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# THE STATUS OF THE GENERA OF THE TRIBE ANTHRACINI (DIPTERA: BOMBYLIIDAE)

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*Abstract.* The taxonomic status of the genera of the tribe Anthracini is reviewed and a key to genera presented. *Argyromoeba* is determined to be a junior synonym of *Spogostylum*. *Spogostylum* is found to be a good genus. A new genus, *Xenox*, is proposed for species of the *Anthrax tigrinus* group. The genera *Coniomastix* and *Turkmeniella* are considered of doubtful validity, pending further material and study.

Throughout the years there have been many attempts by bombyliid taxonomists to split the large and heterogenous genus *Anthrax* Scopoli into many separate taxa. Though mostly abortive, these attempts have unfortunately caused much confusion regarding the taxonomic validity of these taxa and resulted in long lists of synonymies and inconsistent usage of genera.

Macquart (1840) was the first to describe a separate genus allied to *Anthrax*. His genus *Spogostylum* was based on a single new species, *S. mystaceum*, erroneously recorded from South America. Schiner (1860) proposed the genus *Argyromoeba* to include the species *Anthrax tripunctata* Wiedemann, *A. aethiops* (Fabricius), and *A. varia* Fabricius [the first of these designated as the type-species by Coquillett (1910)]. In 1909, Sack described 8 new genera: *Satyramoeba, Anthracamoeba, Molybdamoeba, Leucamoeba, Chalcamoeba, Chionamoeba, Chrysamoeba,* and *Psamatamoeba*. Williston (1896) erected the genus *Coquillettia* for the aberrant North American species *Anthrax vandykei* Coquillett. Bezzi (1924) erected the new genus *Dicranoclista* for his new species *D. simpsoni* from the Afrotropical Region and included *vandykei* Coquillett, noting that *Coquillettia* was preoccupied. Paramonov (1934) described *Walkeromyia,* which contains 2 strictly Neotropical species with conspicuously long scales on the hind tibiae. Enderlein (1934) described *Coniomastix* to include a single new Palearctic species, *C. montana*. In an apparently little-known paper, Paramonov (1939) described a new genus, *Turkmeniella,* with the type-species *T. magnifica,* based mainly on antennal characters. Evenhuis (1979) proposed a new genus, *Meganthrax,* for the unusually large Oriental species *Anthrax bipunctatus* Fabricius, and in 1981 described the genus *Brachyanax* to include 8 *Hemipenthes*-like species from the south and western Pacific and SE Asia. Of the genera thus far described, *Anthrax, Satyramoeba, Dicranoclista, Walkeromyia,* and *Brachyanax* are here considered valid. *Coniomastix* is of doubtful validity [the type-species, *montana,* has been treated under *Spogostylum* by Paramonov (1957)]. I have not seen specimens of *Turkmeniella*; its standing may be in doubt if,

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as in other anthracine genera, the antennal characters on which it is based are found to be unreliable in separating it from other closely related taxa. *Chionamoeba* has been synonymized under *Desmatoneura* by François (1967), which is in the tribe Petrorossiini. The other genera have been relegated to synonymy under various anthracine genera. The validity of 2 of these commonly synonymized genera, *Argyromoeba* and *Spogostylum,* is discussed in detail below.

The status of both *Argyromoeba* and *Spogostylum*[2] has been questionable for some time. Between the 1860's and 1920's new species of anthracine flies were commonly referred to *Argyromoeba,* but this practice later declined considerably [exceptions are those species described in Hesse (1956) and Bowden (1964)]. *Argyromoeba* has since been generally regarded as a synonym of either *Anthrax* or *Spogostylum,* depending on the author. This difference of opinion in synonymic allocation of *Argyromoeba* apparently resulted from confusion as to the correct designation of the type-species of the genus. The earliest was by Sack (1909), who gave *Musca anthrax* Schrank as the type-species. Coquillett (1910) subsequently proposed the 1st of the 3 species listed by Schiner, *Anthrax tripunctata,* as the type of the genus. Those who thought Sack's (1909) designation took priority by virtue of the earlier date, placed *Argyromoeba* as an objective junior synonym of *Anthrax,* since the type-species of *Anthrax* was also *Musca anthrax.* Unfortunately, *Musca anthrax* was not one of the species originally included by Schiner in *Argyromoeba,* thus Sack's designation is invalid. *Anthrax tripunctata,* then, is the valid type of the genus [Becker (1913) subsequently designated *A. tripunctata* (independently of Coquillett) as the type of *Argyromoeba*]. The genus *Argyromoeba* has been placed in synonymy under *Spogostylum* because of similar generic characters. Theodor (1983) corroborated this synonymy by illustrating the male and female genitalia of *A. tripunctata,* the characters of which are congeneric with other species of *Spogostylum.*

This leaves us with the question of the status of *Spogostylum.* In contrast to *Argyromoeba, Spogostylum* is still used in the scientific literature (namely, in those papers dealing with Old World Bombyliidae), with new species in this genus continually being described by Zaitsev (1961, 1971, 1976, 1977) and most recently by Greathead (1980). *Spogostylum* has been characterized as separate from *Anthrax* by most taxonomists on the basis of the presence of 3 submarginal cells in the wing, formed by a sectoral crossvein connecting veins $R_4$ and $R_{2+3}$. This character has proven to be inconsistent among species of *Anthrax* and *Spogostylum,* including specimens of *Spo-*

2. Agassiz (1847: 349) emended the spelling of *Spogostylum* Macquart to *Spongostylum.* The latter spelling has since been adopted by many taxonomists, most recently by Theodor (1983), who incorrectly justified it. Theodor (1983: 208), referring to the ICZN Code (p. 133, footnote), correctly states that *Spogostylum* is an incorrect transliteration of the Greek and the double gamma should be transliterated to an "ng"; however, he failed to notice that the Code also states [Art. 32 a(ii)] that errors such as "incorrect transliteration, improper latinization, and use of an inappropriate connecting vowel are not to be considered inadvertent errors." Thus, the original spelling of *Spogostylum* is retained.

*gostylum mystaceum* (Marston 1970). Paramonov (1957) separated *Spogostylum* from other genera of Anthracinae by the bilobed distal portion of the basistyli: ". . . an der Spitze haben die oberen Lamellen meist deutliche spitze Fortsatze, die manchmal sehr lang sind, ausserdem haben sie dort seitlich gut entwickelte Gelenkanhange." Marston (1963) used the bilobed basistylus character in differentiating his *Anthrax albofasciatus* group from other New World *Anthrax* species. However, some species described in Marston (1970), which consist of *Anthrax* species of the New World other than the *albofasciatus* group, also exhibit a bilobed basistylus; these include *mystaceum,* which Marston treated as an *Anthrax.* Therefore, the bilobed basistylus character, too, is unusable in separating these genera.

In addition to challenges in finding stable characters to separate *Spogostylum* from *Anthrax,* there is the problem with the type-species of the genus, *Spogostylum mystaceum* Macquart. Bowden (1975) hesitated to use the name *Spogostylum* until the question of the type-locality and collector of *S. mystaceum* was clarified. Séguy (1938) stated that *Spogostylum* was actually the same as *Anthrax punctipennis* Wiedemann, and that the type specimen is from the Sinai (not South America), having been collected by Bové in 1830 (not Gaudichaud [-Beaupré] as stated in Macquart's original description). Séguy is correct that the type specimen is from the Sinai, but he misidentified the specimen. It is actually the same as *Anthrax tripunctata,* not *punctipennis,* which is a predominantly southern Afrotropical species (Bowden in litt.). Since the type of *Spogostylum mystaceum* is identical with *Anthrax tripunctata,* and the latter is the type of *Argyromoeba, Argyromoeba* becomes an objective junior synonym of *Spogostylum.* Marston's (1970) concept of *mystaceum* from South America will have to be reevaluated and a possible new species may have to be described.

The problem now arises as to whether or not those species in *Spogostylum* constitute a separate taxon from *Anthrax.* Greathead (1980) provides a key to the genera of Bombyliidae of Saudi Arabia and in it separates *Spogostylum* from *Anthrax, Desmatoneura,* and *Xeramoeba* by the following: "Second joint of antenna flattened, closely applied to first and third, which may be hollowed to receive it; wings without a basicostal infuscation, clear or spotted and sometimes with a diffuse brownish infuscation at base and along fore border; body with shaggy upstanding cuneiform scales, frequently in tufts of contrasting colours at sides of abdomen, on thorax and middle of abdominal tergites with mixed white, black and brown scales achieving an overall dusty, grey effect." Theodor (1983) points out the difficulties in using characters such as the shape of the 2nd antennal segment and the basicostal infuscation individually in separating these taxa, because some *Anthrax* species also exhibit a "cup-shaped" 2nd antennal segment (e.g., *Anthrax aethiops*) and other species of *Anthrax* have hyaline wings. My examinations of *Anthrax* species show that some also have scales that appear cuneiform, though they are not always "upstanding." Theodor's (1983) work on the male and female genitalia reveals additional evidence supporting the separation of *Spogostylum* and *Anthrax* species. His findings show that *Anthrax* females have a distinct ejection apparatus (a muscular portion of the spermathecal

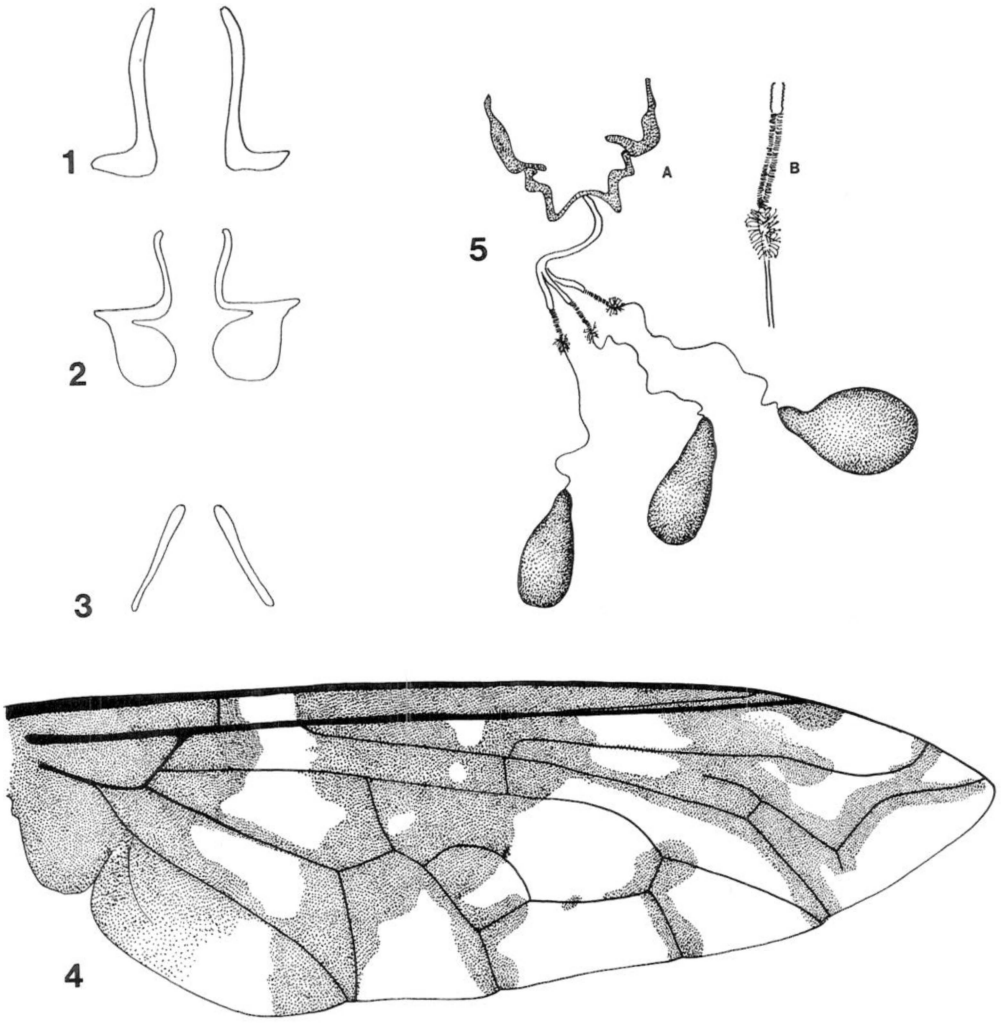


FIG. 1–5. **1–3,** vaginal apodemes of Anthracini: **1,** *Anthrax aethiops*; **2,** *Anthrax sticticus*; **3,** *Spogostylum candidum*. **4–5,** *Xenox xylocopae:* **4,** wing; **5a–b,** genitalia (**b,** enlargement of ejection apparatus showing muscular apparatus and glandular area at base of apical spermathecal duct).

duct that apparently aids in ejecting or pumping the sperm out of the spermathecal reservoir during oviposition), and a vaginal apodeme (=Theodor's "furca") that varies in shape from simply curved outward (Fig. 1) to a more complicated L-shape with various processes (Fig. 2). *Spogostylum* females, on the other hand, do not have a visible ejection apparatus, and the vaginal apodeme consists of a pair of simple, straight, sclerotized arms (Fig. 3). Theodor (1983) also mentions that there are differences in the aedeagi of both taxa, without actually stating what the differences are. The aedeagi of both taxa appear to me to be too variable to use as a separating character at this

time; however, more detailed studies may reveal characters such as those exhibited in the male genitalia that are specific to each taxon.

Given the characters listed by Greathead (1980), in combination with the female genitalia characters illustrated by Theodor (1983), it becomes clear that *Spogostylum* is, in fact, generically separate from *Anthrax*. My studies show that *Spogostylum* is absent from the New World.

Marston (1970) treated *Anthrax tigrinus* (DeGeer) and allied species in the New World as the *Anthrax tigrinus* species group. These taxa are typified by their large size (body length, 15–20 mm; wing length, 18–35 mm), the wing pattern and venation, and the specialized parasitic habit of the immatures [found only on *Xylocopa* spp. (DuMerle 1975)]. Theodor (1983) found additional characters in the male and female genitalia that further separate this group of species from other anthracine genera. Hull (1973) noted the specialized parasitic habits of the immatures of the *A. tigrinus* group, compared the group to *Walkeromyia*, another large New World anthracine genus with similar parasitic habits, and proposed a new name, *Stymphalina*, for the species group. Hull's (1973) *Stymphalina* is, unfortunately, an unavailable name because it was not properly diagnosed in accordance with the ICZN Code; it should be treated as a nomen nudum. The characters given by Marston (1970) and Theodor (1983), as well as the specialized parasitic habit of the larvae, indicate generic status; thus the following is proposed.

### **Xenox** Evenhuis, **new genus**

Type species: *Nemotelus tigrinus* De Geer, 1776, here designated.

♂♀. *Body* generally reddish brown to black, scales and pilosity mostly brown to black, with white and reddish pile and scales also evident on thorax and abdomen; head large, globular; antennal area of face distinctly bulging outward, similar to *Walkeromyia*, otherwise face receding to oral margin; antenna with 1st segment subcylindrical, length subequal to width, segment II short, concave to receive 3rd segment, segment III onion-shaped, bulbous basally, with styliform process originating dorsolaterally from bulbous base, length approximately equal to basal width of segment III; style short, cylindrical, with typical anthracine brush of setae apically. *Mesonotum and scutellum* with scales of varying color, pile densest anteriorly on mesonotum; macrochaetae at root of wing and on postalar callus reddish to black; pleura with posterior portion of ptero- and hypopleuron bare; metapleuron bare; postalar tuft white; halter stem yellow to black, knob brown to black with yellow tip; legs similar to *Anthrax* species. *Wing* (Fig. 4) with brown infuscation forming spots and/or bands of color along veins and in most cells; centers of most cells hyaline to subhyaline; 2 or 3 submarginal cells; rm crossvein at middle of discal cell; 5 posterior cells, the additional cell formed in 3rd posterior cell by crossvein connecting m crossvein with vein $Cu_1$; anal cell open or closed in wing margin; squama with fringe of white scales. *Abdomen* large, obconical-ovate, widest at segment III, tapering to apex; tergite I with long, dense pile, usually white, densest dorsolaterally; remaining tergites with much shorter pile and sparse scales; white scales characteristically present as spots posterolaterally on tergites II–VI (largest on tergites II, V, VI), smaller spots of scales admedially on posterior margins of tergites II–VII (absent on VII in ♀).

♂ *genitalia*, seen in lateral view, with basistylus linear, without basolateral process as in *Anthrax* species; dististylus large, oblong-triangular, flared laterally with large, curved dorsal process; aedeagal complex extremely large; aedeagus sinuous, long, thin; epiphallic sheath large, membranous for most of its length, membranous area inflated; tip of epiphallus sclerotized, bifid; basal apodeme small, reversed in position from typical *Anthrax*, similar to that in *Satyramoeba*; epandrium subtriangular; cercus large, exerted, sclerotized.

Circumversion of the male genitalia is 180° and apparently takes place shortly after adult emergence from the pupal exuvium. I have at hand a teneral specimen of *X. xylocopae* (Marston) reared by Dr John W. Beardsley, Jr (Arizona, Saguaro National Monument, 28.VI.1978, 1220 m) from a pupal exuvium collected from an old flower stalk of sotol (*Dasylirion wheeleri* Wats.). The male genitalia of this specimen are not rotated.

♀ *genitalia* (Fig. 5) with acanthophorites with 22–32 pairs of strong spines hooked apically; vaginal apodeme consisting of a pair of relatively small recurved sclerites each with a large caudal process, more similar to *Anthrax* than *Spogostylum*; spermathecal reservoir extremely large, obovate, sclerotized; apical spermathecal duct thin, membranous; ejection apparatus distinct, without apparent glands; apical and basal valves reduced, vestigial; basal spermathecal duct membranous, length subequal to apical duct, leading to common duct; conspicuously large sclerotized vaginal plate receiving common duct present or absent.

*Etymology.* The name is from the Greek, *xeno*, "stranger, guest"; gender is masculine.

*Included species.* *Xenox delila* (Loew), **n. comb.**; *X. simpson habrosus* (Marston), **n. comb.**; *X. simpson simpson* (Fabricius), **n. comb.**; *X. tigrinus* (DeGeer), **n. comb.**; *X. xylocopae* (Marston), **n. comb.**

The following key includes those genera comprising the tribe Anthracini sensu Bowden (1980). *Xeramoeba* Hesse has been affiliated with *Anthrax* by some authors (viz., Greathead 1980), but is here considered a member of the tribe Petrorossiini. *Turkmeniella* is omitted from the key due to lack of available material.

## Key to genera of Anthracini

1. Abdomen with scales; wing with 2 or 3 submarginal cells (if 3 submarginal cells present, the 3rd is formed by extension of spur vein at base of vein $R_4$ and connection to vein $R_{2+3}$); 1st posterior cell usually open in wing margin; color of body pile variable ..... 2

   Abdomen without scales or bristles; wing with 3 submarginal cells formed by supernumerary crossvein from vein $R_4$ connecting to vein $R_5$; 1st posterior cell closed (African species) or open (Nearctic species); body pile generally yellowish ..... **Dicranoclista**

2. Wing with 4 posterior cells; infuscation variable in wing, either hyaline, infuscated entirely or partially, or variously spotted; size variable (ca. 4.0–18.0 mm in length) ..... 3

   Wing with 5 posterior cells (5th formed by supernumerary crossvein in 3rd posterior cell); infuscation of wing consisting of coalesced spots of color forming bands or other dark patterns; body length ca. 15–20 mm . . . (New World) . . . **Xenox, n. gen.**

3. Antennal segment III onion-shaped, bulbous basally with styliform apical process of varying lengths, apical style with hairs at tip ..... 5
   Antennal segment III cone-shaped, without evident styliform apical process; apical style with or without hairs at tip; size ca. 15–20 mm in length ..... 4
4. Hind legs with conspicuously long fringe of scales from apical portion of femur to apical tarsal segments; antennal style usually without terminal hairs . . . (Neotropical) ..... **Walkeromyia**
   Hind legs without long scales; antennal style with normal terminal hairs . . . (Palearctic, Oriental) ..... **Satyramoeba**
5. Anal cell closed in wing margin; antennal segment III with conspicuously large bulbous basal portion, basal portion often overlapping basal antennal segments, styliform process short; wing with veins $R_{2+3}$ and $R_4$ without spur veins at each bend, darkly infuscated for most its length . . . (western Pacific) ..... **Brachyanax**
   Anal cell usually open in wing margin; antennal segment III not aberrantly enlarged as above, styliform process of varying lengths; wing usually with spur veins at bases of veins $R_{2+3}$ and $R_4$, infuscation variable ..... 6
6. Body scales standing upright, usually matte-colored, pile generally not dark, giving a general grayish color to entire specimen; antennal segment II flattened or hollowed, closely attached to segments I and III; ♀ genitalia without distinct ejection apparatus, vaginal apodeme simple, barlike . . . (Old World) ..... **Spogostylum**
   Body scales usually decumbent, often silvery or shining black; ground color dark brown to black; antennal segment II varying in shape, usually subspherical, loosely attached to segments I and III; ♀ genitalia with distinct ejection apparatus; vaginal apodeme L-shaped . . . (Cosmopolitan) ..... **Anthrax**

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