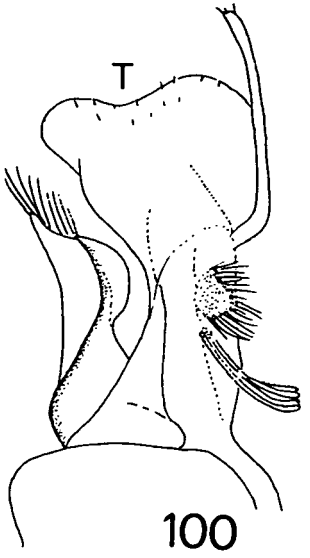

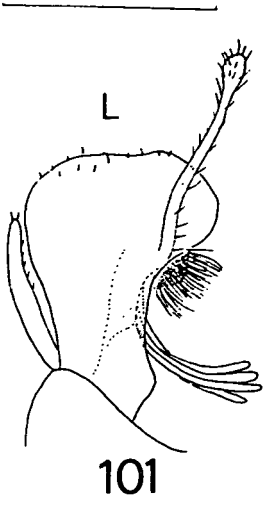

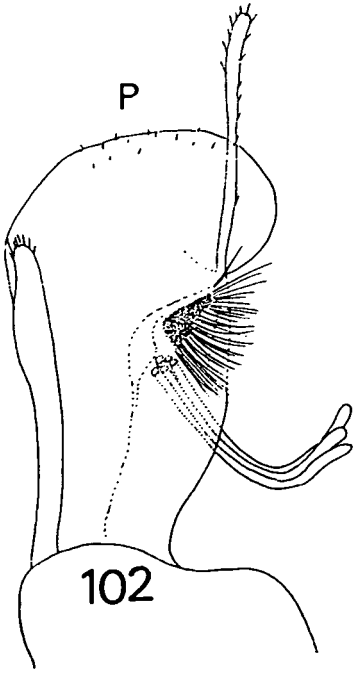

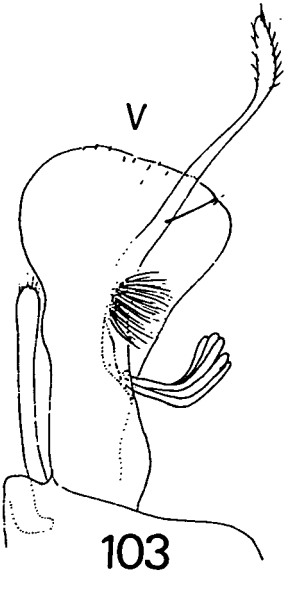

Figs. 100 - 103: Right male gonostylus (Scale = 0.25 mm) in L, P and V. T = *H. tumulorum*.

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on gena and paraocular area poorly covering the surface (Figs. 4, 5, 9, 10). Tegula with postouter impunctate area narrower (Figs. 25, 26). Larger, wing 4.6 - 6.8 mm. 2

2. Hairs longer (Figs. 10, 13), 400 - 425 μ on face and 300 - 325 μ on mesoscutum centrally. Lateral ridge of pronotum acute and extending below (Fig. 23). Tegula without demarcated impunctate area (Fig. 26) (♂ unknown). . . *H. subauratoides* BLÜTHGEN 1926.

- Hairs shorter (Figs. 9, 12), less than 350 μ on face and less than 250 μ on mesoscutum. Lateral ridge of pronotum dull and not extending below (Figs. 20-22). Tegula with circular impunctate area postoutward (Fig. 25). 3

3. Hypostoma strongly striate (Fig. 15). Lateral surface of pronotum below with strong longitudinally parallel ridges while marginal tomental patch narrow (Figs. 20, 21). In female mesoscutum not much densely punctate, with interspaces 1/3 to 2/3 of diameters of punctures (Fig. 42). Ridges on propodeal dorsum rather less irregular (Figs. 34, 63, 64). . . . . *propinquus* SMITH 1853.

- Hypostoma only vestigially striate (less than in Fig. 14). Lateral surface of pronotum below without parallel ridges while marginal tomental patch wider (Fig. 22). Mesoscutum densely punctate, with interspaces 1/4 to 1/3 of diameters of punctures (Fig. 44). Ridges on propodeal dorsum more irregularly arranged (Figs. 35, 65). . . . . *vicinus* VACHAL 1894.

Halictus (*Seladonia*) *lucidipennis* SMITH 1853

1853 *Halictus lucidipennis* SMITH, Catal. Hymen. Brit. Mus., 1: 62, ♀♂. Loc. typ.: N.India. Type: London.

1876 *Halictus varipes* MORAWITZ in FEDČENKO, Turkestan Melliferа, 2: 223-224, ♀♂. Loc. typ.: Turkestan, Džizak. Lectotype: Moskow [Syn.nov.].

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1879 *Halictus vernalis* SMITH, Descr. new spec. Hym. coll. Brit. Mus.: 30, ♀ Loc. typ.: Ceylon. Type: London.

1879 *Halictus niloticus* SMITH, Descr. new spec. Hymen.: 32, ♀. Loc. typ.: Sudan, white Nile. Type in London is a ♂!

1892 *Halictus magrettii* VACHAL, Bull. Soc. Ent. France, 61: 137, ♀. Loc. typ.: Sudan, Suakin. Type: Genova.

1895 *Halictus dives* PÉREZ, Esp. nouv. Mellif. Barbarie: 52, ♀. Loc. typ.: Biskra. Lectotype: Paris.

1907 *Halictus omanicus* PÉREZ, Bull. scient. Fr. Belg., 41: 489-490, ♀. Loc. typ.: Muscat. Lectotype: Paris.

1933 *Halictus varipes* var. *koptica* BLÜTHGEN, Bull. Soc. ent. Egypte, 17: 16-17, ♂♀. Loc. typ.: Egypt, Way to Giza. Type: Berlin.

1945 *Halictus sudanicus* COCKERELL, Ann. Mag. nat. Hist. (11)12: 352, ♀. Loc. typ.: Sudan, Shandi. Type: London.

1945 *Halictus tokarensis* COCKERELL, Ann. Mag. nat. Hist. (11)12: 352-353, ♀. Loc. typ.: Sudan, Tukar. Type: London.

1945 *Halictus dissensis* COCKERELL, Ann. Mag. nat. Hist. (11)12: 353, ♀. Loc. typ.: Sudan, Dissa. Type: London.

1945 *Halictus medanicus* COCKERELL, Ann. Mag. nat. Hist. (11)12: 354, ♀. Loc. typ.: Sudan, Medani. Type: London.

1945 *Halictus mogrensis* COCKERELL, Ann. Mag. nat. Hist. (11)12: 355, ♀. Loc. typ.: Sudan, Mogren. Type: London.

1945 *Halictus tokariellus* COCKERELL, Ann. Mag. nat. Hist. (11)12: 355, ♀. Loc. typ.: Sudan, Tukar. Type: London.

Fig.104: Relationships OOD/IOD, O_CO_CD/IOD and GW/EW in heads of 3 *Seladonia* species (♀♀). (Scale 40 units = 1 mm, broken line = line of isometry).
IOD = Interocellar distance; OOD = Ocellocular distance; O_CO_CD = Ocelloccipital distance; GW = Gena width; EW = eye width (seen laterally).

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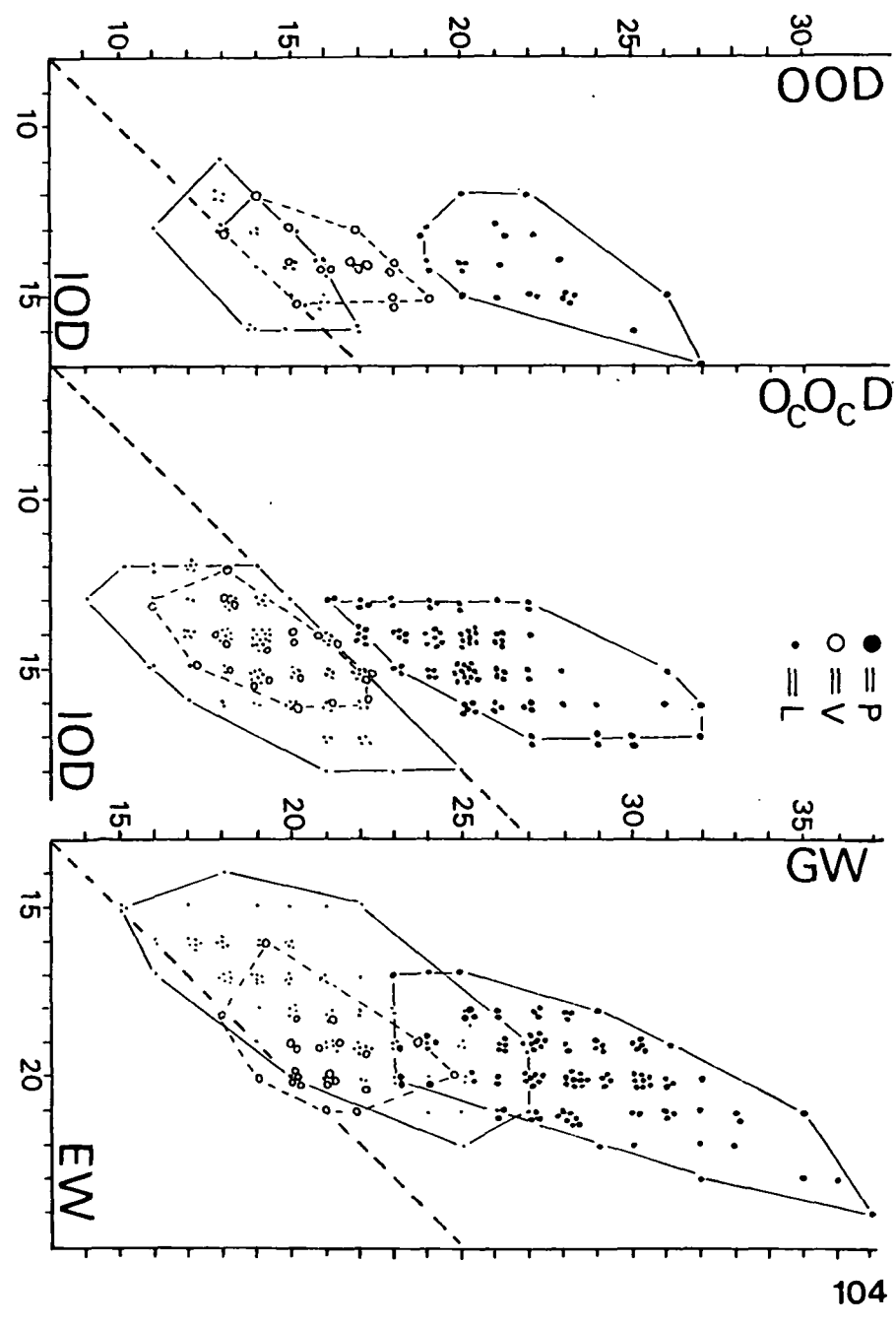

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1945 *Halictus medaniellus* COCKERELL, Ann. Mag. nat. Hist. (11)12: 356, ♂. Loc. typ.: Sudan, Medani. Type: London.

1982 *Halictus morinellus hyemalus* WARNCKE, Boll. Mus. civ. Stor. nat. Venezia, 32(1981): 134, ♀. Loc. typ.: Iran, Bandar Abbas. Type: coll. auct.

Taxonomy (1) *H. lucidipennis* & *vernalis*: BINGHAM 1987: 430, 435*, CAMERON 1897: Mem. Manch. Soc. 41: 99 (*propinquus*, nec SMITH); COCKERELL 1929: 586; BLÜTHGEN 1931: 326; MICHENER 1978: 528-

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* We cite BINGHAM (1987) for this and the subsequent species as his book is still influential in S. Asia, although we never examined *Seladonia* specimens studied by himself.

Fig. 105: Locality map and distributions of 4 species. On Nepal and Sri Lanka see also Figs. 107 and 108. TC = Tropic of Cancer. Alphabets and open circles = previous records. Arabic numerals and solid circles = records in the present work. INDIA A = Shillong, B = N. Khasia Hill, C = Sikkim, D = Teesta Bridge, E = Barrackpore, F = Calcutta, G = Kangra Valley, H = Dehli, I = Agra, J = Mt. Abu, K = Mhow, L = Bombay, M = Matyan, Drasstal, N = Kargil, 1 = Ludhiana, 2 = Simla, 3 = Solan, 4 = Mussoorie, 5 = Dehra Dun, 6 = Hissar, 7 = Sinhagad, 8 = Lonavla, 9 = Mercara, 10 = Bangalore, 11 = Bandipur, 12 = Muldumalai, 13 = Coimbatore, 14 = Anaimalai, 15 = Tekkady, 16 = Calicut, 17 = Adyar n. Madras, 18 = Jaipur. PAKISTAN A = Karachi, 1 = Tandojam*. THAILAND A = Nan, 1 = Fang, 2 = Cheng Dao, 3 = Cheng Mai (with Sampatong, Doi Suthep), 4 = Ubol, 5 = Ayuttaya, 6 = Skiracha. BURMA A = Bhamô, B = Mandaley, C = Thandanny*. NEPAL 3 = Pokhara, 13 = Kathmandu (details in Fig.108). SRI LANKA 1 = Colombo, 2 = Kandy (details in Fig.107).

(* = Approximate location).

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9; EBMER 1980: 483; (2) *varipes* and other synonyms: EBMER 1987. Diagnosis: BLÜTHGEN 1926: 678-9, 684 (*lucidipennis*); 1930: 221 (*varipes*).

Up to the present *H. lucidipennis* and *H. varipes* have been considered 2 very close but different taxa, the former with the head relatively short and distributed in the Indian Subcontinent and the S.W. Palaearktis while the latter spreading in the arid Palaearktis from Cape Verde Is. and N. Africa via Turkestan to Gobi (EBMER 1987). Recently one of us (AWE) compared these 2 forms carefully in both sexes and found no stable differences between them. Consequently, *H. lucidipennis* is now regarded as a very widespread species with 15 synonyms! Among these only *H. lucidipennis* and *vernalis* were named on the basis of the Oriental specimens while all others on the Palaearctic specimens. *H. vernalis* was once considered a *Chloralictus* (COCKERELL 1929) but BLÜTHGEN (1931) mentioned that the type is a composite ♀ specimen, having the fore body of *H. lucidipennis* and the metasoma of another non-*Seladonia* species without apical fimbriae. He concluded that the proper metasoma with fimbriae as mentioned in the original description was lost and replaced by that of another species. We both examined the type independently and confirmed his opinion.

The fore-body was identical with that of *H. lucidipennis* in every aspect except the slightly more bluish tone and hind tibiae and tarsi paler than in most other specimens (wing including tegula = 3.9 mm, WD 43, HW 42, HL 38, 25 = 1 mm). However, the metasoma was apparently of a non *Seladonia* species: (1) homogeneously non metallic deep brown, (2) much flatter, (3) apical fimbriae and basal tomental patch on T_3 absent and integument clearly visible there (Fig. 106) and (4) tergal marginal area widely depigmented.

Female Body: 4.5-7.0 mm, fore wing with tegula 3.5 - 5.1 mm.

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Coloration: Generally paler, non-metallic parts rather brownish than blackish. Flagella below dark brown. Lateral lobe of pronotum apically pale brown to yellow. Tegula semitransparent, pale brown. Legs chestnut brown. Apices of fore and mid femora and bases of fore and mid tibiae yellow or sometimes pale brown. Fore tibia and tarsi, apices of mid tibia and hind femur, and base and apex of hind tibia pale brown; mid and hind tibiae pale chestnut brown; hind basitarsus with dull chestnut stripe of variable size.

Pilosity: Generally paler, non tomental hairs pale fulvous and shorter, 150 - 175 μ on vertex, 175 - 200 μ on face, $\pm$ 125 μ on mesoscutum centrally, and 250 - 275 μ on mesoscutellum marginally; sternal scopa 300 - 325 μ. Tomental patch well developed, along inner orbit covering the surface well (Fig. 1), on gena appressed, dense and partly covering the surface well (Fig. 6). Tomental hairs of lateral surface of pronotum confined to a limited area of lower margin (Fig. 19). Basilateral patch on T 1 usually small.

Structure: Head (Figs. 1, 2, 6, 7) distinctly wider than meso- and metasoma (1 : 0.92 : 0.98). HW : HL = 1 : 0.90; MOD : UOD : LOD = 1 : 0.93 : 0.86. Vertex flatter in larger ♀ and sometimes faintly concave medially (Figs. 1, 2). Mean ratio of IOD : OOD : O_cO_cD = 1 : 1.01 : 0.84; IOD and O_cO_cD not much long, and the latter only weakly allometric, i.e. only slightly longer in larger ♀. Postocellar PP 25 - 30 μ ⌀, rather ill-defined; ocellocular PP 20 - 25 μ ⌀, postocellar depression relatively conspicuous. Frons mildly but distinctly convex, especially in small ♀; frontal carina relatively long, usually longer than the carina-ocellus-distance. Paraocular area with epistomal angle roundly obtuse, lower margin slightly ascending laterad (Figs. 1, 2). PP 20 - 25 μ ⌀ above, 25 - 30 μ ⌀ below. Supraclypeus slightly higher than clypeus, with PP 20 - 25 μ ⌀ or to 15 μ ⌀ along epistomal suture while smaller above; IS much narrower than PP (max. 0.5) and shining above, PP sparser and IS sometimes 1.0 ⌀ or more below (Fig. 1). CPL : CAL : APL =

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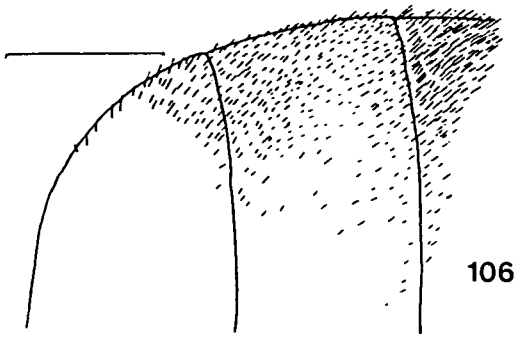

Fig. 106: Pilosity on basal metasoma terga of the type specimen of *Halictus vernalis* (♀, British Museum, Natural History). (Scale = 0,5 mm).

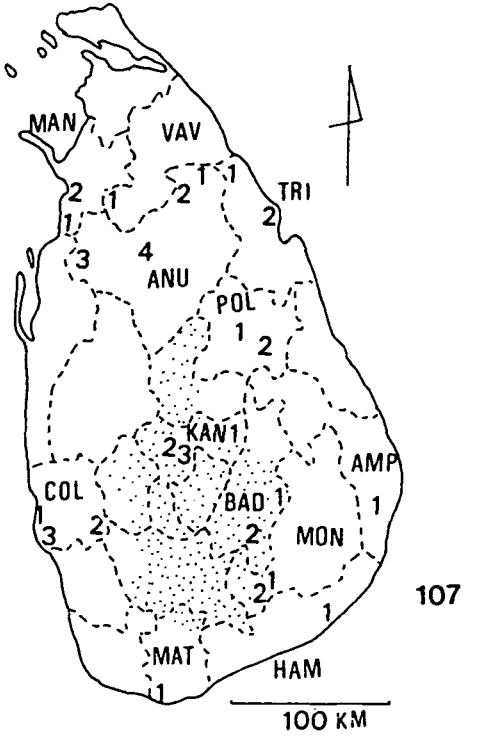

Fig. 107: Distributional map of *H. lucidipennis* in Sri Lanka. Localities (in numerals) in each district (shown with acronym) are given in the text. Dotted = Mountainous areas.

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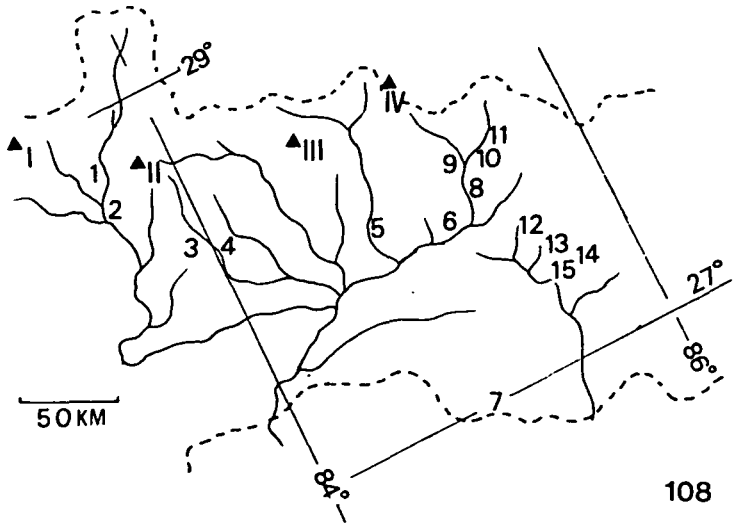

Fig. 108: Distributional map in Nepal. 1 (Lete, 2440 m), 2 (Tapatoni, 1300 m), 3 (Pokhara, 830 m), 4 (Rupakot, 750 m), 5 (Khanchok, 900 m), 6 (Samri-Bhanjang, 1200 - 1500 m), 7 (Birganji, 100 m), 8 (Trisuli, 620 m), 9 (Betrawai, 700 m), 10 (Bokajundo), 11, (Dunche 1900 m), 12 (Balaju), 13 (Kathmandu, 1340 m), 14 (Godavari, 1700 m), 15 (Patan Dhoka, ca. 1300 m). I (Dhaulagiri, 8172 m), II (Annapurna, 8070 m), III (Manasulu, 8125 m), IV (Ganesh Himal, 7406 m).

1 : 1.88 : 0.74. Clypeus subapically slightly depressed, gently raised below; marginal area strongly depressed (Fig. 16); PP 20 - 30 μ ϕ and IS = ϕ or slightly wider, especially below, to 1.5 ϕ or more (Fig. 1). Gena weakly allometric. EW : GW = 1 : 1.20 on average. Hypostoma (Fig. 14) very sparsely and finely punctured (10 - 15 μ ϕ, IS = 5.0 ϕ or more), striation faint, confined along hypostomal carina; generally seen smooth and shining.

Mesosoma: Pronotum with lateral ridge acute but not extending below; lateral surface coriaceous and shagreen, below striated with dull vertically or obliquely paralleled ridges, much weaker than in *H. propin-*

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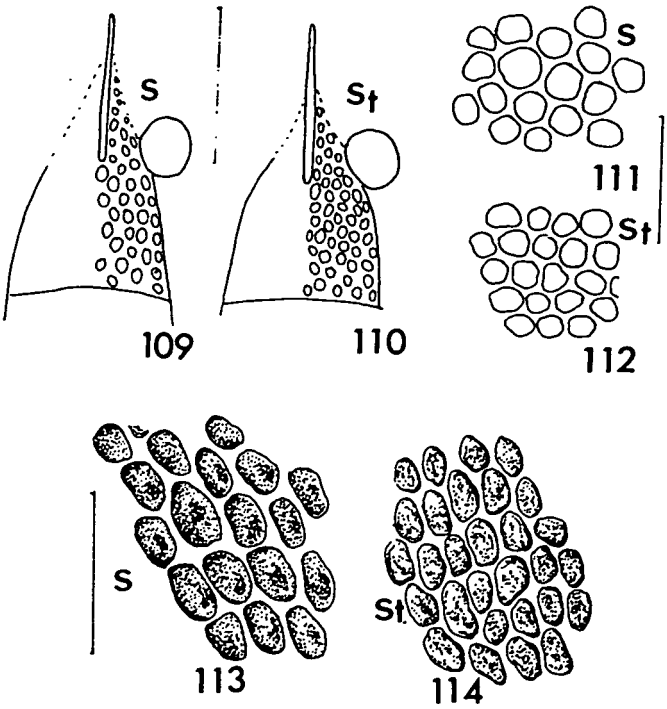

Figs. 109 - 114: Comparison of punctation in *H. subauratoides* (S) and *H. subauratus* (St). 109 - 110 = Supraclypeus (Scale = 0.5 mm). 111 - 112 = Mesoscutum (Scale = 0.5 mm). 111 - 112 = Mesoscutum (Scale = 0.0625 mm). 113 - 114 = Mesopleura (Scale = 0.125 mm).

quus (Fig. 19). PP on mesoscutum and -scutellum homogeneous, ± 20 μ ϕ; IS homogeneous, 1/3 to 2/3 of ϕ, but wider on mesoscutellum centrally, sometimes 1.0 or more (Figs. 41, 45). Mesoscutellum medially not depressed longitudinally. Propodeal side homogeneously tessellate; below without lineolaton, with very weak and sparse PP. Mesoscutellum : metanotum : propodeal dorsum = 1 : 0.60 : 0.88. Propodeal dorsum (Figs. 33, 37) with enclosure mildly depressed;

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ridges occupying only anterior 1/2 to 2/3; medially ridges parallel but often slightly irregular with partial ramification though seldom anastomosing; posterior half of depression tessellate and apical area of dorsum mildly raised; laterally ridges radiate without ramification; lateral field rather broadly impunctate and finely coriaceous and slightly shining. PP of propodeal declivity above laterally very fine. Tegula (Fig. 24) with anterior hairs short, PP fine and sparse; postouter area broadly smooth. Inner hind tibial spur (Fig. 27) with 3-4 relatively long and round-tipped teeth issuing rather perpendicularly.

Metasoma: PP on discs of basal terga fine, 8 - 10 μ, rarely 12 μ; IS = 1.0 - 2.0 ϕ on T_1 (Figs. 49, 52), $\pm$ 1.0 ϕ on $T_{2,3}$.

Male: Body 4.0 - 6.5 mm, fore wing with tegula 3.8 - 5.0 mm.

Coloration: As in $\underset{+}{\varphi}$, non metallic parts rather brownish than blackish. Terga marginally rather broadly brownish and semitransparent. Lower 1/3 of clypeus, labrum, median part of mandible and pronotal lobe apically lemon yellow. Tegula basally brownish, otherwise semitransparent with yellowish patch visible beneath. Legs blackish brown; apices of femora and all tibiae and tarsi lemon yellow; fore tibia inward and below slightly brownish; mid and hind tibiae with black stripes above and below.

Pilosity: Relatively paler and tomental patch well developed as in $\underset{+}{\varphi}$. Hairs $\pm$ 250 μ on face, 175 - 225 μ on vertex, 150 - 200 μ on mesoscutum centrally, and 250 - 275 μ on mesoscutellum marginally. Genal tomental patch distinct though less developed than in $\underset{+}{\varphi}$. Apical fimbria broadly interrupted on $T_{1,2}$, narrowly to very narrowly interrupted on T_3 and T_4 respectively.

Structure: Head (Figs. 56, 59) as wide as mesosoma and slightly wider than metasoma (1 : 1.02 : 0.92). HW : HL = 1 : 1.02, MOD : UOD : LOD = 1 : 0.98 : 078 and IOD : OOD : O_cO_cD = 1 : 0.95 : 0.76. Postocellar PP weak and irregular, laterally to 20 μ ϕ; IS

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shagreen and linear but often to 0.5 ϕ. Ocellocular PP ± 20 μ ϕ and distinct, IS as above. Supraclypeus flat, slightly lower than clypeus, with PP medially ± 20 μ ϕ and peripherally finer; IS very narrow, maximally to 0.5 ϕ, slightly shagreen but shining. CPL : CAL : APL = 1 : 1.75 : 0.69. Clypeus flat to very mildly convex, upper margin rather horizontal; PP shallow, above 20 - 25 μ, IS very narrow, maximally to 0.5 ϕ; below sparser and some ones elongate to 40 μ long (Fig. 56), IS smooth. Hypostoma with weak striation as in ♀. EW : GW = 1 : 0.89. Mandible basimedially only slightly depressed than marginal elevation. $F_{1-3}L$ and F_2W = 1 : 1.54 : 1.42 : 1.53 : 1.09 (Fig. 83). elevation. $F_{1-3}L$, F_{10} and F_2W = 1 : 1.54 : 1.42 : 1.53 : 1.09 (Fig. 83), $F_{1-3}L$, $F_{10}L$ and F_2W.

Mesosoma as in ♀ including pronotal and tegular structures. Mesoscutum with PP sparser than in ♀ (Fig. 66), 17 - 20 μ ϕ and IS 1/3 to even 1.0 of ϕ even anteriorly, sparser posteriorly; mesoscutellum with PP variable, 15 - 20 μ ϕ and IS sparser than on mesoscutum (Fig. 69), IS 0.5 - 1.0 ϕ centrally, 2.0 or even 3.0 submedially. Propodeal side with PP 12 - 20 μ ϕ, relatively sparse, IS as wide as or wider than PP, finely reticulate and dully shining, below with very weak lineolation. *Mesoscutellum : metanotum : propodeal dorsum* = 1 : 0.55 : 0.87. Propodeal dorsum as in ♀, but sculpture of enclosure variable, usually with ridges parallel with little ramification as in ♀ (Fig. 61) but occasionally even anastomosing (Fig. 62); posterior area widely free from ridge as in ♀ and usually coriaceous and shagreen but sometimes rather smooth and shining; PP of propodeal declivity above laterally coarser than in ♀, attaining 20 μ ϕ. Hind tibia : hind basitarsus : hind distitarsi = 1 : 0.55 : 0.72. Tergal PP finer and sparser and IS more shining than in *H. propinquus* and *H. vicinus*. T_1 with anterior declivity smooth and shining, with very sparse finest PP (Fig. 72), disc with PP (Fig. 78) fine but coarser than in ♀, ± 12 μ ϕ IS ± 2.0 ϕ, rarely 1.0 ϕ, smooth and shining; marginal area microtessellate with PP very sparse, partly absent (Fig. 75). T_2 basally with PP 10 μ ϕ or less under pubescence, IS 1.5 - 2.0 ϕ or more, smooth and shining; PP on boss ± 12 μ ϕ, IS ≥ ϕ, smooth and shining; marginal

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area with PP as long as on basal area, IS 2.0 ♂ or more, finely reticulotessellate and dully shining, apicall impunctate. Apical tubercle of T_7 only medially carinate (Fig. 86). S_6 with postgradular area basally sparsely haired (Fig. 88). Main body of S_7 elongate triangular. S_8 apically rather conspicuously projecting, apex rounded with fairly long hairs, often longer than S_8 itself; lateral margin angulate rather near the base, without setae (Fig. 91).

Genitalia: (Figs. 95, 98 with gonostylus (Fig. 101) of ratio length to maximum and minimum widths = 1 : 0.74 : 0.38 seen dorsally; subbasally fairly acutely convex; apex not dilated outward; tufted hairs relatively fine, modified hairs moderately long and mildly curved; dorsal process as long as main body, basally with relatively dense and long hairs as in *H. kessleri* although the latter species similar to *H. vicinus* in other aspects, apically distinctly clavate, with ventral process slightly shorter than main body (0.72 : 1), apically with only a few hairs while subapically sparse but more hairs.

Distribution: (Fig. 105). By synonymization of *H. varipes* the distribution range of *H. lucidipennis* is now very wide. Here is only dealt with the distribution in the Oriental Region. The species is also recorded from Afganistan (EBMER 1974, 1980). Previous records **Burma:** Mandaley (BLÜTHGEN 1926); **India:** Calcutta, Bombay, Mussoorie, Mhow (BLÜTHGEN 1926), Delhi, Agra (BLÜTHGEN, 1931); **Pakistan:** Karachi (BLÜTHGEN 1926); **Sri Lanka:** Peradeniya (BLÜTHGEN, 1926).

Specimens examined: **Thailand** (New records): Skiracha, 1 ♀, xi 15 1962, A. NAGATOMI; Ayuttaya, 1 ♀ (no head), vii 29, 1971, T. TANO. **Nepal** (New records, Fig. 108): Trisuli (620 m), No. 1, West, 1 ♀, v 28 1968 (Ga); T. MATSUMURA; Birganji (100 m), 1 ♀, ii 27 1968 (MD - 3), T. KAWAMICHI. **India** (1) Punjab: Ludhiana, Univ. Campus, 1 ♀, iii 22 1965, Logan/Utah collection (= LU). (2) Haryana: Hissar, 1 ♀, iv 15, 1 ♀, iv 30, 1 ♀, vii 16, 1 ♀, ix 19, all 1974, LU. (3) Maharashtra (all F.L. WAIN leg.): Kandala (450 m), 1 ♀, v 4 1963; Lonavla (650 m), 3 ♀, ii 19 1964, iv 30 1964, v 3 1963; Sinhagad

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(1320 m), 1 ♀, i 7 1964. (4) Karnataka: Bangalore, (Univ. Agric. Sci., Papilionaceae), 7 ♀, i 27 1978, JICT, 2 ♀, iii 18 1978, LU, Mercara/ Coory, V 10 1973, 2 ♀, LU. (5) Tamil Nadu: Adyar n. Madras, 1 ♀, viii 12 1973, I. KUDO; Coimbatore, 1 ♀, iii 1959, 1 ♀ 1 ♂, viii 10, 1975, LU; Mudumalai (ca. 1000 m), 1 ♀, xi 27 - 28, 1978, JICT. **Pakistan** Tandojam/Sind, 1 ♀, v 10 1974, LU. **Sri Lanka** (abbreviations of some collectors : KVK = K.V. KROMBEIN, PBK = P.B. KARUNARATNE, SK = S. KARUNARATNE, DWB = D.W. BALASOORIYA, PF = P. FERNANDO, TW = T. WIJESINE). Vavuniya Distr. (Localities are numbered for each district. Numbers correspond to those in Fig. 107). (1) Parayanalankulan, Irrigation Canal, 25 mi. N. W. Medawachchiya (100 ft), 3 ♀, iii 20 - 25 1970, DAVIS & ROWE. Mannar D. (1) Kokmotte (= Cochmuttai) Bangalow, 5 mi NE, Wilpattu Nat. Park (20 m), 1 ♀, v 21 - 25 1976, KVK, PBK, SK & DWB; 2 ♀ 1 ♂, x 6 - 7 1977, KVK, PBK, PF, TW & M. JAYAWEERA; (2) Kondachchi, Ma Villu, 1 ♀, iv 11 - 12 1981, KVK, L. WEERATUNGE & P. LEANAGE. Trincomalee D. (1) Amarivayal, 1 ♀, v 18 1976, KVK, PBK, SK & DWB; (2a) Trincomalee, China Bay Ridge Bungalow (25 - 50 ft), 4♀ 1 ♂, ii 26 1979, KVK, TW, S. SIRIWARDANE & L.J.T. GUNAWARDANE; (2b) 7 mi, W. Trincomalee, 2 ♀, v 15 1976, KVK, PBK, SK & DWB. Anuradhapura D. (1a) Padaviya (180'), 5 ♀ 3 ♂, xi 2 - 8 1970, O. S. Flint, Jr.; (1b) Irrigation Bungalow, Padaviya (180 ft), 9 ♀, 1 ♂, ii 27 - iii 9 1970, DAVIS & ROWE; (1c) Padaviya, Antiquities Site, 6 ♀ 1 ♂ vii 20 - 23 1978, KVK, TW, L. JAYAWICKREMA & V. KULASELARE (MALAISE tr.); (1d) Padaviya, Archeological Site (180 ft), 2 ♀, v 20; 2 ♀, v 21 1976, KVK, PBK, SK & DWB (MALAISE); 7 ♀, x 11 - 14, 1977, KVK, PBK, PF, TW & M. JAYAWEERA; (2) Padaviya Tank (180 ft), 17 ♀ 1 ♂, iii 12 - 22 1976, PBK, SK & DWB, (MALAISE); (3a) Hunuvilagama, 1 ♀ 3 ♂, v 22 - 26 1976, KVK, PBK, SK & DWB; (3b) Wild Life Soc. Bungalow, Hunuvilagama (200 ft), Wilpattu, 13 ♀ 1 ♂, iii 10 - 19, DAVIES & ROWE. (4) Galkadawala, 2 ♀, iii 13 1976, PBK, SK & DWB. Polonnaruwa D. (1) 25 mi SE

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Polonnaruwa, 2 ♀, vi 10 1975, S.L. WOOD & J.L. PETTY; (2) Pimburettawa, 13 mi S Mannampitiya (1850 ft), 3 ♀, xi 9 - 12 1970, O.S. FLINT, Jr. Kandy D. (1a) Hasalaka (500'), 1 ♀, ix 22 - 25 1970, O. S. Flint, Jr.; (1b) Hasalaka Circuit Bungalow, 1 ♂, v 30 - 31 1975, D.H. MESSERSMITH & G.L. WILLIAMS; (1c) Hasalaka Irrigation Bungalow, 5 mi NW Mahiyangana, 8 ♀ 1 ♂, iii 30 - iv 9 1971, P. & P. SPANGLER (MALAISE); (2a) Kandy, Udwattakele (2100 ft), 2♀ 2♂, ix 1 - 17 1976, SK; (2b) Kandy (Roseneath), 1 ♂, iii 25 1971, P. & P. SPANGLER (MALAISE); (2c) Kandy Reservoir Jungle, 1 ♀, iii 4 1972, KVK. (3) Teldeniya, 1 ♀, ii 11 1975, KVK, PBK, PF & SK. Amparai D. (1) Lahugala Sanctuary, 1 ♀ 1 ♂, vi 13 - 14 1976, KVK, PB & SK; Badulla D. (1) Ella, 1 ♂, xi 26 1975, G.F. HEVEL, R.E. DIETZ IV; PB, SK & DWB. Colombo D. (1a) Colombo, 10 ♀, x 29 - 30 1969, PBK; (1b) Colombo Museum Garden (50 ft), 1 ♀, i 15 1977, KVK, PF, DWB & V. GUNAWARDANE, 1 ♂, i 28 - 31 1975, KVK, PBK & PF, 1 ♀, ii 17 - 23, 2 ♀ 2 ♂, ii 25 1977, KVK, PBK, PF, DWB. (2) Labugama Reservoir Jungle, 1 ♀, ii 2 - 4 1977, KVK, PBK, PF, DWB & V. GUNAWARDANE. (3) Ratmalana Airport, 1 ♀ 1 ♂, i 19 - 21 1975, KVK, PBK, PF & N.V.T.A. WERAGODA, 1 ♀, i 13 1977, KVK, PF, DWB & V. GUNAWARDANE. Monaragala D. (1a) 13 mi E Udawalawe, 1 ♂ (on sand along Mau Ara), vi 16 1976, KVK, PBK & SK; (1b) Mau-Ara (100 m), 10 mi E Udawalawe, 3 ♀ 5 ♂, ix 24 - 26 1977, KVK, PBK, TW & M. JAYAWEERA; (2) Angunakolapelessa (100 m), 7 ♀ 6 ♂, i 21 - 23 1979, KVK, PBK, TW, S. SIRIWARDANE & T. GUNAWARDANE; 1 ♀ 1 ♂, vi 17 - 19 1978, KVK, TW, L. JAYAWICKREMA & V. KULASELARE. Hambantota D. (1) Yala, Palatupana, 1 ♂ iii 8 - 10 1972, KVK & PBK; (2a) Palatupana, 13 ♀ 9 ♂, ii 3 1975 (2 ♀, MALAISE), KVK, PBK, PF & E.G. DABRERA, 2 ♀, viii 10 - 12 1972, KVK & PBK; (2b) Palatupana Tank (15 - 50 ft), 4 ♀, i 18 - 20 1979, KVK, PBK, TW, S. SIRIWARDANE & T. GUNAWARDANE, 2 ♀, vii 21 - 22 1978, KVK, PBK, TW & L. JAYAWICKREMA.

Bionomics. BATRA (1966) discovered some nests of this species at

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Kakankote Forest n. Mysore, Karnataka and Ludhiana, Punjab. The nest pattern was the same to those of other known consubgeners, with brood cells oriented horizontally and opening into vertical burrows directly, neither forming dense clusters nor surrounded with cavities (SAKAGAMI, 1974). Many nests contained more than one ♀. Some ♀♀ were fertilized but others not. Also some ♀♀ had more or less developed ovaries but others undeveloped ovaries. However, the caste differentiation seems still incipient, because even fertilized ♀♀ with well developed ovaries participated in pollen collecting on flowers. BATRA (1967) observed flower-visiting phenology of *H. lucidipennis* in Ludhiana under a semiarid and subtropical climate during September to June (= dry season). Except the coldest period (Mid December - early February), this species was active and polylectic, and probably in other unstudied months, too. Apparently this species is multivoltine in Ludhiana, even though the sequence may be not so simple as in solitary species due to intervention of sociality.

Based on the specimens collected, phenological trends in some life cycle features in Sri Lanka are presented in Tables 2 and 3. Suggested by Dr. K.V. KROMBEIN the country was divided in the humid zone (Colombo and Kandy districts) and the arid zone (all other districts combined, Fig. 107). For each zone, the following items were counted for each month (no collections in December): $\underline{S}$ number of samples (specified by localities, dates and collectors). $\underline{M}_m$ Number of ♂♂ collected, $\underline{N}_f$ number of females collected with which the following items were counted. $\underline{N}_F$ Number of ♀♀ with head width 52 units or more (Table 1), representing the largest individuals and about 25 % of total ♀♀. Most queens are assumed to be included within this group. $\underline{N}_{fw}$ Number of fresh, intact ♀♀ (both wing and mandibular wear showing degree 1 in SAKAGAMI & HAYASHIDA, 1968, Fig.5). $\underline{N}_{fW}$ Number of heavily worn ♀♀ (wing wear degree 4 - 5 and mandibular wear 3 - 5). $\underline{N}_{fp}$ Number of ♀♀ with large pollen loads, indicating foraging for brood rearing. $\underline{T}$ Mean monthly air temperature (^{o}C) at 0830 (Arid zone, Vavuniya nr. Padaviya, annual mean 25.7,

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December 23.7; Humid zone, Colombo, a.m. 26.4, Dec. 25.1). R Monthly rainfall (mm) (Vavuniya, annual total 1488.7, December 277.4; Colombo a.t. 2395.6, Dec. 174.8).

Although collecting in the arid zone was seemingly not made every month with the same effort (Table 2, S), most activities were seen continuously throughout the year without clear correspondence to changes in climatic conditions. Females were seen every month (N_f). Probably they are produced any time, resulting in overlap of generations (N_{fw} and N_{fW}). Brood rearing is continuously active (N_{fp}) and reproductives are seen nearly every month (N_m and N_F). The whole picture suggests the lack of any inactive periods under the local climate.

The collecting in the humid zone (Table 3) is so incomplete that it is uncertain whether activities interrupt seasonally or not. Continous surveys by residential researchers is necessary. *H. lucidipennis* is one of the dominant halictine species in Sri Lanka and widespread in both arid and humid zones, but seemingly more abundant in the arid zone as in many other halictines.

Halictus (*Seladonia*) *propinquus* SMITH 1853

1853 *Halictus propinquus* SMITH, Catal. Hym. Brit. Mus., 1: 60-61, ♂. Loc. typ.: N. India: Type: London.

1896 *Halictus grandiceps* CAMERON, Mem. Proc. Manchester Soc., 41 (4): 98-99, ♀. Loc. typ.: N. India, Mussoorie. Type: Oxford.

1896 *Halictus alexis* CAMERON, Mem. Proc. Manchester Soc., 41 (4): 99-100, ♀. Loc. typ.: India, Barrackpore. Type: Oxford.

1902 *Halictus pinguis* VACHAL; Rev. Russ. Ent., 2: 230, ♂. Loc. typ.: N. India, Mussoorie. Type: Krakow.

Taxonomy: BINGHAM 1897: 426, 430; BLÜTHGEN 1930: 74, 1931: 325; EBMER 1980: 481; MICHENER 1978: 528. Diagnosis: BLÜTHGEN 1926: 685, 687.

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Female: Body 6.8 - 8.6 mm, fore wing with tegula 5.7 - 6.6 mm. **Coloration:** Generally darker, non-metallic parts rather blackish to blackish brown than brownish. Flagella below blackish brown. Lateral lobe of pronotum apically dark brown to blackish. Tegula not transparent, blackish; anterior margin occasionally brown. Legs blackish, apices of femora (hind femur very narrowly, often evanescent), bases of fore and mid tibiae and distitarsi brown; bases of tibiae sometimes paler, rarely yellowish.

Pilosity: Relatively deeper-colored, often yellow ocker, and longer, 250 - 300 μ on vertex, 275 - 350 μ on face, 225 - 250 μ on mesoscutum centrally and 325 - 375 μ on mesoscutellum marginally; sternal scopa 375 - 500 μ. Tomental patch less developed, along inner orbit narrow and covering the surface not much, on gena far less developed than in *lucidipennis* and covering the surface incompletely, seen dorsally hairs more erect (Figs. 4, 9, 12). Tomental hairs of lateral surface of pronotum confined to a limited area of lower margin (Fig. 20).

Structure: Head (Figs. 3, 4, 8, 9) nearly as wide as meso- and metasoma (1 : 0.98 : 1.04). HW : HL = 1 : 0.94; MOD : UOD : LOD = 1 : 0.86 : 0.88. Vertex flatter in larger ♀ but not concave (Figs. 3, 4). Mean ratio of IOD : OOD : O_cO_cD = 1 : 1.44 : 1.28; both OOD and O_cO_cD conspicuously long, and longer in larger ♀ (Fig. 104). Postocellar PP as in *H. lucidipennis*, although the latter more areolate. Frons only mildly convex in small ♀, nearly flat in larger ♀, difference from *H. lucidipennis* probably allometric than specific; frontal carina variably long but on average shorter than in *H. lucidipennis*. Paraocular area with epistomal angle obtuse, lower margin less ascending laterad than in *H. lucidipennis* (Figs. 1 vs 3), PP 20 - 25 μ ϕ above, 30 μ or more below. Supraclypeus as in *H. lucidipennis* but PP sparser, 20 - 25 μ ϕ; IS ± 1.0 or less, only on uppermost part 1.0 - 1.5 medially and 1.5 or more below (Fig. 3), although variable individually. CPL : CAL : APL = 1 : 1.70 : 0.60. Clypeus subapically seldom depressed, apically gradually receded (Fig. 17); PP

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25 - 30 μ ϕ with IS = 1.0 - 1.5 ϕ basally, sparser below. Gena conspicuously allometric (Figs. 8, 9, 104). EW : GW = 1 : 1.35 on average. Hypostoma more extensively and distinctly striated than in *H. lucidipennis* (Fig. 15).

Mesosoma: Pronotum with lateral ridge dull and short; lateral surface coriaceous and shagreen, below striated with strong vertical parallel ridges and IS rather shining (Fig. 20). PP on mesoscutum and -scutellum (Figs. 42, 46) irregular, 20 - 25 μ, rarely 18 μ or 30 μ; IS variable, 1/3 to 1/2 of ϕ, sometimes 2/3 on mesoscutum and, 1/3 - 1/2, sometimes 1.0 on mesoscutellum. Mesoscutellum medially not depressed longitudinally. Propodeal side with sparse but coarse and distinct PP of 10 - 20 μ ϕ, below with distinct lineolation. Mesoscutellum : metanotum : propodeal dorsum = 1 : 0.63 : 0.85. Propodeal dorsum (Figs. 34, 38) with enclosure mildly depressed; ridges, reaching end of depression, medially fairly irregular and partly anastomosing; laterally ridges radiate but submedially rather longitudinal than semiradiate; apical area smooth and shining; narrower and raised more distinctly than in *H. lucidipennis* so that depression of enclosure more conspicuous, lateral field smooth and shining with rather sparse PP (15 - 18 μ ϕ). PP of propodeal declivity above coarser and denser than in *H. lucidipennis*, 15 - 18 μ ϕ. Tegula (Fig. 25) with anterior hairs long, PP coarser and denser than in *H. lucidipennis*, 15 - 18 μ ϕ. Tegula (Fig. 25) with anterior hairs long, PP coarser and denser than in *H. ludidipennis*, postouter impunctate area smaller but well demarcated. Inner hind tibial spur (Figs. 28-30) with 4 - 7 relaltively small teeth.

Metasoma: PP on discs of basal terga (Figs. 50, 53) 10 - 15 μ ϕ, denser and more uniform than in *H. lucidipennis*, with IS rarely more than 2.0 ϕ, much denser on T_2 and much narrower than on $T_{3,4}$.

Male: Body 7.6 - 8.3 mm, fore wing including tegula 6.2 - 6.8 mm.

Coloration: As in ♀, non metallic parts rather blackish. Terga marginally blackish, not transparent. Clypeus apically blackish or only

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dimly brownish. Labrum blackish to chestnut brown. Mandible and pronotal lobe without yellow spot. Tegula blackish, posterior half chestnut, only marginally semitransparent, yellow spot invisible. Legs more extensively darker than in *H. lucidipennis* and paler parts tending to testaceous than yellow. Fore leg with femoral apex to tarsi yellowish or testaceous yellow, apical tarsomeres testaceous; tibia above broadly brownish with obscure blackish to blackish brown stripe, below broadly blackish; apex of femur, base of tibia and tarsi sometimes yellowish, distitarsi testaceous. Hind leg as in mid leg, but basal patch of tibia elongate and occasionally with a small yellow patch on post-subapical area of tibia.

Pilosity: As in ♀ relatively deeper-colored and tomental patch less developed than in *H. lucidipennis*. Hairs 375 - 425 μ on face, ± 375 μ on vertex, 300 - 325 μ on mesoscutum centrally and 375 - 425 μ on mesoscutellum marginally. Genal tomental patch weak. Apical fimbria interrupted rather narrowly on $T_{1,2}$ and uninterrupted on $T_{3,4}$.

Structure: Head (Figs. 55, 58) as wide as meso- and metasoma (1 : 0.99 : 0.95). HW : HL = 1 : 1.08, MOD : UOD : O_cO_cD = 1 : 1.28 : 1.25, quite different from *H. lucidipennis* as in ♀. Postocellar and ocellocular PP slightly coarser than in *H. lucidipennis*, the latter mostly 25 μ ø and IS narrower than in *H. lucidipennis* relative to ø and less smooth with finer etchings. Frons with PP 20 - 25 μ ø, IS as in *H. lucidipennis*. Supraclypeus with PP 25 - 37.5 μ ø medially (Fig. 55), IS maximally to 0.5 ø, often linear, distinctly more shagreened than on clypeus. CPL : CAL : APL = 1 : 1.91 : 0.88. Clypeus imperceptibly more elevated than in *H. lucidipennis*, upper margin outcurved gently; PP 30 - 37.5 μ ø, rather homogeneous, not much coarser and sparser below, apparently due to the absence of pale mark. EW : GW = 1 : 1.06 on average. Hypostoma with strong striation as in ♀. Mandible basimedially more strongly depressed than in *H. lucidipennis* and *H. vicinus*. $F_{1-3}L$, $F_{10}L$ and F_2W = 1 :

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1.37 : 1.37 : 1.39 : 0.92 (Fig. 81). Mesosoma as in ♀ including pronotal structures. Mesoscutum with PP (Fig. 67) ± 25 μ, occasionally 20 μ ϕ, anteriorly distinctly denser than in *H. lucidipennis*; IS linear, though occasionally to 1/3 ϕ, and slightly shagreened; posteriorly IS wider, often to 0.5 ϕ, smooth and shining. Mesoscutellum with PP (Fig. 70) 20 - 25 μ, sometimes 30 μ ϕ, IS linear to 0.5, submedially nearly to 1.0 ϕ, but not so spaced as in *H. lucidipennis*. Propodeal side with very dense PP of 20 μ ϕ, IS linear and not shining, below slightly lineolate. Mesoscutellum : metanotum : propodeal dorsum = 1 : 0.58 : 0.75. Propodeal dorsum as in ♀; ridges on enclosure somewhat variable (Figs. 63, 64); generally sparser and stronger than in ♀ and often more anastomosing; posterior end of dorsum more raised so that demarcation from declivity more acute. PP of propodeal declivity above laterally 20 - 25 μ ϕ, attaining 30 μ upward, IS smooth and shining 0.5 - 1.0 ♀, wider downward. Hind tibia : hind basitarsus : hind distitarsi = 1 : 0.58 : 0.69. Tergal PP coarser than in *H. vicinus* and *H. lucidipennis*, far sparser than in *H. lucidpennis* , and IS shiner than in *vicinus* though less than in *H. lucidipennis*. T_1 with PP (Figs. 73, 76, 79) ± 25 μ on disc, and ± 20 μ on marginal area, IS narrower than ϕ, smooth and shining; basal declivity with PP finer and sparser. IS ≥ ϕ but not so extremely wide as in *H. lucidipennis* , marginal area finely punctate even apically. T_2 basally and on and after boss with dense PP 15 - 20 μ ϕ, IS < ϕ, only anteriorly IS = ϕ; marginal area with PP finer and sparser, apically finely punctate. Apical tubercle of T_7 (Fig. 84) more distinctly and extensively carinate than in *H. lucidipennis*. S_6 (Fig. 89) as in *H. lucidipennis*. S_7 (Fig. 93) with main body forming equilateral triangle. S_8 (Fig. 93) apically projecting more mildly than in *H. lucidipennis*, with short hairs, being sparse and sometimes absent; lateral margin angulate midway, issuing sparse setae. Genitalia (Figs. 94, 97) with gonostylus (Fig. 102) of ratio length to maximum and minimum widths = 1 : 0.60 : 0.38 seen dorsally; subbasally only slightly convex; apex not dilated outward;

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tufted hairs relatively stout; modified hairs long and distinctly geniculate; dorsal process only slightly clavate; ventral process slightly shorter than main body (0.72 : 1), only apically sparsely haired.

Distribution: (Fig. 105). Previous records Burma, Shillong (Assam), Sikkim (*propinquus*), Mussoorie, Kangra Valley, Calcutta (*grandiceps*), Barrakpore (*alexis*) (BLÜTHGEN 1926); Matyan, Drasstal, 3120 m / Ladakh (EBMER 1980). As shown in the following records this species seems widespread in the Indian Subcontinent but less abundant than *H. lucidipennis*. Specimens examined: **India:** Solan (1500 m), Himachal Pradesh, 1 ♀, x 29 1978, JICT; Solan-Balog (1500 m), H. P., 1 ♀, x 31 1978, JICT; Sadhupul n. Simla (1250 m), Uttar Pradesh, 2 ♀ 1 ♂, x 27 1978, JICT; Kemptee Fall, Mussoorie (1400 - 1500 m), U. P., 2 ♀, xi 4 1978, JICT; Dehra Dun, 1 ♀, iv 22 1974, 1 ♂, iii 21 1978, Logan, Utah collection; Bhatta Reserve, n. Dehra Dun (1500 m), U. P., 1 ♀, xi 3 1978, JICT; Sahastradhara n. D. D. (800 - 600 m), U. P., 13 ♀, xi 6 1978, JICT; Mohand Forest n. D. D. (± 500 m), 1 ♀, xi 7 1978, JICT; Lachiwala n. D. D. (550 m), U. P., 3 ♀, xi 8 1978, JICT; Bangalore, Karnataka, 1 ♀, III 18 1978, LU; Jaipur, Orissa, 1 ♀, x 1958, LU. **Nepal** (new records, Fig. 108 T. K. = T. KAWAMICHI, T. M. = T. MATSUMURA) Tapatoni, Palpa (1300 m), 1 ♀, v 3 1968, T. KUMATA; Pokhara (800 m), No. 3, West, 3 ♀, iv 25 1968, 1 ♀ iv 9 1972, T. M.; Rupatok Tal (750 m), 1 ♂, v 19 1968, T. KUMATA; Khanchok (900 m), 1 ♂, i 29 1968, T. K., Samri Bhanjang (1200 - 1500 m), 5 ♀, i 28 1968, T. K., Bokajundo-Dunche (1500 - 1800 m), temperate forest, 1 ♀, x 19 1974, I. KUDO; Balaju, Kathmandu (1340 m), 2 ♀, iii 22 1968, T. M.; Kathmandu, 13 ♀, iv 20 - 22, 1 ♂, iv 14 1968, T. M.; Godavari n. Kathmandu, 15 ♀, iii 26, 57 ♀, iv 18 - 20, 1 ♂ vi 16 1968, T. M.; Betrawati-Ramche (1000 - 1500 m), 1 ♀, x 17 1974, I. KUDO. **Thailand** (new records) Chendow (= Cheng Dao), 1 ♀, iii 17 1961, K. IWATA; Fang, 1 ♀, xi 29 1962, A. NAGATOMI.

Two ♀♀ from Thailand slightly differ from Indian and Nepalese speci-

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mens and might represent an eastern subspecies though treated here tentatively as a forma: *H. propinquus* f. *viciniformis* nov. Body 7.2 - 7.6 mm, fore wing with tegula 5.2 - 5.6 mm. Hairs on vertex ± 245 μ, on face 225 μ. Pronotal, propodeal and tegular structures as in the typical form but striation on pronotum weaker (Fig. 21), PP on mesoscutum and -scutellum smaller (± 20 μ), more homogeneous, and IS seen narrower as in *H. vicinus*. Hypostoma distinctly striated as in typical *H. propinquus*. Further, AWE recently received 1 ♀ from Prov. Guandong (= Kwantung), S. China, which was identical with the Indian specimens except for paler tergal color.

Bionomics: Nothing has been recorded on the life history of this species. Table 4 presents phenological data which might help to understand some aspects of its life. Unlike in Sri Lanka, the climate of the southern slope of the Hymalaya exhibits a clear seasonality. The maximum, mean and minimum temperatures (°C) in Kathmandu in the cold season are, XI 23.0, 14.8, 6.7; XII 20.0, 11.0, 2.0; I 18.6. 9.7, 1.0; II 20.7, 12.2, 3.8, and monthly rainfall (mm) in Kathmandu and Pokhara are I 16.9, 33.1; II 17.7, 35.6; III 27.9, 44.0; IV 44.3, 83.5; V 104.5, 201.8; VI 224.8, 636.9; VII 361.0, 828.1; VIII 360.7, 913.3; IX 146.8, 493.0; X 44.2, 166.4; XI 7.9, 20.5; XII 2.7, 12.6. The cold winter and rainy monsoon occur also in more arid NW India. However, 1 ♂ and 5 ♀♀ (4 foraging pollen) were collected in January. Therefore, the flight and brood rearing activities do not completely stop in the winter. This tendency is suggested also in the collection data of *Lasioglossum albescens* in Nepal, a representative of typical Indomalayan halictines (MATSUMURA & SAKAGAMI 1971). Similarly the monsoon may partly but not completely suppress flight and foraging activities.

From the fact that all biologically known *Seladonia* species are social (SAKAGAMI & OKAZAWA 1985) and from the conspicuous cephalic allometry in *H. propinquus*, some large ♀♀ of this species are presumed to be queens or principal egg layers. Such large ♀♀

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prevailed in the sample collected in NW. India in October - November (Tables 1, 4). Probably these months correspond to the time after a brood rearing period covering the monsoon. At the end of this period queens may be produced and subsequently start the solitary or polygynous brood rearing. The occurrence of intact or pollen foraging large ♀♀ in the Indian sample (F_W or F_{WP}) indicates such activity. Two ♀♀ collected from Nepal in the same season are similarly interpreted because both were very large (Head width = 69 and 75 units. Table 1) and carried large pollen loads. Offspring of these "queens" may start the foraging at the end of the winter, some already in January, but more intensely in the next spring, as shown by many ♀♀ collected in March to April in Kathmandu area. These ♀♀ may rear the sisters, and large ♀♀ or queens which were produced after the monsoon may be their youngest sisters. If this model ist valid, which assumes a clear caste differentiation and a long lifespan of queens, *H. propinquus* is regarded as practicing a principally univoltine life cycle under a subtropical climate due to its caste-linked life cycle. However, this theoretically conceivable life cycle may be seldom realized by the absence of neat caste differentiation and rather short life span of the queens expected in *Seladonia* (SAKAGAMI 1978). The occurrence of males, large females, fresh females and pollen foragers in diverse months favors a principally multivoltine cycle. The only difference from the complete overlap of generations, expected under the tropical climate, may be the appearance of a partial synchronization of the life cycle in the adverse season, which enables to trace the sequence of generations to some degree. Continuous surveys by residential researchers are indispensable for further clarification of the life cycle sequence under subtropical climates. The populations inhabiting S. India (e.g. Bangalore) may behave as those of *H. lucidipennis*.

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Halictus (*Seladonia*) *vicinus* VACHAL 1894

1894 *Halictus vicinus* VACHAL, Ann. Mus. civ. Stor. nat. Genova, 24: 431-432, ♀. Loc. typ.: Burma, Bhamô. Type: Genoa.

1908 *Halictus abuensis* CAMERON, J. Bombay nat. Hist. Soc., 18 (2): 310-311, ♀. Loc. typ.: India, Abu. Type: London.

1926 *Halictus propinquus* var. *silvatica* BLÜTHGEN, Zool. Jb. Syst., 51: 677, ♀. Loc. typ.: India, Tenasserim-Thandanny. Typus: Berlin.

1929 *Halictus daturae* COCKERELL, Ann. Mag. nat. Hist., (10)4: 584-585, ♀. Loc. typ.: Siam, Nan. Type: New York.

1929 *Halictus daturae* var. *laosina* COCKERELL, Ann. Mag. nat. Hist., (10)4: 585, ♀. Loc. typ.: Siam, Nan. Type: London.

1929 *Halictus speculiferus* COCKERELL, Ann. Mag. nat. Hist., (10)4: 585, ♀. Loc. typ.: Siam, Nan. Type: London.

1929 *Halictus umbrosus* COCKERELL, Ann. Mag. nat. Hist., (10)4: 588-589, ♀. Loc. typ.: Siam, Nan. Type: London.

Taxonomy: BINGHAM 1897: 431; BLÜTHGEN 1926: 676, 1931): 325-6; EBMER 1980: 481; MICHENER 1978: 528-9.

Female: Body 6.0 - 7.7 mm, fore wing with tegula 4.6 - 5.5 mm.

Coloration as in *H. propinquus*, sometimes non-metallic parts paler and bases of fore and mid tibiae more frequently yellowish. Pilosity generally as in *H. propinquus* but hair length nearer to *H. lucidipennis*, 175 - 225 μ on vertex, 175 - 220 μ on face, 125 - 175 μ on mesoscutum centrally and 250 μ on mesoscutellum marginally. Extent, hair density and color of tomental patches intermediate between *H. lucidipennis* and *H. propinquus* but nearer to the former by its pale and conspicuous appearance, though variable individually. Tomental hairs of lateral surface of pronotum extending along lower margin (Fig. 22).

Structurally similar to *H. propinquus*. Head nearly as wide as meso-

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and metasoma (1 : 1.00 : 1.07). HW : HL = 1 : 1.06, MOD : UOD : LOD = 1 : 0.89 : 0.83. Vertex flatter in larger ♀ but less conspicuously than in *H. propinquus*. Mean ratio of IOD : OOD : O_CO_CD = 1 : 1.13 : 0.86, seemingly with allometric tendency intermediate between *H. lucidipennis* and *H. propinquus* (Fig. 104). Hypostoma virtually without striation, smoother than in *H. lucidipennis* (Fig. 14).

Mesosoma: Pronotum with lateral ridge mild and short, lateral surface coriaceous and less shiny than in *H. subauratoides*, without parallel ridges (Fig. 22). PP on mesoscutum and -scutellum (Figs. 44, 48) 18 - 20 μ ϕ, rather homogeneous, IS narrow, 1/4 - 1/3 ϕ on mesoscutum, only slightly wider on mesoscutellum centrally, ± 0.5 marginally. Mesoscutellum medially not depressed longitudinally. Propodeal side as in *H. lucidipennis*, but tessellation coarser and below with weak lineolation. Mesoscutellum : metanotum : propodeal dorsum = 1 : 0.63 : 0.89. Propodeal dorsum (Figs. 35, 39) with enclosure similar to that in *H. subauratoides* in degree of depression, apical margin more strongly curved and anastomosis of ridges more conspicuous than in *H. propinquus*; lateral field with PP arranged intermediate of the both species. PP of propodeal declivity above relatively sparse and fine. Tegula as in *H. propinquus* (Fig. 25). Inner hind tibial spur (Fig. 31) with 4 - 7, relatively small teeth.

Metasoma: PP on terga as in *H. propinquus*.

Male: Body 6.5 - 6.8 mm, fore wing with tegula 4.9 - 5.4 mm.

Coloration: Similar to *H. lucidipennis* but clypeal mark occasionally obscure and tending testaceous, tegula more brownish and less transparent. Paler parts of legs often testaceous than yellow.

Pilosity: Similar to *H. propinquus* but tomental hairs on lateral surface of pronotum more developed, extending along lower margin as in ♀ (Fig. 22). Hairs ± 300 μ on face, 225 - 275 μ on vertex, 200 - 225 μ on mesoscutum centrally and ± 300 μ on mesoscutellum marginally.

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Structure: Head (Figs. 57, 60) metrically intermediate between *H. lucidipennis* and *H. propinquus*. Head : meso- and metasoma = 1 : 0.99 : 0.98; HW : HL = 1 : 1.06; MOD : UOD : LOD = 1 : 0.94 : 0.95. IOD : OOD : O_cO_cD = 1 : 1.00 : 0.82. Sculpture as in *H. lucidipennis* and *H. propinquus* with PP intermediate between the 2 species. Frons flat as in large *H. lucidipennis* ; supraclypeus flat, as high as clypeus; with PP ± 25 μ ϕ medially, IS slightly wider than in the 2 species, smooth and shining. Clypeus as in *H. lucidipennis*, PP 20 - 30 μ ϕ. Hypostoma virtually not striated as in ♀. Mandible as in *H. lucidipennis* . $F_{1-3}L$, $F_{10}L$ and F_2W = 1 : 1.39 : 1.39 : 1.39 : 0.96 (Fig. 82).

Mesosoma as in ♀ including pronotal structures. Mesoscutum with PP (Fig. 68) 20 μ, sometimes 25 μ ϕ, IS linear to 1/3, occasionally 0.5 ϕ, slightly wider postward, to 0.5 or rarely 1.0 ϕ, smooth throughout. Mesoscutellum with PP (Fig. 71) 15 - 20 μ, postlaterally to 25 μ ϕ, IS 0.5 to often 1.0, smooth and shining. Propodeal side with PP of 20 - 25 μ ϕ homogeneously, IS less than ϕ, weakly tessellate but shining, below slightly lineolate. Mesoscutellum : metanotum : propodeal dorsum = 1 : 0.58 : 0.80. Propodeal enclosure (Fig. 65) depressed as in ♀, ridges often coarser, PP of propodeal declivity above 20 - 25 μ ϕ, IS ≥ ϕ, hind tibia : hind basitarsus : hind distitarsi = 1 : 0.59 : 0.68.

Metasoma: Tergal PP denser than in *H. propinquus*, much denser than in *H. lucidipennis* , and finer than in *H. propinquus* but coarser than in *H. lucidipennis*; IS more shagreen than in *H. lucidipennis* and *H. propinquus*. T_1 with PP (Figs. 74, 77, 80) very dense, 15 - 25 μ ϕ; IS > ϕ to ≫ ϕ , smooth to microtessellate, dully shining. T_2 basally with PP ± 15 μ ϕ and IS linear and smooth; on boss PP ± 10 μ ϕ, distinctly finer and weaker than in *H. propinquus*, IS linear, microreticulate and dully shining, after boss PP sparser: IS = ϕ (anteriorly) to 2 ϕ (posteriorly), microreticulate and dully shining, apically finely punctate. Apical tubercle of T_7 (Fig. 85) with carina slightly

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more developed than in *H. lucidipennis* but less than in *H. propinquus*. S_6 (Fig. 90) with postgradular area basally homogeneously haired. S_7 (Fig. 92) with main body forming equilateral triangle, apically rather sharply projecting. S_8 (Fig. 92) apically rather gently projecting., apical hairs more developed than in *H. propinquus* but less than in *H. lucidipennis*, lateral margin mildly angulate midway with sparse setae. **Genitalia** (Figs. 96, 99) with gonostylus (Fig. 103) of ratio length to maximum and minimum widths = 1 : 0.58 : 0.30 seen dorsally, sublaterally gently convex; apex dilated outward as in *H. smaragdulus*; tufted hairs relatively stout; modified hairs of moderate length and distinctly geniculate; dorsal process slightly shorter than main body, basally only with a single, rather stout and long hair, subapically dilated; ventral process distinctly shorter than main body (0.58 : 1), only apically sparsely haired.

Distribution (Fig. 105). Previous records: **Burma** Bhamò (VACHAL), Thandanny, Tenasserim (BLÜTHGEN). **India** Mt. Abu; Teesta bridge; Sikkim; Shillong, Assam; N. Khasia Hill (BLÜTHGEN); Kargil, 2590 m/Ladakh (EBMER). **Thailand** Nan (COCKERELL). This species seems as widespread as *H. propinquus* in India but less abundant anywhere.

Specimens examined **India** Lonavla (620 m), Mahrashtra, 2 ♀, V 13 1963, each 1 ♀, III 26 1961, VII 1963, V 23 1963, X 23 1959, 1 ♂, V 2 1963, all F.L. WAIN; Sinhagad, Mahar., i 25 1964, F.L. WAIN; Bandipur, Karnataka, 1 ♂, XI 28 1973, JICT; Top Slip, Anamalai (550 - 800 m), Tamil Nadu, 7 ♀, XII 2 1978, JICT; Mudumalai (± 1000 m), T. N., 2 ♀ 1 ♂, XI 27-28 1978, JICT; Agric. College, Coimbatore, T. N., 2 ♀, XII 1 1978, JICT; Periyar Sanctuary, Thekkady, Kerala, 1 ♀, XII 21 1978, JICT. **Thailand** Doi Suthep, 1 ♀, XI 18 1962, A. NAGATOMI; Chieng Mai, 1 ♀, V 1 1961, K. IWATA; Sampatong n. Chieng Mai, 1 ♀ XII 11 1962, A. NAGATOMI; Ubol 1 ♀, XII 20 1962, A. NAGATOMI.

Bionomics: BATRA (1966) excavated 8 nests at Kankote forest n.

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Mysore with those of *H. lucidipennis*. The nest pattern was as in *H. lucidipennis*, but the castes seem to be more differentiated than in *H. lucidipennis* as all pollen foragers taken from nests were unfertilized and worn.

Halictus (*Seladonia*) *subauratoides* BLÜTHGEN 1926

1926 *Halictus subauratoides* BLÜTHGEN
BLÜTHGEN, 680, ♀ 1931, 327, ♀, Typ. loc. Shillong, type London.
Taxonomy: MICHENER 1978: 527.

Female: Body 7.5 - 8.1 mm, fore wing with tegula 5.8 - 6.7 mm.

Coloration: As in *H. propinquus*, but (1) metallic tint seen as if different due to longer and denser hairs, (2) supraclypeus usually more metallic and (3) non-metallic parts tending to paler. As in *H. propinquus*, legs occasionally with pale patches yellow instead of brown, and lateral lobe of pronotum blackish.

Pilosity: (1) Color hue deep, comparable to the deepest case in *H. propinquus*. Even in palest parts such as paraocular area and gena, fulvous instead of whitish; rather brownish yellow on vertex and mesosomal dorsum. (2) Hairs very long and erect (Figs. 10, 13), 375 μ on vertex, 400 - 425 μ on face, 300 - 325 μ on mesoscutum centrally and 450 - 475 μ on mesoscutellum marginally. (3) Tomental patches on paraocular area and gena moderately dense, not completely covering the surface. (4) Tomental hairs of lateral surface of pronotum extending downward along lower margin (Fig. 23). (5) Basilateral patch on T_1 usually sparse and incomplete (6) Basal tomenta on $T_{2,3}$ poor and appressed hairs on T_2 sparse. Apical fimbria as in other species, sometimes interrupted on T_2.

Structure: **Head** (Figs. 5, 10) nearly as wide as meso- and metasoma (1 : 1.01 : 1.08). HW : HL = 1 : 0.91, MOD : UOD : LOD = 1 : 0.93 : 0.86, UOD relatively short. Number of specimens insufficient

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to show allometric trend. Mean ratio of IOD : OOD : O_cO_cD = 1 : 1.51 : 1.03, OOD very long. Postocellar PP 25 - 30 μ ♂ less weakened and postocellar depression less conspicuous than in *H. lucidipennis* and *H. propinquus*. Frons as in the latter species, carina as long as or shorter than carina-ocellus-distance. Paraocular area with epistomal angle obtuse but nearer rectangle than in other species (Fig. 5), lower margin rather distinctly ascending laterad; PP 20 - 25 μ ♂ above, coarser below, 35 - 37 μ ♂; IS linear. Supraclypeus gently convex, nearly as high as clypeus, PP (Fig. 5) ± 25 μ ♂ and very dense on uppermost part, 30 - 37 μ ♂ medially, and variable with IS 0.5 ♂ and uniform in some ♂, to 1.0 ♂ and smooth to microreticulate in other ♀. Clypeus relatively taller than in other species, subapically not depressed and apically receded gradually but more distinctly than in *H. propinquus* (Fig. 18), PP (Fig. 5) 30 - 37 μ, above rather homogeneously dense, IS mostly 0.5 ♂, much denser than in *H. lucidipennis*, PP finer (± 25 μ) and denser on uppermost part, sparser below. Gena (Fig. 10) probably weakly allometric. Hypostoma more extensively and distinctly striated than in *H. lucidipennis* though less than in *H. propinquus*.

Mesosoma: Pronotum with lateral ridge acute and extending below; lateral surface finely coriaceous and rather shiny, without parallel ridges (Fig. 23). PP on mesoscutum and -scutellum (Figs. 43, 47) ± 20 μ ♂; IS very narrow, less than 1/4 on mesoscutum and less than ♂ even on mesoscutellum centrally. Mesoscutellum medially often weakly depressed longitudinally. Mesoscutellum : metanotum : propodeal dorsum = 1 : 0.61 : 0.78. Propodeal dorsum (Figs. 36, 40) similar to that in *H. propinquus*, but enclosure more depressed and apical area more raised; parallel ridges more irregular, especially on posterior half, with frequent anastomosing; PP on lateral field denser than in *H. propinquus* but sparser and coarser than in *H. vicinus*. Tegula (Fig. 26) with anterior hairs very long, PP sparser postmedially but not forming a definite impunctate area. Inner hind spur (Fig. 32) with 6 - 7 rather small teeth.

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Metasoma: PP on discs of basal terga individually variable but generally coarse, 20 - 25 μ ϕ and IS 1.0 or less than ϕ on T_1 much narrower on $T_{2,3}$.

Distribution: (Figs. 105) Previous records **India** Shillong, Assam; Himalayas (7200 ft) (all BLÜTHGEN).

Specimens examined **Nepal** (new records) 1 ♀ no data, I. YONETA; Lete, Palpa (2440 m, Fig. 109), 1 ♀, V 5 1968, T. MATSUMURA; Godavari n. Kathmandu (1500 m), 3 ♀, III 26 1968, T. MATSUMURA; Ramche-Bokajundo (1500 - 1800 m), 1 ♀, x 18 1974, I. KUDO; Patan Dhoka (South of Kathmandu), 1 ♀, iii 24 1980, HOHMANN. **India** Mahobra n. Simla (2100 m), Himachal Pradesh, 1 ♀, x 28 1978, JICT.

Remarks: BLÜTHGEN mentioned some differences from the closely allied vicarious species, *H. subauratus* ROSSI, which is principally S. Palaearctic. The differences between these 2 species were reconfirmed as follows:

In *H. subauratus*, (1) Supraclypeus with PP finer, 20 - 25 μ ϕ above, $\pm$ 25 μ medially and below, and IS 0.5 ϕ above, 0.8 - 1.0 ϕ medially and 1.0 - 1.2 ϕ below (Figs. 109 vs 110). (2) Mesopleura with areolation less conspicuous with each alveolus 37 - 50 μ ϕ (much larger, 25x50 - 50x75 μ in *H. subauratoides*), IS less carina-like, and bottom of each alveolus not flat, with irregular undulation (Figs. 113 vs 114). (3) Mesoscutum with PP finer, 15 - 20, rarely 20 μ ϕ (slightly larger in a Turkish specimen) and IS homogeneously narrower (Figs. 111 vs 112). (4) Basal terga with PP finer, IS more homogeneous and $\geq$ ϕ. (5) Propodeal enclosure with IS of ridges more mat. (6) Fore and mid legs with apices of femora and bases of tibiae more extensively paler. (7) Hairs shorter, 250 - 300 μ on vertex, 250 - 325 on face, 200 - 250 on mesoscutum medially and 300 - 350 μ on mesoscutellum marginally.

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Zusammenfassung

Die Arten der Gattung *Halictus*, Untergattung *Seladonia*, des indischen Subkontinentes wurden von BLÜTHGEN (1926) erstmals in brauchbaren Bestimmungstabellen dargestellt; dazu kamen noch nomenklatorische Ergänzungen (BLÜTHGEN 1930). Eine nicht unbeträchtliche Zahl weiterer beschriebener Taxa spiegelte einen größeren Artenreichtum vor, als er sich nach den nun vorliegenden umfangreichen Aufsammlungen und den Untersuchungen aller betreffenden Typen herausstellte. Als tatsächlich orientalische Arten erwiesen sich: *H. (S.) lucidipennis* SMITH (♀, ♂), *H. (S.) propinquus* SMITH (♀, ♂), *H. (S.) vicinus* VACHAL (♀, ♂) und *H. S. subauratoides* BLÜTHGEN (♀). Die *Seladonia*-Arten des geographischen Randgebietes des indischen Subkontinentes werden kurz kommentiert.

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Table 1: Frequency distributions of head widths (25 units = 1 mm) of four *Seladonia* species (females)

Head width	40	1	2	3	4	45	6	7	8	9	50	1	2	3	4	55	6	7	8	9	60	1	2	3	4	65	6	7	8	9	70	1	2	3	4	75	Total
lucidipennis																																					
India	2				1		3	2	2		2		2	1																							15
Nepal							1					1																									2
Thailand														1																							1
Sri Lanka	1	2	5	2	6	10	14	18	13	5	10	13	13	4	5	7	5	1		2																	136
Total	3	2	5	2	7	10	18	20	15	5	12	14	15	5	6	7	5	1		2																	154
vicinus																																					
Thailand								1				1		1	1																						4
India								1			1		3	2	4	2	4		1																		18
Total								2			1	1	3	3	5	2	4		1																		22
subauratoides																																					
Nepal													1				2	1	2			1	1														8
India																							1														1
Total													1				2	1	2			1	2														9
propinquus																																					
Thailand														1				1																			2
Nepal											1		1	2	5	8	5	9	13	8	11	14	5	5	3	4		1		1			1				97
India																			1	2	2	4	5	3	2		1		1								21
Total											1		1	3	5	8	5	10	14	10	13	18	10	8	5	4	1	1		1	1		1				120

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Table 2: Phenology of *H. lucidipennis* in the arid Zone in Sri Lanka (Explanations in the text)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
S	2	4	8	1	6	5	1	1	1	2	3
N_m	6	10	4	0	4	3	1	5	0	0	4
N_f	12	15	48	1	9	6	6	2	3	9	8
N_{fw}	8	7	35	1	6	2	2	0	0	4	3
N_{fW}	3	4	9	0	1	0	2	2	1	0	2
N_{fp}	4	8	17	0	4	3	1	0	1	4	3
N_F	2	6	17	0	1	1	0	0	1	2	3
T	23.0	23.4	25.5	27.2	27.6	27.4	26.9	26.7	26.7	25.8	24.7
R	133.4	53.6	62.5	143.3	111.0	11.9	26.9	68.3	79.0	223.0	293.4

Table 3: Phenology of *H. lucidipennis* in the humid zone in Sri Lanka (Explanations in the text)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
S	4	4	2	1	1	0	0	0	2	1	0
N_m	2	1	2	1	1				2	0	
N_f	3	5	2	7	0				3	10	
N_{fw}	2	1	0	4					0	3	
N_{fW}	0	1	0	1					0	0	
N_{fp}	2	0		0					2	0	
T	24.5	24.9	26.4	27.3	27.8	27.5	26.9	27.1	26.9	26.5	25.8
R	87.9	96.0	117.6	259.8	352.6	211.6	139.7	123.7	153.4	354.1	324.4

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Table 4: Phenology data of *H. propinquus* in NW. India and Nepal

Area	NW. India	Pokhara area	E. Nepal Autumn	E. Nepal Winter	Kathmandu area	
Period	X 27-XI 8	IV 9-V 19	X 17-19	I 28/29	III 27-IV 22	VI 14-16
$\underline{N}_m$	1	1	0	1	0	2
$\underline{N}_f$	24	5	2	5	87	
$\underline{N}_{fw}$	6	1	1	4	28	
$\underline{N}_{fW}$	0	0	0	0	5	
$\underline{N}_{fp}$	7	2	2	4	60	
$\underline{N}_F$	15	0	2	0	16	
$\underline{N}_{Fw}$	7	0	1	0	5	
$\underline{N}_{FW}$	0	0	0	0	3	
$\underline{N}_P$	5	0	2	0	12	

Symbols as in Table 2. $\underline{N}_F$ was defined as large ♀♀ with head width >62 units or more (See Table 1). Pokhara area = Tapatoni, Pokhara and Rupakot. Kathmandu area = Kathmandu, Balaju, Godavari (Fig. 108).