

# ***Andrena* (Hym., Apoidea) on the Island of Öland, Sweden, with Key to Species. I.**

## **Subgenus *Andrena* (s. s.) Fabricius**

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### **Abstract**

SVENSSON, B. G. and TENGÖ, J. *Andrena* (Hym., Apoidea) on the Island of Öland, Sweden, with key to species. I. Subgenus *Andrena* (s.s.) Fabricius. — Ent. Tidskr. 97: 78–89, 1976.

Six species of *Andrena* F., *A. apicata* Sm., *A. clarkella* (K.), *A. fucata* Sm., *A. helvola* (L.), *A. lapponica* Zett. and *A. praecox* (Scop.) classified to the subgenus *Andrena* s.s. are found on

Öland. *A. apicata* is here reported from Sweden for the first time. Key to species and illustrations of important characteristics for the species and subgenus are given. A seventh Swedish species, *A. varians* (Ross.) is included in the key. The phenology of the common species on Öland is shown.

### **Introduction**

The genus *Andrena* F. in the superfamily Apoidea is rich in species. The number of species in Sweden is estimated to be about 60 and divided between 20 subgenera. A study of behaviour releasing chemical signals of *Andrena*-bees at the Ecological Station of Uppsala University on Öland made obvious the need for a useful key to the species of this area, as well as for all of Sweden. The available literature is outdated (Aurivillius 1903, Jørgensen 1921, Stoeckhert 1930, v.d. Vecht 1928) and illustrations of important characteristics are often lacking.

This study of the subgenus *Andrena* sensu stricto is intended to be the first step in a taxonomical survey of the genus *Andrena* on Öland. Our intention is also to compile a simple key for determination, rich in illustrations, for some of the subgenera on the island Öland. If possible we will include most of the species occurring in Sweden.

Our division into subgenera follows

Warneke (1968), as also the taxonomical nomenclature (Warneke 1967).

The references also include the literature studied but not quoted in the text.

### **Material**

For this investigation we studied collections belonging to the Department of Entomology, University of Uppsala, Professor Bertil Kullenberg, Mr. Björn Cederberg and the authors. A few individuals studied, representing species missing or poorly represented in these collections, were borrowed from the Department of Entomology, University of Lund and the Swedish Museum of Natural History, Stockholm. As references for identification of the species we used collections at the Department of Entomology, University of Uppsala and at the Ecological Station of Uppsala University on Öland, determined by J. D. Alfken and K. Warneke. Table 1 gives the numbers of studied specimens from Öland.

Studied specimens belonging to private collections are deposited at the Department of Entomology.

Table I. Number of specimens studied of Swedish *Andrena* s.s. — species from Öland.

Species	Number of	
	♀	♂
<i>A. apicata</i> Sm. ....	1	—
<i>A. clarkella</i> (K.) ....	5	4
<i>A. fucata</i> Sm. ....	12	13
<i>A. helvola</i> (L.) ....	22	31
<i>A. praecox</i> (Scop.) ....	35	42
<i>A. lapponica</i> Zett. ....	1	—
<i>A. varians</i> (Ross.) ....	—	—

mology, University of Uppsala and at the Ecological Station of Uppsala University on Öland.

The phenology of the species, based on specimens collected on Öland and observed during the field studies during 1971–1975, is shown in Fig. 1.

Öland has a varied composition of biotopes (Sternér 1950.) Its geographical location and the many large steppe areas mean that elements of the East-European bee-fauna might possibly occur. Our specimens have generally been collected in the biotopes of the deciduous woods and the rural landscape on the southern part of Öland.

### Subgeneric identification

The subgenus *Andrena* s.s. has a holarctic distribution. About twelve species are recognized north of the Alps.

Important characteristics of subgenus *Andrena* s.s.:

♂: Long mandibles distinctly crossed before the tips (Fig. 2 D) and in most cases with

a more or less large, basal tooth (Figs. 2 D and 3).

Angled genal area (Fig. 2 B).

Pronotum with a marked ridge (Figs. 2 C).

Eighth abdominal sternite hardly enlarged apically (Fig. 4).

General structure of genitalia (Figs. 2 N and 5).

♀: Trapezoidal shape of process of labrum (Figs. 2 A and 6).

Clypeus flat to weakly convex.

Pronotum with a marked ridge (Fig. 2 C).

Basal area of the propodeum with slender wrinkles at the basis (Fig. 2 E).

Inner hind tibial spur not enlarged (Fig. 2 G, cf. H–J).

Pygidial plate with a sharp edged, raised, triangular area in the middle (Fig. 2 K, cf. L–M).

For the separation of the other subgenera of *Andrena*, Warncke (1968) also uses, for example, the pollen baskets of the propodeum (Fig. 2), the malar area (Fig. 2 A) and the preoccipital ridge (Fig. 2 B).

The main component in the volatile secretion of the Dufour glands of *Andrena* s.s. females is geranyl octanoate. All other *Andrena* species studied including *A. fucata* belonging to *Andrena* s.s., produce farnesyl hexanoate (Bergström and Tengö 1974, Tengö and Bergström 1975). The mandibular gland secretions of *A. clarkella*, *A. helvola*, *A. fucata* and *A. praecox* are species specific (Tengö and Bergström 1976).

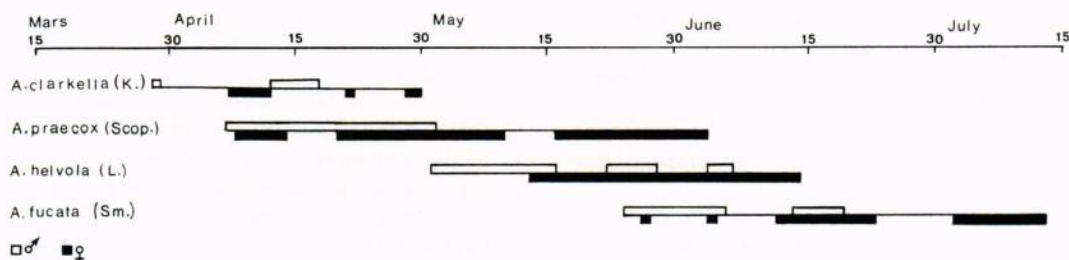


Fig. 1. Phenology of *Andrena clarkella* (K.), *A. praecox* (Scop.), *A. helvola* (L.), and *A. fucata* Sm. on Öland.

## Remarks and key to species

In the illustrations we have the intention of giving an average picture of the limited variations that occur, e.g. the variable length and form of the basal tooth of the male mandibles necessitates the examination of both mandibles; the shagreened and punctured parts of clypeus of the females are variable in distribution and strength.

The colours of the coat have to be considered only as a complement useful for young and fresh individuals. The aim of the key is to enable the determination of old and worn specimens, regardless of coat colouring.

**Definitions.** *Length* is the distance between face, head vertically, and tip of pygidial plate. *Face* is the area between the inner margins of the compound eyes, the lower margin of the median ocellus and the median apical margin of clypeus. *Lower part of the face* is the area in front of the lower margin of antennal attachments.

### Abbreviations:

Proc. of labr.	Process of labrum
Tergite	Surface structure of second abdominal tergite
Hair-col. face	Colour of the coat of lower part of the face
Hair-col. thorax	Colour of the coat of thorax dorsally
Mand. tooth	Basal tooth of the mandibles
Spec. remarks	Special remarks of the species

Fig. 1 concerns the phenology of the species collected on Öland. When days of collection are separated by a maximum of five days without collections, they have been connected. *A. apicata* and *A. lapponica* which are few in number in collections from Öland are not included. The figure indicates the relative abundance of the species.

Material studied but not collected by the team at the Ecological Station is acknowledged in connection with species remarks below.

### *Andrena apicata* Smith (*batava* Pérez)

♀ Proc. of labr.:	Slightly emarginate
Clypeus:	Middle-line shining, broadening in the lower part and all well delimited by dense punctate and shagreened areas
Tergite:	Finely shagreened, sparsely and shallowly punctate
Scopa:	Two-coloured, blackish brown/yellowish white
Haircol. face	Blackish brown with some whitish yellow hair
Spec. remarks	Apical margins of abdominal tergites yellowish transparent
Length:	12—14 mm

Fig. 2. Basic morphologic characteristics for subgeneric identification of *Andrena*-bees.

Main figure: *Andrena* (s.s.) *helvola* (L.) ♀ (p = pronotum, see also C; p.t. = propodeal triangle, see also E, F; t.s. = tibial spurs, see also G—J; p.p. = pygidial plate, see also K—M; p.b. = pollen-basket of propodeum).

A. Frontal view of *Andrena* (s.s.) female head. (cl. = clypeus; p.l. = process of labrum; m. = malar area; f.f. = facial fovea.)

B. Lateral view of male *Andrena* head. (g.a. = general area; p.r. = postgeneral ridge).

C. Lateral left view of pronotum with pronotal ridge, (p.r.).

D. Mandibles of *A.* (s.s.) male. (t. = tooth).

E. Propodeal triangle, dorsal view of *A.* (s.s.) *helvola* (L.).

F. Same of *A.* (Biareolina) *haemorrhoea* (F.).

G. Left tibia with spurs (i.s. = inner tibial spur.).

H. Inner tibial spur of *A.* (Biareolina) *haemorrhoea* (F.).

I. Same of *A.* (Charitandrena) *hattorfiana* (F.).

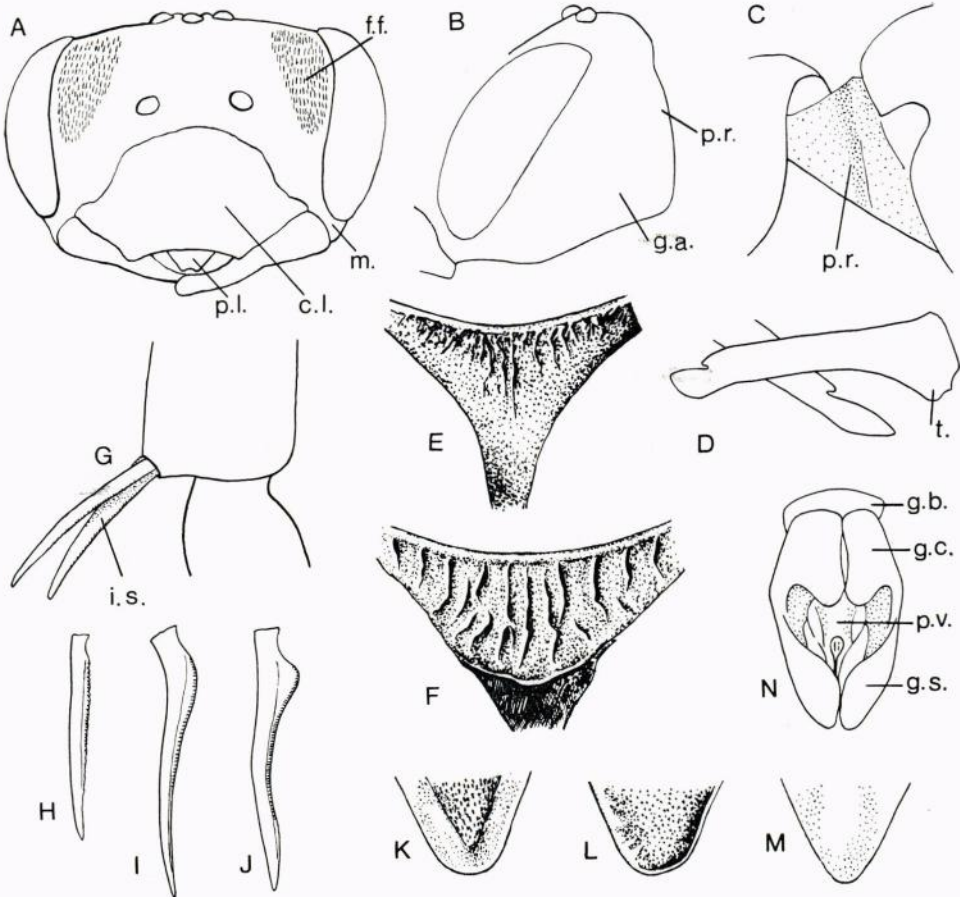
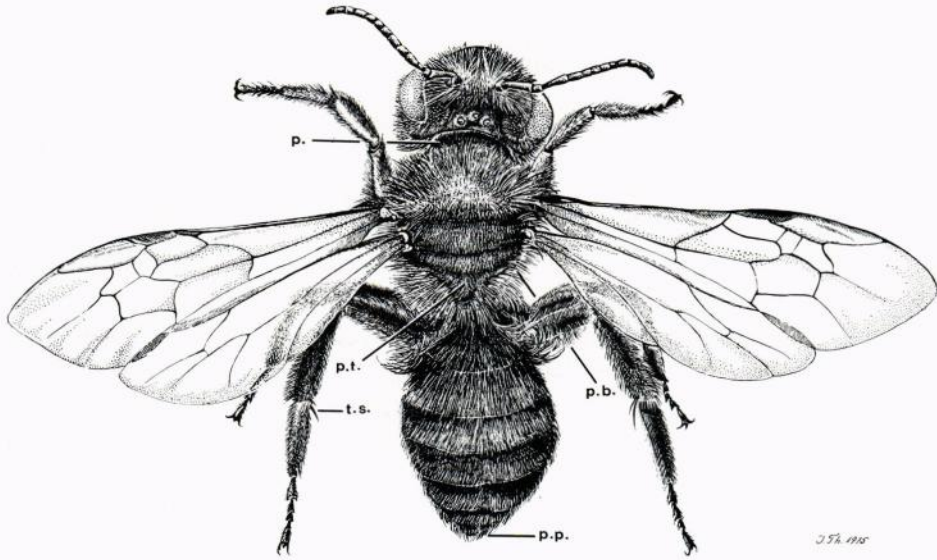
J. Same of *A.* (Plastandrena) *tibialis* (K.).

K. Pygidial plate of *A.* (s.s.) *helvola* (L.).

L. Same of *A.* (Hoplandrena) *carantonica* Pér.

M. Same of *A.* (Cnemidandrena) *nigriceps* (K.).

N. Genitalia of male *Andrena* (g.b. = gonabase; g.c. = gonocoxite; g.s. = gonostylus; p.v. = penes valvulae).





Flight period:	In Bremen — late March to late May, just as <i>A. clarkella</i> (Alfken 1913)
♂ Mand. tooth:	Long, pointed
Proc. of labr.:	Square, slightly emarginate
Spec. remarks:	Eighth sternite apically not emarginate
Haircol. thorax:	Dirty brownish grey
Genitalia:	Gonostyli apically broadly rounded
Length:	8—12 mm
Flight period:	See ♀ above

Studied Swedish material: 2 ♂♂ Sk, Hälsingborg, 27/4 1931, May 1917, leg. O. Ringdahl, in Department of Entomology, Lund; 1 ♀ Öl, Torslunda, 11/5 1951, leg. B. Kullenberg.

### *A. clarkella* (Kirby)

♀ Proc. of labr.:	Apically square and slightly emarginate
Clypeus:	Strongly punctuate and shagreened with narrow shagreened mid-line
Tergite:	Densely shagreened, dull, weakly punctuate
Scopa:	One-coloured, reddish yellow
Haircol. face:	Black
Spec. remarks:	Except for thorax dorsally (brownish red), scopa and hind tarsi (rusty brown) the coat is black
Length:	12—14 mm
Flight period:	Late March to early May
♂ Mand. tooth:	Missing
Proc. of labr.:	Apically square, very weakly emarginate
Haircol. thorax:	Dirty greyish brown
Genitalia:	Large opening in penes valvulae. Lateral view of penes valvulae characteristic
Length:	10—12 mm
Flight period:	Late March to mid-April (Alfken 1913)

### *A. fucata* Smith

♀ Proc. of labr.:	Short and wide, apically deeply emarginate
Clypeus:	Mid-line in the apical part diffuse, shiny and wide-

Tergite:	Shiny, finely shagreened, sparsely punctuate
Scopa:	Two-coloured, light brownish red/yellowish white
Haircol. face:	Yellowish white with some dark hair
Spec. remarks:	Outer joints of the flagella more or less light brown. Hind tarsi more or less yellowish brown
Length:	11—12 mm
Flight period:	Late May to mid-July.
♂ Mand. tooth:	Short, pointed, the tip forms a right angle
Proc. of labr.:	Emarginate, broad
Haircol. thorax:	Brownish red
Spec. remarks:	Hind basitarsi transparent brownish yellow
Genitalia:	Gonostyli elongate and inner apical margin concave. Lateral view of penes valvulae characteristic
Length:	7.5—10 mm
Flight period:	Late May to mid-June

### *A. helvola* (Linnæus)

♀ Proc. of labr.:	Trapeziform, apically rounded and very weakly emarginate
Clypeus:	In the lower part the mid-line widening and with a transverse wavy sculpture, punctuate and shagreened
Tergite:	Distinctly shagreened including dense, rugously edged punctures
Scopa:	Two-coloured, light reddish brown/greyish white
Haircol. face:	Whitish yellow
Spec. remarks:	Coat of abdominal tergites 1—2 brownish red, 3—4 greyish white
Length:	10—12 mm
Flight period:	Early May to mid-June
♂ Mand. tooth:	Short, weakly obtusely angled
Proc. of labr.:	Weakly emarginate

Haircol. thorax:	Brownish red to brownish grey
Genitalia:	Gonostyli in lateral view broad
Length:	7.5—10 mm
Flight period:	Early May to early June

*A. lapponica* Zetterstedt

♀ Proc. of labr.:	Trapeziform, weakly emarginate
Clypeus:	Mid-line wide and shiny, sparsely, laterally more densely punctate
Tergite:	Shiny, weakly shagreened with scattered punctures
Scopa:	Distinctly two-coloured, blackish brown/greyish white
Length:	11—13 mm
Flight period:	In Bremen during May, same period as <i>helvola</i> (Alfken 1913)

♂ Mand. tooth:	Long, but shorter than 1/2 mandible basis, tip rounded and directed forward
Proc. of labr.:	Wide, very weakly emarginate
Haircol. thorax:	Brownish red to brownish grey
Genitalia:	Mid-dorsal projections of the gonocoxites long. Inner margin of the gonostyli with an angled tooth
Length:	9—11 mm
Flight period:	In Bremen — mid-April to mid-May, starts a little later than <i>helvola</i> (Alfken 1913)

Studied Swedish material: 1 ♀ Öl, Byerum, 22/7, leg. E. Wieslander, in Museum of Natural History, Stockholm and a large material from Sm, Upl, and Lpm in Department of Entomology, Uppsala and our own collections.

*A. praecox* (Scopoli)

♀ Proc. of labr.:	Narrow, length 2/3 of basis width
Clypeus:	Mid-line narrow and shagreened. Punctures coarse and deep

Tergite:	Distinctly shagreened with dense rugously edged punctures
Scopa:	Two-coloured greyish brown/whitish grey
Haircol. face:	Dirty yellow brown
Spec. remarks:	Coat of 1—4 abdominal tergites brownish red
Length:	10—11 mm
Flight period:	Mid-April to early June
♂ Mand. tooth:	Long, apically broadly rounded
Proc. of labr.:	Wide, more or less weakly emarginate
Haircol. thorax:	Dirty brownish grey
Spec. remarks:	Eighth abdominal sternite apically emarginate
Genitalia:	Mid-dorsal projections of the gonocoxite short
Length:	8—10 mm
Flight period:	Early April to early May

*A. varians* (Rossi)

♀ Proc. of labr.:	Trapeziform, basis wide, not emarginate
Clypeus:	Mid-line wide and more or less shagreened, scattered, laterally more densely punctate
Tergite:	Shagreened including dense, rugously bound punctures
Scopa:	Distinctly two-coloured, blackish brown/yellowish white
Haircol. face:	Blackish brown with some light brown hair
Length:	10—12 mm
Flight period:	In Bremen — April to June, starts after <i>praecox</i> but before <i>helvola</i> (Alfken 1913)
♂ Mand. tooth:	Very weak
Proc. of labr.:	Square, apically rounded, not emarginate
Haircol. thorax:	Reddish brown
Genitalia:	Gonostyli and penes valvulae broad
Length:	7—10 mm

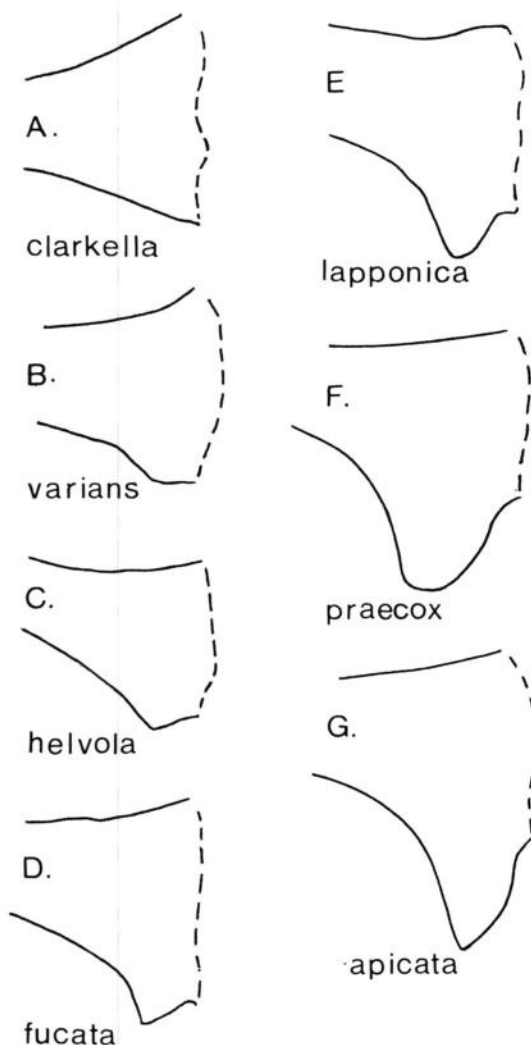


Fig. 3. Base of left mandible of A: *A. clarkella* (K.), B: *A. varians* (Ross.), C: *A. helvola* (L.), D: *A. fucata* Smith, E: *A. lapponica* Zett., F: *A. praecox* (Scop.) and G: *A. apicata* Smith.

Flight period: In Bremen — early April to late May, somewhat later than *helvola* (Alfken 1913)

Studied Swedish material: Specimens belonging to the Department of Entomology, Lund. Not recorded from Öland.

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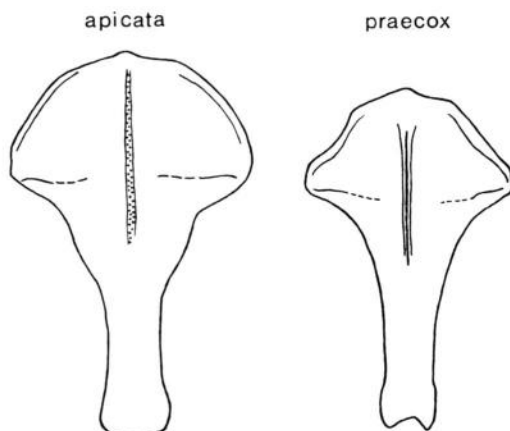


Fig. 4. Eighth abdominal sternite of *A. apicata* Smith and *A. praecox* (Scop.) males (hair not shown).

### Key to species

♂

1. Mand. tooth (=basal tooth of the mandibles) longer than half the breadth of the mandible basis (Fig. 3 F, G) ..... 2
- Mand. tooth shorter or wanting (Fig. 3 A–E) ..... 3
2. Eighth sternite emarginated apically (Fig. 4). Mand. tooth (Fig. 3 F); genitalia (Fig. 5) .. *A. praecox*
- Eighth sternite rounded apically (Fig. 4). Mand. tooth (Fig. 3 G); genitalia (Fig. 5) .. *A. apicata*
3. Mand. tooth small, rounded and obtuse or wanting (Fig. 3 A–C) ..... 3
- Mand. tooth pointed (Fig. 3 D; E) ..... 6
4. Without any mand. tooth (Fig. 3 A). Clypeus in the middle shagreened. Genitalia (Fig. 5) ..... *A. clarkella*
- Mand. tooth small (Fig. 3 B; C). Clypeus in the middle shining ..... 5
5. Mand. tooth minute (Fig. 3 B). Genitalia (Fig. 5). ..... *A. varians*
- Mand. tooth small (Fig. 3 C). Genitalia (Fig. 5). ..... *A. helvola*
6. Process of labrum broader than long and apically roundedly emarginate (cf. Fig. 6). Hind tarsi orange yellow. Mand. tooth (Fig. 3 D); genitalia (Fig. 5). ..... *A. fucata*

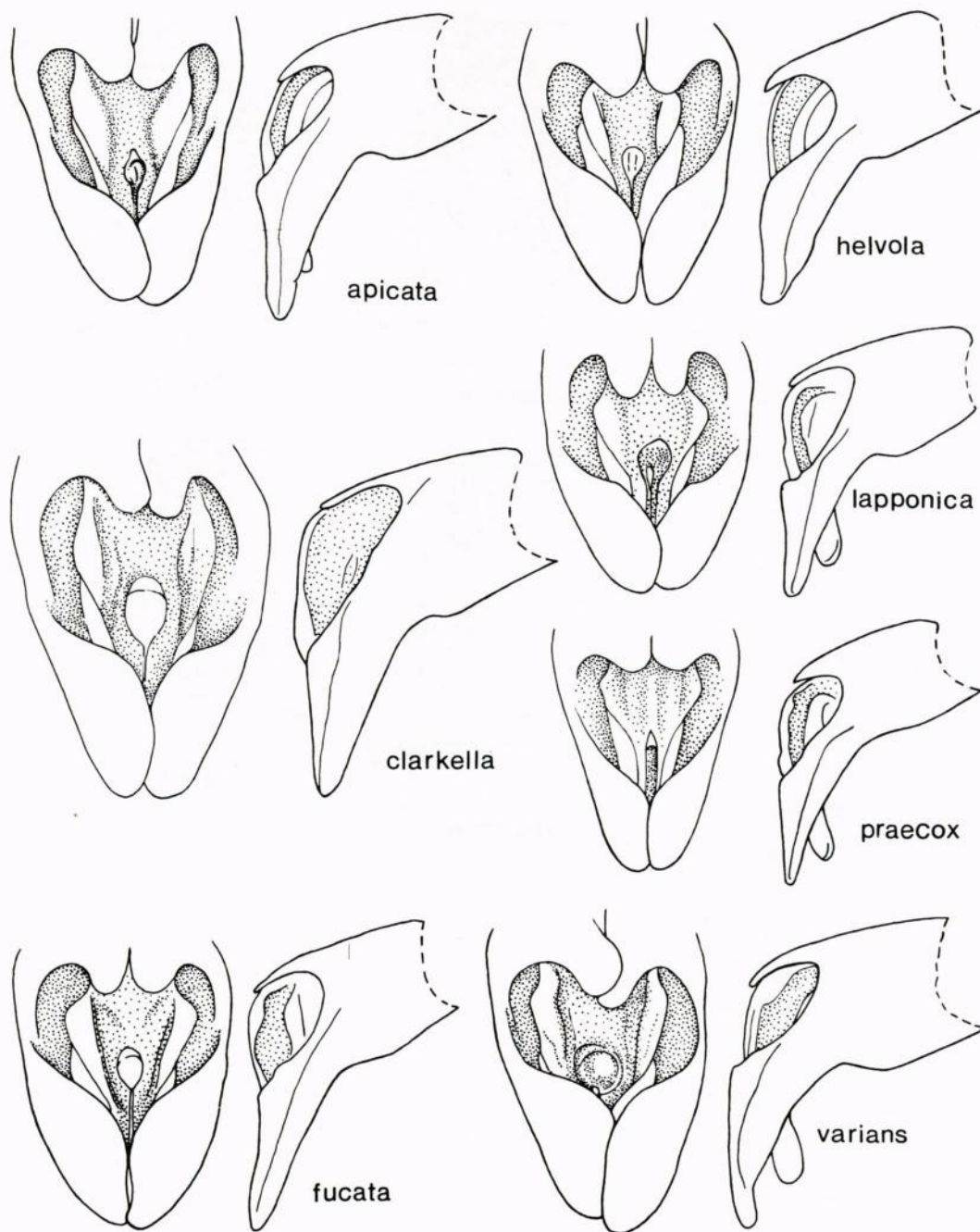


Fig. 5. Dorsal (left) and lateral (right) view of male genitalia of *A. apicata* Smith, *A. clarkella* (K.), *A. fucata* Smith, *A. helvola* (L.), *A. lapponica* Zett., *A. praecox* (Scop.) and *A. varians* (Ross.). Hair not shown.



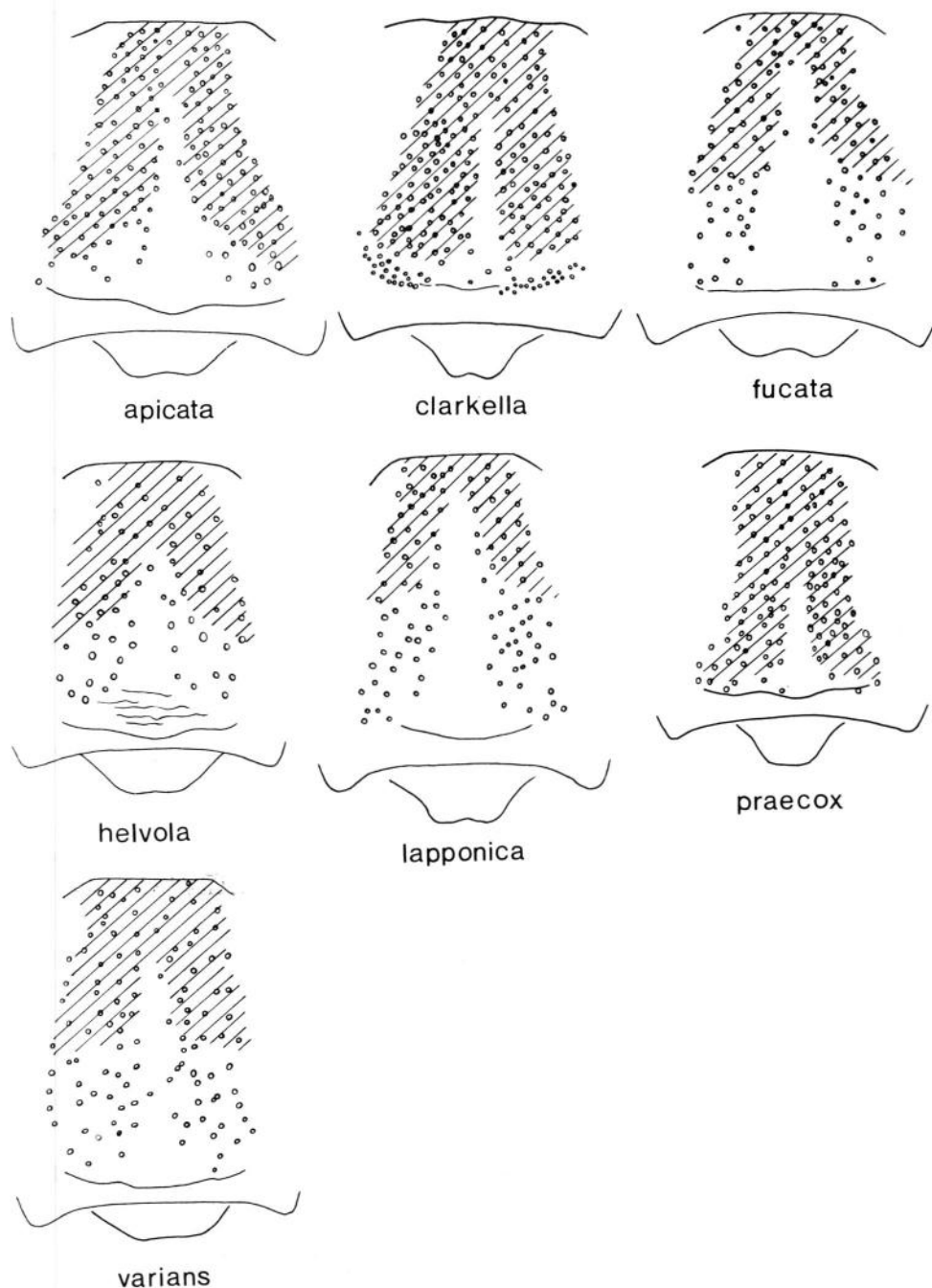


Fig. 6. Surface structures of clypeus and shape of process of labrum and clypeus from females of *A. apicata* Smith, *A. clarkella* (K.), *A. fucata* Smith, *A. helvola* (L.), *A. lapponica* Zett., *A. praecox* (Scop.) and *A. varians* (Ross.). Hair not shown. Areas marked with lines are shagreened, small circles indicate punctures.

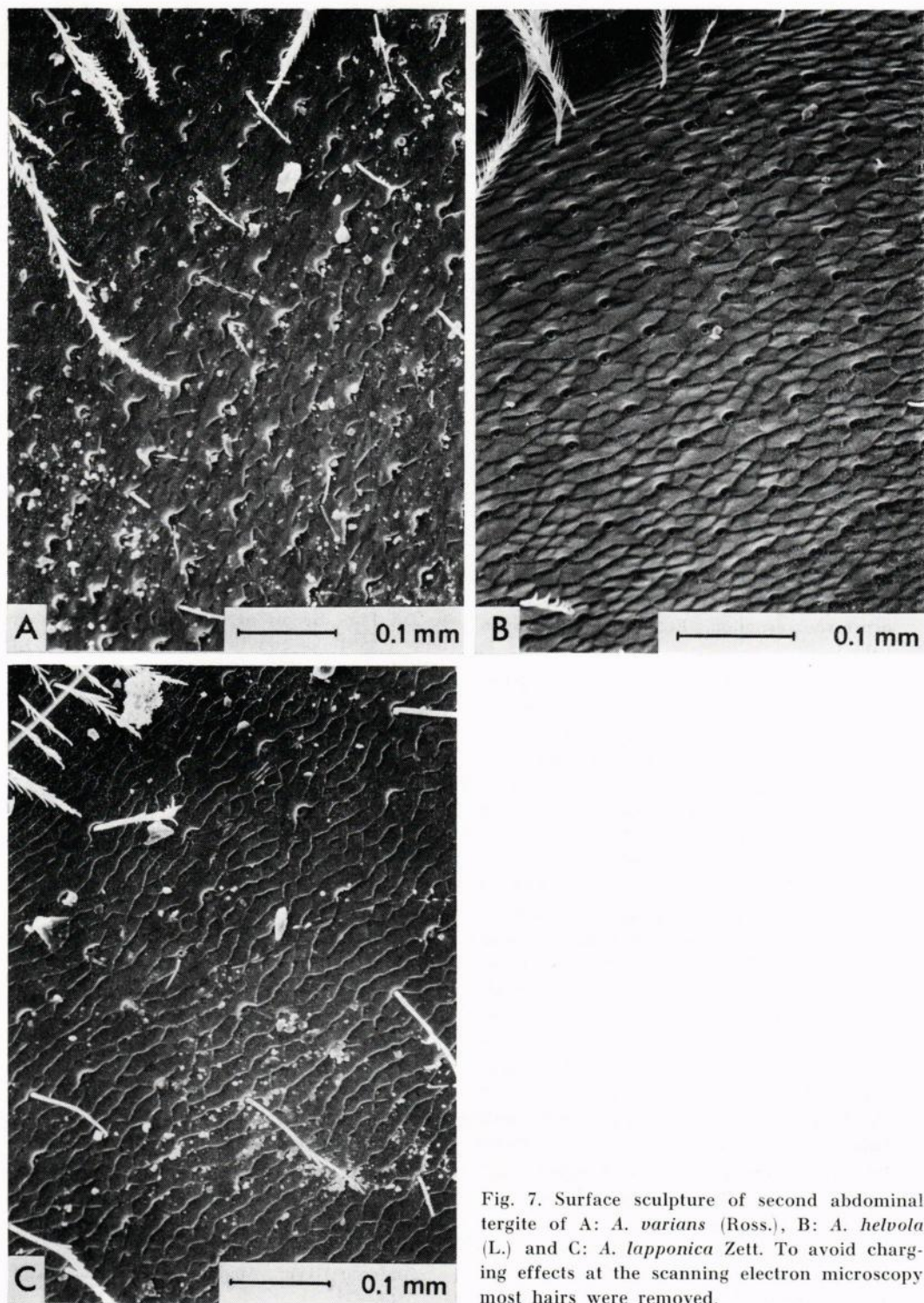


Fig. 7. Surface sculpture of second abdominal tergite of A: *A. varians* (Ross.), B: *A. helvola* (L.) and C: *A. lapponica* Zett. To avoid charging effects at the scanning electron microscopy most hairs were removed.

- Process of labrum as long as broad and apically entire (cf. Fig. 6). Mand. tooth (Fig. 3 E); genitalia (Fig. 5). . . . . *A. lapponica*

♀

1. Hind tibia with orange yellow hair and abdomen with black hair. Clypeus and labrum (Fig. 6). . . . . *A. clarkella*
- Hind tibia coloured otherwise. Abdomen with light hair . . . . . 2
2. Second abdominal tergite, basal part: densely punctuate with edge of punctures ridge-like; shagreened, dull, distance between punctures 1—2 times Ø of the puncture (Fig. 7 A). Clypeus in the middle with a broad shining unpunctuate midline (Fig. 6). Clypeus with brownish-black hair . . . . . *A. varians*
- Second abdominal tergite, basal part: not so densely punctuate with edge of punctures smooth; shagreened, sometimes more or less shining . . . . . 3
3. Second abdominal tergite, basal part: punctures more or less joined with the rather dense shagreenation. (Fig. 7 B). Clypeus light haired . . . . . 4
- Second abdominal tergite, basal part: punctures well defined from the shagreenation (Fig. 7 C). Clypeus light or dark haired . . 5
4. Clypeus with coarse and deep punctures, with a narrow shagreened mid-line (Fig. 6). Process of labrum rounded apically and nearly as long as broad. Abdominal tergite 3—4 (—5) with erect brownish-yellow hair . . . . . *A. praecox*
- Clypeus with regular punctures, the mid-line widening in the lower part with a sinuous transverse structure (Fig. 6). Process of labrum somewhat emarginate apically, broader than long. Abdominal tergite 3—4 (—5) with adpressed whitish-yellow hair . . . . *A. helvola*
5. Process of labrum short and deeply emarginate (Fig. 6). Mid-line of clypeus shining in the lower part (Fig. 6). Clypeus with light hair . . . . . *A. fucata*
- Process of labrum without a shallow emargination (Fig. 6). Clypeus with dark hair . . 6
6. Mid-line of clypeus widening in the lower part and neatly delimited. Surrounding area densely punctuate and shagreened (Fig. 6). Thorax greyish brown . . . . . *A. apicata*
- Mid-line of clypeus broad, vaguely delimited. The surrounding area sparsely punctuate, more or less shining (Fig. 6). Thorax reddish brown . . . . . *A. lapponica*

### Notes on the distribution of *Andrena* (s.s.) species in all Sweden

All Sweden: *A. clarkella*, *A. fucata* and *A. lapponica*, the southern part (62°N): *A. helvola* and *H. praecox* and the southernmost part: *A. apicata* and *A. varians*.

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