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A review of the species of *Hyadina* Haliday occurring in Israel (Diptera: Ephydridae)

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ABSTRACT

Five species of *Hyadina* are reported from Israel, including two that are new: *H. freidbergi* (Israel. 'En Mor (near Sede Boqer)) and *H. kugleri* (Israel. Golan, Horbat Nappah). *H. humeralis* Becker is determined to be conspecific with *H. guttata* (Fallen).

INTRODUCTION

The shore-fly genus *Hyadma* Haliday is represented by 39species worldwide and by 14in the Palearctic Region (Mathis and Zatwarnicki, 1995). If *Lytogaster* Becker were treated as an included sublineage, as Hollmann-Schirrmacher (1998) has proposed, then the numbers would be 49species worldwide and 15species from the Palearctic Region. Although most species of *Hyadina* occur relatively commonly in semiaquatic habitats and are usually well represented in museum collections, only the Nearctic fauna has recently been revised (Clausen, 1983). Recent field work in Israel and study of shore flies in the insect collection at Tel Aviv University, collected mostly by Amnon Freidberg, have revealed the occurrence of five species of *Hyadina* in Israel. Clarifying the status of these species, including the description of two new species, is the primary objective of this paper.

Three of the species occurring in Israel were described previously. One, *H. guttata* (Fallen), occurs throughout Israel and is a widespread European species. The second species, *H. fenestrata* (Becker), was first found in Egypt, was then reported from the Canary Islands (Cresson, 1930), and has now been found near the Dead Sea in Israel. The third species, *H. pollinosa* Oldenberg, was described from specimens collected in Germany and has since been found in France, Italy, Mallorca, and now in Israel, indicating a mostly Mediterranean distribution.

Species of *Hyadina* are found throughout the world in temperate and tropical regions (Mathis and Zatwarnicki, 1995). Larvae of *Hyadina* are multivoltine, specialized consumers of soil-inhabiting cyanobacteria (blue-green algae; Foote, 1993, 1977).

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Adults occur in marsh-reed habitats, sedge marshes, and grass lawns adjacent to aquatic habitats (Deonier, 1965; Foote, 1993).

MATERIAL AND METHODS

The descriptive terminology, with the exceptions noted in Mathis (1986) and Mathis and Zatwarnicki (1990a), follows that published in the *Manual of Nearctic Diptera* (McAlpine, 1981). Because specimens are small, usually less than 3.5 mm in length, study and illustration of the male terminalia required use of a compound microscope. We follow the terminology for most structures of the male terminalia that other workers in Ephydridae have used (see references in Mathis, 1986; Mathis and Zatwarnicki, 1990a, 1990b) and these agree with terms Zatwarnicki (1996) proposed in the "hinge" hypothesis for the origin of the eremoneuran hypopygium. The terminology for structures of the male terminalia is provided directly in Figs. 1–4 and is not repeated for comparable illustrations of other species. The species descriptions are composite and not based solely on the holotypes. One head and two venational ratios that are used in the descriptions are defined below (all ratios are averages of three specimens (the largest, the smallest, and one other).

1. Gena-to-eye ratio is the genal height measured at the maximum eye height divided by the eye height.
2. First costal vein ratio is the straight-line distance between the apices of R_{2+3} and R_{4+5} (costal section II) divided by the distance between the apices of R_1 and R_{2+3} (costal section III).
3. Second costal vein ratio is the straight-line distance between the apices of R_1 and R_{2+3} (costal section III) divided by the distance between the apices of R_{2+3} and R_{4+5} (costal section IV).
4. M vein ratio is the straight-line distance along M between crossvein dm–cu and r–m divided by the distance apicad of crossvein dm–cu.

Although most specimens for this study are in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM) and in the insect collection at the Tel Aviv University (TAU), we also studied specimens, especially primary types, that are deposited in the Deutsches Entomologisches Institut, Eberswalde, Germany (DEI); Zoological Institute, Lund University, Lund, Sweden (ZIL); and the Zoologisches Museum, Humboldt Universität, Berlin, Germany (ZMHU).

TAXONOMY

GENUS HYADINA *HALIDAY*

Hydrina Robineau-Desvoidy, 1830: 794

Type species: *Hydrina vernalis* Robineau-Desvoidy, 1830 (= *Notiphila guttata* Fallén, 1813), subsequent designation, Coquillett, 1910: 553. Preoccupied (Rafinesque, 1815, Coelenterata). Frey, 1945: 84 [key to Palearctic species].

Hyadina Haliday in Curtis, 1837: 282. [published in synonymy, first used for a taxon by Haliday, 1839: 404]. Type species: *Notiphila guttata* Fallén, 1813, subsequent designation, Westwood, 1840: 153. Loew, 1860: 27 [generic status]. Thompson and Mathis, 1981: 84 [historic review of the nomenclature]. Canzoneri and Meneghini, 1983: 132–138 [review, Italian fauna]. Cogan, 1984: 158–159 [Palearctic catalog]. Mathis and Zatwarnicki, 1995: 202–207 [world catalog].

Ephydrosoma Lioy, 1864: 1103. Type species: *Ephydra rufipes* Meigen, 1830, monotypy. Mathis and Zatwarnicki, 1995: 202 [synonymy].

Lytogaster Becker, 1896: 202. Type species: *Notiphila (Philygria) abdominalis* Stenhammar, 1844: 238, original designation. Hollmann-Schirrmacher, 1998: 32 [synonymy].

Diagnosis

Small to medium-sized shore flies, body length 1.20–2.70 mm; mostly shiny black, often with dense microtomentum on abdomen; setation generally weakly developed.

Head: Frons bare to densely microtomentose. Face generally paler than frons, yellow to dark yellowish brown with golden, yellowish silver, or silvery gray microtomentum extended to gena. Gena often concolorous with ventral parafacial plate, sometimes ventral gena bare or with sparse microtomentum. Chaetotaxy: ocellar setae well developed, divergent, proclinate; pseudopostocellar setae minute, divergent, proclinate; fronto-orbital setae, minute, 3–5 pairs, proclinate; medial vertical seta well developed; lateral vertical seta well developed or reduced; facial setae minute, in 2 rows. Antenna yellow, yellowish brown, or brown; scape, pedicel, and 1st flagellomere often darker dorsally; scape with row of setulae along apicoventral margin; 1st flagellomere microtomentose with numerous setulae; arista bearing very short rays on dorsum. Palpus prominent, yellow to dark yellowish. Gena low to moderately high.

Thorax: Mesonotum bare or with sparse to dense microtomentum, ground color pale brown to dark brown, microtomentum golden, silver, velvety black, or brown, often marked with distinct vittae. Scutellum trapezoidal with posterior margin slightly rounded, lateral margins sometimes with dense velvety black patches; pleura often paler than mesonotum; anepisternum bare or with dense microtomentum, often dorsally with black velvety patches; katepisternum bare or with sparse to dense microtomentum. Chaetotaxy: pre- and postsutural dorsocentral setae lacking; scutellar and acrostichal setae well developed; 1 prominent supra-alar seta; anterior notopleural seta either well developed, reduced, or lacking; 1 anepisternal seta, small to minute, inserted along posteromedial margin; 1 katepisternal seta, small to minute, inserted along dorsomedial margin; 2 lateral scutellar setae, posterior seta inserted apically, lateral seta 1/3–1/2 length of posterior seta. Wing: hyaline to yellowish brown; crossvein dm–cu often with dark rims and hyaline spots in the surrounding wing areas; rarely with additional stump veins or brownish pattern in wing; costa extended to vein M. Legs: yellow, yellowish brown, to dark brown; covered by rows of minute setulae; femora and tibiae often with

pattern of pale and dark areas; apical tarsomere and sometimes tarsomere 4 often darker than proximal tarsomeres. Halter knob white, yellow to yellowish brown.

Abdomen: Five abdominal tergites normally exposed in males, cerci well developed; abdominal tergites 6–8 normally exposed in females, cerci well developed; generally shiny with sparse microtomentum; ground color yellowish brown, brown to dark brown; partially bare, and usually with distinct areas of sparse to dense microtomentum; tergites setulose, with setal rows along margins. In some species tergites 2 and 3 laterally with separated plates, reaching ventral margin of abdomen. Female without fused sternites. Male terminalia: epandrium often narrow, especially dorsally, lacking setae, separated from cerci; surstylus attached to venter of epandrium, variously shaped, mostly triangular or rounded anteriorly, bearing 1 to several strong setae towards or at anterior margin; cercus semicircular to oval; aedeagus in most species long, slender, bearing posterodorsal process, rarely oval in ventral view, usually conspicuously arched in lateral view; phallapodeme usually long and narrow, rarely triangular in lateral view; gonite fused with hypandrium, rarely bearing anteroventral seta, usually without setae; often arcuately triangular and tapered apically in lateral view; hypandrium shallow, directed perpendicularly [transversely] to gonites.

Discussion

The nomenclatural issues associated with *Hyadina* are rather complex and warrant further explanation. Robineau-Desvoidy (1830) first described the genus *Hydrina* but without designating a type species. Coquillett (1910) subsequently designated *Hydrina vernalis* Robineau-Desvoidy (= *H. guttata* (Fallén), 1813) as the type species for *Hydrina,* thus making *Hydrina* the senior synonym of *Hyadina.* Both genus-group names share *H. guttata* (Fallén) as their type species. As the senior synonym, *Hydrina* was used by some authors as the valid generic name (Cresson, 1926; Frey, 1945). *Hydrina,* however, is preoccupied (Rafinesque, 1815; Coelenterata) and is thus not a valid genus-group name in the Ephydridae. Although Loew (1862) noted that *Hydrina* was preoccupied much earlier, this generic name continued to be used in faunistic papers (Cresson after 1926 and almost all European authors until 1975), and until 1968 it was also used for species descriptions in the genus *Philygria* Stenhammar. This resulted in part because Cresson (1930) did not accept Coquillett's designation of *H. guttata* Fallén as the type species of *Hyadina,* assuming that it was not the senior synonym of *Hydrina vernalis.* Cresson (1930) reasoned that *H. guttata* was ineligible to be the type species because it was not a species that Robineau-Desvoidy (1830) had included in his genus, and thus Cresson (1930) designated *H. maculipennis* Robineau-Desvoidy (junior synonym of *Philygria interstincta* (Fallén, 1813)) as the type species for *Hydrina,* making *Philygria* and *Hydrina* synonyms. Coquillett's designation, however, is valid (ICZN article 69.2.2., ITZN 1999) and Cresson's (1930) subsequent typification is thus superfluous. Two other subsequent designations of type species for *Hydrina* are also invalid as they did not designate an originally included species: (1) Westwood's (1840) designation of *H. punctatonervosa* (Fallén, 1813) and (2) Becker's (1926) designation of *H. stictica* Meigen. Thus, *Hyadina* is the valid senior synonym for this genus.

Although Hollmann-Schirrmacher (1998) synonymized *Lytogaster* with *Hyadina,* as noted in the generic synonymy of this paper, we question the basis for the synonymy (his interpretation of characters of the male terminalia) and may not follow his precedent once we have better studied and analyzed the evidence.

Key to Species of *Hyadina* Occurring in Israel

1. Head with both medial and lateral vertical setae **2**
–. Head with only medial vertical seta **3**
2. Vein R_{4+5} with 2 stump veins apicad of crossvein r–m, anterior stump vein sometimes connected with R_{2+3} ..... ***H. freidbergi* n. sp.**
–. Vein R_{4+5} normal, lacking stump veins apicad of crossvein r–m ..... ***H. pollinosa* Oldenberg**
3. Anepisternum with velvety blackish spot on dorsal half ..... ***H. guttata* (Fallén)**
–. Anepisternum lacking velvety blackish spot on dorsal half **4**
4. Wing with hyaline spot in cell M, distad of crossvein dm–cu ..... ***H. fenestrata* Becker**
–. Wing lacking hyaline spot in cell M, distad of crossvein dm–cu ..... ***H. kugleri* n. sp.**

Hyadina fenestrata Becker

Figs. 1–8

Hyadina fenestrata Becker, 1903: 173; 1905: 204 [Palearctic catalog]; 1926: 59 [review, Palearctic fauna]. Cresson, 1930: 103 [discussion, Canary Islands]. Steyskal, 1968: 31 [list, Egypt]. Cogan, 1984: 158 [Palearctic catalog]. Mathis and Zatwarnicki, 1995: 203 [world catalog].

Hydrina fenestrata. Frey, 1931: 114 [list, Canary Island].

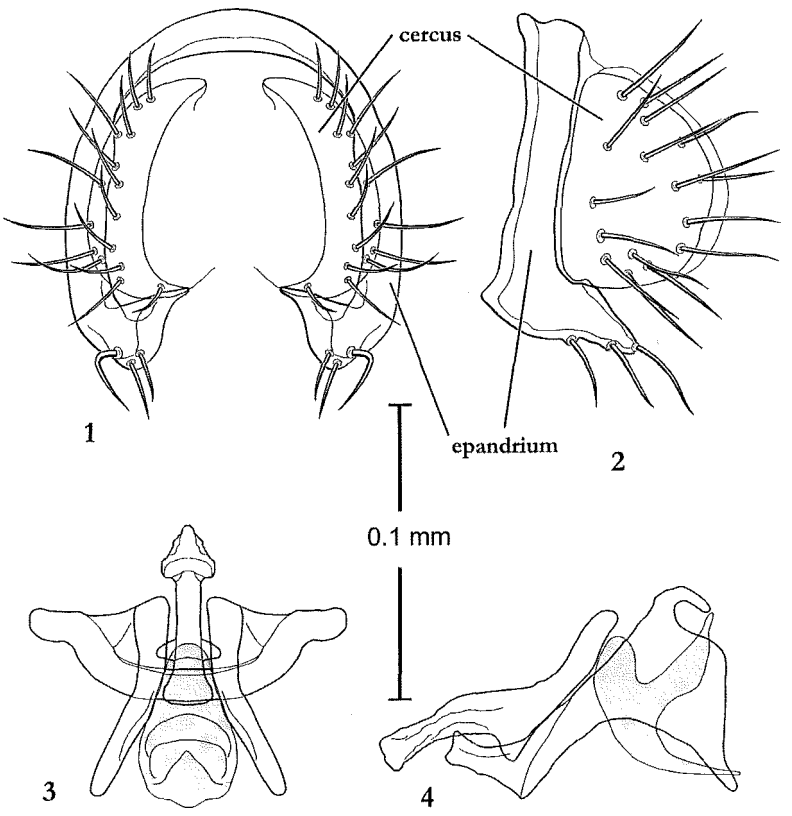
Description

Small shore flies, body length: male 1.79–1.82 mm, female 1.77 mm.

Head: Gena-to-eye ratio: male 0.25–0.28, female 0.28. Frons and ocellar triangle shiny brownish black, sparsely microtomentose; fronto-orbital setae reduced to fine setulae; only medial vertical seta well developed. Face below antenna descending in straight line, anterior margin of face positioned only a little in front of anterior margin of eyes; face bearing row of 6–8 mesoclinate setulae, dorsal pair of setulae distinctly longer than others; face, parafacial and gena sparsely covered by silver gray microtomentum; parafacial bearing row of 8–12 fine setulae curved toward medial margin of eye. Scape and pedicel black; 1st flagellomere yellow, darkened black on dorsal half; arista with short hairs.

Thorax: Mesonotum: Length of scutum: male 0.54–0.63 mm, female 0.62 mm; length of scutellum: male 0.17–0.18 mm, female 0.16 mm; length of wing: male 1.70–1.85 mm, female 1.81 mm; width of wing: male 0.58–0.62 mm, female 0.57 mm; first costal vein ratio: male 0.80–0.87, female 0.82; second costal ratio: male 3.10–3.14, female 3.16; M vein ratio: male 0.31–0.33, female 0.45. Scutum and scutellum shiny brown; scutellum with velvety black stripes laterally; apical scutellar seta 4× length of basal seta; basal seta close to apical seta, distance between apical setae 2× distance

between apical and basal setae; except for prescutellar acrostichal seta and postalar seta, generally lacking larger setae; 1 row of acrostichal setulae on anterior 2/3 of scutum, 2 rows on posterior third; anterior notopleural seta lacking, posterior notopleural seta slightly shifted towards anterior margin of notopleuron; anepisternum and katepisternum each bearing 1 longer seta; anepisternum and katepisternum densely gray microtomentose; dorsal half of anepisternum lacking velvety black spot around anterior spiracle. Wing: pale, faintly brownish; veins pale brown; vein R_{2+3} at merger with costa forming acute angle; costa extended to apex of vein M; crossvein r–m positioned distinctly behind 2nd costal break; crossvein dm–cu slightly brown, flanked by distinct hyaline spots (spot basad of crossvein vein dm–cu in cell dm; spot distad of crossvein dm–cu in cell M). Legs brown, coxae gray microtomentose, last 3 tarsomeres not darkened.

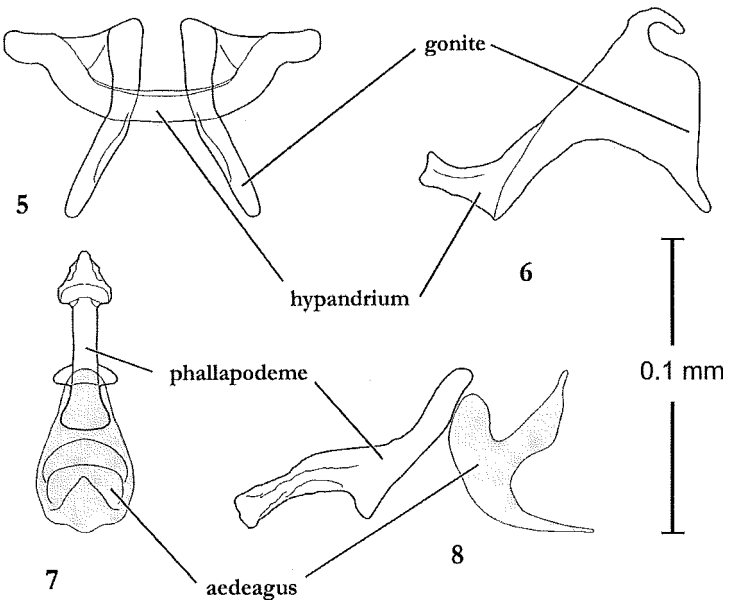


Figs. 1–4. Structures of the male terminalia of *Hyadina fenestrata* (Israel. Nahal 'Arugot (31°27.4′N, 35°22.7′E)). 1. Epandrium and cerci, posterior view. 2. Same, lateral view. 3. Aedeagus (shaded), phallapodeme, gonites, ventral view. 4. Same, lateral view.

Abdomen: Brown gray microtomentose. Last tergite shiny. Male terminalia (Figs. 1–8): Epandrium in posterior view (Fig. 1) broadly U-shaped, dorsal arch narrow, parallel sided, becoming wider only on ventral 1/5 in lateral view, ventral margin bearing a few setae; cerci in posterior view (Fig. 1) shallowly and narrowly lunate, both dorsal and ventral apices pointed, oriented medially, in lateral view (Fig. 2) broadly and deeply D-shaped; aedeagus in lateral view (Figs. 4, 8) bilobed, both lobes pointed and subequal in length, dorsal lobe wider on basal 2/3, in ventral view wider in profile apically; phallapodeme in lateral view (Figs. 4, 8) long, and with keel shallowly angulate, keel long, subrectangular, length almost equal to basal width; gonite fused with hypandrium, gonite in lateral view (Fig. 4) with basodorsal recurved, short, narrow process, very basally, abruptly narrowed, especially ventrally, to moderately wide middle portion, thereafter narrowed dorsally to pointed apex; hypandrium in ventral view (Figs. 3, 5) very widely and shallowly U-shaped, posterior arms extended laterally.

Type Material

The lectotype female of *Hyadina fenestrata* Becker, here designated to stabilize and make more universal the use of this name, is labeled "[Egypt.] Assuan 44551. I [Jan][handwritten]/Hyadina n. sp. [handwritten]/Typus [red]/Zool. Mus. Berlin [yellow]/ LECTOTYPE Hyadina fenestrata Becker ♀ By Mathis and Zatwarnicki [handwritten



Figs. 5–8. Structures of the male terminalia of *Hyadina fenestrata* (Israel. Nahal 'Arugot (31°27.4′N, 35°22.7′E)). 5. Gonites and hypandrium, ventral view. 6. Same, lateral view. 7. Phallapodeme and aedeagus (shaded), ventral view. 8. Same, lateral view.

except for "LECTOTYPE" and "By"; black sub-border]." The lectotype is double mounted (minuten in a retangular block of pith), is in excellent condition, and is deposited in the ZMHU.

Other specimens examined

ISRAEL: Panyas, 21.x.1984, I. Nussbaum (1♂; TAU); Golan, Nahal Nimrod (spring), 6.viii.1986, W. N. Mathis (2♂, 1♀; TAU, USNM); Ramot Naftali, 18.v.1981, W.N. Mathis (1♂, 1♀; USNM); Biq'at Bet Zayda, NE shore of Yam Kinneret, 5.viii.1986, W.N. Mathis (1♂; USNM); Ma'agan Mikha'él (Nahal Tanninim Spill), 20.iv.1986, A. Freidberg (1♂; TAU); 'Enot Zuqim, 22.iii.1993, A. Freidberg (1♂; TAU); 'En Gedi, 21.iii.1980, W.N. Mathis, A. Freidberg (4♂; USNM); Nahal 'Arugot (31°27.4′N, 35°22.7′E), 31.v.2000, D., W.N. Mathis (6♂, 2♀; USNM); 'En Mor (30°49.6′N, 34°45.8′E), 31.v.–4.vi.2000, D. and W.N. Mathis (1♂, 1♀; USNM).

Distribution

Afrotropical: Seychelles (La Digue, Mahé). Palearctic: Canary Islands, Egypt, Israel.

Remarks

Now that the correct identity of this species has been established and accurate illustrations of structures of the male terminalia are available, we anticipate that this species will be found to be more widespread than current records now indicate.

This species is distinguished from congeners occurring in Israel by the following combination of characters: one vertical seta (lateral seta lacking); lack of velvety black areas at the lateral scutellar base and around the anterior spiracle on the anepisternum; and a hyaline spot in cell M, distad of crossvein dm–cu.

Hyadina freidbergi Mathis and Zatwarnicki, n. sp.

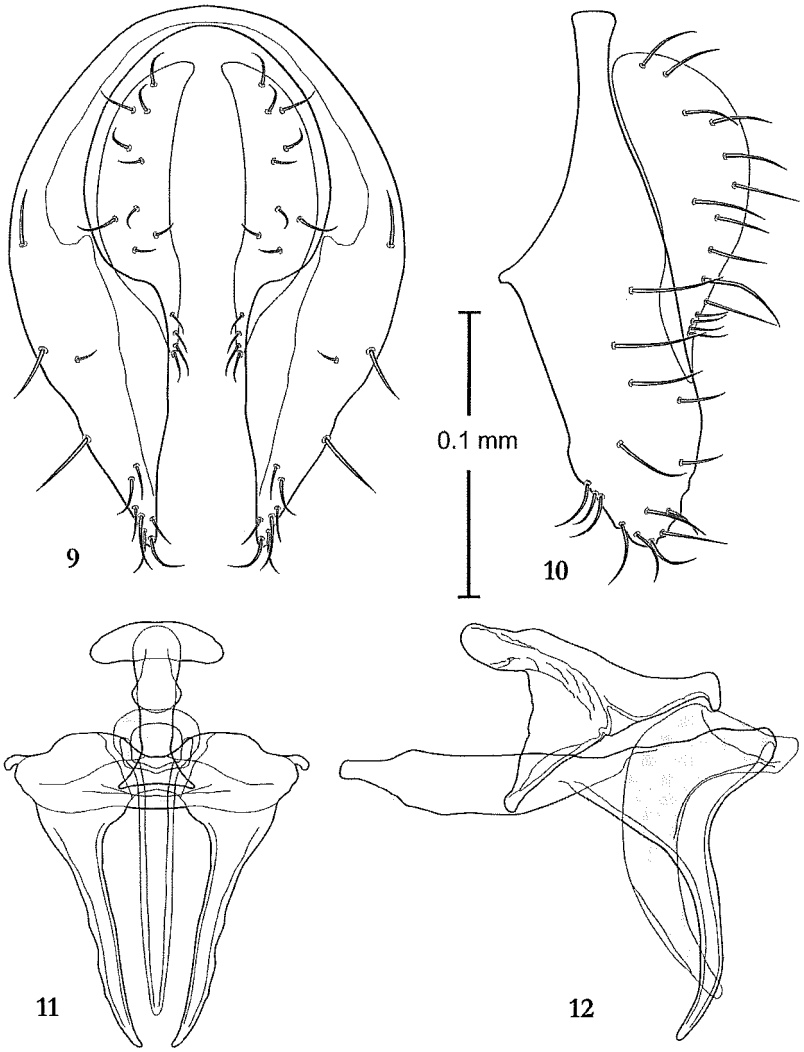
Figs. 9–16

Description

Small shore flies, body length: male 1.35–1.52 mm, female 1.39–1.56 mm.

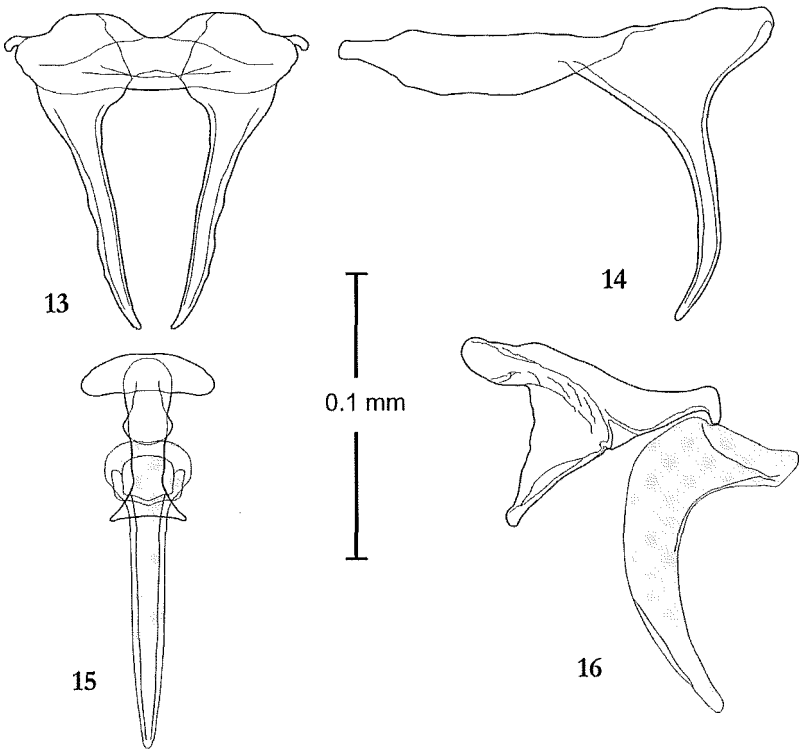
Head: Gena-to-eye ratio: male 0.48–0.52, female 0.50–0.58. Frons and ocellar triangle dull, with grayish to brownish microtomentum; fronto-orbital setae reduced to fine setulae; both medial and lateral vertical seta well developed. Face below antenna slightly concave; face bearing row of 6–8 mesoclinate setulae, dorsalmost pair of setulae distinctly longer than others; face, parafacial and gena covered by grayish brown microtomentum; parafacial bearing row of 8–10 fine setulae curved toward medial margin of eye. Scape and pedicel yellowish brown; 1st flagellomere yellow, darkened, mostly black dorsally and anteriorly; arista with short hairs.

Thorax: Mesonotum: Length of scutum: male 0.48–0.55 mm, female 0.50–0.59 mm; length of scutellum: male 0.18–0.22 mm, female 0.18-0.23 mm; length of wing: male 1.33–1.48 mm, female 1.45–1.51 mm; width of wing: male 0.52–0.54 mm, female 0.54–



Figs. 9–12. Structures of the male terminalia of *Hyadina freidbergi* (Israel. 'En Mor (30°49.6′N, 34°45.8′E)). 9. Epandrium and cerci, posterior view. 10. Same, lateral view. 11. Aedeagus (shaded), phallapodeme, gonites, ventral view. 12. Same, lateral view.

0.56 mm; first costal vein ratio: male 0.58–0.62, female 0.6–0.67, second costal ratio: male 3.55–3.62, female 3.52–3.60; M vein ratio: male 0.45–0.46, female 0.44–0.45. Scutum and scutellum grayish brown microtomentose, scutum with grayish stripes laterally; scutellum laterally lacking velvety black stripes; apical scutellar seta 4× length of basal seta; basal seta close to apical seta, distance between apical setae 2× distance



Figs. 13–16. Structures of the male terminalia of *Hyadina freidbergi* (Israel. 'En Mor (30°49.6'N, 34°45.8'E)). 13. Gonites, ventral view. 14. Same, lateral view. 15. Aedeagus (shaded) and phallapodeme, ventral view. 16. Same, lateral view.

between apical and basal setae; generally lacking larger setae except for prescutellar acrostichal seta and postalar seta; 1 row of acrostichal setulae on anterior 2/3 of scutum, 2 rows on posterior third; anterior notopleural seta lacking, posterior notopleural seta slightly shifted towards anterior margin of notopleuron; anepisternum and katepisternum each bearing 1 longer seta and with dense gray microtomentum; dorsal half of anepisternum lacking large velvety black spot around anterior spiracle. Wing: faintly brown, infuscate, lacking additional spots; veins pale brown; costa extended to vein M; vein R_{2+3} short, costal section III about 1.5× longer than section II; crossvein r–m positioned distinctly behind 2nd costal break; crossvein dm–cu slightly brown; 2 additional stump veins along R_{4+5}, one extended anteriorly, sometimes connecting with vein R_{2+3}, the other extended posteriorly (in some specimens one or both stump veins not reaching next vein); indefinite whitish areas at crossveins and along posterior wing margin. Legs yellowish brown; coxae gray microtomentose; last 3 tarsomeres brown (some specimens with tibiae and femora brown apically).

Abdomen: Brownish gray microtomentose. Male terminalia (Figs. 9–16): Epandrium in posterior view (Fig. 9) narrowly oval, dorsal arch narrow, becoming wider on ventral 2/3, wider portion bearing setae; ventral apex pointed, especially in posterior view; cerci in posterior view (Fig. 9) lunate, more pointed ventrally; aedeagus in lateral view (Figs. 12,16) wider basally, curved and tapered to narrowly rounded apex, in ventral view (Figs. 11,15) with basal 1/4 wider, thereafter apical projection tapered; phallapodeme in lateral view (Figs. 12,16) irregularly triangular, extended keel with rounded point that orients toward hypandrium; gonite fused with hypandrium, gonite wide on basal 1/3, thereafter abruptly narrowed to slender, long process; hypandrium moderately shallow in lateral view.

Type Material

The holotype male is labeled "ISRAEL. 'En Mor near Sedé Boqér 22.viii.1990 Wayne N. Mathis/HOLOTYPE Hyadina freidbergi ♂ W.N. Mathis and T. Zatwarnicki USNM [red; species name, gender, and "T. Zatwarnicki" handwritten]." The holotype is double-mounted (minuten in a block of plastic), is in good condition (somewhat dusty appearing), and is deposited in the USNM. Paratypes are as follows: eight paratypes (3♂, 5♀; TAU, USNM) bear the same locality data as the holotype. Other paratypes are as follows: Israel. 'En Mor (30°49.6′N, 34°45.8′E), 4.vi.2000, 30.x.1984, A. Freidberg, D., Mathis, W.N. (3♂, 1♀; TAU, USNM); Nizzanim, 26.viii.1983, 15.ix.1983, 12.x.1984, I. Nussbaum (2♂, 6♀; TAU).

Distribution

Palearctic: Israel.

Etymology

The species epithet, *freidbergi,* is a genitive patronym to honor and recognize the collecting efforts of Dr. Amnon Freidberg. The specimens he collected contributed substantially to this paper.

Remarks

This species is distinguished from congeners occurring in Israel by the following combination of characters: two vertical setae (medial and lateral); stump veins on vein R_{4+5}, apicad of crossvein r–m (the anterior stump vein is sometimes connected with vein R_{2+3}).

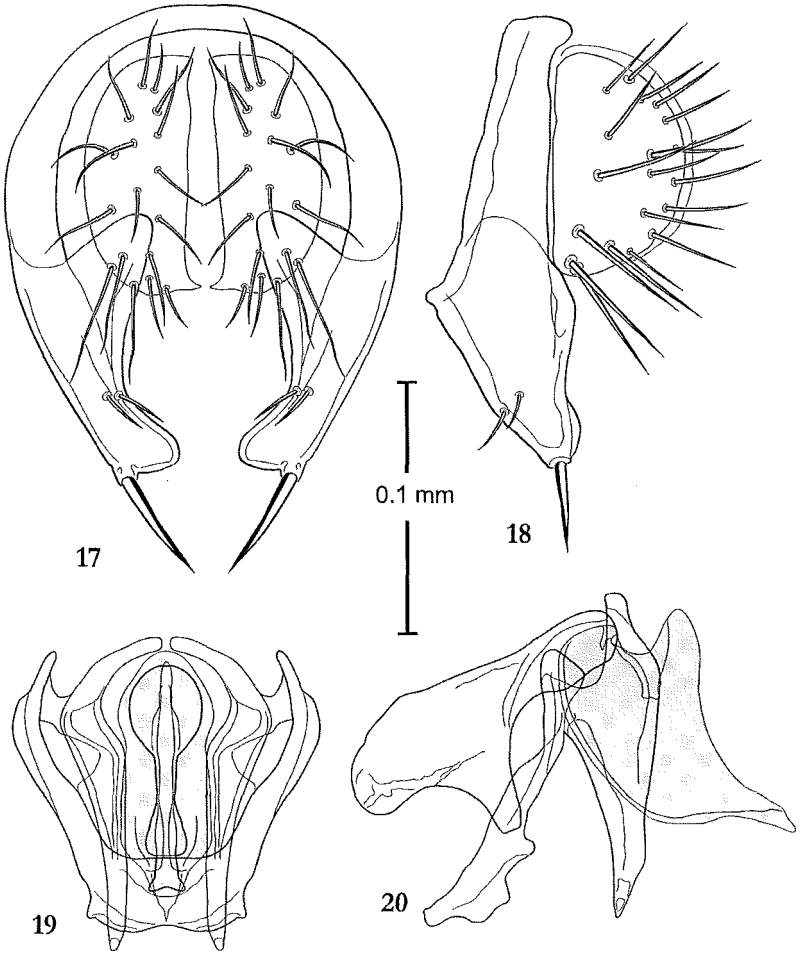
Hyadina guttata (Fallén)

Figs. 17–24

Notiphila guttata Fallén, 1813: 253.

Ephydra (Hyadina) guttata. Haliday, 1839: 406 [generic combination].

Hyadina guttata. Haliday in Walker, 1856: 345 [generic combination]. Dainat and Dainat, 1973: 342. Balazuc, 1974: 352 [parasite: *Stigmatomyces hyadinae* Dainat (Laboulbeniaceae)]. Rossi, 1993: 37 [parasite: *Stigmatomyces spiralis* Thaxter



Figs. 17–20. Structures of the male terminalia of *Hyadina guttata* (Belgium. Zeebrugge; compared with specimens from Israel). 17. Epandrium and cerci, posterior view. 18. Same, lateral view. 19. Aedeagus (shaded), phallapodeme, gonites, ventral view. 20. Same, lateral view.

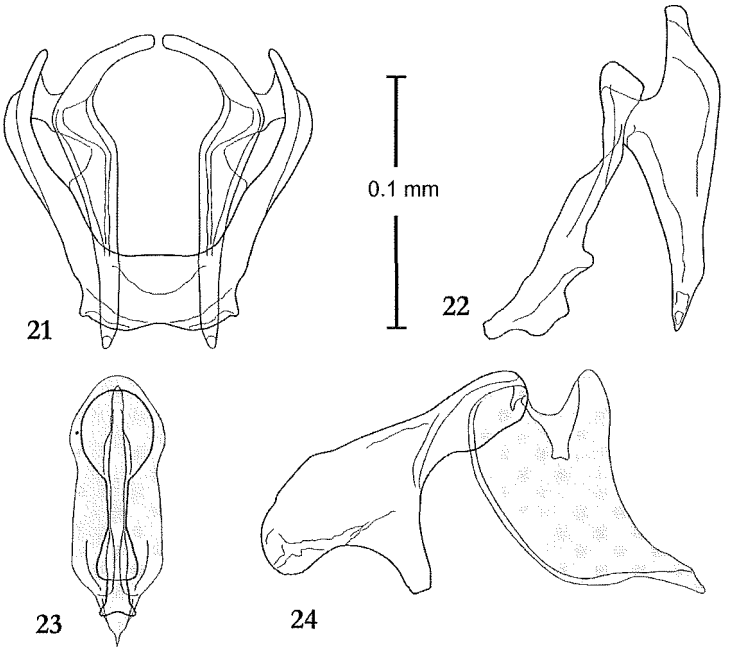
(Laboulbeniaceae)]. Mathis and Zatwarnicki, 1995: 203–204 [world catalog].

Hyadina guttata variety *nigripes* Strobl, 1900: 3 [Spain. Irun; HT ♂, DCSA]. Cogan, 1984: 158 [synonymy].

Hyadina guttata variety *obscuripes* Strobl, 1900: 2 [Spain. "Algeciras, S. Morena, Irun"; ST (1♂, 4♀), DCSA]. Cogan, 1984: 158 [synonymy].

Hydrina vernalis Robineau-Desvoidy, 1830: 795 [not given (? France); ST (sex ?), MNHN (apparently destroyed)]. Haliday, 1839: 406 [synonymy].

Hyadina vernalis. Becker, 1905: 204 [generic combination].



Figs. 21–24. Structures of the male terminalia of *Hyadina guttata* (Belgium. Zeebrugge; compared with specimens from Israel). 21. Gonites and hypandrium, ventral view. 22. Same, lateral view. 23. Phallapodeme and aedeagus (shaded) separated, ventral view. 24. Same but in situ, lateral view.

Hydrellia viridis Macquart, 1835: 527 [France. "Du nord de la France"; ST (sex ?), MNHN]. Becker, 1905: 204 [synonymy].

Hyadina humeralis Becker, 1896: 195; 1926: 59 [review, Palearctic Region]. Dahl, 1966: 121 [comparison of genitalia with *H. guttata*]. Cogan, 1984: 159 [Palearctic catalog, in part]. Mathis and Zatwarnicki, 1995: 204 [world catalog, in part]. **New Synonym**.

Description

Small shore flies, body length: male 1.75–1.82 mm, female 1.77–1.86 mm.

Head: Gena-to-eye ratio: male 0.29–0.31, female 0.28–0.32. Frons and ocellar triangle shiny brownish black, sparsely microtomentose; fronto-orbital setae reduced to fine setulae; only medial vertical seta well developed. Face below antenna in a straight line, at about height of lower margin of eyes, slightly curved backwards, anterior margin of face positioned only a little in front of anterior margin of eyes; face bearing row of 6–8 mesoclinate setulae, dorsal pair of setulae distinctly longer than others; face, parafacial and gena covered by yellowish gray microtomentum in male, silvery gray in female; parafacial bearing row of 8–12 fine setulae curved toward inner margin of eye. Scape and pedicel black; 1st flagellomere yellow, black on dorsal half; arista with short hairs.

Thorax: Mesonotum: Length of scutum: male 0.50–0.55 mm, female 0.49–0.57 mm; length of scutellum: male 0.18–0.22 mm, female 0.17–0.24 mm; length of wing: male 1.74–1.92 mm, female 1.80–1.95 mm; width of wing: male 0.65–0.71 mm, female 0.67–0.74 mm; first costal vein ratio: male 1.01–1.14, female 1.02–1.16; second costal ratio: male 3.14–3.23, female 3.09–3.29; M vein ratio: male 0.37–0.39, female 0.36–0.40. Scutum and scutellum shiny brown; scutellum laterally with velvety black stripes; apical scutellar marginal seta 4× length of basal seta; basal seta close to apical seta, distance between apical setae 2× distance between apical and basal setae; generally lacking larger setae except for prescutellar acrostichal seta and postalar seta; 1 row of acrostichal setulae on anterior 2/3 of scutum, 2 rows on posterior third; anterior notopleural seta lacking, posterior notopleural seta slightly shifted towards anterior margin of notopleuron; anepisternum and katepisternum with one longer seta and densely gray microtomentose; dorsal half of anepisternum with large velvety black spot around anterior spiracle. Wing pale, faintly brown, lacking additional spots; veins pale brown; costa extended to vein M; crossvein r–m positioned distinctly behind 2nd costal break; crossvein dm–cu slightly brown, flanked by faint though evident hyaline spots in cells dm and M. Legs yellowish brown; coxae ventrally gray microtomentose; last 3 tarsomeres brown (some specimens with tibiae and femora brown apically).

Abdomen: Brown-gray microtomentose. Last tergite shiny. Male terminalia (Figs. 17–24): Epandrium in posterior view (Fig. 17) ovate, dorsal arch moderately narrow, becoming wider on ventral 1/3 in lateral view, wider portion bearing few setae; ventral apex pointed in lateral view, truncate in posterior view, slightly expanded medially, bearing a large seta at apex; cerci in posterior view (Fig. 17) broadly lunate, with medially oriented point ventrally; aedeagus in lateral view (Figs. 20, 24) wider basally, curved and gradually tapered to pointed apex, in ventral view (Figs. 19, 24) with basal 3/4 wider, thereafter apically tapered; phallapodeme in lateral view (Figs. 20, 24) as a lopsided triangular, extended keel wide, broadly rounded, oriented toward hypandrium; gonite fused with hypandrium, gonite in lateral view (Fig. 20) wide basally, thereafter gradually narrowed to slender, long, apically pointed process; hypandrium moderately shallow in lateral view, in posterior view (Fig. 21) lyre-shaped, with anterior margin quadrate, posterobliquely extended arms tapered, curved on apical half.

Type Material

The lectotype male of *Notiphila guttata* Fallén, here designated to stabilize and make more universal the use of this name, is labeled "[small red square]/N. guttata. Scania [handwritten; yellowish]/LECTOTYPE ♂ Notiphila guttata Fallén By Mathis and Zatwarnicki [handwritten except for "LECTOTYPE" and "By"; black sub-border]." The lectotype is directly pinned, is in poor condition (fungal hyphae; lacking most of abdomen, left first flagellomere, both hindlegs, and left wing), and is deposited in the ZIL. There are also three female paralectotypes that are deposited in the ZIL.

The lectotype male of *Hyadina humeralis* Becker, here designated to stabilize and make more universal the use of this name, is labeled "Liegnitz IV. [April 1895] 36816

[numbers handwritten; black submargin]/LECTOTYPE ♂ Hyadina humeralis Becker By Mathis & Zatwarnicki [handwritten except for "LECTOTYPE" and "By"; black sub-border]." The lectotype is double-mounted (minuten in a rectangular block of pith), is in good condition, and is in the ZMHU.

Other specimens examined

ISRAEL. Nahal Senir (Hazbani), 17.v.1976, A., Freidberg (1♂; TAU); Panyas, 19.viii.1977, 14.v.1981, 25.vii.1985, 8.v.1986, A. Freidberg, W.N. Mathis, I. Nussbaum (5♂; TAU, USNM); Golan, Nahal Nimrod (spring; 1000 m), 6.viii.1986, A. Freidberg, W.N. Mathis (4♂, 1♀; TAU, USNM); Ramot Naftali, 18.v.1981, W.N. Mathis (3♂, 4♀; USNM); Montfort, 4.iii–2.vi.1981, 1993, A. Freidberg, W.N. Mathis (1♂, 6♀; TAU, USNM); Har Meron, 5.v.1987, F. Kaplan (1♂, 1♀; TAU); Kefar Shammay, 18.v.1981, W.N. Mathis (3♂, 4♀; USNM); Nahal 'Ammud (3 km W Zefat), 28.v.1981, W.N. Mathis (1♂; USNM); Park HaYardén, 25.vii.1983, 7.v.1987, 7.v.1997, A. Freidberg, F. Kaplan, I. Nussbaum (3♂, 1♀; TAU); Biq'at Bet Zayda (NE shore of Yam Kinneret), 14.iii.1975, 2.vi.1986, 5.viii.1986, W.N. Mathis (3♀; TAU, USNM); Hammat Gader, 13.v.1981, W.N. Mathis (1♀; USNM); Nahal Tut, 18.v.1982, 29.iv.1993, A. Freidberg (1♂, 2♀; TAU); Hadera, 21.v.1992, A. Freidberg (2♂; TAU); Hadera, Berekhat Ya'ar (Birket 'Atta), 24.v.1980, A. Freidberg (2♂; TAU); Ga'ash, 30.v.1974, A. Freidberg (1♂, 1♀; TAU); Central Nahal Tirza, 20.ii.1974, A. Freidberg (2♂, 5♀; TAU); West Bank, Ein Shibli (3 km SE Beit Hasan), 31.v.1981, W. N. Mathis (3♂, 1♀; USNM); Nahal Tirza (W. Faria), Jiftlik, 31.v.1981, A. Freidberg (1♂, 1♀; TAU); West Bank, Jiftlik Post, 31.v.1981, W.N. Mathis (2♀; USNM); Kefar Shemaryahu, 1.v.1984, A. Freidberg (2♂, 2♀; TAU, USNM); Herzliyya, 10.iii.1975, A. Freidberg (1♂; TAU); Yaqqir, 4.iv.1981, A. Freidberg (1♀; TAU); Tel Aviv, dunes, 8.iv.1981, A. Freidberg (2♂; TAU); Tel Aviv, 10.iii.1975, F. Kaplan (1♂; TAU); Rosh ha'Ayin, 8–10.iv.1976, 16.iv.1993, A. Freidberg, F. Kaplan (8♀; TAU)

Distribution

Palearctic: Austria, Azores, Belgium, Canary Islands, Czech Republic, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Israel, Italy, Netherlands, Poland, Macedonia, Madeira Islands, Morocco, Romania, Russia (European Territory, Far East), Slovakia, Spain, Sweden, Switzerland, Yugoslavia.

Remarks

This species has frequently been misidentified, in part due to the lack of complete agreement between Becker's original description of *H. humeralis* and his type series, especially the syntype specimens from Liegnitz. Becker's description indicates that *H. humeralis* lacks hyaline spots on either side of crossvein dm–cu, whereas the only syntypes available have faint but evident hyaline spots, which is a distinguishing character of *H. guttata.* Our study has thus revealed that the syntypes of *H. humeralis* are conspecific with *H. guttata* (Fallén) and that *H. humeralis* is a junior synonym of the latter, as Dahl (1966) first suggested. This discrepancy has resulted in some confusion,

especially with specimens that had been misidentified as *H. humeralis* and which typically (1) lack hyaline spots, (2) occur sympatrically with *H. guttata* in the western Palearctic, and (3) probably represent an undescribed species (apparently there is no available name for this species).

In temperate zones of the Old World, this is one of the most widespread species of *Hyadina,* and in Israel, it also occurs widely and is relatively abundant.

This species is distinguished from congeners occurring in Israel by the following combination of characters: one vertical seta (medial; lateral seta lacking); anepisternum with a velvety blackish spot on dorsal half around the anterior spiracle.

Hyadina kugleri Mathis and Zatwarnicki, n. sp.

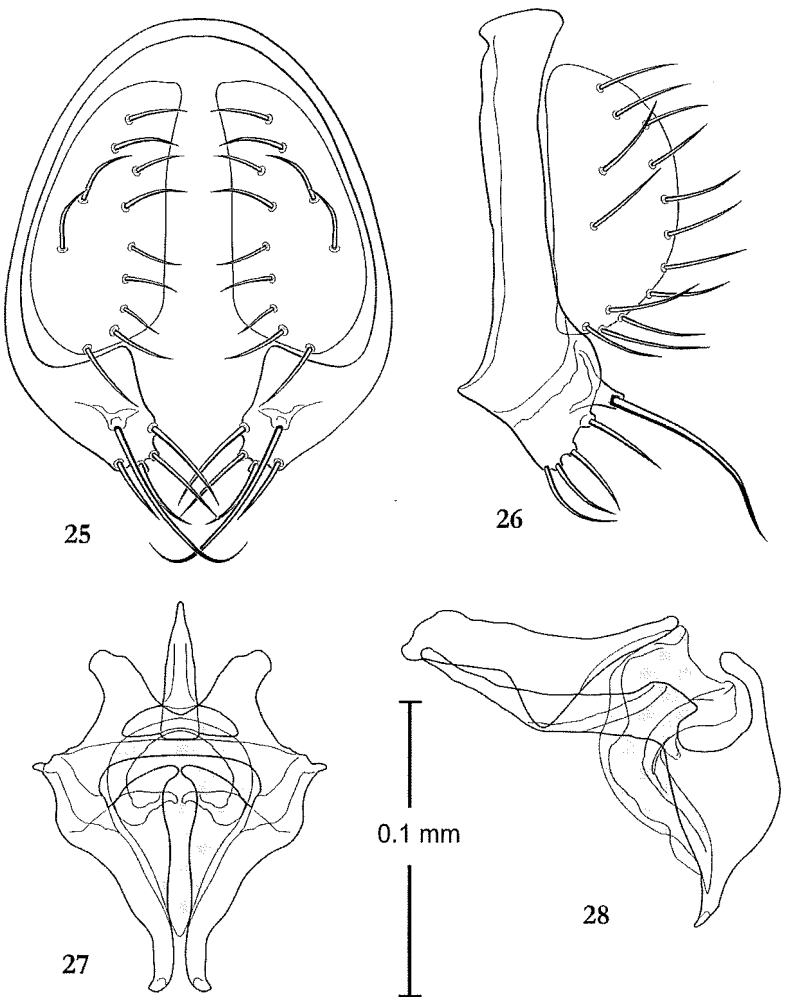
Figs. 25–32

Description

Small shore flies, body length: male 1.64–1.73 mm, female 1.67–1.77 mm.

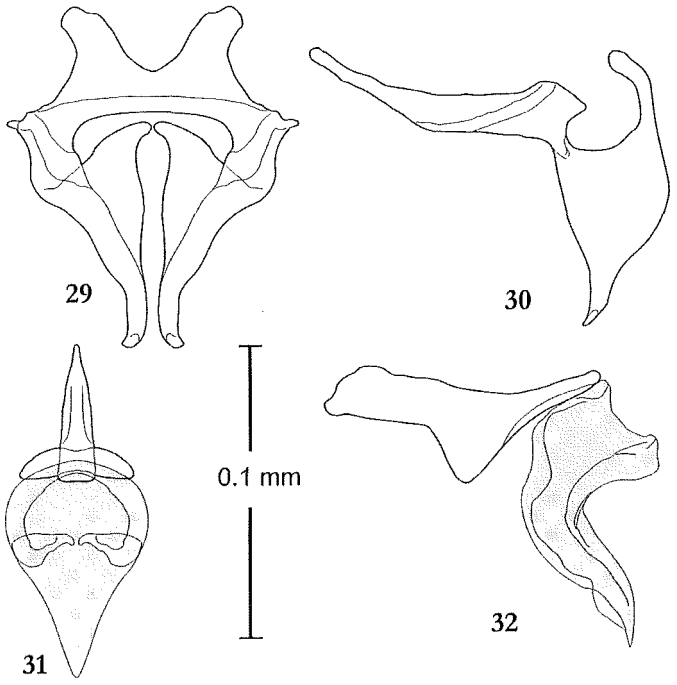
Head: Gena-to-eye ratio: male 0.32–0.38, female 0.29–0.37. Frons and ocellar triangle shiny, although slightly less than *H. guttata* and *H. fenestrata,* brownish black, sparsely microtomentose; fronto-orbital setae reduced to fine setulae; only medial vertical seta well developed. Face below antenna descending in straight line, anterior margin of face positioned only a little in front of anterior margin of eyes; face bearing row of 6–8 mesoclinate setulae, dorsal pair of setulae distinctly longer than others; face, parafacial, and gena covered by grayish brown microtomentum; parafacial bearing row of 8–12 fine setulae curved toward medial margin of eye. Scape and pedicel gray-brown, flagellomere yellow, darkened black in dorsal half; arista with short hairs.

Thorax: Mesonotum: Length of scutum: male 0.64–0.69 mm, female 0.63–0.70 mm; length of scutellum: male 0.20–0.21 mm, female 0.20–0.22 mm; length of wing: male 1.42–1.56 mm, female 1.53–1.62 mm; width of wing: male 0.73–0.81 mm, female 0.75–0.86 mm; first costal vein ratio: male 0.75–0.82, female 0.80–0.86; second costal ratio: male 2.48–2.55, female 2.50–2.65; M vein ratio: male 0.24–0.32, female 0.21–0.23. Scutum and scutellum shiny brown; scutum laterally and between rows of setulae with gray stripes; scutellum laterally with velvety black stripes; apical scutellar seta short, about 2× length of basal seta; basal seta close to apical seta, distance between apical setae 2× distance between apical and basal setae; generally lacking larger setae except for prescutellar acrostichal seta and postalar seta; 1 row of acrostichal setulae on anterior 2/3 of scutum, 2 rows on posterior third; anterior notopleural seta lacking, posterior notopleural seta slightly shifted towards anterior margin of notopleuron; anepisternum and katepisternum each bearing 1 longer seta; anepisternum and katepisternum densely gray microtomentose; dorsal half of anepisternum with large velvety black spot. Wing: hyaline to faintly brown, lacking spots; veins pale brown; costa extended to vein M; crossvein r–m positioned distinctly behind 2nd costal break; crossvein dm–cu slightly brown, lacking hyaline spots. Legs yellow; coxae gray, microtomentose; last tarsomeres brown (some specimens with tibiae and femora brown apically).



Figs. 25–28. Structures of the male terminalia of *Hyadina kugleri* (Israel. Horbat Nappah). 25. Epandrium and cerci, posterior view. 26. Same, lateral view. 27. Aedeagus (shaded), phallapodeme, gonites, ventral view. 28. Same, lateral view.

Abdomen: Brown-gray microtomentose. Last 2 tergites shiny. Male terminalia (Figs. 25–32): Epandrium in posterior view (Fig. 25) more or less ovate, dorsal arch narrow, parallel sided, becoming wider only on ventral 1/4 in lateral view, posteroventral margin bearing several long setae; cerci in posterior view (Fig. 25) broadly lunate, both dorsal and ventral apices angulate but not pointed, in lateral view broadly D-shaped; aedeagus in lateral view (Figs. 28, 32) angulate, wide basally, apical



Figs. 29–32. Structures of the male terminalia of *Hyadina kugleri* (Israel. Horbat Nappah). 29. Gonites and hypandrium, ventral view. 30. Same, lateral view. 31. Phallapodeme and aedeagus (shaded), ventral view. 32. Same, lateral view.

2/3 at right angle, tapered apically to pointed apex, in ventral view (Figs. 27, 31) like an inverted drop; phallapodeme in lateral view (Figs. 28, 32) with keel long, subrectangular, length equal to basal length; gonite fused with hypandrium, gonite in lateral view (Fig. 28) with backwards C-shaped basal margin, dorsal process extended basally, apical 1/3 angulate, rest of gonite in lateral view (Fig. 28) mostly wide, parallel-sided to abruptly narrowed, apical 1/3, tapered to point that bears a blunt, short, seta; hypandrium in ventral view (Fig. 29) very wide anteriorly, bilobed with each lobe wide, oriented obliquely posterolaterally.

Type Material

The holotype male is labeled "ISRAEL, Golan[,] Nafech[,] 10.XII.1973 [Horbat Nappah] A. FREIDBERG ["Golan Nafech" and "10.XII...73" handwritten]/HOLOTYPE Hyadina kugleri ♂ W.N. Mathis and T. Zatwarnicki [red; species name, gender, and "T. Zatwarnicki" handwritten]." The holotype is double-mounted (minuten in a rectangular block of polyporus), is in excellent condition, and is deposited in TAU. Paratypes are as follows: ISRAEL: Panyas, 24.iv.1982, 14.v.1981, A. Freidberg, F.

Kaplan, W.N. Mathis (5♀; TAU, USNM); Golan, Nahal Nimrod (spring), 30.x.1985, 6.viii.1986, A. Freidberg, W.N. Mathis (3♂, 5♀; TAU, USNM); Dan, 8.viii.1983, I. Nussbaum (1♀; TAU); Mizpé Golani (Tel Facher), 11.ix.1981, A. Freidberg (1♀; TAU); Ramot Naftali, 18.v.1981, W.N. Mathis (1♀; USNM); Gonen, 15.iii.1975, A. Freidberg (1♂; TAU); Golan, Horbat Nappah (Kefar Nafech), 1.xii.1973, 10.xii.1973, 20.xii.1973, A. Freidberg (6♂, 10♀; TAU, USNM); Park HaYardén, 4.iv.1983, 27.iv.1984, 5.viii.1986, 7.v.1987, 14,iv.1999, A. Freidberg, W.N. Mathis, A. Shlagman (7♂, 9♀; TAU); Biq'at Bet Zayda (Betteihe), 14.iii.1975, 16.xi.1982, A. Freidberg (2♀; TAU); 6.viii.1986, I. Nussbaum (1♀; TAU); Qusbīya, 20.iv.1976, 20.ix.1978, A. Freidberg, D. Furth (2♀; TAU, USNM); Hadera, Berekhat Ya'ar, 24.v.1980, A. Freidberg (1♂; TAU); West Bank, Ein Shibli (3 km SE Beit Hasan), 31.v.1981, W.N. Mathis (1♂; USNM); Rosh ha'Ayin, 13.v.1993, A. Freidberg, F. Kaplan (2♂, 1♀; TAU).

Distribution

Palearctic: Israel.

Etymology

The species epithet, *kugleri,* is a genitive patronym to recognize the numerous contributions of Professor Yehoshua Kugler to Dipterology, the fauna of Israel in particular.

Remarks

This species is distinguished from congeners occurring in Israel by the following combination of characters: only medial vertical seta present; lack of velvety black areas at the lateral scutellar base and around the anterior spiracle on the anepisternum; and lack of a hyaline spot in cell M, distad of crossvein dm–cu.

Hyadina pollinosa Oldenberg

Hyadina pollinosa Oldenberg, 1923: 314 [Germany. Sülldorf (Salzgebiet nähe Magdeburg); HT ♀, DEI]. Dainat and Dainat, 1973: 344 [parasite: *Stigmatomyces spiralis* Thaxter (Laboulbeniaceae)]. Balazuc, 1974: 354 [parasite: *Stigmatomyces spiralis* Thaxter (Laboulbeniaceae)]. Mathis and Zatwarnicki, 1995: 205 [world catalog].

Description

Small shore flies, body length: female 1.10–1.25 mm.

Head: Gena-to-eye ratio: female 0.25–0.33. Frons and ocellar triangle subshiny to dull, moderately densely microtomentose, brownish black; fronto-orbital setae reduced, not evident; both vertical setae well developed. Face below antenna descending in straight line, anterior margin of face positioned only a little in front of anterior margin of eyes; face bearing row of 4–5 mesoclinate setulae, dorsal pair of setulae distinctly longer than others; face, parafacial, and gena covered by grayish brown microtomentum; parafacial bearing row of 5 fine setulae curved toward medial margin of eye. Scape and

pedicel black; 1st flagellomere yellow basally, darkened black on apicodorsal half; arista with short hairs.

Thorax: Mesonotum: Length of scutum: female 0.45–0.46 mm; length of scutellum: female 0.18–0.20 mm; length of wing: female 1.10–1.20 mm; width of wing: female 0.50–0.55 mm; first costal vein ratio: female 1.12–1.18; second costal ratio: female 2.20–2.80; M vein ratio: female 0.28–0.32. Scutum and scutellum subshiny brown; scutellum lacking lateral, velvety black stripes; apical scutellar seta 4× length of basal seta; basal seta close to apical seta, distance between apical setae 2× distance between apical and basal setae; except for prescutellar acrostichal seta and postalar seta, generally lacking larger setae; acrostichal setulae very small, as 2 rows; anterior notopleural seta lacking, posterior seta inserted toward anterior margin of notopleuron; anepisternum and katepisternum each bearing 1 longer seta; anepisternum and katepisternum densely gray microtomentose; dorsal half of anepisternum lacking velvety black spot. Wing: pale, faintly brownish; veins pale brown; vein R_{2+3} at merger with costa forming acute angle; costa extended to apex of vein M; crossvein r–m positioned distinctly behind 2nd costal break; crossvein dm–cu slightly brown, lacking hyaline spots. Legs brown; coxae grayish brown, microtomentose; last 3 tarsomeres brown.

Abdomen: Brown-gray microtomentose.

Type Material

The holotype female of *Hyadina pollinosa* Oldenberg is labeled "Suelldorf 5. 6. 11 [handwritten]/67 [handwritten/Type [pink; handwritten]/Hydrina pollinosa n. sp. Old. [handwritten]/coll. Oldenberg/pollinosa Old. [handwritten]/Holotypus [red]/Typus [red; crossed-out]." The holotype is double-mounted (minuten in a block of pith), is in moderate condition (lacking both 1st flagellomeres and some setae), and is deposited in the DEI.

Other Specimens Examined

ISRAEL: Park HaYardén, 5.viii.1986, W.N. Mathis (1♀; USNM); 'Enot Zuqim, 11.viii.1986, W.N. Mathis (2♀; USNM).

Distribution

Palearctic: France, Germany, Israel, Italy, Spain (Mallorca).

Remarks

This species is distinguished from congeners occurring in Israel by the following combination of characters: two vertical setae (medial and lateral); vein R_{4+5} lacking stump veins apicad of crossvein r–m.

We only have females available to us and thus our identification of this species is tentative. Specimens are rare in collections, and we are unable to assess variation properly. For example, among the few female specimens from Israel, the frons is partially dull (microtomentose), but in specimens from Germany, the frons is mostly shiny. Whether this is a character that is of species importance remains to be resolved.

ACKNOWLEDGMENTS

We gratefully acknowledge the assistance and cooperation of many organizations and individuals who contributed to the field work and production of this paper. To Joachim Ziegler (DEI), Amnon Freidberg (TAU), Marion Kotrba and Hella Wendt (ZMHU) and Roy Danielsson (ZIL), and their institutions, which loaned specimens, we express our sincere thanks.

For reviewing a draft of this paper we thank Amnon Freidberg. A.L. Leonid Friedman helped with current spellings and transliterations of locality names in Israel. We are also grateful to David L. Pawson, former Associate Director for Science (USNM), Smithsonian Institution, for granting financial support from the Research Opportunity Fund to conduct field work in Israel.

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