

## An updated key to the genera of Egyptian beeflies (Diptera: Bombyliidae)

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### Abstract

An updated key for the Egyptian genera of Bombyliidae with some elucidative drawings is provided. A total of 52 genera, 15 tribes, and 11 subfamilies are treated. The key is based mainly on morphological characters including the genitalia.

### Introduction

The Bombyliidae is one of the largest families of Diptera with over 4600 known species found worldwide, primarily in arid to semiarid habitats (Greathead & Evenhuis 1997). In a warm and sunny country like Egypt, the Bombyliidae, also called “children of the south”, are very well represented, and the diversity of their appearance in correspondence with their parasitic mode of life of different kinds can scarcely fail to excite interest (Eflatoun 1945).

The position of Egypt amongst the faunal regions of the world is a rather anomalous one, since it combines the characteristics of both Palaearctic and Afrotropical regions. It has generally been considered to belong to the Palaearctic, but there is evidence that the Afrotropical element is much greater than usually thought (Steyskal & El-Bialy 1967). Egypt as a whole forms a part of the great desert belt, characterized by a warm and almost rainless climate. Only the coastal strip, Eastern Desert, Gebel Elba, and higher parts of southern Sinai mountains receive comparatively higher rainfall. This is reflected in their floral and faunal composition, perhaps part of the reason for the higher beefly species diversity there than in the other zones of Egypt.

Mario Bezzi published extensively on the African fauna. His contributions included several important studies, notably on the Egyptian Bombyliidae (Bezzi 1925, 1926). Bezzi's contributions were followed by the monumental work of H.C. Eflatoun Bey (Eflatoun 1945), which was based on Bezzi's studies. However, only the first part (dealing with the Homoeophthalmae) of his project “Bombyliidae of Egypt” was published. The studies of Bezzi and Eflatoun were not comprehensive, focusing instead on only certain subfamilies or genera. Even recent studies on Egyptian Bombyliidae also focused on certain tribes, genera or species, notably studies on the tribe Anthracini (El-Hawagry 1998, 2002; El-Hawagry *et al.* 2000), a paper on the genus *Xeramoeba* (El-Hawagry 2001), a review of the genus *Villa* (El-Hawagry & Greathead 2006), and a study of the tribe Aphoebantini (El-Hawagry 2007).

Since Eflatoun's work was published, many generic concepts have been changed and new species described. Some genera have even been transferred to a separate family, the “Mythicomyiidae”.

The present study presents an updated key for all known Egyptian genera of Bombyliidae, with some drawings: subfamilies and tribes are keyed as well. Combined with a previous checklist of species (El-Hawagry 2002), the two are intended as a nucleus for a future monograph on the Bombyliidae of Egypt.

### Materials & Methods

A number of specimens representing the majority of beefly genera were collected from 1991 to 2005 from different Egyptian localities. The localities were chosen to cover all Egypt's ecological zones: the coastal strip, lower Nile Valley (including the Delta), upper Nile Valley, Fayoum Basin, Eastern Desert, Western Desert, Gebel Elba, and Sinai. Data from specimens preserved in Egyptian insect collections and literature records are also taken into consideration.

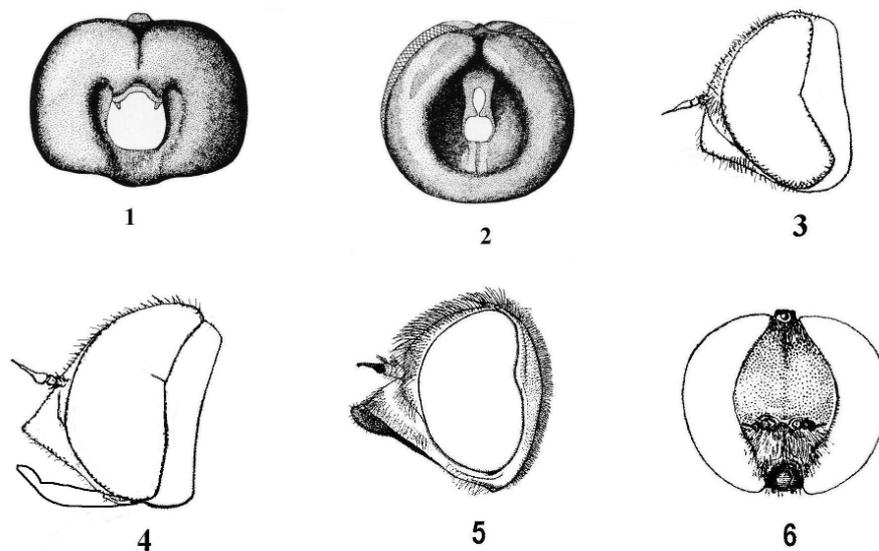
The layout of this treatment follows the current arrangement of subfamilies, tribes, and genera based on Greathead & Evenhuis (2001).

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## Results

### Key to Egyptian genera of Bombyliidae

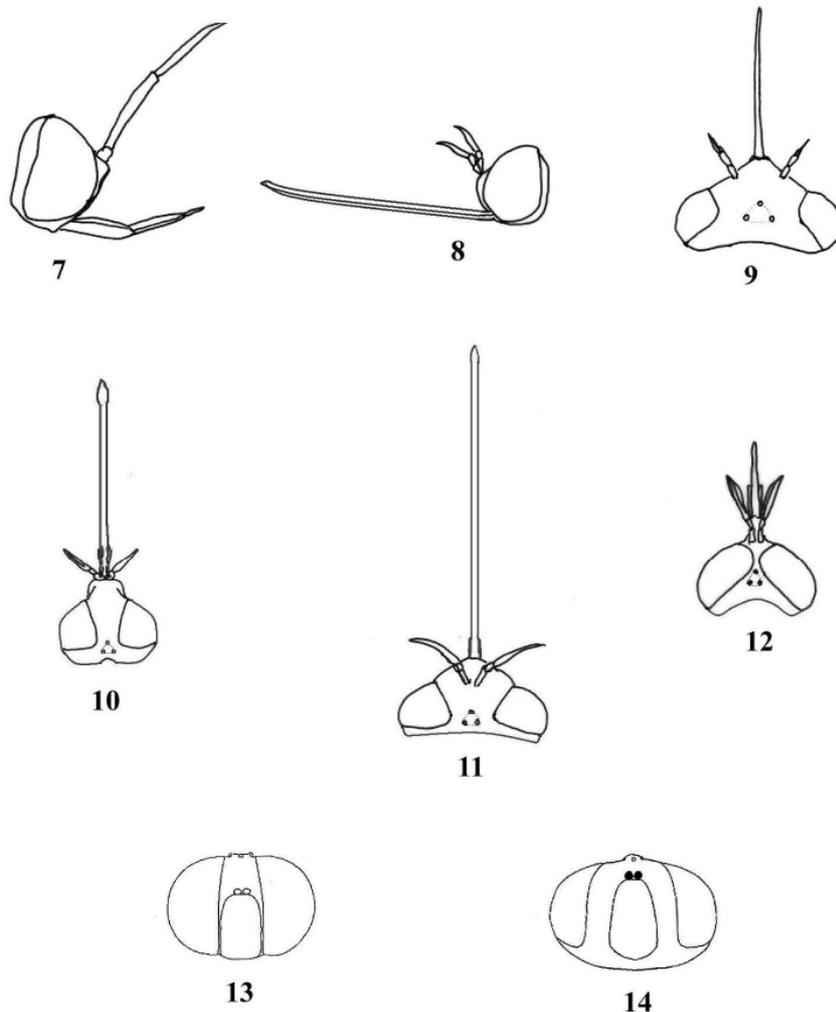
1. Postcranium flattened or tumid, without a concavity surrounding the occipital foramen (Fig. 1) ..... 2
  - Postcranium with a deep or shallow concavity surrounding occipital foramen (Fig. 2) ..... 7
2. Wing with three posterior cells (Fig. 24) ..... 3
  - Wing with four posterior cells (Figs. 25, 27, 28) ..... 4
3. Antennal flagellum with a subapical pit or sulcus containing a style (Fig. 15); flies with a small head, broad body and relatively short rounded abdomen ..... Subfamily **Usiinae**..... 11
  - Antennal flagellum without a subapical pit or sulcus (Fig. 7), elongate flies, sometimes resembling bees; if scales present, forming a pattern of dark, often metallic, and pale yellow or white ..... Subfamily **Toxophorinae** ..... 13
4. First antennal flagellomere with an apical pit containing a spine-like style (Fig. 16); rather bare, elongate, narrow-bodied flies..... Subfamily **Phthirinae** / Genus *Phthiria* Meigen
  - First antennal flagellomere lacking an apical sulcus (Fig. 18), style arising from apex of second flagellomere ..... 5



Figs 1–6. Heads: 1. *Bombylius* sp., posterior view; 2. *Pachyanthrax* sp., posterior view; 3. *Pachyanthrax* sp., lateral view; 4. *Exhylanthrax muscarius* (Pallas), lateral view; 5. *Stomylomyia europea* (Loew), lateral view; 6. *Desmatoneura nivea* (Rossi), frontal view. [Figs 1,2 from Greathead & Evenhuis 2001; Figs 5,6 from Engel 1936]

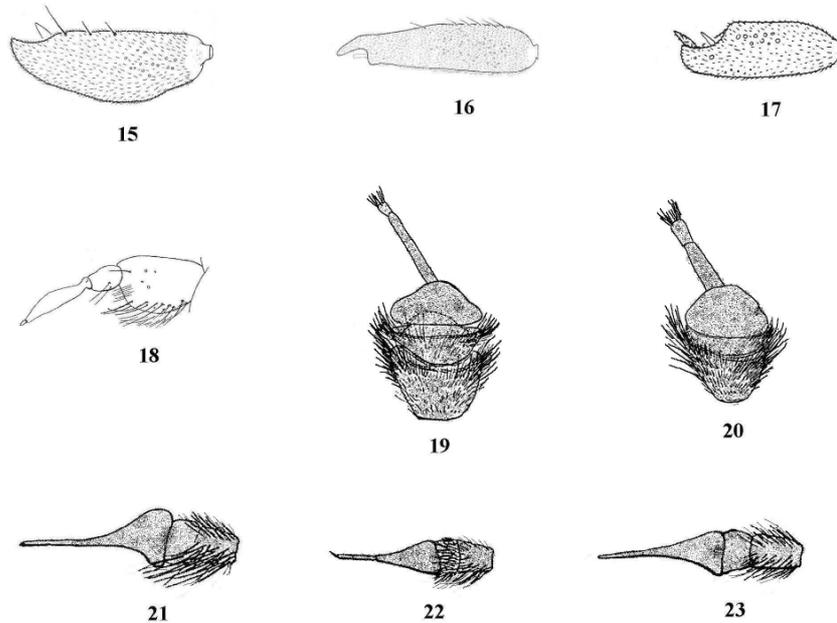
5. Hind coxal peg present medially; tibial spurs present on mid-tibiae; scape not swollen (Fig 12); abdomen elongate, narrow; up to 6 mm, usually less ..... Subfamily **Crociinae** / Genus **Crocidium** Loew
- Hind coxal peg absent (except *Heterotropus*); tibial spurs absent (except *Conophorus*); scape often swollen (Fig. 18); abdomen ovate or cordate; usually over 5 mm. .... 6
6. Anal cell closed; discal cell very wide opposite r-m crossvein (Fig. 25); body rather bare, without bristles or scales; compact flies with a pattern of dark and pale cuticle..... Subfamily **Heterotropinae** / Genus **Heterotropus** Loew
- Anal cell usually open; discal cell not markedly widened in middle; body usually with abundant hair and/or scales, bristles well developed; broad or narrow-bodied, elongate flies; antennae often thickened ..... Subfamily **Bombylinae** ..... 14
7. Clypeus reaching antennal sockets; eyes with an indentation on the posterior margin ..... Subfamily **Lomatiinae** / Tribe **Lomatiini** / Genus **Anisotamia** Macquart
- Clypeus not reaching antennal sockets; eyes with or without an indentation on the posterior margin ..... 8
8. Eyes without an indentation on the posterior margin or any indication of a bisecting line;  $R_{2+3}$  always arises at an acute angle close to the origin of  $R_s$  ..... 9
- Eyes with an indentation on the posterior margin and at least an indication of a bisecting line (Figs. 3, 4);  $R_{2+3}$  arises at right angle at a distance from the origin of  $R_s$  ..... 10
9. Head much broader than high when viewed from front; antennae separated by not more than the length of scape and pedicel combined; scape with a short dorsal spine; body short and broad ..... Subfamily **Mariobezziinae** / Genus **Mariobezzia** Becker
- Head not markedly broader than high when viewed from front, or if so, antennae separated by very much more than length of flagellum (Fig. 9); scape without a short dorsal spine; body elongate, usually narrow ..... Subfamily **Cythereinae** ..... 26
10. Face protruding and frons bulging, boss-like, with antennae in a groove between them; body slender, abdomen elongate conical; rather bare flies with short hair and without distinct bristles, cuticle with a yellow and black pattern; female with only one spermatheca ..... Subfamily **Antoniinae** / Genus **Antonia** Loew
- Face protruding or not and frons at most only slightly tumid; body slender or broad, usually densely covered with hair and/or scales, with well developed bristles; female with three spermathecae ..... Subfamily **Anthracinae** ..... 29
11. Antennal flagellum with an articulated spine-like second flagellomere in addition to a stylus (Fig. 17); discal cell open or closed by cross-vein m-m; narrow-bodied flies, usually under 3mm long ..... Tribe **Apolysini** / Genus **Apolysis** Loew
- Antennal flagellum without a second flagellomere (Fig. 15); discal cell always closed by cross-vein m-m; compact bee-like flies over 3mm long ..... Tribe **Usiini** .....12
12. Oral margin narrow in frontal view, gena almost non-existent or extremely narrow, usually only represented by a ridge between oral cavity and inner eye margin (Fig. 13); males dichoptic ..... Genus **Usia** Latreille
- Oral margin much broader, gena present between inner eye margin and oral cavity (Fig. 14); males usually holoptic ..... Genus **Parageron** Paramonov
13. Pronotum well developed and with strong bristles; mesothorax humped; proboscis as long as or shorter than head; body with a striking pattern of dense large scales ..... Tribe **Toxophorini** / Genus **Toxophora** Meigen
- Pronotum normal, without bristles; mesothorax humped or not; proboscis elongate, longer than head (Fig. 8); scales and tomentum minute ..... Tribe **Gerontini** / Genus **Geron** Meigen

14. Wing with discal cell broad towards apex, vein m-m meets dm-cu at an obtuse angle; radial sector broad with costa tending to bulge forwards near apex of wing; mid-tibial spurs present in some genera .....Tribe **Conophorini** ..... 15
- Wing with discal cell broadest near middle, vein m-m meets dm-cu at not much more than a right angle; radial sector not enlarged with costa more or less straight along fore margin of wing (Fig. 26); mid tibial spurs always absent ..... Tribe **Bombyliini** ..... 17
15. Scape greatly swollen, longer than pedicel and flagellum combined (Fig. 18); mid tibial spur present; interradiial vein present in some species (2 or 3 submarginal cells); abdomen elongate ovate; body hair long; male holoptic ..... Genus **Conophorus** Becker
- Scape at most only moderately swollen, shorter than pedicel and flagellum combined; mid-tibial spur absent; interradiial vein absent (2 submarginal cells); abdomen elongate ovate or short and broad; body hair short, sparse with abdomen often almost bare; males with eyes narrowly separated .....16



Figs 7–14. Heads: 7. *Toxophora aegyptiaca* Eflatoun, lateral view; 8. *Geron garagniae* Eflatoun, lateral view; 9. *Cytherea barbara* Sack, dorsal view; 10. *Phthiria gaedii* Wiedemann, dorsal view; 11. *Bombylius medius* Linnaeus, dorsal view; 12. *Crocidium nudum* Eflatoun, dorsal view; 13. *Parageron* sp., frontal view; 14. *Usia bicolor* Macquart, frontal view. [Figs 13,14 from Evenhuis 1990]

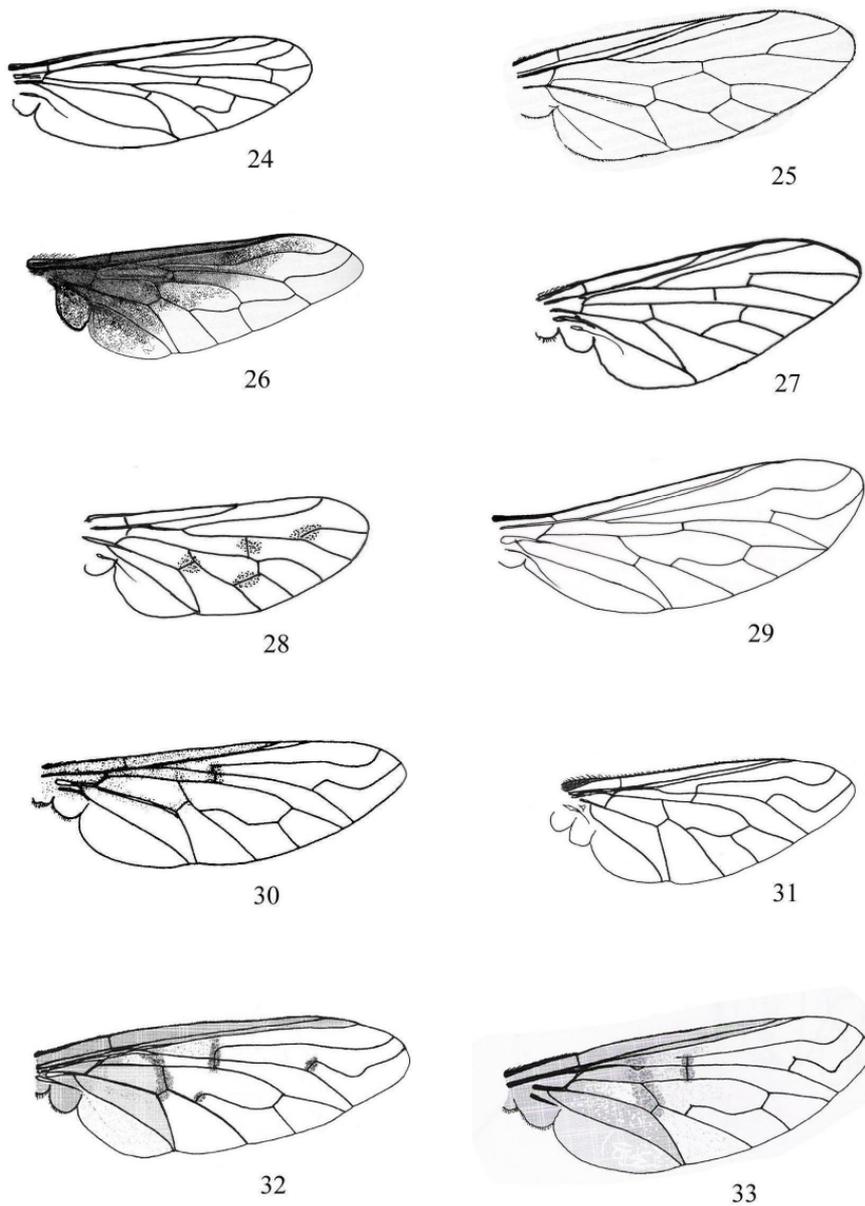
16. Scape moderately swollen, first flagellomere bare, frequently broad and dorsoventrally flattened; wing with an extensive dark mottled pattern, including dark spots at middle of cells (Fig. 39); abdomen elongate; body uniformly dark blackish ..... Genus *Prorachthes* Loew
- Scape not swollen, wing hyaline or with a basicostal infuscation tending to be more intense along the margins of veins, and more extensive in females; abdomen broad; body sometimes with pale markings ..... Genus *Legnotomyia* Bezzi



Figs 15–23. Antennae: 15. *Usia* sp.; 16. *Phthiria gaedii* Wiedemann; 17. *Apolysis* sp.; 18. *Conophorus* sp.; 19. *Anthrax* sp.; 20. *Spogostylum* sp.; 21. *Villa* sp.; 22. *Exhyalanthrax* sp.; 23. *Thyridanthrax* sp. [Figs 15–17 from Evenhuis 1990; Fig 18 from Engel 1932]

17. Head usually distinctly narrower than thorax; laterotergite always with hair; first posterior cell ( $r_5$ ) usually closed at a distance from the wing margin (Fig. 26); wings usually large, broad at base with anal lobe, alula and squama well developed; male genitalia with narrow or leaf-like gonostyli, apodemes usually large ..... 18
- Head usually as broad as thorax; laterotergite bare and/or cell  $r_5$  broadly open at wing margin; wings often small, narrowed at base with at least alula reduced; male genitalia with long robust gonostyli ending in a curved point; apodemes usually small (Fig. 41) ..... 21
18. First basal cell equal in length to second basal cell, r-m usually much shorter than m-m, occasionally almost as long; wing infuscation, if present, diffuse and darker along fore border (Fig. 26); vestiture fine and silky with a trimmed appearance at least on occiput and thorax, hair white to straw-yellow or brown shading to paler on underside; male with phallosome compact often with clasper-like outgrowths ..... Genus *Systoechus* Loew
- First basal cell longer than second basal cell; r-m sometimes equal to m-m; wing pattern various, sometimes with a clear-cut dark infuscation and/or with isolated dark spots; vestiture various, often with black hair and/or scale patches; male with phallosome usually without clasper-like outgrowths ..... 19

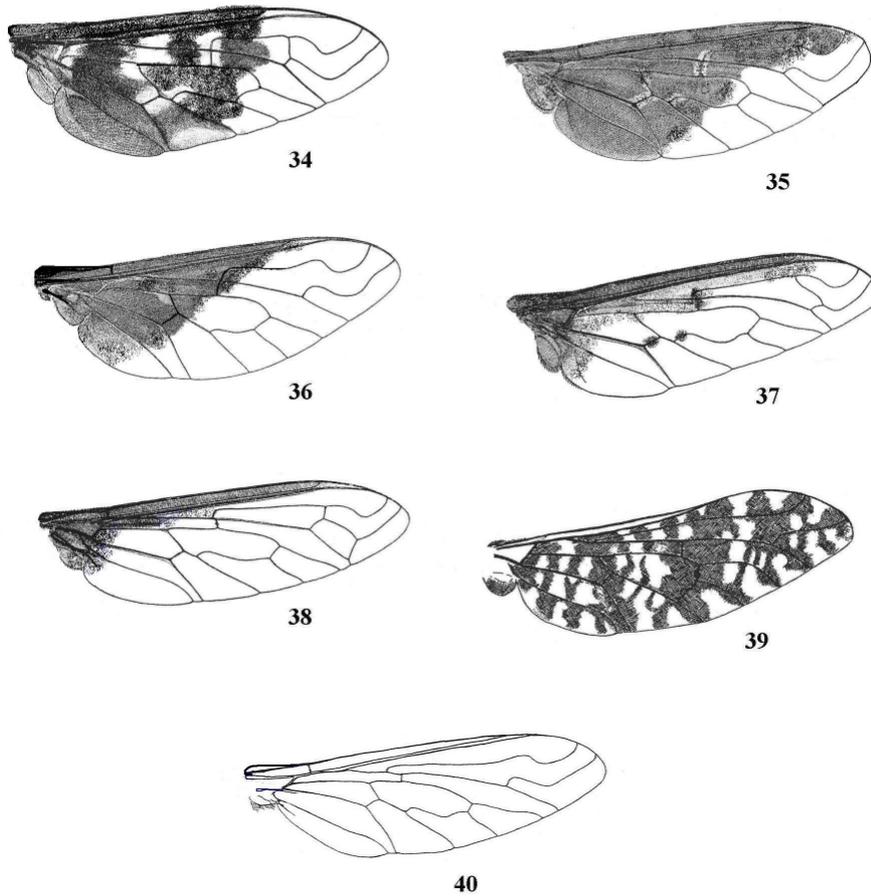
19. Abdomen truncate, rapidly tapering from tergum 4; frons of female narrow, eyes separated by less than width of ocellar triangle; gonocoxae with robust elongate terminal lobes, gonostyli thick, parallel-sided blunt or with a small point and with short hairs only (Fig. 42); female with a tubular ovipositor and vestigial sand chamber ..... Genus *Beckerellus* Greathead
  - Abdomen ovate, less tapered beyond tergum 4 than above; frons of female at least as broad as ocellar triangle; gonocoxae with terminal lobes no longer than wide, gonostyli slender, pointed and crowned with long hairs at base or broad with short upright hairs, female with a sand chamber guarded by long silky hairs ..... 20
20. Scape at least 3 times length of pedicel; small, relatively slender flies with relatively long slender legs; alula long and narrow, squama reduced; vestiture usually predominantly black, hair long and tufted, usually with metallic or opalescent scales in spots on frons and often on thorax and abdomen ..... Genus *Bombylilla* Greathead
  - Scape at most 3 times length of pedicel (Fig. 11); more robust and compact flies with shorter less slender legs; alula broad, squama not reduced; vestiture often pale yellow to brown, if black then without spots of metallic or opalescent scales ..... Genus *Bombylius* Linnaeus
21. Laterotergite hairy and cell  $r_5$  open or closed on wing margin .... Genus *Bombylisoma* Rondani
  - Laterotergite bare but if obscured by long hair elsewhere on pleura and squama, then cell  $r_5$  closed and with a long stalk ..... 22
22. Posterior margin of eyes indented; claws of males toothed; gonocoxae constricted in middle ..... Genus *Efflatounia* Bezzi
  - Posterior margin of eyes entire; claws usually without a tooth, or a tooth present in both sexes ..... 23
23. Scape markedly swollen, barrel-shaped; gonostyli long and sinuous.... Genus *Dischistus* Loew
  - Scape about equal in diameter to pedicel, if somewhat swollen then hind femora with a row of strong but short bristles beneath; gonostyli usually broad, leaf-like or with a ventral spine, not long and leaf-like ..... 24
24. Wing narrow at base, costal comb not developed, cell  $r_5$  broadly open..... Genus *Gonarthus* Bezzi
  - Wing broad at base, costal comb well developed, cell  $r_5$  closed or only narrowly open ..... 25
25. Cell  $r_5$  long and pointed or narrowly open at wing margin; abdomen elongate ..... Genus *Neobombylodes* Evenhuis
  - Cell  $r_5$  closed and with the terminal segment of vein  $R_5$  as long as the penultimate segment; abdomen broad ..... Genus *Anastoechus* Osten Sacken
26. Head with face very broad, antennae separated by more than length of scape (Fig. 9); body with abundant hair and/or scales as well bristles ..... Tribe *Cythereini* ..... 27
  - Head with face not exceptionally broad, antennae separated by less than length of space; body with sparse hair and/or small scales, bristles strong and conspicuous ... Tribe *Cylleniini* ..... 28
27. Pulvilli rudimentary; vestiture predominantly grey to brown; wing infuscation often faint and with paler areas within the infuscated part; sexes similar in appearance..... Genus *Cytherea* Fabricius
  - Pulvilli normally developed; vestiture black with patches of white to yellow hair and scales; wing infuscation uniformly dark; male with an elongate, conical, hairy abdomen; female with a broad, scaly abdomen, and superficially tachinid-like ..... Genus *Chalcochiton* Loew



Figs 24–33. Wings: 24. *Toxophora* sp.; 25. *Heterotropus* sp.; 26. *Systoechus* sp.; 27. *Phthiria salmayensis* Efflatoun; 28. *Crocidium aegyptiacum* Bezzi; 29. *Cononedys bilobatoides* El-Hawagry; 30. *Xeramoeba sabulonis* (Becker); 31. *Villa stenozyoides* El-Hawagry & Greathead; 32. *Anthrax zohrayensis* El-Hawagry; 33. *Anthrax galali* El-Hawagry. [Fig 29 from El-Hawagry 2007; Fig 30 from El-Hawagry 2001, Fig 31 from El-Hawagry & Greathead 2006; Figs 32,33 from El-Hawagry 2002]

- 28. Face conically produced; proboscis 2-4 times as long as head; occiput not broader above than below ..... Genus *Amictus* Wiedemann
- Face gently rounded; proboscis about as long as head; occiput distinctly broader above .....  
..... Genus *Sinaia* Becker

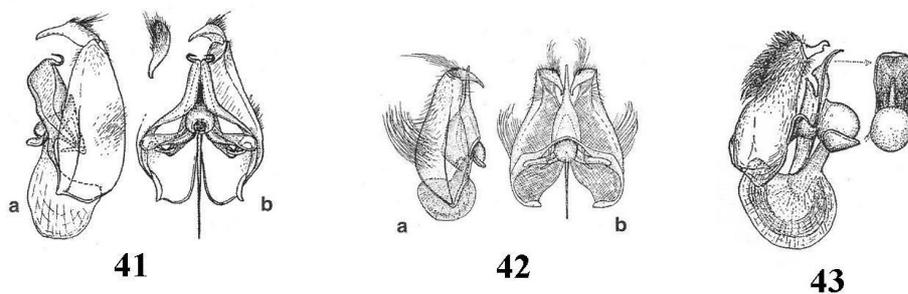
29.  $R_{2+3}$  originating at an acute angle close to origin of Rs (Fig. 29); face not produced or with oral rim slightly projecting; abdomen conical or elongate ovate; palpi with two segments; male holoptic ..... Tribe **Aphoebantini** ..... 30
- $R_{2+3}$  originating at right angles between the origin of Rs and the r-m crossvein (Figs. 30-40), exceptionally in some Prorostomatini arising at an acute angle close to origin of Rs but then face is produced; face projecting or smoothly rounded; abdomen conical, elongate ovate or broad and flattened; palpi with one segment; male dichoptic ..... 31



Figs 34–40. Wings: 34. *Thyridanthrax* sp.; 35. *Hemipenthes* sp.; 36. *Exhyalanthrax* sp.; 37. *Exoprosopa* sp.; 38. *Ligyra* sp.; 39. *Prorachthes* sp.; 40. *Petrorossia* sp. [Fig 39 from Hesse 1938]

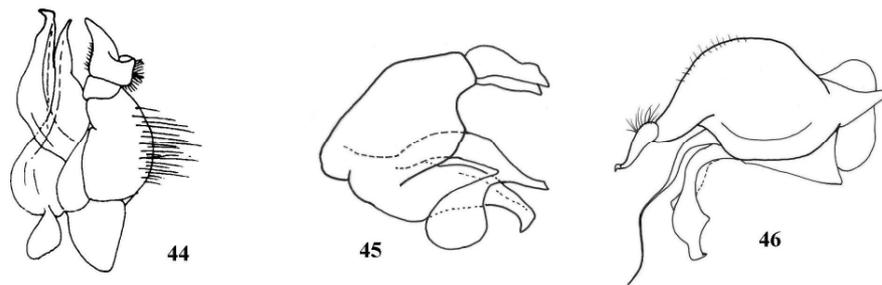
30. Antenna with two flagellomeres; gonocoxae tapered from a broad base; aedeagus conical (Fig. 45) ..... Genus **Aphoebantus** Loew
- Antennae with three flagellomeres; gonocoxae broad in basal half, abruptly narrowed in middle and narrow in apical half; aedeagus elongate and narrow (Fig. 46) ..... Genus **Cononedys** Hermann
31.  $R_{2+3}$  usually originating closer to the origin of Rs than to the r-m crossvein; facial cone strongly developed and distinctly separated from frons; hind margin of eye usually without a bisecting line; body narrow, elongate ..... Tribe **Prorostomatini** / Genus **Stomylomyia** Bigot
- $R_{2+3}$  originally closer to r-m crossvein than to Rs or opposite it (Figs. 30-40); face projecting to a variable extent but not distinctly separated from frons or smoothly rounded; hind margin of eye usually with a bisecting line; body narrow, elongate, or broad, abdomen flattened ..... 32

32.  $R_{2+3}$  usually originating before the r-m crossvein (Fig. 30); face rounded, not produced; femora without strong bristles below; body narrow, elongate to moderately broad ..... Tribe **Xeramoebini** ... 33
- $R_{2+3}$  originating opposite the r-m crossvein or very close to it (Figs. 31-40); body broad, at least hind femora usually with a row of strong bristles below; abdomen usually broad, flattened ..... 37
33. Wing relatively broad, alula large and lobe-like; discal cell short, origin of  $R_{2+3}$  opposite r-m crossvein or less than twice its length from r-m crossvein (Fig. 30) ..... 34
- Wing relatively narrow, alula reduced and narrow; discal cell long, origin of  $R_{2+3}$  basal to r-m crossvein by at least twice its length, often three times its length (Fig. 40) ..... 36
34. Frons broad at level of antennae, tumid, with silvery tomentum and fine hairs; body narrow, abdomen conical; gonostyli elongate, rod-like; phallosome large, conical without an epiphallus ..... Genus **Desmatoneura** Willston
- Frons not usually broad; body with small scales and coarse hairs; gonostyli broad at base and with a curved pointed apical part; phallosome with a large dorsal epiphallus ..... 35
35. Fore tibiae spiculate; wing often with an infuscation along margins of veins towards base; laterotergite bare; cuticle brown to black with white, brown to black dull scales ..... Genus **Xeramoeba** Hesse
- Fore tibiae smooth; wing iridescent, hyaline; laterotergite with a tuft of hair; cuticle black with white and glossy black scales ..... Genus **Prothaplocnemis** Bezzi
36. Crossvein r-m before middle or discal cell (Fig.40); body elongate, abdomen flattened, with hairs and sparse small scales; phallosome with epiphallus about equal in length to aedeagus and without spines on dorsal surface ..... Genus **Petrorossia** Bezzi
- Crossvein r-m near middle of discal cell; body short, cylindrical; abdomen with scales and without hairs; epiphallus much longer than aedeagus, with spines on dorsal surface ..... Genus **Pipunculopsis** Bezzi
37. Antennae with scape and pedicel quadrate and of similar width, flagellum elongate; radial veins usually without recurrent appendices, mediotergite and laterotergite with hair; abdomen usually covered with adpressed scales of various colours, hairs fine, sparse ..... 39
- Antennae remarkably compacted, flagellum terminating in a circlet of hairs, often onion-shaped, narrow part usually with a distinct suture (Figs. 19, 20); radial veins often with recurrent appendices (Fig. 33); midotergite and laterotergite bare; body usually broad with an ovate abdomen; usually with coarse hair and scales not adpressed, usually mostly black, white or silvery and dull ochreous to brown ..... Tribe **Anthracini** ..... 38



Figs 41–43. Male genitalia: 41. *Bombylisoma* sp., a. lateral view, b. ventral view; 42. *Beckerellus* sp., a. lateral view, b. ventral view; 43. *Thyridanthrax* sp. [Figs 41,42 from Hesse 1938; Fig 43 from Hesse 1956]

- 38. Pedicel flattened, closely applied to scape and flagellum, sometimes hollowed to receive flagellum (Fig. 20); wing without an extensive black basicostal infuscation, clear or spotted, sometimes with a diffuse brownish infuscation at base and along fore border; body without predominantly black dense scales lying flat on abdomen ..... Genus *Spogostylum* Macquart
  - Pedicel globular or disc-shaped, not moulded to flagellum (Fig. 19); wings usually with a more or less extensive infuscation, seldom almost completely hyaline (Figs. 32, 33); body with dense scales, lying flat, predominantly black with patches of white or silver scales on abdomen ..... Genus *Anthrax* Scopoli
- 39. Wing usually with interradiation crossvein between  $R_{2+3}$  and  $R_4$  absent (2 submarginal cells) (Fig. 31); claws without a tooth at base; pulvilli sometimes present ..... Tribe **Villini** ..... 40
  - Wing with interradiation crossvein between  $R_{2+3}$  and  $R_4$  present (3 submarginal cells), sometimes also cell  $r_4$  divided into two by a crossvein (4 submarginal cells) (Figs. 37, 38); claws with a tooth at base ..... Tribe **Exoprosopini** ..... 48
- 40. Mouthparts reduced, not functional; wing with basicostal infuscation ..... Genus *Oestranthrax* Bezzi
  - Mouthparts normally developed ..... 41
- 41. Antennae usually with first flagellum onion-shaped, composed of a single flagellomere (Fig. 21); face rounded, at most only slightly bulging ..... 42
  - Antennae with first flagellum conical, frequently with two flagellomeres (Figs. 22); face frequently strongly produced, conical, never completely undeveloped ..... 43
- 42. Fore tibiae with short bristles, spiculate; pulvilli absent; wing with at most a narrow basicostal infuscation. Male often with a patch of silvery scales at its base; usually with extensive yellowish hair, especially on thorax; abdomen with a more or less distinctly banded pattern and one or more pairs of tufts of black scales at sides ..... Genus *Villa* Lioy
  - Fore tibiae smooth or with a few weak bristles; pulvilli sometimes present; wing with an extensive dark pattern reaching the hind margin at base and covering at least half its surface; body with extensive black hair; abdomen with at most two white scale bands, remainder black and without contrasting tufts of black scales at sides ..... Genus *Hemipenthes* Loew



Figs 44–46. Male genitalia: 44. *Xeramoeba salvae* El-Hawagry; 45. *Aphoebantus wadensis* Bezzi; 46. *Cononedys bilobatoides* El-Hawagry. [Fig 44 from El-Hawagry 2001; Figs 45,46 from El-Hawagry 2007]

- 43. Pulvilli present; vestiture uniform whitish or yellowish ..... Genus *Laminanthrax* Greathead
  - Pulvilli absent; vestiture usually including bands of scales of various colours, rarely entirely white or yellow ..... 44

44. Flagellum elongate conical with a terminal bristle-like style; face weakly developed; cell  $r_5$  narrowed at wing margin, contact of fourth posterior cell with discal cell much shorter than basal vein of former; often with an extensive wing pattern; apex of epiphallus curled dorsally at apex (Fig. 43) ..... 45
- Flagellum elongate conical with a distinct second segment, or flagellum blade shaped (Figs. 22, 23); face often markedly produced (Fig. 3); cell  $r_5$  narrowed or not; contact of fourth posterior cell with discal cell often long; wing pattern usually reduced, if extensive, it is fully developed in one sex only; apex of epiphallus flat ..... 46
45. Wing with anal area very broad; r-m crossvein beyond middle of discal cell, terminal vein oblique to wing margin; wing pattern dimidiate, uniform, dark; metallic scales present on body; vestiture mainly black; abdomen with a fringe of hairs at sides ..... Genus *Caecanthrax* Greathead
- Wing normally developed; r-m crossvein at middle of discal cell, its terminal vein more or less parallel with wing margin; wing infuscation paler at base and with hyaline spots on crossveins (window panes) (Fig. 34); vestiture composed of black, brown, yellow and white elements; face with pale scaling; abdomen banded and with dense hair at sides of basal segments only ..... Genus *Thyridanthrax* Osten Sacken
46. Face rounded with abundant hair (Fig. 3); antenna with two flagellomeres; fore claws greatly reduced, inner one sometimes smaller than outer one, wing with a pale infuscation at base and in costal cell, and with, or without, a dark infuscation in middle, pattern equally developed in both sexes; cell  $r_5$  narrowed at wing margin; contact of fourth posterior cell with discal cell shorter than basal vein of former; abdomen cordate or elongate ovate with hair at sides and on dorsal surface sparse, not forming distinct rows across tergites; gonocoxa with a crest bearing stiff spine-like hairs ..... Genus *Pachyanthrax* Francois
- Face angularly produced (Fig. 4) with few if any hairs but with dense scales; antenna with one or two flagellomeres (Fig. 22); fore claws large equally well developed; wing with various degrees of infuscation, often sexually dimorphic; cell  $r_5$  hardly narrowed at wing margin; contact of fourth posterior cell with discal cell longer than basal vein of former; abdomen elongate ovate or parallel-sided with dense hair at sides of first tergite only and with bristly hair in rows at hind margins of tergites; gonocoxa with or without a crest, but if crested, scarcely raised and with normal hairs ..... 47
47. Face strongly developed, conical, often forming an acute angle when viewed in profile (Fig. 4); flagellum elongate conical with a well developed second flagellomere (Fig. 22); head usually with at least some metallic scales, often with dense patches above antennae; wing usually with a more or less well-developed dark basicostal infuscation, tending to be more extensively developed in females, rarely almost completely hyaline; gonocoxa sometimes with a crest, epiphallus usually with a pair of dorsal spines ..... Genus *Exhyalanthrax* Becker
- Face less strongly developed, blunt in profile; flagellum blade-shaped, lacking an obvious second flagellomere; head with few hairs and without metallic scales but yellow or white scales present on face; wing pattern, if present, variable but more extensive in males and ending almost perpendicular to fore margin; gonocoxa always without a crest, epiphallus often spinulate ..... Genus *Veribubo* Evenhuis
48. Wing with interradiial crossvein present between  $R_{2+3}$  and  $R_4$ , but  $r_4$  not divided into two by a crossvein (3 submarginal cells) (Fig. 37) ..... 49
- Wing with interradiial crossvein between  $R_{2+3}$  and  $R_4$  and cell  $r_4$  divided into two by a crossvein (4 submarginal cells) (Fig. 38) ..... Genus *Ligyra* Newman

- 49.** Body and legs with bristles weak and reduced in number; wing often iridescent in certain views; epiphallus much widened at apex and pointed at each side and gonostyli, simple, U-shaped; spermatheca narrow, thin-walled, elongate, not pigmented ..... Genus *Micomitra* Bowden
- Bristles normally developed; wing not as above; epiphallus not markedly widened at apex and without points at each side and gonostyli of a different shape; spermatheca thick-walled, usually pigmented and usually with a rounded terminal bulb ..... 50
- 50.** Wing usually with normal venation, rarely with appendices or subdivision of cells; cell r<sub>5</sub> open at wing margin; wing pattern various, but rarely with veins bordered with infuscation, and of a different colour to infuscation in centers of cells, usually without isolated spots on crossveins (Fig. 37); hair and scales of various colours, frequently with stripes or uniform colouring; male genitalia large, epiphallus not chisel or axe-shaped, apodemes large; spermatheca of various shapes but not narrow, tubular and thick walled ..... 51
- Wing tending to have unstable venation, frequently with appendices and divided cells; cell r<sub>5</sub> sometimes closed; wing pattern often with veins bordered with a different colour to centers of cells, frequently with isolated spots; hair and scales black, brown and yellow to white, often mixed or arranged in ill-defined bands; male genitalia small, epiphallus chisel or axe-shaped, apodemes weak and usually not projecting outside enclosing gonocoxae; spermatheca narrow, tubular and thick-walled ..... Genus *Heteralonia* Rondani
- 51.** Hind tibiae with a fringe of large scales, giving a feathered appearance; predominantly black and with chiefly black vestiture; wing infuscated black, except at extreme apex ..... Genus *Pterobates* Bezzi
- Hind tibiae with small scales lying flat; body and vestiture of various colours; wing with a variety of patterns or almost completely hyaline ..... Genus *Exoprosopa* Macquart



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Figs 47–52. Colored photos:

- 47. *Prorachthes longirostris* Bezzi, 1925;
- 48. *Geron (Geron) macquarti* Greathead in Evenhuis & Greathead, 1999;
- 49. *Mariobezzia lichtwardti* Becker, 1913;
- 50. *Amictus gebeli* Efflatoun, 1945;
- 51. *Dischistus separatus* (Becker, 1906);
- 52. *Toxophora fasciculata* (Villers, 1789).



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Figs 53–58. Colored photos:

- 53. *Anastroechus nivifrons* (Walker, 1871);
- 54. *Systoechus gradatus* (Wiedemann in Meigen, 1820);
- 55. *Neobombylodes multisetosus* (Loew, 1857);
- 56. *Anastroechus trisignatus* (Portschinsky, 1881);
- 57. *Bombylius (Bombylius) fimbriatus* Meigen, 1820;
- 58. *Bombylius (Bombylius) medius* Linnaeus, 1758.



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Figs 59–64. Colored photos:

- 59. *Cytherea maroccana* (Becker, 1903);
- 60. *Thyridanthrax incanus* (Klug, 1832);
- 61. *Thyridanthrax fenestratus* (Fallen, 1814);
- 62. *Villa stenozoides* Greathead & Elhawagry, 2006;
- 63. *Villa eflatouni* Greathead & Elhawagry, 2006;
- 64. *Antonia suavissima* Loew, 1856.



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Figs 65–70. Colored photos:

65. *Antonia* sp.;

66. *Anisotamia ruficornis* Macquart, 1840;

67. *Spogostylum hamadnallahi* El-Hawagry, 2002;

68. *Anthrax greatheadi* El-Hawagry, 2002;

69. *Anthrax moursyi* El-Hawagry, 2002;

70. *Anthrax galali* El-Hawagry, 2002.



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Figs 71–76. Colored photos:

71. *Anthrax zohrayensis* El-Hawagry, 2002;

72. *Xeramoeba salwae* El-Hawagry, 2001;

73. *Heteralonia (Homolonia) aegina* (Wiedemann, 1828);

74. *Heteralonia (Homolonia) megereli* (Meigen, 1820);

75. *Exoprosopa disrupta* Walker, 1871;

76. *Exoprosopa zanoni* Bezzi, 1922.

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## الملخص العربي

مفتاح تصنيفي مُحدَّث لأجناس ذباب النحل (فصيلة ذباب النحل، رتبة ثنائيات الأجنحة) في مصر

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يقدم البحث مفتاحاً تصنيفياً حديثاً لأجناس فصيلة ذباب النحل في مصر. وقد عالج البحث 52 جنساً تنتمي إلى 15 قبيلة و 11 تحت فصيلة. وقد اعتمد المفتاح على الصفات الشكلية بما في ذلك المناسل الخارجية. وقد عززت الدراسة بالعديد من الرسوم التوضيحية بالإضافة إلى 30 صورة ملونة تمثل معظم الأجناس المصرية.