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Phylogeny of the genus *Xylota* MEIGEN, 1822 (Diptera, Syrphidae), with descriptions of new taxa

[Phylogenie der Gattung *Xylota* MEIGEN, 1822 (Diptera, Syrphidae),
mit Beschreibungen neuer Taxa]

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Abstract: The taxonomic status of various taxa in the genus *Xylota* MEIGEN, 1822 is clarified, and new taxa described. A phylogenetic system of the genus is proposed based on 75 characters scored on 82 species.

Key words: Syrphidae, *Xylota*, new subgenus, new species, new synonyms, phylogeny

Zusammenfassung: Der taxonomische Status verschiedener Taxa in der Gattung *Xylota* MEIGEN, 1822 wird aufgeklärt und neue Taxa beschrieben. Ein phylogenetisches System der Gattung ist anhand von 75 Merkmalen bewertet bei 82 Arten vorgeschlagen.

Stichwörter: Syrphidae, *Xylota*, neue Untergattung, neue Arten, neue Synonyme, Phylogenie

Introduction: A number of species from the genus *Xylota* MEIGEN, 1822 were analysed in detail by HIPPA (1978) in his review of this and related genera in the tribe Xylotini. He considered the genus *Hovaxyloa* KEISER, 1971 from Africa and Madagascar to be the sister-group to *Xylota*, and *Sterphoides* HIPPA, 1978 from the New World to form a clade with them. He thought that *Brachypalpoidea* HIPPA, 1978 was more distantly related, belonging to quite a separate clade within the Xylotini. However THOMPSON (1975) considered *Brachypalpoidea* to be the sister-group or a subgenus of *Xylota*, with *Sterphoides* a subgenus of *Xylota*. We attempt here to clarify the status of some species of *Xylota* s. str., and to examine the phylogenetic relationships between these taxa and the species groups established by HIPPA (1978).

Material and methods: We studied material from the following museums: The Natural History Museum, London (BMNH); Royal Museum of Scotland, Edinburgh (RMS); United States National Museum, Washington, D. C. (USNM); Zoological Institute, Russian Academy of Science, St. Petersburg (ZIRAS); Zoological Museum of Moscow State University, Moscow (ZMMSU); Institute of Systematics and Ecology of Animals, Siberian Branch of Russian Academy of Science, Novosibirsk (ISEA); Institute of Biology and Pedology, Far-Eastern Branch of Russian Academy of Science, Vladivostok (IBPV). The personal collection of one of the authors (MUTIN) was also used (VAM). In a number of cases we could only use the original descriptions and figures of species, since material was not available for study.

Morphological terms were taken from MCALPINE (1981) and THOMPSON (1999), and HIPPA (1978) for genitalic characters. A set of 9 geographical, 43 male and 25 female characters was developed (Table 1); some characters were the same for males and females, but we retained them in the final character set since the scored states could differ in some cases. A phylogenetic system was developed using parsimony as implemented by the Hennig86 program, using runs for all the taxa together, as well as clades within the eventual tree. Following HIPPA (1978), male genitalic characters were regarded as more useful and hence had weights of 3, all other characters had weights of 1. All characters were unordered, and *Brachypalpoides* was chosen as the outgroup, since both THOMPSON (1975) and HIPPA (1978) regard it as distinct.

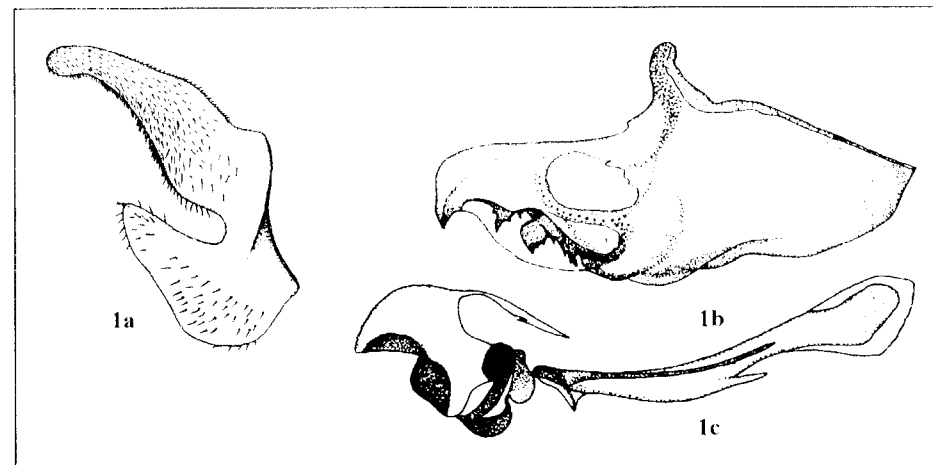
Taxonomy

Haploxygota subgen. nov.

Type species: *Xylota sichotana* MUTIN, 1985

Metasternum not pilose, hind femur moderately thickened, hind tibia without conspicuous apical projections (but with ventral retrolateral corner clearly produced in male), apicoventral margin of scutellum with well-developed pile.

Scutellum conspicuously pointed apically, without premarginal sulcus or its trace, with long erect and short subpressed pile, without apical setae. Wing membrane, mainly with dense microtrichia, except bare basal 1/3 - 1/4 of bm and anterior 1/3 of cup. r-m oblique, rather curved, ending on discal cell just near end of basal 2/5. Hind trochanter simple, without tubercles or calcars (spurs). Hind femur ventrally with dense thin spinae, thicker and longer toward to apex, especially in female. Apicoventral pro- and retrolateral spinose rows and carinae (ridges) not pronounced, but between spinae there is apicomedian bare strip as long as 1/5 length of femur. Hind tibia without baso-ventral carina or small spinae (spinules). First tarsomere of front tarsus with retrolateral row of black and yellow setulae and without modified long setae.



Figures 1 a-c: *Xylota (Haploxygota) sichotana* MUTIN, 1985: a. surstylus; b. hypandrium theca; c. aedeagus, (lateral view, right side).

Genitalia (figures 1 a-c): Surstyli with unusually elongate and apically pointed ventral lobe. Theca with single pair of well developed fenestrae. Lateral arm with apicoventral lobe and inner ventrolateral lobe, which bears a basoventral dentate blade and apicoventral tooth. Aedeagus differs from *Xylota* s. str. by the hood being strongly expanded apicoventrally, which overhangs the sclerotized ejaculatory lobes. Basal and ventral canoes small but conspicuously differentiated. Ejaculatory processes undeveloped, very weak, rising at the sclerotized plates inside lateral wall of aedeagus. Aedeagal apodeme basoventrally unsclerotized.

Distribution: Eastern Asia (the Far-East of Russia, Eastern Siberia).

Discussion: The monotypical subgenus *Haploxygota* subgen. nov. is very similar to the subgenus *Xylota* in appearance, best distinguished by the structure of the genitalia, the absence of any calcar on the hind trochanter, and by the location of r-m relative to the discal cell (in the latter, *Haploxygota* subgen. nov. is similar to the genus *Lejota* RONDANI, 1857). Undoubtedly *Haploxygota* subgen. nov. is closely related to *Xylota* s. str., but its position relative to other taxa such as *Brachypalpoides* or *Sterphoides* is uncertain. The subgenus *Haploxygota* subgen. nov. includes only one known species.

Xylota amamiensis SHIRAKI, 1968 stat. nov.

= *Xylota coquilletti* HERVE-BAZIN, 1915 sensu HIPPA, 1978 and others

The paratype *Xylota cuprina* COQUILLET, 1898 turned out to be a specimen of a different species from the holotype. It corresponds to *X. coquilletti* sensu HIPPA

(1978) and other authors (STACKELBERG, 1952; SHIRAKI, 1968; VILOVICH, 1983). Numerous examined specimens determined by A. A. Stackelberg, N. A. Violovich and V. A. Mutin as *X. coquilletti* HERVÉ-BAZIN, 1915 also belong to this species. We suggest for this species the name *amamiensis* used by SHIRAKI (1968) as the subspecies name of her "*Xylota coquilletti*". The original description and the picture of *amamiensis* SHIRAKI 1968 contain no significant differences from specimens of *X. coquilletti* sensu STACKELBERG (1952) and the paratype of *X. cuprina*.

Xylota coeruleiventris ZETTERSTEDT, 1838

This species was described by ZETTERSTEDT (1838) for specimens with silvery maculae on tergites 2-4 from Lapland ("Lappona Umensi rarissime"). Later he distinguished two forms of *X. coeruleiventris*: form A with silvery maculae, and form B with reddish ones (ZETTERSTEDT, 1843). The first form corresponds to the original description of *X. coeruleiventris*, and the second form is a separate species, *X. jakutorum* BAGACHANOVA, 1980.

Examination of specimens determined by A. A. Stackelberg as "*X. coeruleiventris*" and collected in the environs of St. Petersburg discovered males with silvery maculae that correspond to the original description. We believe that these specimens should be recognized as *X. coeruleiventris*. They differ from *X. pseudoignava* MUTIN, 1984 by the absence of black pile and setae on the scutum and postalar callus, the more uniform pilosity of the scutum in front of the scutellum, and the usually flattish posteroventral tubercula of the hypandrial theca.

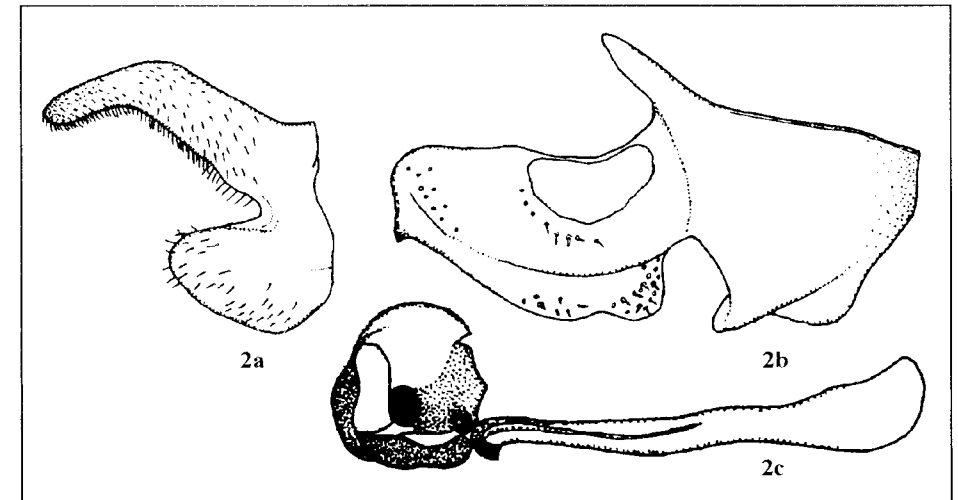
♂: Body length 9-10 mm, wing length 7.5-8 mm.

Head: Face in lower part weakly protruding forward (view in profile). Face black, silvery pollinose. Frontal protuberance small. Frons shining black on anterior 1/2 or more, pale pollinose posteriorly and along eye margins. Vertical triangle with yellowish pile. Antenna dark brown, base of flagellomere as a rule red-brown.

Thorax: Scutum and scutellum shining black, with uniform short, pale pile. Pronotum pale pollinose. Postalar callus with longer and stronger yellow pile. Scutellum with weak premarginal sulcus and long goldenish setae along apex. Pleura black, pale pilose, lightly pale pollinose. Posterior dorsal corner of postanepisternum with longer and brighter pile. Wing membrane mainly with dense microtrichia; extreme basal part of bm and basal part of cup along anterior margin bare. Legs mainly black; basal 1/2 of front- and mid-tibiae and basal 1/3 of hind-tibia. tarsomeres 1-3 of front and mid tarsi yellow. Hind trochanter with a distinct short and thin calcar. Ventral spinae of hind femur numerous and short, forming rather distinct pro- and retrolateral rows from the apex to the base of femur. First tarsomere of front tarsus usually with one long curved seta at apicodorsal prolateral corner. Length of this seta as long or longer than length of second tarsomere. Pile of

femora and tibiae mainly short and pale; hind femur excluding prolateral basal 1/3 with pressed black pile.

Abdomen: Black, tergites 2 and 3 as a rule with distinct shining iron-coloured maculae; tergite 4 mostly with black pressed pile and metallic reflections. Shining spots and sides of abdomen with longer and pale pile. Syntergosternite black pilose. For genitalia, see figures 2 a-c.



Figures 2 a-c: *Xylota coeruleiventris* ZETTERSTEDT, 1838: a. surstylus; b. hypandrium theca; c. aedeagus (lateral view).

♀: Similar to the male. Frons shining over antennae, with weak pollinose areas posteriorly, and with pale pollinose fascia between the shining and obscure parts. First tarsomere without modified setae at apex. Hind trochanter without any calcar.

Material: 32 ♂♂ and 18 ♀♀, Great Britain, Switzerland, Estonia, Western Siberia, Amurland, Primorye: 1 ♂, Russia, Lower Amurland, Evoron Lake, 7.vii.1990 (V. Mutin) (VAM); 1 ♂, 3 ♀♀ with same data, but collected on 7-15.vii.1990; 3 ♂♂, 20 km N Komsomolsk-on-Amur, 10,13.vi.1983 (V. Mutin); 7 ♂♂, 17 ♀♀, Lower Amurland, Pivan, 13.vi.1978, 14,25.vi.1979 (V. Mutin); 3 ♂♂, Myaochan Chain, Amut Lake, 15,22.viii.1994 (V. Mutin); 1 ♀, Myaochan Chain, environs of Gornyi, 25.vi.1986 (V. Mutin); 3 ♀♀, Lower Amurland, mouth of Gorin River, 19,22.vi.1984 (V. Mutin); 11 ♀♀, North-west of Amurskaya Territory, environs of Tynda, Sigikta River, 4-8.vii.1990 (V. Mutin); 1 ♀, Primorye, Taezhnaya River, 6.vii.1982 (V. Mutin); 1 ♂, Sakhalin, 15 km NW of Aniva, 23.vi.1989 (A. Barkalov); 2 ♂♂, Sakhalin, Yuzhno-Sakhalinsk, 8.vii.1957 (N. Violovich).

Discussion. The true *X. coeruleiventris* is closely similar to *X. pseudoignava*, from which it is best distinguished by: the absence of black pile on the postalar callus and on posterior part of the scutum; usually by the presence only of one

modified seta at the apex of first tarsomere of the front tarsus; and by the form of the hypandrium theca in the ventrobasal part, and of the lower lobe of the surstyli (figures 2 a+c).

***Xylota coquilletti* HERVÉ-BAZIN, 1915**

= *Xylota silvicola* MUTIN, 1987 **syn. nov.**

= *Xylota huangshanensis* HE & CHU, 1992 **syn. nov.**

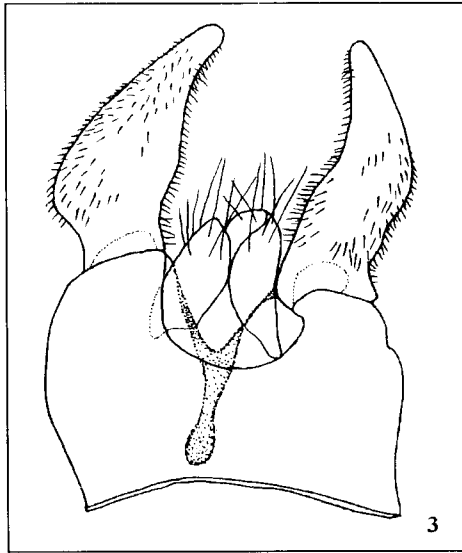


Figure 3: *Xylota coquilletti* HERVÉ-BAZIN, 1915: epandrium (dorsal view).

HERVÉ-BAZIN (1915) proposed to use the name "*coquilletti*" for *X. cuprina* COQUILLET, 1898 preoccupied by BIGOT (1885). We examined the holotype and the paratype of *X. cuprina*, kept in the USNM. The holotype is supplied with the label "No. 3999" and is a different species from the paratype: it does not correspond to *X. amamiensis* (= *X. coquilletti* sensu SHIRAKI, 1968; HIPPA, 1978; and other authors). However, it is identical to *X. silvicola* MUTIN, 1987 **syn. nov.** and *X. huangshanensis* HE & CHU, 1992 **syn. nov.**. The latter is known to us only from the original description and figures. Unfortunately we could not score it adequately enough to include here in the analysis.

X. coquilletti has the typical appearance of the *carbonaria* group, but the genitalia (although plesiomorphic) are more like the *aeneimaculata* group of HIPPA (1978) [note that *amamiensis* SHIRAKI, 1968 (= *coquilletti* sensu HIPPA, 1978) belongs to the *carbonaria* group of HIPPA, 1978]; it differs from known species of the *aeneimaculata* group by the symmetrical ejaculatory hood, weak setulae (bristles) of the hypandrium theca and the absence of the lateral lobe. The surstyli are unsymmetrical (figure 3). It is possible that *X. coquilletti* has more plesiomorphic characters than other species of this group.

***Xylota jakutorum* BAGACHANOVA, 1980**

= *Xylota coeruleiventris* auct., nec ZETTERSTEDT, 1838 (ZETTERSTEDT, 1843 in part [variation B]; HIPPA, 1968; STACKELBERG, 1952 in part and other Russian authors; STUBBS & FALK, 1983 and other European authors; VILOVICH, 1983 in part; others)

ZETTERSTEDT (1843) mentioned this species as the form B of *X. coeruleiventris*. Males of this species differ from other Palearctic species of the *X. triangularis* group by the reddish maculae on their tergites. Females have more or less developed reddish maculae on tergites 2 and 3, sometimes very strongly reduced and obscured.

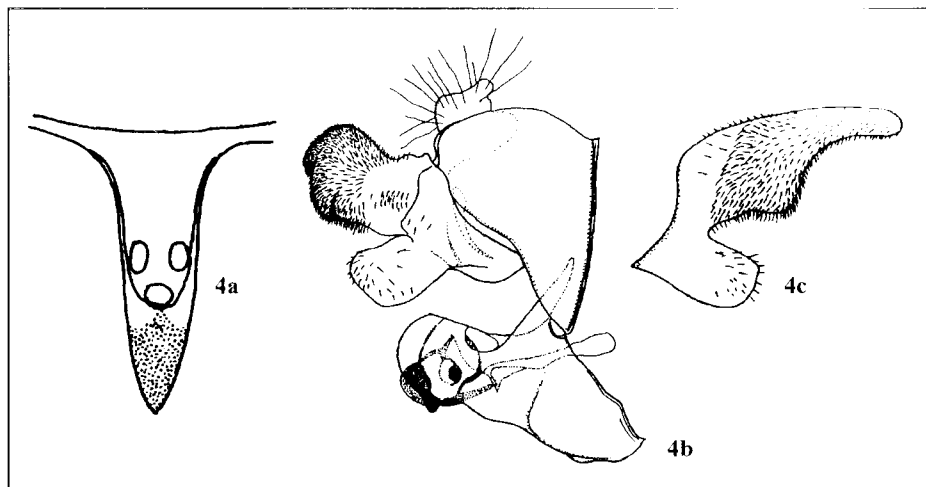
***Xylota philippinica* spec. nov.**

♂: Body length 10.5 mm, wing length 8 mm.

Head: In front view subcordate. Frons protruding forward hardly more than lower part of face. Eyes large, eye suture 3 times shorter than vertical triangle. Face and frons brown, pale pollinose, less dense over antennae. Antenna bright yellow. Length of basoflagellomere 1.5 times as long as wide. Arista brownish, very long and thin, its length nearly 3 times as long as length of basoflagellomere. Vertical triangle very elongate, mainly shining black, with very short black pile and blue reflections; beyond front ocellus, dense yellowish pollinose and with short pale pile. Ocellar triangle set a long way back (figure 4 a).

Thorax: Scutum black, with a complex pattern of pile and pollinosity. Postpronotum mainly grey pollinose and with yellow pile, its posterior part shining black, with slightly blue reflections and short black pile. Scutum before transverse suture and its posterior margin along scutellum and postalar callus with golden short pile and a bright bronze sheen. Anterior part of scutum with two submedian vittae of erect pile. Scutum beyond transverse suture dull black, with very short adpressed black pile. Scutellum trapezoidal, shagreened black, weakly shining, with short adpressed yellowish pile, without marginal setae. Premarginal sulcus of scutellum distinct. Pleura pale pilose, with pale pollinosity. Wing membrane mainly with dense microtrichia, posterior basal 1/4 of br and basal 1/4 of bm and cup clear. Front and mid femora black, with slight bronze sheen and with short erect pale pile. Front and mid tibiae and tarsomeres 1-3 of front and mid tarsi pale yellow, with very short adpressed whitish and yellow pile. Apical tarsomeres of these tarsi darkened. Hind trochanter with short acute spur (calcar). Hind femur dark brown, bronze shining, rather thick, ventrally with pro- and retrolateral rows of regular spines (spinac) and mainly with pale adpressed pile. Hind tibia yellow with darkened apical 1/3, with basoventral (spinose carina) ridge of black setulae. Hind tarsus with yellow tarsomeres 2-3, and tarsomeres 1 and 4-5 brown dorsally.

Abdomen: Constricted, narrowest at junction of segments 2 and 3. Tergites 2 and 3 dull black, near anterior margin with reddish triangular inner-facing maculae. Sides of tergites 2 and 3 and whole tergite 4 brightly shining bronze, with erect pale pile. Sternites 2 and 3 reddish with pale pile. Sternite 4 brown, mainly with dark pile. Syntergosternite with pale pile. For genitalia, see figures 4 b+c.



Figures 4 a-c: *Xylota philippinica* spec. nov.: a. vertex of male; b. male genitalia (lateral view); c. left surstylus (lateral view).

♀: Similar to the male except for the usual sexual dimorphism. Frontal prominence without pollinosity, brown over antennae, posteriorly black, weak shining. Posterior part of frons pale pollinose and with short erect yellow pile. Ocellar triangle and vertex posteriorly shining black, with blue reflections and mainly with yellow pile. Abdominal reddish maculae smaller.

Holotype: ♂, Philippines: Sibuyan, San Fernando, 11.ix.1980 (T. Borrero & R. I. Vane-Wright) (BMNH)

Paratype: ♀, Philippines: Negros Oriental, Amian Falls, 25-28.viii.1980 (R. I. Vane-Wright) (BMNH)

Discussion: *X. philippinica* spec. nov. belongs to the *pendleburyi* group of HIPPA (1978): it is similar to *X. processifera* HIPPA, 1978 in the theca of the hypandrium and the surstyli; it is also similar to *X. petulans* CURRAN, 1928 in its hind leg. It is easily distinguished from all known species of this group by the pattern of scutum and the situation of the ocellar triangle.

Xylota pseudoignava MUTIN, 1984

= *Xylota crepera* HE & CHU, 1992 **syn. nov.**

= *Zelima coeruleiventris* ZETTERSTEDT, 1838 sensu STACKELBERG (1952) [in part]

The author of *pseudoignava* made an unfortunate mistake in his description of this species as an accidental result of the substitution of genitalic preparations. *X. pseudoignava* was described with the genitalia of *X. ignava* (PANZER, [1798]).

Examination of the original description of *X. crepera* HE & CHU, 1992 **syn. nov.** allows us to recognise it as a synonym of *X. pseudoignava* MUTIN, 1984.

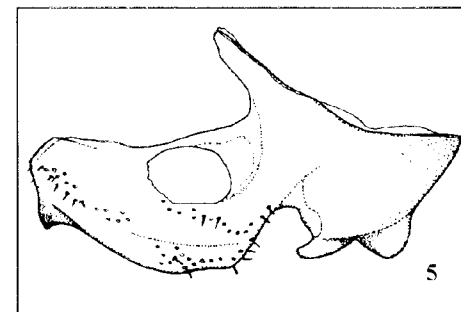


Figure 5: *Xylota pseudoignava* MUTIN, 1984: hypandrium theca (lateral view).

theca of hypandrium with a sharp posteroventral tubercle (figure 5).

Material: 53 ♂♂ and 70 ♀♀ from southern Siberia (Altai, Tuva, western Sayan), Amurland, Primorye.

Xylota tarda MEIGEN, 1822

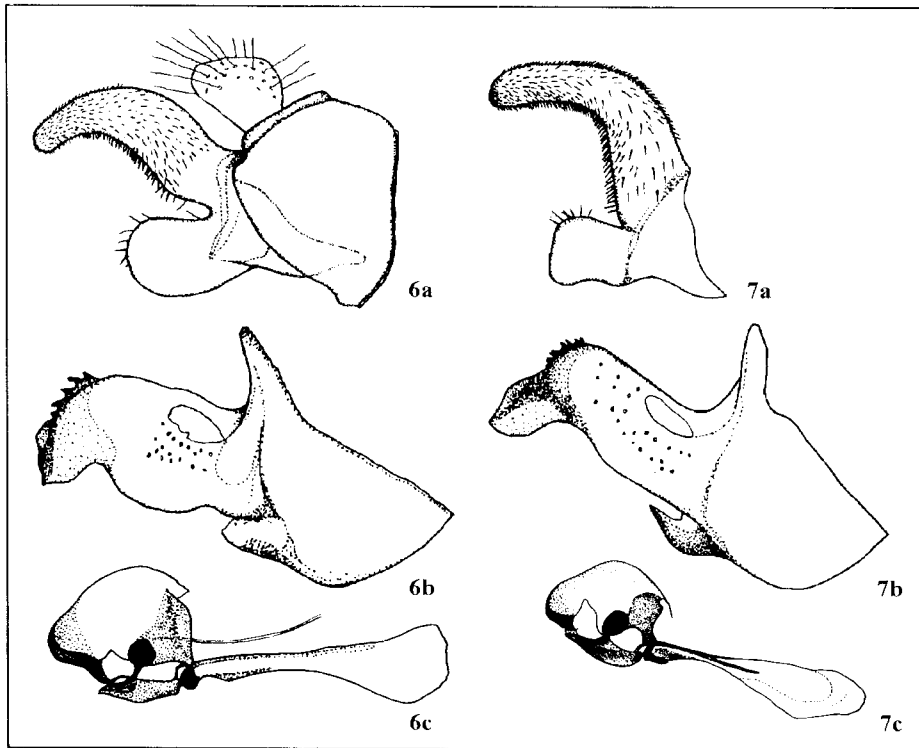
= *Xylota arboris* HE & CHU, 1992 **syn. nov.**

Examination of the original description and the figures of the genitalia of *X. arboris* HE & CHU, 1992 **syn. nov.** showed that this taxon is identical to *X. tarda* MEIGEN, 1822. We studied a large number of specimens of Far-Eastern *X. tarda* and found wide variability in the abdominal pattern. The majority of the studied specimens of *X. tarda* have reddish abdominal maculae, joined medially. This character was designated by HE & CHU (1992) as the important characteristic of *X. arboris* **syn. nov.**

Xylota zeya spec. nov.

♂: Body length 8 mm, wing length 6.5 mm.

Head: In front view elliptical. Face rather slightly concave. Lower part of face protruded forward less than the frontal prominence. Frons and face black, pale pollinose. Antennae and arista dark brown, basoflagellomere and apex of arista paler. Vertical triangle black, with long dark brown pile.



Figures 6 a-c, 7 a-c: 6. *Xylota zeya* **spec. nov.**: a. epandrium; b. hypandrium theca; c. aedeagus (lateral view); 7. *Xylota nartshukae* Bagachanova, 1984: a. surstylus; b. hypandrium theca; c. aedeagus (lateral view, right side).

Thorax: Scutum and scutellum mainly shining black, with erect black pile, longer along apical margin of scutellum. Postpronotal lobes and space between them with brownish and whitish pile, grey pollinose. Pleura with weak pale pollinosity, and with mainly white pile; posterior dorsal corner of anepisternum and anepimeron with black pile. Premarginal sulcus of scutellum absent; apical setae of scutellum indistinct. Wing membrane with dense microtrichia, stigma yellowish, unicolorous with cells C and Cs. Legs entirely black. Femora mainly with erect pale pile. Tibiae retrolaterally with pressed black pile. Hind trochanter with hardly developed spur (id est with trace of spur). Hind femur ventrally with numerous thin setae (bristles) which do not form distinct rows toward base. First tarsomere of front tarsus without modified setae.

Abdomen: Dull black, with shining triangular maculae on tergites 2 and 3; basal part of tergite 4 shining black. Shining areas and sides of tergites pale erect pilose, dull areas with brown short pressed pile. Syntergosternite pale pilose. For genitalia, see figures 6 a-c.

♀: Unknown.

Holotype: ♂. Amurskaya Territory, Zeya Town, 29.vi.1979 (A. Shatalkin) (ZMMSU).

Discussion. In appearance, *X. zeya* **spec. nov.** is very similar to *X. nartshukae* BAGACHANOVA, 1984 and *X. suecica* RINGDAHL, 1943. The former is distinguishable by its pale pilose scutellum and tibiae, by the less elliptical form of the lower lobe of the surstyli, and the form of the lateral arms of the hypandrium theca (figures 7 a-c). The latter has more short pile on the scutum and scutellum, a thinner and longer arista, a distinct premarginal sulcus of the scutellum, mainly pale pilose tibiae, the black pile of the syntergosternite, and a different type of hypandrium theca.

Phylogenetic analysis

The subgenera and species groups of HIPPA (1978) are in general well supported by our data, and the genus *Brachypalpoides* is also monophyletic according to our data. However, the eventual tree (figure 18) shows that some species groups are unclear, and that the subgenus *Xylota* is not monophyletic, since the other subgenera are dispersed among its species groups. The characters supporting this tree are given in table 2: one can see that there are no synapomorphies defining the *carbonaria* group, and it may be worth reassessing the validity of this grouping. Furthermore there are apparently no changes supporting the monophyly of the main clade (from node 4 on figure 18). The clade consisting of the *segnis*, *flavitaris* and *ignava* groups of HIPPA (1978) is very distinct, and probably these should all be recognised as a single group, the *segnis* group. The most plesiomorphic group is the Holarctic *triangularis*, indicating the geographical origins of the genus *Xylota*.

Relationships of the species within two of the species groups, the *sylvarum* and *triangularis* group, are shown in figures 19-20. The other main species group, the *carbonaria* group, was poorly resolved by the characters we use here. We do not have space here to explore the suggested geographical transitions and character changes among species within groups.

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Table 1: Characters and character states used in the phylogenetic analysis.

	State 0	State 1	State 2
Geographic distribution			
1 Eastern Palaearctic	absent	present	
2 Western Palaearctic	absent	present	
3 North America	absent	present	
4 Neotropical	absent	present	
5 Oriental	absent	present	
6 Australasian	absent	present	
7 Afrotropical (inclusive Madagascar)	absent	present	
Male characters			
8 Frons pollinose	entire	partial	
9 Vittae of paler pile on scutum	absent	present	
10 Fascia of dark pile between wings	absent	present	
11 Scutellar setae along hind margin	absent	present	
12 Scutellar pile	short	mixed	long
13 Scutellar submarginal sulcus	absent	present	
14 Anterior anepisternum pollinose	entire	partial	
15 Posterior anepisternum pollinose	entire	partial	
16 Katepisternum pile between dorsal and ventral patches	absent	present	
17 Microtrichia of cell C	entire	absent on basal one-third or more	
18 Modified setae at apicodorsal prolateral corner of first tarsomere of front leg	absent	present	
19 Mid-femur with subapical retrolateral ventral spina or spinae	absent	present	
20 Calcari of hind trochanter	absent/very small	normal (distinct)	very long
21 Ventral spinae of hind femur form two rows	absent	present	
22 Ventral spinae of hind femur regular	absent	present	
23 Ventral spinae develop on only apical one-third of hind femur	absent	present	
24 Prolateral setae on middle hind femur	absent	present	
25 Ventral tuft of long pile on hind femur	absent	present	
26 First tarsomere of hind tarsus	black	yellow	
27 2nd (and 3rd) tarsomeres of hind tarsus	black	yellow	
28 (4th and) 5th tarsomeres of hind tarsus	black	yellow	
29 Basoventral setulae of hind tibia	absent	present	
30 Subbasal prolateral process of mid femur	absent	present	
31 Metasternal pile	absent	present	
32 Submedian ventral dens of hind tibia	absent	present	
33 Hind femur apicoventrally bituberculate	absent	present	
34 Pattern of abdominal tergites 2 and 3	shining metallic	red or yellow or absent	entirely red or yellow
35 Pile of syntergosternite	dark	pale	
36 Posterior margin of sternum 4 with claw-like appendages	absent	present	
37 Lateral basodorsal sternum 9 modified (<i>Hovaxylota</i>)	absent	present	
38 Flat setulae of hypandrium theca (<i>aethusa-fo</i> type)	absent	present	
39 Dorsal thin setae of lateral arms (<i>florum</i> type)	absent	present	

	State 0	State 1	State 2
40 Dorsal dentis of lateral arms (<i>tarda</i> type)	absent	present	
41 Lateral dentis of lateral arms (<i>naknek-umbrosa</i> type)	absent	present	
42 Ventral setulae of hypandrium theca (<i>coeruleiventris-triangularis</i> type)	absent	present	
43 Ventral dentis of hypandrium theca (<i>lenta</i> type)	absent	present	
44 Outer lateral lobe of hypandrium theca (<i>aethusa-fo</i> type)	absent	present	
45 Apicoventral lobe of lateral arms (<i>pendleburyi</i> type)	absent	present	
46 Apicoventral dens of lateral arms (<i>ignava</i> type)	absent	present	
47 Lateral arms with 3 apical lobes (<i>Sterphoides</i> type)	absent	present	long
48 Ejaculatory process	absent/very small	long	
49 Apicoventral spinae (dentis) on superior lobe of hypandrium theca (<i>flavifacies-violaceus</i> type)	absent	present	
50 Ventral branched lamella of hypandrium theca (<i>mimica-setosa</i> type)	absent	present	
Female characters			
51 Frons pollinose	absent	present	
52 Scutum vitta of paler pile	absent	present	
53 Scutum fascia of dark pile	absent	present	
54 Scutellum pile	short	mixed	long
55 Scutellum sulcus	absent	present	
56 Scutellum apical setae	absent	present	
57 Microtrichia of cell C	entire	absent on basal one-third or more	
58 Pollinose anterior anepisternum	entire	partial	
59 Pollinose posterior anepisternum	entire	partial	
60 Ventral spinae of hind femora form two rows	absent	present	
61 Ventral spinae developed only on apical one-third of hind femur	absent	present	
62 Ventral spinae of hind femur regular	absent	present	
63 First tarsomere of hind tarsus	black	yellow	
64 2nd (and 3rd) tarsomere of hind tarsus	black	yellow	
65 (4th and) 5th tarsomere of hind tarsus	black	yellow	
66 Pattern of abdominal tergites 2 and 3	absent/	red or yellow shining metallic	entirely red or yellow
67 Pile of tergite 5	dark (black)	pale	
68 Pile of posterior callus	pale	black	
69 Pile of dorso-ventral corner of posterior anepisternum	pale	black	
70 Ventral setae of mid basotarsomere	absent	present	
71 Prolateral setae of hind basotarsomere	absent	present	
72 Apicoventral corner of hind tibia	absent	present	
73 Basoventral unispinose carina of hind tibia	absent	present	
74 Basoventral setulae of hind tibia	absent	present	
75 Upper and lower pilose spots of katepisternum connected along anterior side	absent	present	

Table 2: Apomorphy list for main groups (node numbers correspond to figure 18)

Node	Ancestor	Character	Ancestral state	Derived state		
1	<i>Brachypalpoides</i>	16	1	0		
		17	1	0		
		23	1	0		
		34	2	0		
		48	1	0		
		57	1	0		
		59	1	2		
		61	1	0		
		66	2	0		
		67	1	0		
		73	1	0		
		75	1	0		
		<i>triangularis</i> group	1	10	0	1
				20	0	1
42	0			1		
53	0			1		
54	1			2		
2	1	3	1	0		
		8	0	1		
		15	1	0		
3	2	59	2	0		
		13	1	0		
		47	0	1		
<i>Haploxygota</i>	3	55	1	0		
		56	1	0		
		1	0	1		
		8	1	0		
<i>Sterphoides</i>	3	46	0	1		
		4	0	1		
4	2	none				
		<i>sylvarum</i> group	4	40	0	1
5	4	71	0	1		
		9	0	1		
		12	2	1		
		21	0	1		
		52	0	1		
		60	0	1		
		74	0	1		
		<i>Hovaxygota</i>	5	7	0	1
				12	1	0
				17	0	1
26	0			1		
27	0			1		
28	0			1		
30	0			1		
37	0	1				

Node	Ancestor	Character	Ancestral state	Derived state		
6	5	38	0	1		
		51	0	1		
		53	0	1		
		22	0	1		
		29	0	1		
7	6	62	0	1		
		11	1	0		
		45	0	1		
		54	1	0		
<i>aneimaculata</i> group	7	56	1	0		
		67	0	1		
		6	0	1		
		17	0	1		
		38	0	1		
<i>pendleburyi</i> group	7	5	0	1		
		12	1	0		
		20	0	2		
8	6	18	0	1		
		46	0	1		
<i>carbonaria</i> group	8	none				
		9	8	1	0	
9	8	9	1	0		
		20	0	2		
		27	0	1		
		34	0	2		
		52	1	0		
		64	0	1		
		66	0	2		
		<i>segnis</i> group	9	2	0	1
				3	0	1
				10	9	17
10	9	22	1	0		
		26	0	1		
		54	1	2		
		57	0	1		
		62	1	0		
		63	0	1		
		<i>flavitaris</i> group	10	6	0	1
				8	0	1
				9	0	1
				34	2	0
<i>ignava</i> group	10	66	2	0		
		21	1	0		
		29	1	0		
		60	1	0		
		74	1	0		

Table 3: Character table for the taxa considered here. Taxa marked with an asterisk are those with more complete data, used in the phylogenetic analysis. Taxa are organized in their species groups. Characters are in the order of table 1, with the geographic, male and female character sets separated by spaces. Undescribed species of Sterphoides come from the USNM.

Table with 2 columns: Taxon names and Character sets. Taxa listed include Brachypalpoidea, Sterphoides, and triangularis group. Each entry has a long string of binary characters (0s and 1s).

Table with 2 columns: Taxon names and Character sets. Taxa listed include triangularis group, Sterphoides, Haploxyloa, and sylvorum group. Each entry has a long string of binary characters (0s and 1s).

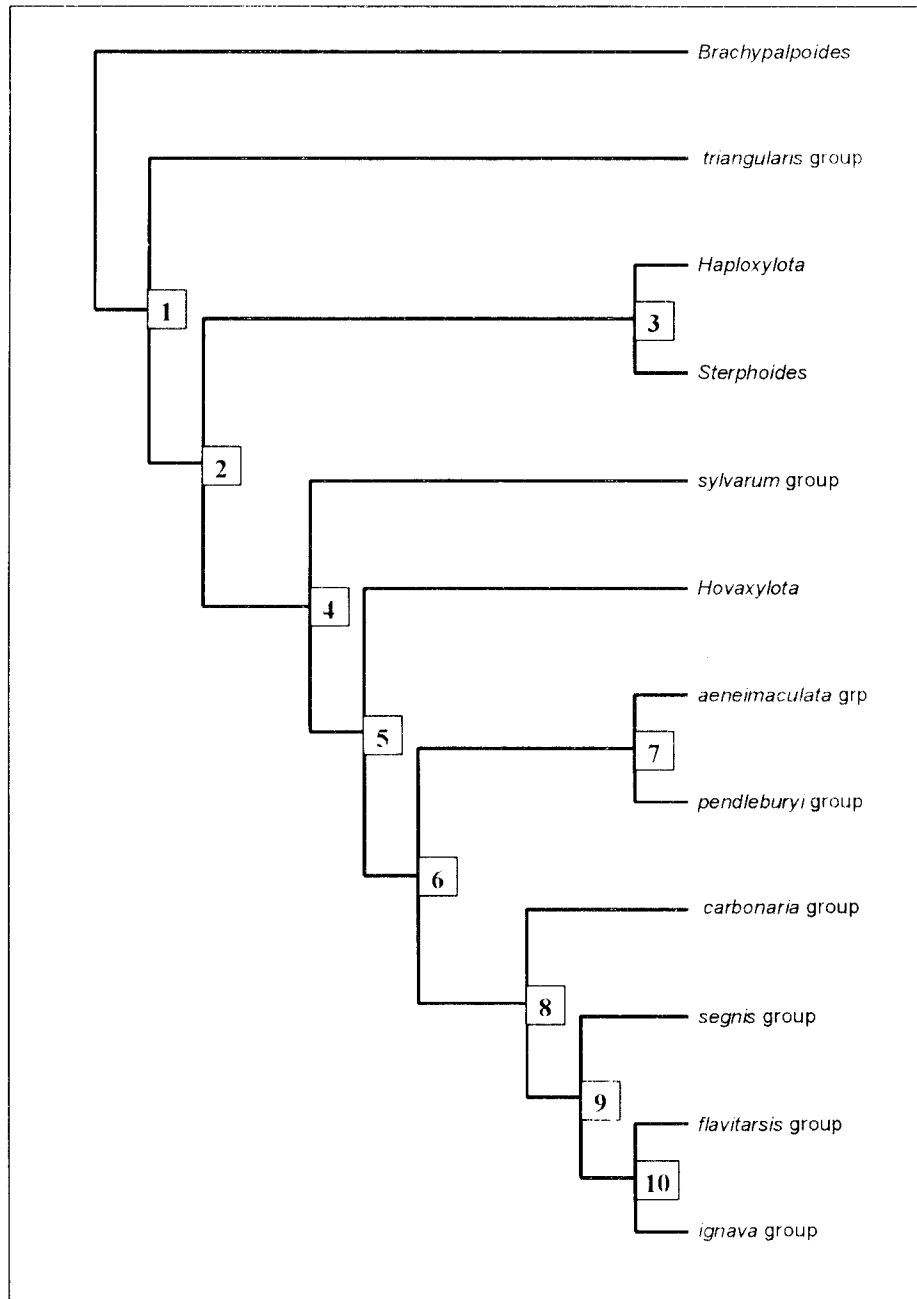


Figure 18: Phylogenetic system of the subgenera and species groups of the genus *Xylota*, developed from analyses using the Hennig86 program. Total length of the full tree (85 taxa, 75 characters) = 259, CI = 0.255.

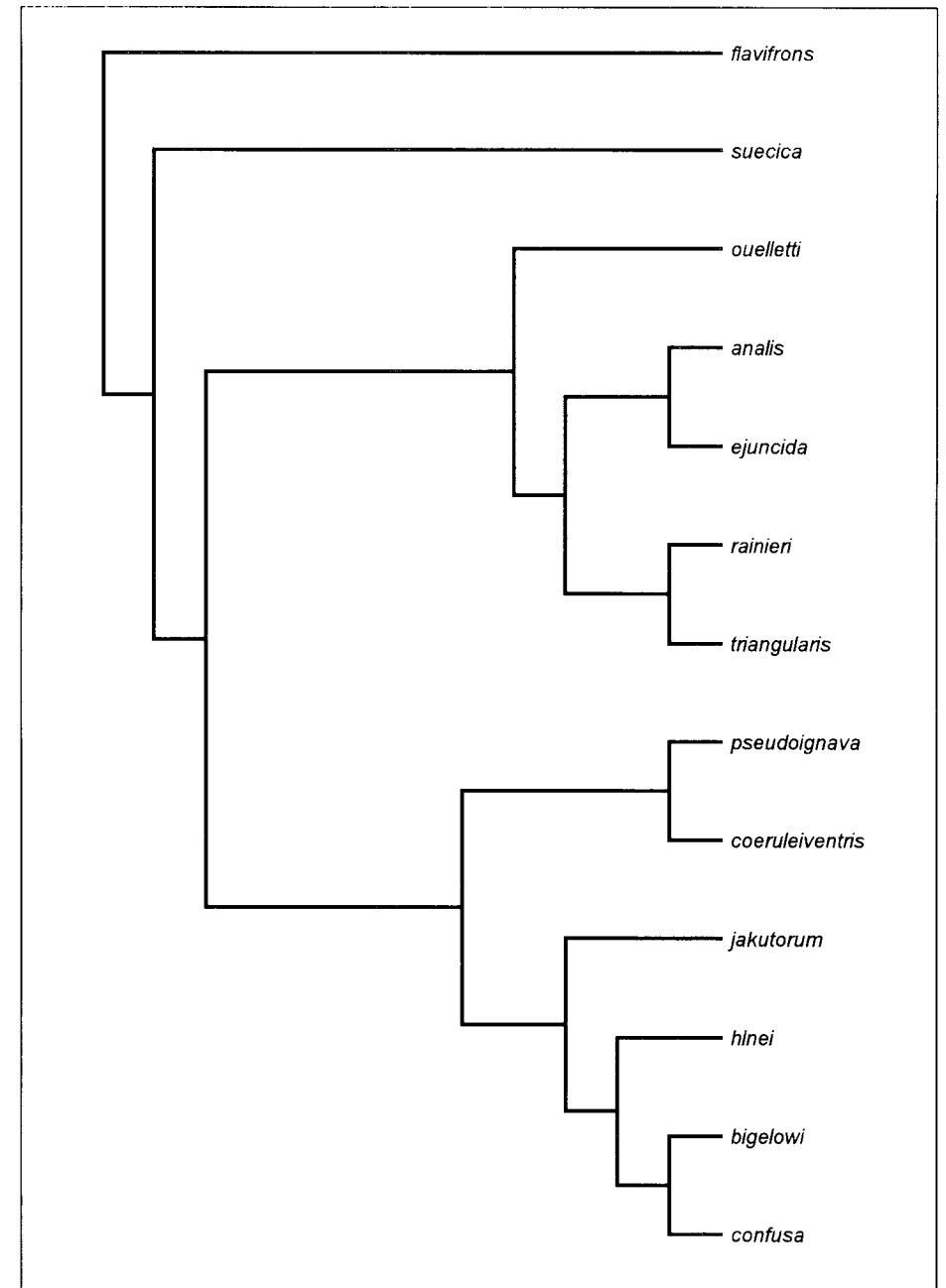


Figure 19: Phylogenetic system of the *triangularis* species group.

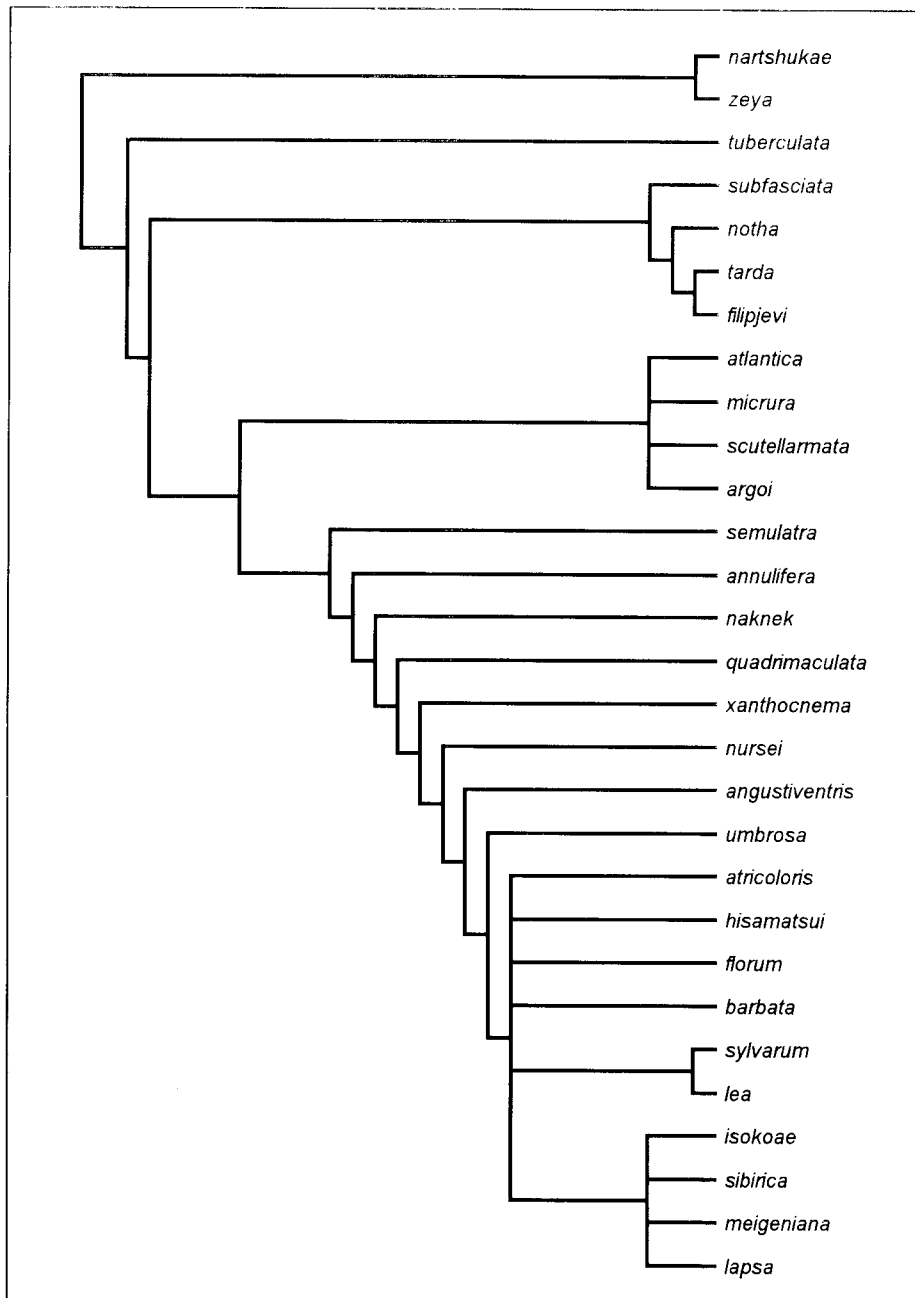


Figure 20: Phylogenetic system of the *sylvorum* species group.

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