

A REVIEW OF THE SHORE-FLY GENUS *AXYSTA* HALIDAY (DIPTERA: EPHYDRIDAE) WITH DESCRIPTION OF NEW SPECIES FROM AUSTRALIA, INDIA, AND THAILAND¹

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ABSTRACT: *Axysta austra* sp. n. from Australia, *A. indica* sp. n. from India, and *A. nikita* sp. n. from Thailand are described. The synonymy of *A. americana* Clausen with *A. nigrifacies* (Miyagi) is proposed. The genus *Axysta* is recorded from the Australasian and Oriental Regions for the first time. Keys to genera in Hyadinini and species of *Axysta* are provided, as are illustrations of all species.

KEY WORDS: Diptera, Ephydridae, *Axysta*, new species, Australia, India, Thailand

Specimens of *Axysta* are uncommon in collections and perhaps in nature, and discovery of specimens and undescribed species from the Australasian and Oriental Regions was wholly unexpected, especially as the genus was generally known to have a north temperate distribution (Clausen 1983, Mathis and Zatwarnicki 1995). Describing and otherwise documenting these species within the context of a species review is the primary purpose of this paper. This review was prompted when collections made by Dr. N. Vikhrev in Thailand were made available to us for study and one of the new species described below was discovered.

To facilitate identification of the genus, which is generally uncommon, we have included keys to the subtribes and genera within Hyadinini. We are reviewing *Axysta* rather than producing a more comprehensive revision because Clausen's (1983) thorough revision is largely current and valid for much of the world. His illustrations, which he graciously allowed us to use herein, should be consulted if there are questions about the identification of a species. We are essentially updating Clausen's revision with the addition of new taxa and new locality information.

The shore-fly genus *Axysta* Haliday (1839) currently includes seven species (three new species are added in this paper) that are found in both the Old and New Worlds (Mathis and Zatwarnicki 1995). Although the genus is generally widespread and is now known to occur in most biotic regions except the Afro- and Neotropics, the included species have relatively more restricted distributions: *A. cesta* (Haliday 1833) from Europe, *A. nigrifacies* Miyagi (1977) from Japan, *A. bradleyi* Cresson (1930) from the United States, and *A. americana* Clausen (1983) and *A. extera* (Cresson 1924) from the United States and Canada.

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Although the literature on *Axysta* is sparse, perhaps reflecting the paucity of specimens in collections, the genus-group name was proposed relatively early in the nomenclatural history of shore flies (Haliday 1839). Clausen (1983) reviewed this history in his revision. Since Clausen's revision, the genus was reported in a world catalog (Mathis and Zatwarnicki 1995) and in a review of Ilytheinae (Hollmann-Schirmmacher 1998), and some species have been noted in faunistic lists from various countries, as is noted in the synonymical listings for each species. Hollmann-Schirmmacher's review of the subfamily Ilytheinae mostly presented a revision of *Philygria* Stenhammar and his hypotheses concerning the phylogenetic relationships among the included genera. Hollmann-Schirmmacher (1998) confirmed the monophyly of Ilytheinae by essentially using the same characters that Zatwarnicki (1992) had proposed, but in addition, Hollmann-Schirmmacher suggested that Ilytheinae be divided into just two rather than three tribes. The tribe Ilytheini remained essentially unmodified, but Philygriini was made a junior synonym of Hyadinini, based primarily on conferring greater weight to some characters of the male genitalia. Hollmann-Schirmmacher's preferred classification is presented in a cladogram that has the genera *Nostima* and *Philygria* as the most derived, monophyletic lineage within Hyadinini and as the sister group of *Axysta*. We concur and adhere to the precedent of Zatwarnicki (1992), Hollmann-Schirmmacher (1998), and Edmiston and Mathis (2005) in recognizing the genera *Nostima* and *Philygria*, formerly in the tribe Philygriini, as being in the subfamily Ilytheinae and tribe Hyadinini.

We know virtually nothing about the immature stages or biology of *Axysta*.

METHODS

The descriptive terminology, with the exceptions noted in Mathis (1986) and Mathis and Zatwarnicki (1990a) and below, follows that published in McAlpine (1981). Specimens of *Axysta* are moderately small, and study and illustration of the male genitalia required use of a compound microscope. We have followed the terminology for most structures of the male genitalia that other workers in Ephyridae have used (see references in Mathis 1986; Mathis and Zatwarnicki 1990a, 1990b, Zatwarnicki 1996) except the term aedeagal apodeme has been replaced with the synonymous term phallapodeme.

Dissections of male and female genitalia and descriptions were performed using the method of Clausen and Cook (1971) and Grimaldi (1987). Microforceps were used to remove abdomens, which were macerated in a hot sodium hydroxide solution. Cleared terminalia were rinsed in distilled water and 70% ethanol and then transferred to glycerin for observation. If necessary for proper orientation, the specimen was transferred from glycerin to glycerine jelly. The glycerin jelly was heated, and the specimen appropriately oriented. After cooling, the embedded specimen in glycerin jelly became immobilized. For long-term storage, abdomens were placed in an attached plastic microvial filled with glycerin and attached to the pin supporting the remainder of the insect from which it was removed.

The species descriptions are composite and not based solely on the respective holotype.

Costal sections: Section I is the straight distance between the humeral cross-vein and the second costal break, just before the merger of vein R_1 with the costa; section II is the straight distance between the second costal break and the merger of vein R_{2+3} with the costa; section III is the straight distance between the merger of veins R_{2+3} and R_{4+5} .

Specimens examined for this study or where primary types are located are from:

ANSP	Academy of Natural Sciences of Philadelphia, Pennsylvania, USA.
AMS	Australian Museum, Sydney, Australia.
CAS	California Academy of Sciences, San Francisco, USA.
CSIRO	Commonwealth Scientific and Industrial Research Organisation, Canberra, Australia.
CUIC	Cornell University, Ithaca, New York, USA.
EIHU	Hokkaido University, Sapporo, Hokkaido, Japan.
MNHN	Muséum National d'Histoire Naturelle, Paris, France.
NHRS	Naturhistoriska Riskmuseet, Stockholm, Sweden.
NMI	National Museum of Ireland, Dublin, Ireland.
USNM	former United States National Museum, collections in the National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA.
WSU	Maurice T. James Collection, Department of Entomology, Washington State University, Pullman, Washington, USA.
ZMUM	Zoological Museum, Moscow University, Moscow, Russia.

SYSTEMATICS

Subfamily Ilytheinae Cresson

Ilytheinae Cresson 1943: 2 (as Ilytheini). Type genus: *Ilythea* Haliday in Curtis 1837.

Key to Subtribes and Genera of Hyadinini Phillips et al., 1949

1. Posterior notopleural seta inserted near ventral margin and at about same level as anterior seta (subtribe Hyadinina Phillips et al., 1949)2
 - Posterior notopleural seta inserted at conspicuously higher level than anterior seta (subtribe Philygrinina Lizarralde de Grosso 1989).....11
2. Vein R_{2+3} short, costal section II about 1/3 length of III, and with a stump vein. A single, proclinate, fronto-orbital seta*Parydroptera* Collin
 - Vein R_{2+3} longer, costal section II at least half section III, lacking a stump vein. Usually either a reclinate and proclinate or a laterocline fronto-orbital seta3
3. Costa extended to at most slightly beyond vein R_{4+5} . Tergite 4 at least 3X length of tergite 5*Axysta* Haliday

- Costa extended to vein M. Tergite 4 at most twice length of tergite 5.....4
- 4. Vein R_{2+3} long; costal section II nearly 3X length of III. Face flat or weakly carinate, not medially prominent. Flagellomere 1 rounded at apex above5
- Vein R_{2+3} short; costal section II less than twice length of III. Face with low conical median prominence. Flagellomere 1 usually angulate at apex above8
- 5. Both medial and lateral vertical setae well developed; fronto-orbital setae usually moderately well to well developed, laterocline (Holarctic)*Pelina* Haliday
- Only medial vertical seta present, lateral seta lacking; lacking well-developed fronto-orbital setae (Neotropical) (genus *Pelinoidea* Cresson).....6
- 6. Femora and palpus yellow to yellowish red; arista with dorsal rays, length of rays subequal to basal arista width; eye height about twice genal heightthe *pallipes* group
- Femora and palpus black or dark colored; arista mostly bare, if short hairs present, these shorter than basal arista width; eye height only slightly longer than genal height, sometimes smaller7
- 7. Tergite 4 bare, shiny, enlarged, length subequal to combined length of 2nd and 3rd tergites.....the *cyclocerus* group
- Tergite 4 microtomentose, appearing dull, at most subshiny, tergite length only slightly longer than 3rd.....the *sulcatus* group
- 8. Wing brown with about 14 distinct white spots.....*Pseudohyadina* Clausen
- Wing unmarked or with at most faint spots or clouds at apex of vein R_1 and on crossveins9
- 9. Tergite 4 from 1.3-2X length of tergite 5, both conspicuously punctate. Medial vertical seta present, lateral vertical seta absent. Lateral margins of scutellum not densely microtomentose, not appearing velvety*Lytogaster* Becker
- Tergite 4 subequal in length to tergite 5, neither conspicuously punctate. Usually both medial and lateral vertical setae present, if lateral absent then lateral margins of scutellum densely microtomentose, appearing velvety10
- 10. Dorsocentral seta 1. Lacking well-developed, fronto-orbital setae*Hyadina* Haliday
- Dorsocentral setae 2. One, well-developed, laterocline, fronto-orbital seta*Parahyadina* Tonnoir and Malloch
- 11. Lateral vertical seta lacking; fronto-orbital setae lacking...*Garifuna* Mathis
- Both medial and lateral vertical setae usually present; fronto-orbital seta present, sometimes reduced.....12
- 12. Arista bare or minutely haired; 2 rows of facial setae. Presutural or sutural dorsocentral seta present*Philygria* Stenhammar
- Arista short- to long-haired; 1 row of facial setae. Presutural or sutural dorsocentral seta lacking*Nostima* Coquillett

Genus *Axysta* Haliday

Axysta Haliday 1839: 406 (as a subgenus of *Ephydra*). Type species: *Hydrina viridula* Robineau-Desvoidy 1830 (= *Ephydra cesta* Haliday 1833), monotypy.—Loew 1860: 28 [generic status].—Wirth 1965: 751-752 [Nearctic catalog].—Clausen 1983: 59-72 [revision of Nearctic species].—Canzoneri and Meneghini 1983: 131-132 [fauna of Italy].—Cogan 1984: 157-158 [Palearctic catalog].—Mathis and Zatwarnicki 1995: 200-201.—Hollmann-Schirmacher 1998: 29-31 [revision].

Microlytogaster Clausen 1983: 72. Type species: *Lytogaster extera* Cresson 1924, original designation.—Mathis and Zatwarnicki 1995: 200 [synonymy].
 Diagnosis.—*Axysta* is distinguished from other genera of the tribe Hyadini by the following combination of characters: Small to moderately small shore flies, body length, 1.40-2.25 mm; mostly shiny black, setation generally weakly developed. *Head*: Fronto-orbital setae present or absent, if present, laterocline; ocellar setae well developed; medial vertical seta well developed, lateral seta absent; arista mostly bare, if short hairs present, these shorter than basal arisal width. Face in lateral view almost straight to rather convex, anterior oral margin just ventrad or slightly anterior to antennal bases; facial protuberance (carina) small, usually polished, extended slightly beyond anterior oral margin; face black with dense silvery or grayish to sometimes golden microtomentum; oral margin without setae; genal height subequal to height of basal flagellomere; maxillary palpus yellow or black. *Thorax*: Setation generally reduced; 1 dorsocentral seta. Lateral margins of scutellum not densely microtomentose, not appearing velvety; katepisternum densely microtomentose, usually whitish to gray. Wing generally hyaline or very faintly infumate, lacking a maculation pattern; costa extended at most to slightly beyond vein R_{4+5} ; vein R_{2+3} moderately long, costal section II at least half section III, lacking a stump vein. Femora black (species in north temperate) or yellow (*A. indica*, forefemur of *A. nikita*). *Abdomen*: Generally shiny; tergite 4 at least 3X length of tergite 5. Male terminalia: Epandrium narrowed dorsally, a thin band only; aedeagus and phallapodeme unfused; subepandrial plate complete; gonite slender, elongate, almost straight to conspicuously curved, apex acutely and narrowly pointed.

Key to Species of *Axysta*

1. Legs, including tarsi, yellow, except darkened mid- and hindfemoral apices (India) *A. indica* sp.n.
- Legs at least partially black 2
2. Basal flagellomere entirely black; arista black; 1 large fronto-orbital seta ... 3
- Basal flagellomere black dorsally, yellowish basoventrally; lacking a fronto-orbital seta 5
3. Abdomen rough dorsally with fine punctures and yellow setae but lacking conspicuous pits, not dorsoventrally flattened, lateral margins of tergites

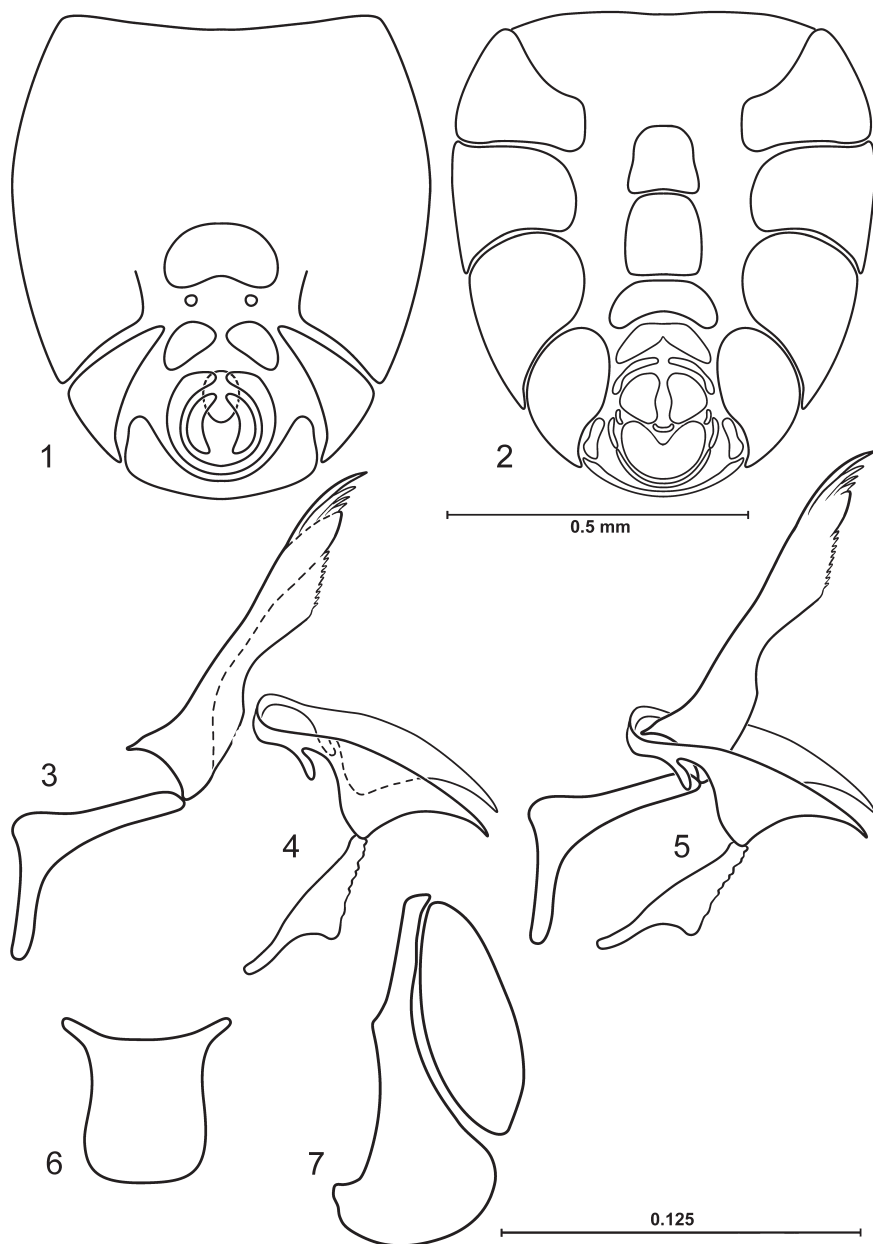
- rounded; 1 fronto-orbital seta and 2-4 setulae (northern Nearctic Region).....*A. extera* (Cresson)
- Abdomen with conspicuous pits, each bearing a long, yellow seta, moderately dorsoventrally flattened with lateral margins of tergites sharply creased; 1 fronto-orbital seta4
4. Midfacial carina completely silvery microtomentose (Europe).....*A. cesta* Haliday
- Midfacial carina bare or with sparse microtomentum (northern Nearctic Region, eastern Palearctic Region)*A. nigrifacies* (Miyagi)
5. Midfacial carina with sparse, silvery microtomentum. Scutellum without apical papillae (southeastern United States).....*A. bradleyi* Cresson
- Midfacial carina shiny black. Apical scutellar setae arising from conspicuous apical papillae (Australia, Thailand)6
6. Basal flagellomere elongate, narrowly rounded apically; palpus yellow, forefemur yellow (Thailand)*A. nikita* sp. n.
- Basal flagellomere round; palpus black, forefemur black (Australia).....*A. austra* sp. n.

Axysta austra Krivosheina and Mathis, new species

Figs. 1-7

Diagnosis.—This species is distinguished from congeners by the following combination of characters: palpus black, basal flagellomere round, legs generally black with yellowish tarsi, and presence of apical, scutellar papillae.

Description. Male body length 1.75 mm, wing length 1.85 mm. *Head*: shiny black with silvery microtomentum except as noted; orbital setae absent; frons shiny black with ocellar triangle and anterior narrow band silvery microtomentose, face convex on ventral half, silvery microtomentose except shiny black carina; occiput silvery microtomentose as 2 stripes divided with narrow black area, parafacial setulae in 2 rows: lateral row of 8 setulae thin, short, curved dorsally and outwardly; medial row of 3 setulae more well developed, convergent. Clypeus with silvery microtomentum; palpus black. Antennal scape and pedicel black, basal flagellomere round, 1.2X as long as wide, yellow, darkened dorsoapically; arista black. *Thorax*: Shiny black, smooth, with rather dense coppery microtomentum; scutum shiny black with coppery microtomentum; with 2 indistinct stripes; anepisternum completely silvery microtomentose; anepimeron shiny black; katepisternum silvery microtomentose, as anepisternum. Anepisternal setae not developed. Scutellum black, transversely rugose dorsally with rather sparse coppery microtomentum; posterior margin rather truncate and blunt apically, with 2 apical papillae. Wing hyaline, faintly brownish; costa extended slightly beyond vein R_{4+5} ; costal section II 0.86X costal section III; halter dirty-white, knob darkened. Legs with all femora and tibiae black, all tarsi yellow with apical tarsomeres darkened. *Abdomen*: Shiny black, sparsely coppery microtomentose, with conspicuous pits, each bearing a long yellow seta. Sternite 5 of



Figs. 1-7. *Axysta austra* sp. n. Australia. Queensland: The Boulders (W. of Babinda). 1. Male abdomen, terminal segments, ventral view. 2. Female abdomen, ventral view. 3. Aedeagus and phallapodeme, lateral view. 4. Gonites and hypandrium, lateral view. 5. Internal male terminalia, lateral view. 6. Hypandrium, ventral view. 7. Epandrium and cercus, lateral view.

male (Fig. 1) divided medially in 2 symmetrical parts, each more or less as isosceles triangular with rounded angles, posteromedial side longest, also with very small, circular sclerite at anterior margin; sternite 4 wider than long, posterior margin shallowly emarginate. Male terminalia (Figs. 1, 3-5, 7): Epandrium in lateral view (Fig. 7) as a narrow strap dorsally, ventral half becoming much wider, posterior margin shallowly convexly arched, ventral width greater than width of cercus in lateral view; cercus narrowly oval in lateral view; sclerotized portion of aedeagus in lateral view (Figs. 3, 5) generally narrow, angulate, L-shaped, widest at angle, otherwise arms narrow, basal arm longer than apical arm; phallopodeme in lateral view (Figs. 3, 5) elongate and narrow, pointed apically, base shallowly concave, ventral side even, nearly straight, dorsal side irregular; gonite in lateral view triangular, acutely pointed and shallowly curved apically; hypandrium in ventral view (Fig. 6) subrectangular, with anterolateral angles rounded and posterolateral angles narrowly produced, in lateral view (Figs. 4, 5) elongate, widest medially as obtuse angle. Female abdomen as in Fig. 2.

Type material.—The holotype male is labeled “AUSTRALIA. QLD: The Boulders (W. of Babinda; 17°20.5'S, 145°52.2'E; 70m) 23 Sep 2002, D&W Mathis/HOLOTYPE ♂ *Axysta austra* Krivosheina & Mathis AM [red].” The holotype is double mounted (minuten in a block of plastic), is in excellent condition, and is deposited in the AMS. One male paratype (USNM) bears the same locality label data as the holotype (abdomen removed, dissected, parts in an attached microvial). Other paratypes are as follows: Australia. New South Wales: Narrabeen Lake, Sydney (33°42.7'S, 151°17.1'E), 18 Sep 1960, Z. Liepa (1♀; CSIRO). Queensland: Ravenshoe (8 km W; 17°38.5'S, 145°24.2'E; 780 m), 6 Nov 1962, E. S. Ross and D. O. Cavagnaro (1♀; CAS).

Distribution.—Australasian: Australia (New South Wales, Queensland).

Etymology.—The species epithet, *austra*, is of Latin derivation and means southern, in reference to the distribution of this species in the southern hemisphere.

Axysta bradleyi Cresson

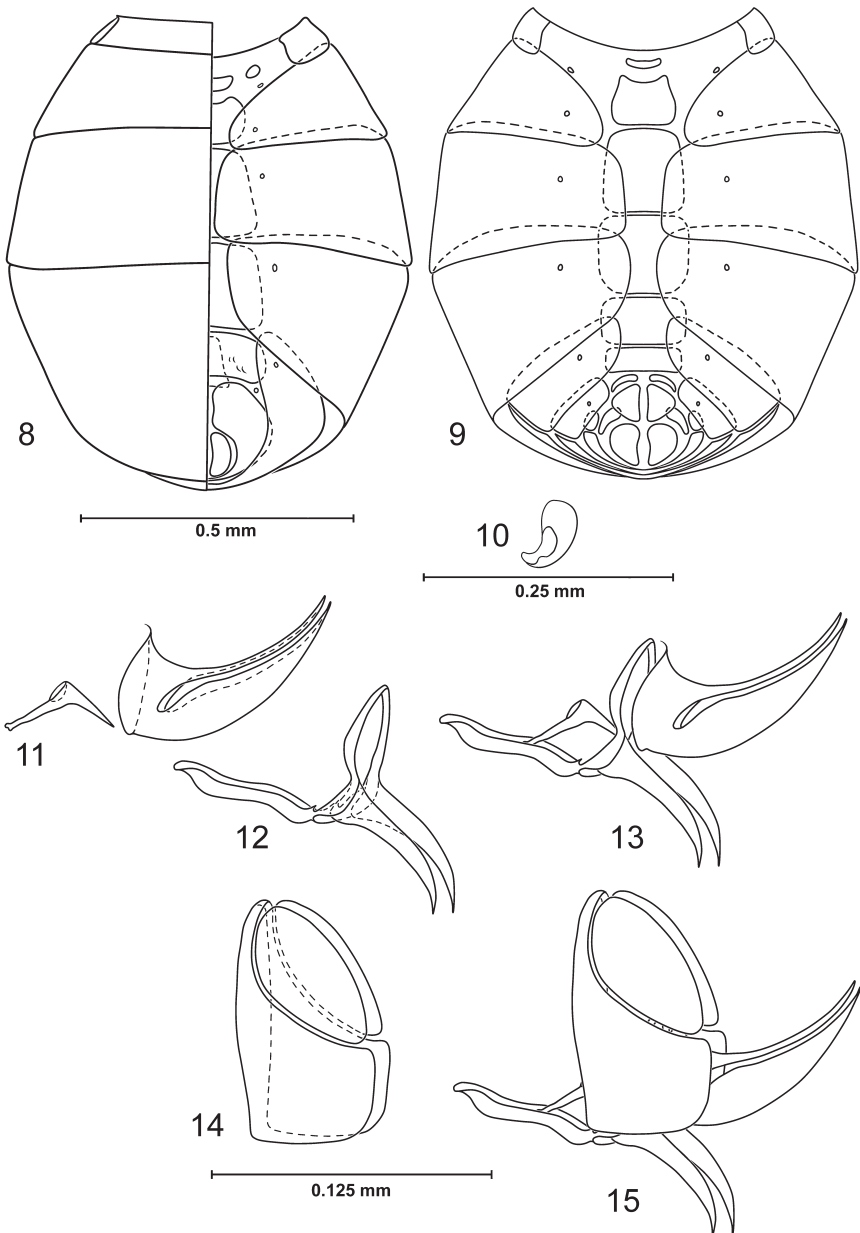
Figs. 8-15

Axysta bradleyi Cresson 1930: 79 [United States. Georgia. Ware: Waycross (31°12.5'N, 82°21.7'W); HT ♂, CUIC].—Wirth 1965: 751 [Nearctic catalog].—Clausen 1983: 69-70 [revision].—Mathis and Zatwarnicki 1995:

201 [world catalog].

Hyadina bradleyi.—Sturtevant and Wheeler 1954: 211 [generic combination].

Diagnosis.—This species is distinguished from congeners by the following combination of characters: *Head*: Basal flagellomere elongate, narrowly rounded apically, black dorsally, yellowish basoventrally; arista white to yellowish; fronto-orbital seta lacking. Midfacial carina with sparse, silvery microtomentum. *Thorax*: Scutellum without apical papillae. Anepisternum and anepimeron shiny,



Figs. 8-15. *Axysta bradleyi*. 8. Male abdomen, dorsal view left, ventral view right. 9. Female abdomen, ventral view. 10. Female ventral receptacle, lateroblique view. 11. Aedeagus and phallapodeme, lateral view. 12. Gonites and hypandrium, lateral view. 13. Internal male terminalia, lateral view. 14. Epandrium and cercus, lateral view. 15. Male terminalia, lateral view.

mostly to entirely bare of microtomentum. *Abdomen*: Tergites with conspicuous pits, moderately dorsoventrally flattened with lateral margins of tergites creased, sharply angulate. Male terminalia (Figs. 8, 11-15): Ventral portion of epandrium robustly developed, as high as wide, height equal or greater than width of cerci; aedeagus in lateral view deeply bilobed, both dorsal and ventral portions elongate and acutely pointed, dorsal portion much thinner; phallapodeme narrowly triangular; hypandrium shorter than length of cerci. Female abdomen as in Figs. 9-10.

Distribution.—Nearctic: United States (Georgia, Florida, New Jersey, Ohio, South Carolina, Tennessee, Virginia).

Axysta cesta (Haliday)

Figs. 16-23

Ephydra cesta Haliday 1833: 177 [Great Britain. Northern Ireland. Down: Holywood (54°38.5'N, 5°49.8'W); LT ♂ (designated by Clausen 1983: 71), NMI].

Axysta cesta.—Loew 1860: 28 [generic combination].—Ardö 1957: 132 [ecology, Norway, Sweden].—Becker 1896: 167 [review]; 1926: 47 [review].—de Meijere 1907: 311 [catalog, Netherlands].—Cresson 1930: 101 [list, Germany].—Séguy 1934: 412 [review, France].—Papp 1975: 96 [review, Hungary].—Canzoneri and Meneghini 1983: 132 [review, Italy].—Clausen 1983: 70-72 [revision].—Huldén 1983: 64 [parasite: *Stigmatomyces axystae* Huldén (Laboulbeniaceae)].—Cogan 1984: 157-158 [Palearctic catalog].—deCourcy Williams and O'Connor 1989: 64 [notes on Haliday's collection].—Zatwarnicki 1991: 221 [checklist, Poland].—Mathis and Zatwarnicki 1995: 201 [world catalog].—Zatwarnicki and Hollmann-Schirmacher 1995: 42 [list, Switzerland].—Hollmann-Schirmacher 1998: 29-31 [revision].

Hyadina cesta.—Sturtevant and Wheeler 1954: 211 [generic combination, review, Nearctic].

Hyadina (Axysta) cesta.—Dahl 1959: 138 [biology, morphology, Norway, Sweden].

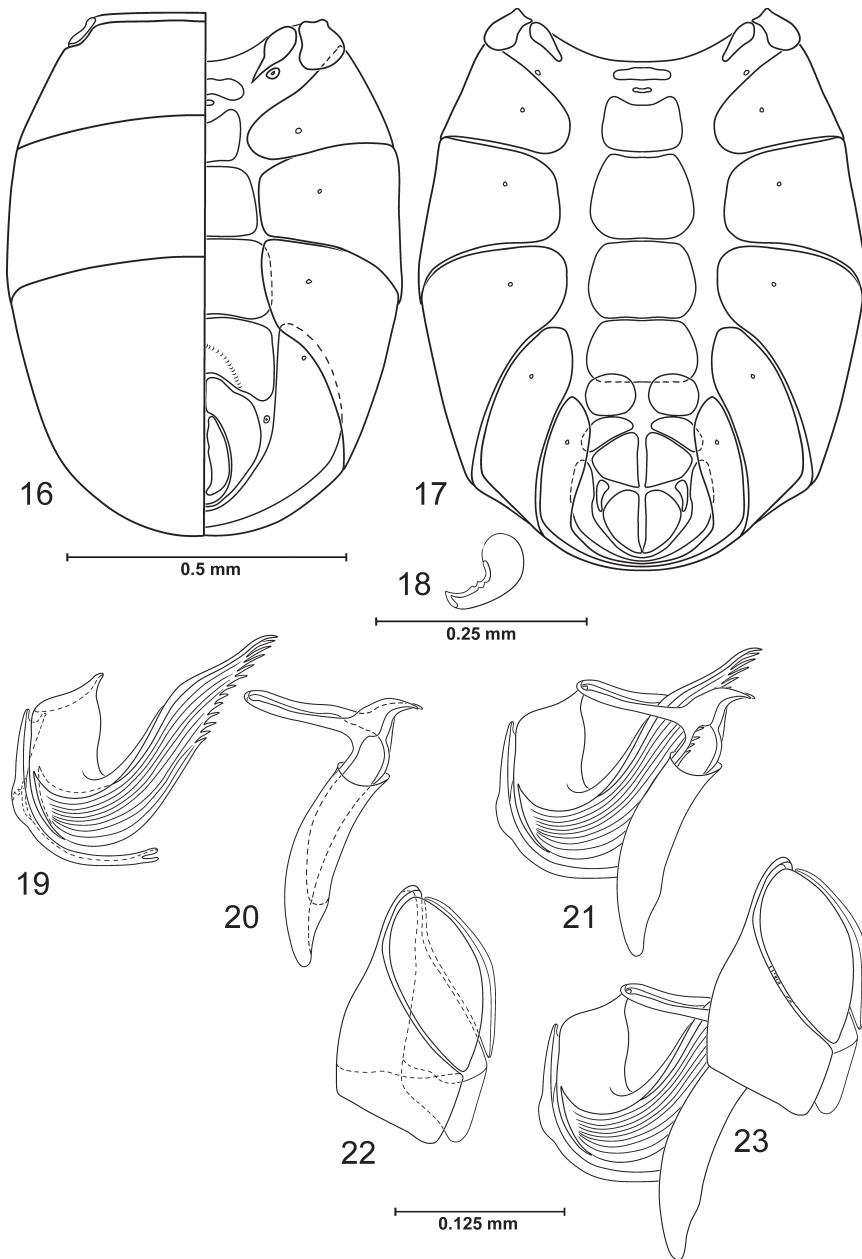
Hydrina viridula Robineau-Desvoidy 1830: 795 [not given (? France); ST (sex ?), MNHN (apparently destroyed)].—Schiner 1863: 255 [synonymy].

Ephydra (Axysta) viridula.—Haliday 1839: 406 [generic combination, Ireland].

Trimerina coeruleiventris Macquart 1835: 529 [France. "Du nord de la France"; ST (sex ?), MNHN].—Haliday 1839: 407 [synonymy].

Notiphila (Philygria) punctulata Stenhammar 1844: 241 [Sweden. "Uplandia ad Holmiam, Ostrogothia, Scania"; ST ♂♀, NHRS].—Haliday in Walker 1856: 345 [synonymy with *Hydrina viridula* Robineau-Desvoidy].—Loew 1860: 28 [synonymy with *Ephydra cesta* Haliday].

Diagnosis.—This species is distinguished from congeners by the following combination of characters: *Head*: Basal flagellomere short, only slightly longer than high, bluntly rounded apically, entirely black; arista black; 1 laterocline



Figs. 16-23. *Axysta cеста*. 16. Male abdomen, dorsal view left, ventral view right. 17. Female abdomen, ventral view. 18. Female ventral receptacle, lateroblique view. 19. Aedeagus and phallapodeme, lateral view. 20. Gonites and hypandrium, lateral view. 21. Internal male terminalia, lateral view. 22. Epandrium and cercus, lateral view. 23. Male terminalia, lateral view.

fronto-orbital seta. Midfacial carina mostly sparsely or moderately densely, silvery microtomentose. *Thorax*: Scutellum without apical papillae. Anepisternum sparsely to moderately densely microtomentose, less so posterodorsally; anepimeron largely shiny, at most very sparsely microtomentose anteriorly to almost entirely bare of microtomentum posteriorly. *Abdomen*: Tergites with conspicuous pits, moderately dorsoventrally flattened with lateral margins of tergites creased, sharply angulate; sternite 5 as a parallelogram, posterior margin broadly but shallowly V-shaped. Male terminalia (Figs. 16, 19-23): Ventral portion of epandrium robustly developed, as high as wide; aedeagus in lateral view relatively large, deeply curved, multilobed, layered, with lateral slits and broad, dentate apex; phallapodeme elongate, conspicuously arched in lateral view; hypandrium elongate and narrow, forming a tubular sheath around length of aedeagus. Female abdomen as in Figs. 17-18.

Distribution.—Palearctic: Austria, Belgium, Czech Republic, Finland, France, Germany, Great Britain, Hungary, Ireland, Italy, Kazakhstan, Netherlands, Norway, Poland, Russia (European Territory, Far East, Yakutia [Sakha], and southern Primorye), Sweden, Switzerland.

Axysta exera (Cresson)

Figs. 24-31

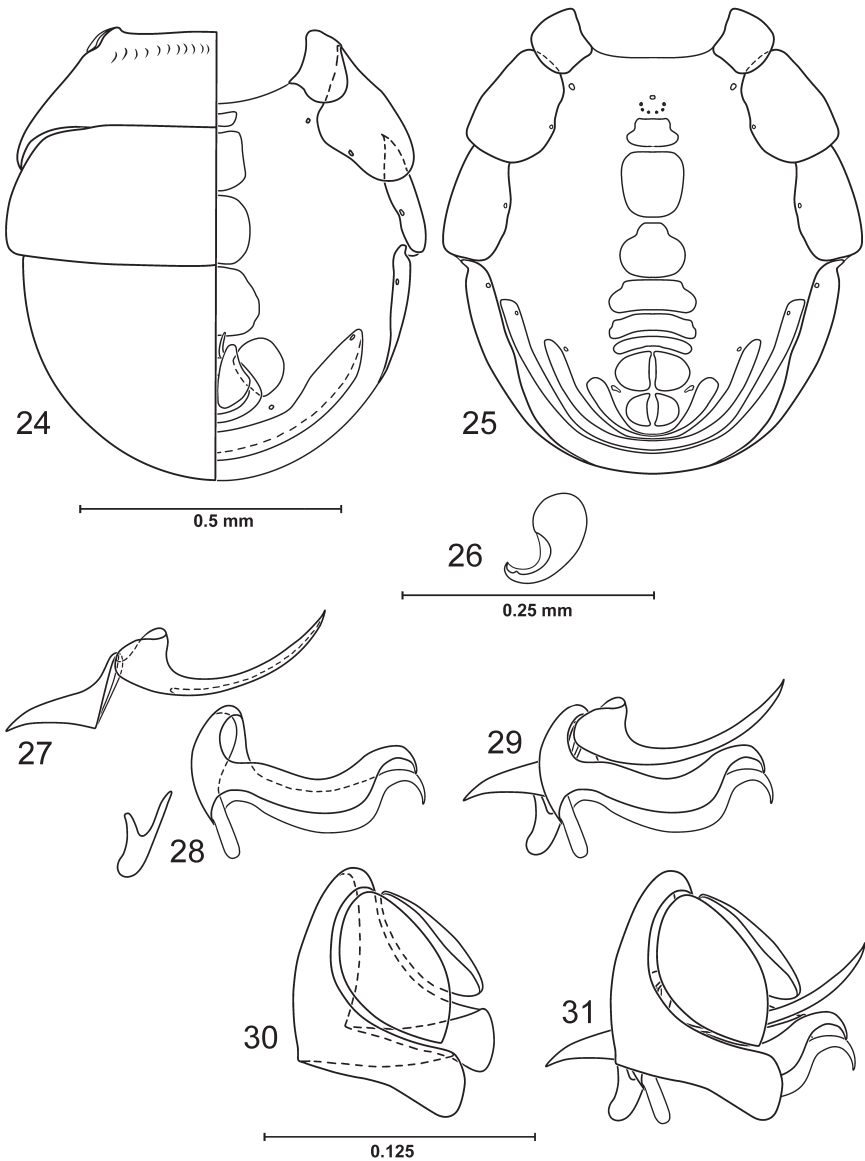
Lytogaster exera Cresson 1924: 162 [United States. New Jersey. Mercer: Trenton (40°13.2'N, 74°45.8'W); HT ♂, ANSP (6315)].

Axysta exera.—Wirth 1965: 752 [Nearctic catalog; generic combination].—Scheiring and Foote 1973: 162 [natural history].—Mathis and Zatwarnicki 1995: 201 [world catalog].—Hollmann-Schirmacher 1998: 31-32 [revision].

Microlytogaster exera.—Clausen 1983: 74-75 [generic combination, revision].

Diagnosis.—This species is distinguished from congeners by the following combination of characters: *Head*: Basal flagellomere short, only slightly longer than high, bluntly rounded apically, entirely black; arista black; 1 laterocline fronto-orbital seta. Midfacial carina with sparse, silvery microtomentum, appearing subshiny. *Thorax*: Scutellum without apical papillae. Anepisternum and anepimeron shiny, mostly to entirely bare of microtomentum. *Abdomen*: Abdomen rough dorsally with fine punctures and yellow setae, but lacking conspicuous pits, not dorsoventrally flattened, lateral margins of tergites rounded. Male terminalia (Figs. 24, 27-31): Ventral portion of epandrium (ventrad of cerci) in lateral view relatively short vertically, but horizontally elongate, height less than width of cerci, forming right angle with anterior, dorsal extension; aedeagus in lateral view as a single, elongate, thin, shallowly curved, acutely pointed process; phallapodeme moderately narrowly triangular; hypandrium greatly reduced, length only slightly greater than greatest width. Female abdomen as in Figs. 25-26.

Distribution.—Nearctic: Canada (Ontario, Quebec), United States (Alaska, Colorado, Connecticut, Iowa, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Jersey, North Dakota, Ohio, Wisconsin).



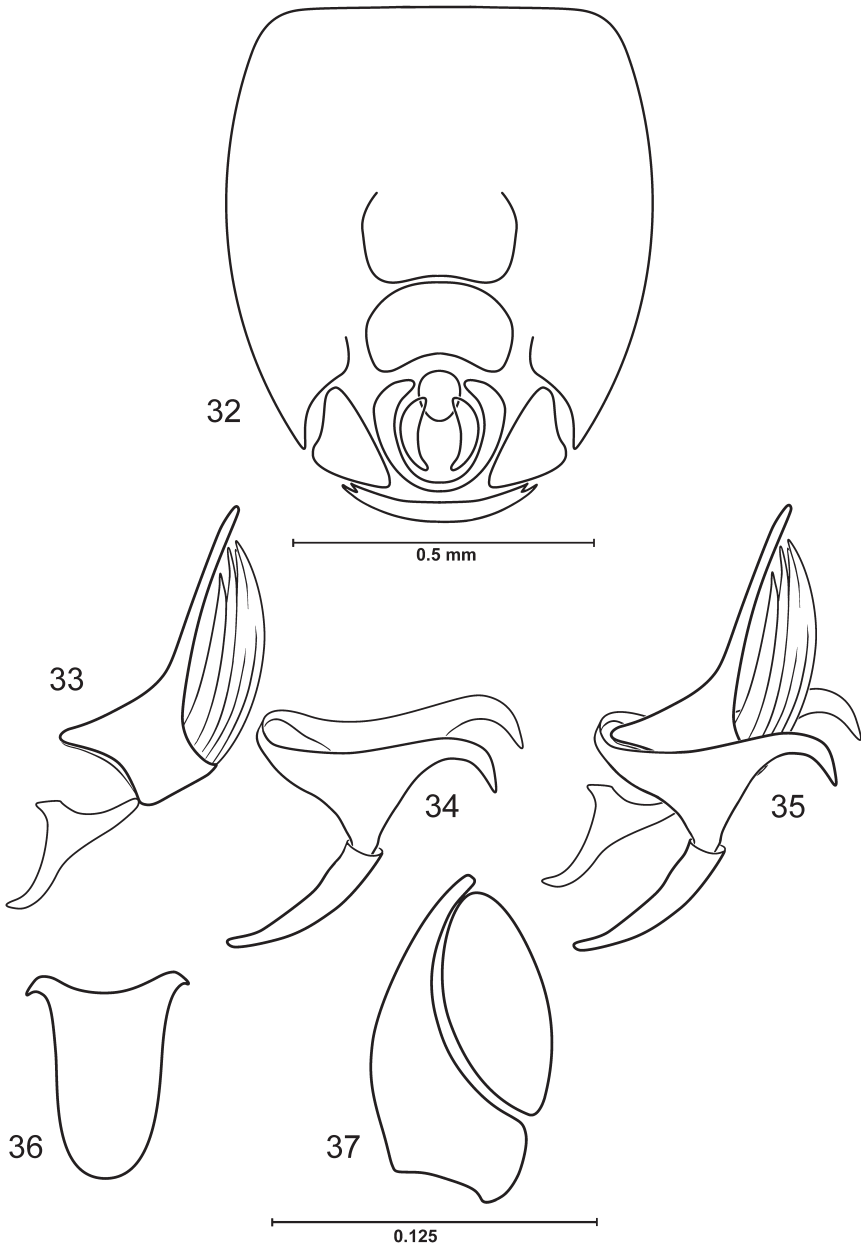
Figs. 24-31. *Axysta extera*. 24. Male abdomen, dorsal view left, ventral view right. 25. Female abdomen, ventral view. 26. Female ventral receptacle, lateroblique view. 27. Aedeagus and phallapodeme, lateral view. 28. Gonites and hypandrium, lateral view. 29. Internal male terminalia, lateral view. 30. Epandrium and cercus, lateral view. 31. Male terminalia, lateral view.

Axysta indica Krivosheina and Mathis, new species

Figs. 32-37

Diagnosis.—This species is distinguished from congeners by the following combination of characters: occipital spots silvery, contrasted with coppery ocellar triangle, katapisternum silvery, contrasted with coppery surface of thorax, legs yellow, and apical scutellar papillae lacking.

Description. Male body length 1.35 mm, wing length 1.35 mm. *Head:* Shiny black, coppery microtomentose except as noted; orbital setae absent; frons shiny black with ocellar triangle and anterior narrow band coppery microtomentose; upper occiput with 2 central silvery spots, brightly differing from coppery coloration of frons; face convex on ventral half, densely silvery microtomentose except shiny black parafacials; carina silvery microtomentose; parafacial setae in 2 rows: lateral row of 5 thin, short setulae curved dorsally and outwardly; medial row of 3 setulae more well developed, convergent. Clypeus silvery microtomentose; palpus yellow. Antennal scape and pedicel yellow, basal flagellomere and arista missing. *Thorax:* Shiny black, smooth, with rather dense coppery microtomentum, no stripes; scutum shiny black, coppery microtomentose; anepisternum coppery microtomentose; anepimeron shiny black with sparse microtomentum; katapisternum densely silvery microtomentose, distinctly contrasted with other thoracic surfaces. Anepisternal setae not developed. Scutellum black, transversely rugose dorsally with rather sparse coppery microtomentum; posterior margin rather truncate and blunt apically, lacking apical papillae. Legs including tarsi yellow except mid- and hindfemoral apices darkened. Wing hyaline, faintly brownish; costa extends slightly beyond vein R_{4+5} ; costal section II 0.83X costal section III; stem of haltere yellow, knob black. *Abdomen:* Shiny black, sparsely coppery microtomentose, with conspicuous pits, each bearing yellow seta. Sternite 5 of male (Fig. 32) undivided, wider than long, posterior margin emarginate, very shallowly and broadly V-shaped; sternite 4 with posterior margin very shallowly concave. Male terminalia (Figs. 33-37): Epandrium in lateral view (Fig. 37) as a narrow strap dorsally, ventral half becoming much wider, posterior margin shallowly concave, ventral width greater than width of cercus in lateral view; cercus in lateral view narrowly elliptical; sclerotized portion of aedeagus in lateral view (Figs. 33, 35) with base subquadrate, basoposterior angle somewhat produced, basoanterior and apicoanterior angles nearly right angles, apical 2/3 of aedeagus very narrowly produced, parallel sided, elongate, aedeagus also with striated apical extension, 4X longer than wide, apex deeply and sharply dentate; phallopodeme in lateral (Figs. 33, 35) elongate, both apices narrowly produced, medial keel narrowly extended, angularly truncate; gonite in lateral view triangular, wide basally, ventral extension becoming narrowed with apex conspicuously curved and acutely pointed; hypandrium in ventral view (Fig. 36) subrectangular, with anterior margin rounded and posterolateral angles narrowly produced and slightly recurved, in lateral view (Figs. 34-35) elongate, widest posteriorly, narrowed toward anterior margin.



Figs. 32-37. *Axysta indica* sp. n. (India. Assam: Digboi (9.7 km NW)). 32. Male abdomen, terminal segments, ventral view. 33. Aedeagus and phallapodeme, lateral view. 34. Gonites and hypandrium, lateral view. 35. Internal male terminalia, lateral view. 36. Hypandrium, ventral view. 37. Epandrium and cercus, lateral view.

Type material.—The holotype male is labeled “INDIA, Assam, 6 mi NW Digboi, III-30-1944 D.E. Hardy/HOLOTYPE ♂ *Axysta indica* Krivosheina & Mathis USNM [red].” The holotype is double mounted (glued to paper triangle), is in good condition (end of abdomen removed, dissected, and in an attached microvial; basal flagellomere and arista missing), and is deposited in the USNM.

Type locality.—India. Assam: Digboi (9.7 km NW; 27°22.7'N, 95°37'E).

Distribution.—Oriental: India (Assam).

Etymology.—The species epithet, *indica*, has reference to the country where the holotype was collected and is a noun in apposition.

Axysta nigrifacies (Miyagi)

Figs. 38-45

Hyadina nigrifacies Miyagi 1977: 80 [Japan. Hokkaido: Sapporo (43°03.7'N, 141°21.3'E); HT ♀, EIHU].—Cogan 1984: 159 [Palearctic catalog].

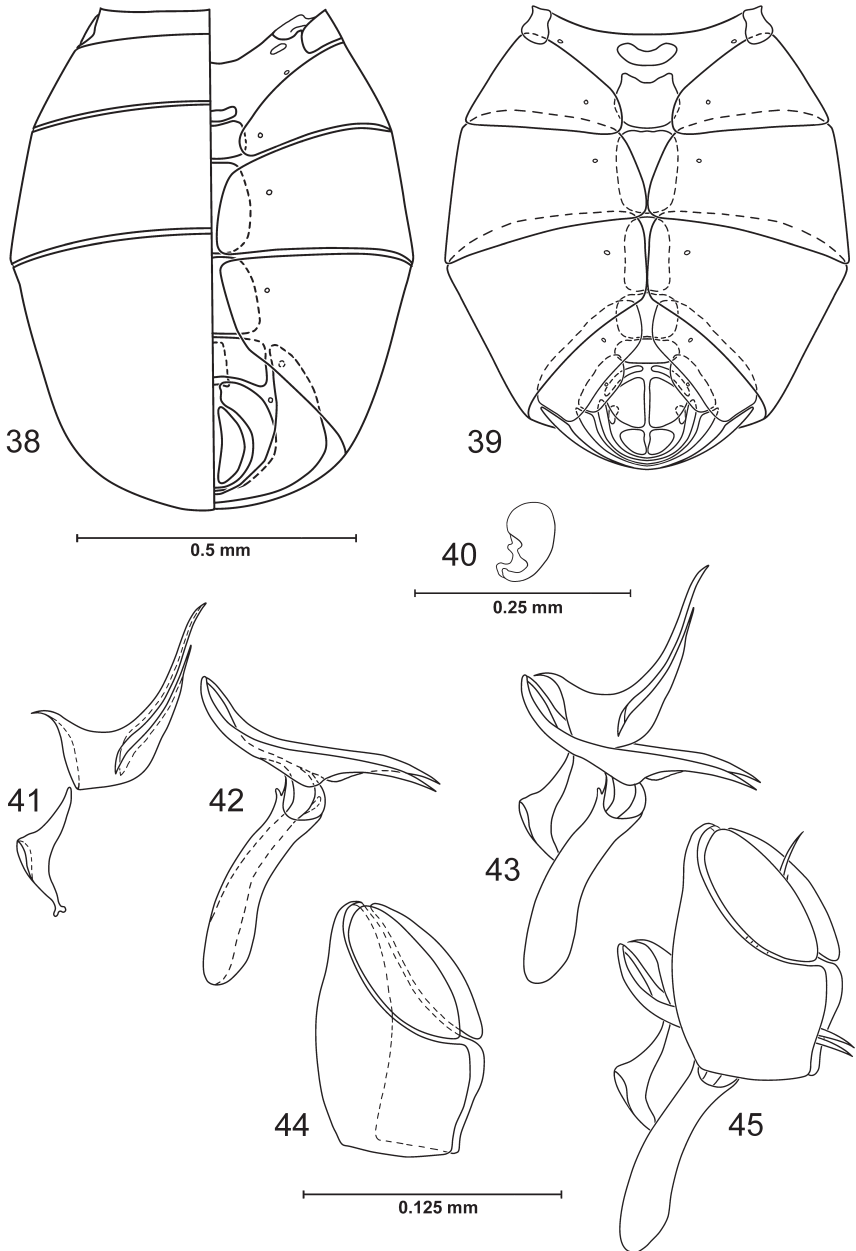
Axysta nigrifacies.—Zatwarnicki 1991: 318 [generic combination].—Mathis and Zatwarnicki 1995: 201 [world catalog].

Axysta americana Clausen 1983: 66 [United States. Washington. Pierce: Mt Rainier National Park, Sunshine Point Campground (pool, 5.2 km NE; 46°45'N, 121°49'W); HT ♂, WSU].—Mathis and Zatwarnicki 1995: 200 [world catalog]. New Synonym.

Diagnosis.—This species is distinguished from congeners by the following combination of characters: *Head*: Basal flagellomere short, only slightly longer than high, bluntly rounded apically, entirely black; arista black; 1 laterocline, fronto-orbital seta. Midfacial carina variable from completely bare to sparsely or moderately densely, silvery microtomentose. *Thorax*: Scutellum without apical papillae. Anepisternum sparsely to moderately densely microtomentose, less so posterodorsally; anepimeron largely shiny, at most very sparsely microtomentose anteriorly to almost entirely bare of microtomentum posteriorly. *Abdomen*: Tergites with conspicuous pits, moderately dorsoventrally flattened with lateral margins of tergites creased, sharply angulate. Male terminalia (Figs. 38, 41-45): Ventral portion of epandrium robustly developed, as high as wide; aedeagus in lateral view deeply bilobed, both dorsal and ventral portions elongate and acutely pointed, dorsal portion longer and thinner than more robust ventral portion; phallapodeme moderately narrowly triangular; hypandrium elongate, length subequal to length of cerci. Female abdomen as in Figs. 39-40.

Distribution.—Nearctic: Canada (British Columbia, Manitoba, Newfoundland, Northwest Territories, Ontario, Quebec), United States (Alaska, Massachusetts, Minnesota, Montana, New Jersey, New York, Ohio, Oregon, Utah, Washington, Wisconsin). Palearctic: Japan (Hokkaido).

Remarks.—This species was initially described in the genus *Hyadina* (Miyagi 1977) and was later transferred to *Axysta* (Zatwarnicki 1991, Mathis and Zatwarnicki 1995), which we reconfirm here. The conspecificity of *A. nigrifacies* with *A. americana* was determined from direct comparison of the female holotype and



Figs. 38-45. *Axysta nigrifacies*. 38. Male abdomen, dorsal view left, ventral view right. 39. Female abdomen, ventral view. 40. Female ventral receptacle, lateroblique view. 41. Aedeagus and phallapodeme, lateral view. 42. Gonites and hypandrium, lateral view. 43. Internal male terminalia, lateral view. 44. Epandrium and cercus, lateral view. 45. Male terminalia, lateral view.

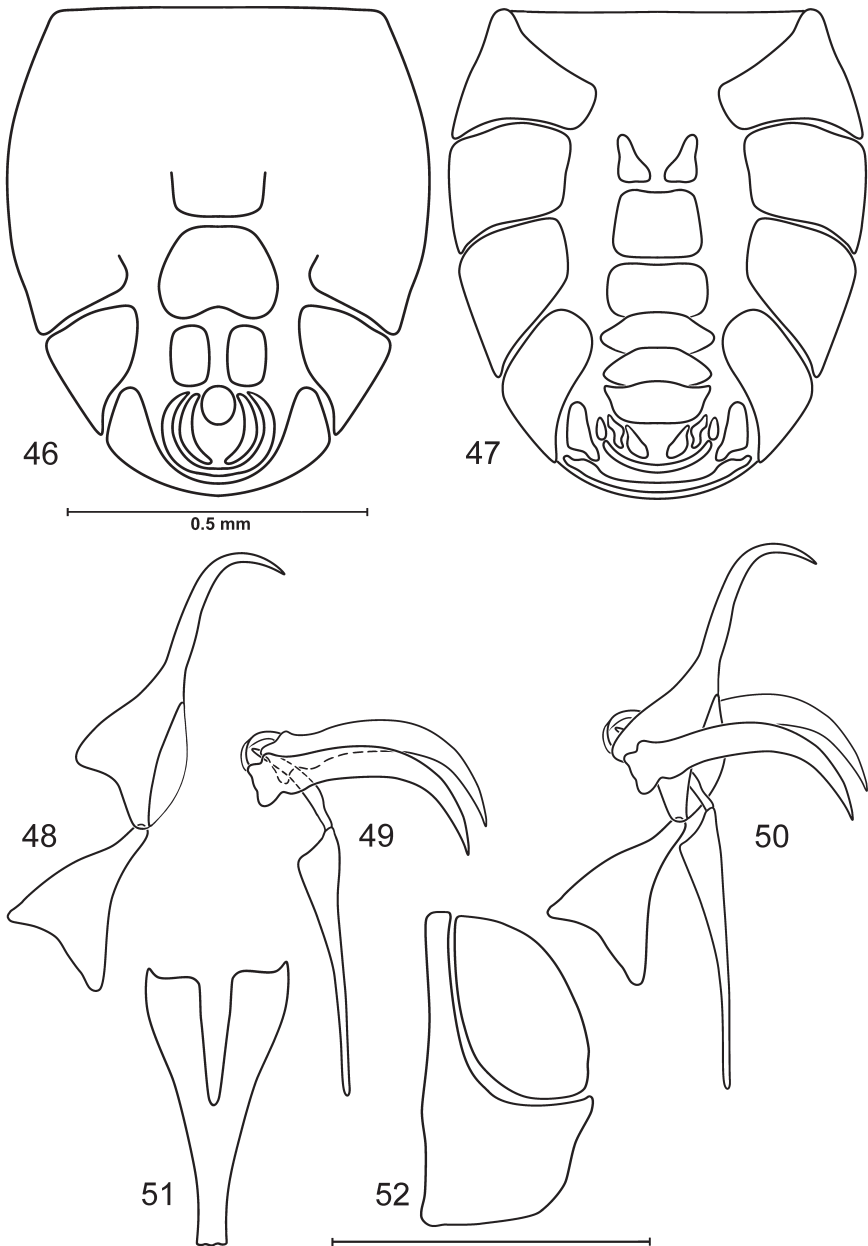
paratype of *A. nigrifacies*, kindly loaned to us by I. Miyagi, with specimens of *A. americana*. This is the first example of a Holarctic species in *Axysta*.

Axysta nikita Krivosheina and Mathis, new species

Figs. 46-52

Diagnosis.—This species is distinguished from congeners, especially *A. bradleyi*, by the following combination of characters: arista black, pleura partially shiny, tibiae yellow, and presence of apical papillae on scutellum.

Description.—Wing length: 1.75 mm, body length 1.5 mm. **Head:** Shiny black with silvery microtomentum except as noted; frons shiny black with ocellar triangle and narrow, anterior margin of frons silvery microtomentose. Scape black, pedicel yellow dorsally darkened, flagellomere 1 yellow with narrow dorsal portion black; flagellomere 1 elongated, 2 times as long as wide; arista black. Face convex in the lower half, with silvery microtomentum except shiny black carina; clypeus with silvery microtomentum, palpus yellow. Head setation reduced: fronto-orbital setae absent; 1 ocellar seta; 1 medial vertical seta, lateral vertical seta lacking; parafacial setae in 2 rows, 4-5 curved dorsally and outwardly curved thinner and shorter outer setae and 3 convergent stronger inners. **Thorax:** Shiny black, smooth, with rather dense silvery and coppery microtomentum, no stripes; scutum shiny black on the anterior third with coppery microtomentum on rest of surface. Anepisternum with sparse, silvery microtomentum except the ventral half; anepimeron partially shiny black; katepisternum with silvery microtomentum same as on anepisternum. Anepisternal setae not developed. Scutellum shiny black, transversely rugose dorsally with rather sparse coppery microtomentum; rather truncate and blunt apically; with 2 apical papillae at base of strong apical setae, lateral setae much weaker and shorter. Wing hyaline to faintly brownish; costa extended slightly beyond vein R_{4+5} ; costal section II 0.65X section III; halter dirty-white. Forefemur yellow, mid and hind femora black except apices, all tibiae yellow, hindtibia with indistinct dark medial band, all tarsi yellow with apical 2 foretarsomeres darkened and 1 apical mid- and hindtarsomeres darkened. **Abdomen:** Shiny black, with sparse coppery microtomentum, with conspicuous pits, each bearing a long yellow seta. Sternite 5 of male (Fig. 46) divided medially in 2 symmetrical parts, each rectangular with angles rounded; sternite 4 about as long as wide, posterior margin emarginate medially, lateral margins arched. Male terminalia (Figs. 46, 48-52): Epandrium in lateral view (Fig. 52) as a narrow strap dorsally, ventral half becoming much wider, ventral half subquadrate with posteroventral angle rounded, posterior margin slightly slanted dorsally, otherwise nearly flat, ventral width greater than width of cercus in lateral view; cercus in lateral view narrowly oval; sclerotized portion of aedeagus in lateral view (Figs. 48, 50) moderately wide on basal 1/3-1/2 apical 1/2-2/3 very narrow, elongate, abruptly curved subapically, apex acutely pointed; phallapodeme in lateral view (Figs. 48, 50) moderately elongate, more narrowly produced toward attachment with aedeagal base, keel produced to a point, trian-



Figs. 46-52. *Axysta nikita* sp. n. (Thailand. Chantaburi: Pong Nam Ron). 46. Male abdomen, terminal segments, ventral view. 47. Female abdomen, ventral view. 48. Aedeagus and phallapodeme, lateral view. 49. Gonites and hypandrium, lateral view. 50. Internal male terminalia, lateral view. 51. Hypandrium, ventral view. 52. Epandrium and cercus, lateral view.

gular; gonite in lateral view (Figs. 49, 50) narrow, elongate, sickle-shaped, conspicuously curved on apical half, apex acutely pointed; triangular, acutely pointed and shallowly curved apically; hypandrium in ventral view (Fig. 51) narrowly Y-shaped, arms of Y thickly developed, truncate apically, anterior extension narrow, truncate apically, in lateral view (Figs. 49-50) generally elongate and narrow, relatively wide basally, anterior portion narrowly developed.

Type material.—The holotype male is labeled “THAILAND: Chantaburi prov., Pong Nam Ron, 20.XII.2008, leg. N. Vikhrev/HOLOTYPE ♂ *Axysta nikita* Kri-vosheina & Mathis ZMUM [red].” The holotype is intact, glued to a pin, genitalia extracted so that the aedeagus and gonites are visible laterally, is in good condition, and is deposited in ZMUM. Paratypes (6♂, 1♀; ZMUM; 1♂; USNM) with same locality label as the holotype, 20-21.XII.2008 (3 paratype males and 1 female with end of abdomen cut and dissected, parts in glycerol in plastic container under the fly), leg. N. Vikhrev.

Type locality.—Thailand. Chantaburi: Pong Nam Ron (12°53'N, 102°26.6'E).

Distribution.—Oriental: Thailand (Chantaburi).

Etymology.—The species epithet, *nikita*, is named to honor its collector, Dr. Nikita Vikhrev (Zoological Museum, Moscow University).

Natural history.—The specimens were collected from a regularly watered grass-plot in front of buildings.

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