

A SECOND EUROPEAN AXYSTA SPECIES (DIPTERA: EPHYDRIDAE)

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Axysta clausseni **sp. n.** is described from Finland and Germany. All available names of European *Axysta* are discussed, and *Hydrina viridula* Robineau-Desvoidy, 1830 is placed as nomen dubium in the genus *Hyadina* (**stat. rev.**).

Key words: Ephydridae, *Axysta*, Europe, new species, key

INTRODUCTION

The genus *Axysta* has only seven valid species worldwide, which were recently reviewed by KRIVOSHEINA and MATHIS (2010). Records are known from Australasia (1 species), the Nearctic (3 species), the Palaearctic (2 species) and the Oriental (2 species). Only *A. cesta* (Haliday, 1833) has been reported from Europe to date. Within the Ephydridae, *Axysta* belongs in the Hyadinini, Ilytheinae (ZATWARNICKI & RYCZKO 2014). The larval biology is almost unknown (KRIVOSHEINA & MATHIS 2010). Larvae of a Nearctic *A. cesta* were found in a colony of cyanobacteria *Lynghya* sp. Agardh ex Gomont, 1892 growing on moist tree leaves near a shaded pond (FOOTE 1977). At least in Europe, adults of *Axysta* have a strong preference for wetlands with dense vegetation that may be within a forest. The adults probably hibernate and can be found early in the year.

Motivated by the excellent work of KRIVOSHEINA and MATHIS (2010), I had a closer look at European *Axysta*, and surprisingly it turned out that two very similar species occur. This paper resolves the identity of the second species.

MATERIAL AND METHODS

Terminology is adopted from CUMMING and WOOD (2017) and the genus-specific interpretations in KRIVOSHEINA and MATHIS (2010). Numbers of setae refer to one side of the body only. Indices are defined in the text below. To describe the orientation of the postabdomen, I use the term “dorsal view” when looking at the outer surface of the epandrium with the cerci at the top. Nomenclature was checked against the original descriptions. To investigate the male terminalia the abdomen was dissected, macerated for about 4 hours in the aqueous solution of sodium hydroxide, neutralized with acetic acid and stored in a microvial filled with glycerine. A distribution map was generated with QGIS 3.16. All specimens were collected by the author, air-dried and pinned on minutens, and are deposited in the author’s private collection (PJHS) unless stated otherwise.

TAXONOMY

Axysta cesta (Haliday, 1833)
(Figs 2–3, 6)

Ephydra cesta Haliday, 1833: 177; type-locality: “Holywood in Downshire” [Northern Ireland]; lectotype ♂, des. by CLAUSEN 1983, deposited in National Museum of Ireland, Dublin (DE COURCY WILLIAMS & O’CONNOR 1989).

Material examined. GERMANY: 1 ♀, 23.v.2010, Bavaria, Isaraue NW Rosenau (4 km s Moosburg a. d. Isar) [48,442°N 11,932°E]; 1 ♂, 23.v.2010, Bavaria, gravel pit 2 km W Mitterlern (11 km ESE Freising) [48,387°N 11,898°E]; 1 ♂, 3.iv.2007, Bavaria, Inning am Ammersee, Martinsberg [48,088°N 11,163°E], 550 m, leg. W. Schacht; 1 ♂, 29.iv.2007, Bavaria, Inning, Martinsberg, Toteisloch, swamp [48,085°N 11,169°E], 570 m, leg. W. Schacht; 1 ♀, 9.viii.2014, Brandenburg, Kolpinsee [52,349°N 12,798°E]; 1 ♀, 12.v.2013, Mecklenburg-Western Pomerania, Peene valley S Trantow [53,967°N 13,200°E]; 1 ♂, 26.v.2003, Lower Saxony, Ahlhorner Teiche [52,928°N 8,139°E]; 1 ♂ 1 ♀, 6.iv.2009, Lower Saxony, Dollart, Dyksterhusen [53,294°N 7,242°E]; 1 ♂ 1 ♀, 6.viii.2008, Lower Saxony, Elbe valley Jasebeck [53,163°N 11,135°E]; 1 ♂, 6.viii.2008, Lower Saxony, Elbe valley Kaltenhof [53,126°N 11,248°E]; 1 ♂, 25.v.2017, Lower Saxony, forest 1 km S Volzendorf [52,883°N 11,263°E]; 1 ♂ 1 ♀, 28.v.2017, Lower Saxony, forest NW Gudow [53,298°N 11,000°E]; 1 ♂, 29.iv.2007, Lower Saxony, Großes Giebelmoor [52,508°N 10,940°E]; 1 ♂, 23.v.2009, Lower Saxony, limeswamp Beierfelde [51,698°N 10,248°E]; 1 ♀, 4.iv.2017, Lower Saxony, Leer, Westerhammrich [53,241°N 7,440°E]; 1 ♀, 1.v.2005, Lower Saxony, Markatal SW Markhausen [52,923°N 7,827°E]; 1 ♂, 17.viii.2008, Lower Saxony, Meppener Kuhweide [52,666°N 7,257°E]; 1 ♂, 11.v.2008, Lower Saxony, Penkefitzer lake [53,136°N 11,129°E]; 1 ♂, 16.viii.2009, Lower Saxony, Thülsfelder reservoir [52,910°N 7,948°E]; 1 ♀, 29.iii.2003, Lower Saxony, Timmeler Meer [53,355°N 7,510°E]; 1 ♀, 3.v.2008, Lower Saxony, Zwischenahner Meer, Meyerhausen [53,207°N 8,032°E]; 1 ♂, 25.vii.2010, Saxony Anhalt, Elbe valley SE Schelldorf, Tangermünde [52,461°N 11,988°E]; FINLAND: 1 ♂, 18.vii.2020, Central Finland, Kolima 7.9 km ESE Pihtipudas [63,308°N 25,649°E]; 1 ♂, 20.vii.2020, Northern Ostrobothnia, Iijoki N Kauppila [65,331°N 25,381°E]; 1 ♂, 27.vii.2020, Northern Ostrobothnia, Kantoselkä 2.4 km E Lahokas [65,887°N 29,330°E]; GEORGIA: 3 ♀♀, 10.vii.2019, small lake 2.2 km ENE Imera [41,650°N 44,215°E]; 1 ♂, 3.vii.2019, Snostskali River 0.6 km SE Achkhoti [42,618°N 44,624°E]; GREAT BRITAIN: 1 ♂, 21.vii.1982, East Norfolk, Catfield Great Fen, dykeside vegetation [52,735°N 1,494°E], leg. et det. A. G. Irwin, coll. Norwich Castle Museums; 1 ♂, 5.vii.1985, West Norfolk, Caudlesprings, south side of pond [52,572°N 0,861°E], leg. et det. A. G. Irwin, coll. Norwich Castle Museums; 1 ♂, 6.viii.1983, West Norfolk, Thompson Common dry *Ranunculus/Cladium* pool, [52,527°N 0,843°E], leg. et det. A. G. Irwin, coll. Norwich Castle Museums.

Remarks. The identification of this species is based on the interpretation of CLAUSEN (1983), which was subsequently adopted by KRIVOSHEINA and MATHIS (2010). CLAUSEN (1983) designated the lectotype and illustrated the terminalia, which clearly show the relevant identification characters. *Axysta cesta* is reported to be widely distributed in the Palaearctic, with by far the most published records being from central and northern Europe (KRIVOSHEINA & MATHIS 2010). The records from Georgia presented here are the first for that country.

***Axysta clauseni* sp. n.**
(Figs 1, 4–5, 7–9)

Holotype. Male: (1) “NDS Lüneburg / Forst nw Gudow / 28.5.2017, Stuke leg. / 2073 [cross written]”; (2) “Holotypus / *Axysta clauseni* ♂ / spec. nov. ♂ / Stuke det. 2021”. The locus typicus is located at 53,298°N 11,000°E, and the forest is called “Bohldamm”. The specimen is pinned on a minute and, except from a missing right antenna, is in excellent condition (Fig. 1). The holotype is preserved in the collection of the Museum für Naturkunde – Leibniz Institute for Evolution and Biodiversity Science, Berlin, Germany (ZMB).

Paratypes. GERMANY: 1 ♀, 14.iv.2007, Lower Saxony, Ahlhorner ponds [52,928°N 8,139°E]; 1 ♀, 30.iv.2017, Lower Saxony, Aschendorfer Obermoor S Papenburg [53,027°N 7,424°E]; 1 ♀, 7.v.2017, Lower Saxony, Esterwegen, Teufelsbergweg [53,011°N 7,596°E]; 1 ♀, 7.v.2017, Lower Saxony, Esterweger Dose [53,018°N 7,647°E]; 1 ♂, 28.v.2017, Lower Saxony, forest NW Gudow [53,298°N 11,000°E]; 1 ♂, 23.iv.2019, Lower Saxony, Heseler forest [53,306°N 7,618°E]; 1 ♀, 28.iii.2019, Lower Saxony, Leer, Westerhammrich [53,241°N 7,440°E]; 1 ♀, 1.viii.2018, Lower Saxony, “Neuer Teich” close to Zorge [51,651°N 10,629°E]; 1 ♀, 11.v.2008, Lower Saxony, Sumter See [53,281°N 10,894°E]; 1 ♀, 16.viii.2009, Lower Saxony, Thülsfelder reservoir, [52,934°N 7,924°E]; FINLAND: 1 ♂ 1 ♀, 21.vii.2020, Lapland, Vuojoki 2.5 km NNE Vuojärvi [67,106°N 26,638°E]; 1 ♀, 17.vii.2020, Päijät-Häme, Jääsjärvi 2.6 km NE Hartola [61,597°N 26,051°E].



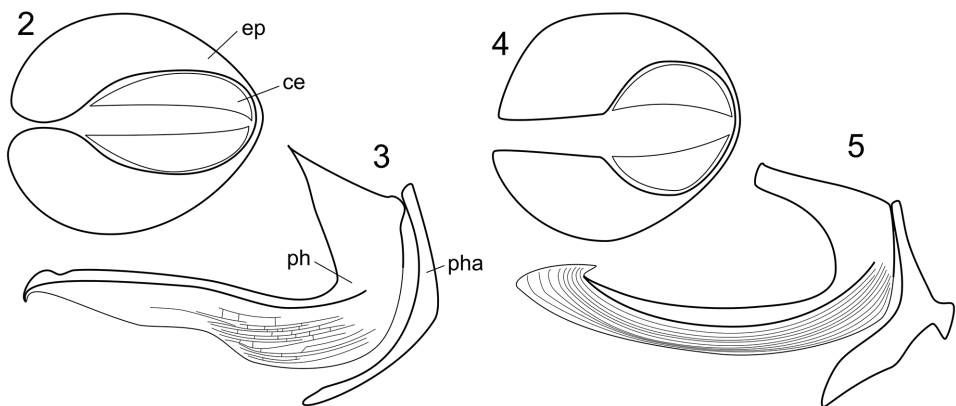
Fig. 1. Habitus of *Axysta clauseni* (holotype)

Additional material. GREAT BRITAIN: 1 ♂, 8.x.1977, Wales, Craig Cerrid Gleisiad NNR [51,887°N 3,497°W], ex *Juncus*, leg. et det. A. G. Irwin, coll. Norwich Castle Museums; 1 ♀, 6.viii.2008, West Norfolk, Caudlesprings, *Nymphaea/Phragmites* pond [52,578°N 0,863°E], leg. et det. A. G. Irwin, coll. Norwich Castle Museums; 1 ♂, 10.viii.1983, West Norfolk, Thompson Common [52,527°N 0,843°E], ex *Carex tussock*, leg. et det. A. G. Irwin, coll. Norwich Castle Museums; 1 ♀, 1.viii.1985, West Norfolk, Thompson Common near old car park [52,532°N 0,848°E], leg. et det. A. G. Irwin, coll. Norwich Castle Museums.

Diagnosis. Only the two species *A. cesta* and *A. claussemi* are known within Europe and these may be distinguished using the key below. In the key of KRIVOSHEINA and MATHIS (2010) *A. claussemi* will run to couplet 4, where *A. cesta* and the Holarctic *A. nigrifacies* are separated. The distinction of these two species using the characters given at couplet 4 of that key is unreliable because the facial dusting of *A. cesta* can vary, with some specimens having a completely dusted facial carina and others with a subshining or shining facial carina. Therefore, segregation of the species using this character is not possible and reliance should be placed instead on the shape of the phallus. *A. claussemi* differs distinctly from *A. nigrifacies* in the shape of the phallus (cf KRIVOSHEINA & MATHIS 2010: 385, Figs 41, 43).

Description of male Holotype. Length about 1.7 mm. Wing length = 1.6 mm. Head height = 0.4 mm. Head black. Gena-eye ratio = 0.3 (in lateral view, genal height measured at maximum eye height).

Antenna black, light brown dusted. Arista brown, with short setulae only. All ommatidia of about same size, all over with scattered, distinct ommatrichia. Eye height-length ratio = 0.9 (in lateral view, maximum eye height / maximum eye length). Ocelli almost forming an isosceles triangle. Frons shining black, with ocellar triangle, anterior margin of frons and fronto-orbital plate slightly dusted. Frontal triangle not delimited. Frons polished, fronto-orbital plate slightly wrinkled. Face with small and barely projecting facial

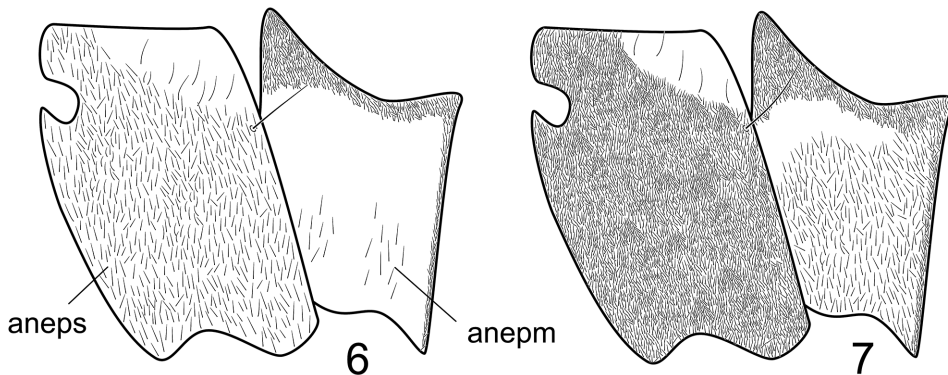


Figs 2–5. Terminalia of European *Axysta*: 2 = epandrium *A. cesta*, dorsal view; 3 = phallus *A. cesta*, lateral view; 4 = epandrium *A. claussemi*, dorsal view; 5 = phallus *A. claussemi*, lateral view. Abbreviations: ce = cercus, ep = epandrium, ph = phallus, pha = phallus apodeme

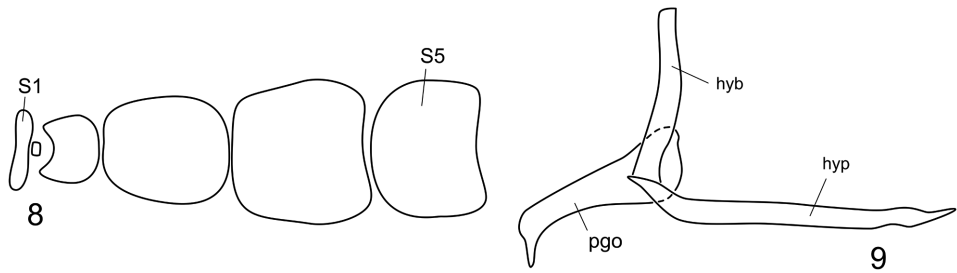
tubercle. Face silver dusted with central area around facial tubercle subshining. Facial ratio = 1.5 (in frontal view, distance between the oral margin and the dorsum of the ptilinal fissure / narrowest distance between the compound eyes across the face). Clypeus black, short, slightly silver-grey dusted. Gena silver-grey dusted, black in anterior view. Occiput silver-grey dusted. Palpus black. Proboscis inconspicuous. Chaetotaxy: large ocellar seta inserted lateral to anterior ocellus; no setulae between ocelli; no postocellar seta; 1 large medial vertical seta; no paravertical seta; no postocular setae; 1 large laterocline fronto-orbital seta; no frontal setulae; 2 inconspicuous lateral inclinate facial setae and facial ridge with 4 upcurved setae; 5-6 inconspicuous genal setae.

Thorax with brown to grey dusting and lacking any obvious setulae. Scutum and scutellum lightly covered with brown dusting, lacking any dusting patterns. Pleurae densely grey dusted. Anepisternum dorsally with scattered brown setulae. Anepisternum subshining, with posterodorsal corner shining. Anepimeron subshining, with upper third mainly shining. Chaetotaxy reduced: 1 line of minute acrostichal setulae; 0+1 dorsocentral setae, with a line 7-8 setulae which might represent additional dorsocentral setae in front of the dorsocentral seta; no prescutellar seta; no postsutural supra-alar seta; no postpronotal seta; 1 notopleural seta only; 1 postalar seta; 1 large apical and 1 small lateral scutellar seta; 1 small posterodorsal katepisternal seta; 1 small seta at posterior margin of anepisternum. Wing slightly brownish infuscated, veins light brown to black. Wing completely covered with microtrichia. Costa without setae between subcostal break and R_{4+5} but with slightly elongated setulae. Alula small, with long brown setulae at hind margin. Costal Index I = 0.9 (straight line distance between the apices of R_1 and R_{2+3} [S2 C] / straight line distance between the apices of R_{2+3} and R_{4+5} [S3 C]). Costal Index II = 2.5 (straight line distance between the apices of R_{4+5} and R_{2+3} [S3 C] / straight line distance between the apices of Media and R_{4+5} [S4 C]). R_{4+5} -vein ratio = 0.2 (straight line distance along vein R_{4+5} between crossvein r-m and branch of R_{4+5} and R_{2+3} [S1 R_{4+5}]) / distance apical of r-m [S2 R_{4+5}]). M-vein ratio = 0.5 (straight line distance along vein M between crossveins dm-cu and r-m [S1 M] / distance apical of dm-cu [S2 M]). Costa reaching apex of R_{4+5} only. Radial vein R_{4+5} almost straight. Haltere brownish, with black knob. Legs black, with knees and tarsi dark brown. Legs slightly brown dusted except for the shining posterior surface of hind leg. Legs with short black to golden setulae. No distinct setae on legs. Metatarsus II-tibia II ratio = 0.4 (length metatarsus 2 / length tibia 2).

Abdomen black. Lateral margins of tergites sharply creased. Tergites shining and with conspicuous pits, with brown setulae originating in the pits. Tergite III-IV ratio = 0.5 (length



Figs 6–7. Distribution of microtrichia on anepisternum and anepimeron, lateral view: 6 = *A. cesta*; 7 = *A. clausseni*. Abbreviations: anepm = anepimeron, aneps = anepisternum



Figs 8–9. *Axysta clausseni*, male: 8 = sternites 1–5; 9 = postgonite and hypandrium, lateral view. Abbreviations: hyb = hypandrium bridge, hyp = hypandrium plate, pgo = postgonite, S1 = sternite 1, S5 = sternite 5

tergite 3 medially / length tergite 4 medially). Tergite IV–V ratio = 7.4 (length tergite 4 medially / length tergite 5 medially). Sternites not visible without preparation because lateral margins of tergites overlap ventrally. Sternites as shown at Fig. 8. No setulae recognised on sternites. Epandrium small (Fig. 4), with fine setulae only. Cercus small, only slightly longer than depth of epandrium anterior to it. No recognisable surstylus-like structure. Subepandrial plate not recognised. Hypandrium represented by an elongated plate with its lateral edges connected by a semicircular bridge (Fig. 9). Gonite with broad base that is fused with hypandrium, and with a pointed and downcurved tip. Phallus apodeme with distinct angle (Fig. 5). Phallus U-shaped at base, distiphallus with folds that reach from base to tip. [Male postabdomen and sternites are described based on 2 dissected paratypes].

Variability. Knob of haltere may be brown. Legs may be completely black.

Female. Except for the postabdomen, there are no obvious differences between sexes.

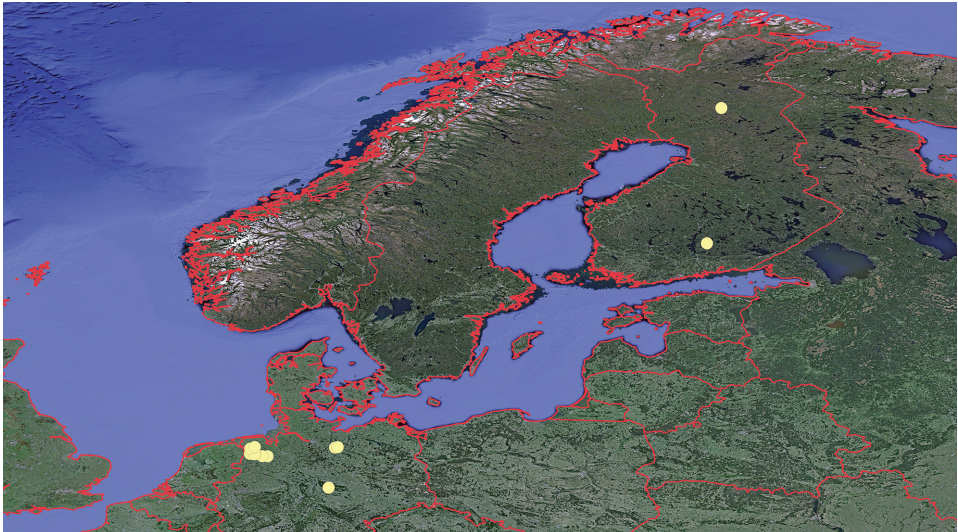


Fig. 10. Distribution of *Axysta clausseni*

Key to European species of *Axysta* Haliday

- 1 Anterior 2/3 of anepimeron shining and usually without microtrichia, or with very few (< 20) microtrichia in the centre of the anterior 2/3 (Fig. 6); hind metatarsus usually yellow to light brown, distinctly contrasting with hind tibia; knees may be yellow; wing less-infuscated, costa light brown to brown; ♀ abdomen typically metallic blue; ♂ cercus larger, about twice as long as depth of epandrium anterior to it (Fig. 2); phallus V-shaped at base (Fig. 3); phallus apodeme curved in lateral view (Fig. 3). *A. cesta* (Haliday)
- Anteroventral 2/3 of anepimeron typically mostly covered with scattered microtrichia, only shining dorsally (Fig. 7); hind metatarsus usually brown to black, hardly contrasting with hind tibia; knees dark brown to black; wing brown infuscated, costa dark brown to black; ♀ abdomen typically metallic green to brown; ♂ cercus small, only slightly longer than depth of epandrium anterior to it (Fig. 4); phallus U-shaped at base (Fig. 5); phallus apodeme with distinct angle in lateral view (Fig. 5). *A. claussemi* sp. n.

Etymology. This species is dedicated to Claus Clausen (Flensburg), who has greatly influenced modern dipterological research in Germany by introducing many new researchers to rigorous and patient work, motivating them with his approachable manner. The author himself has been repeatedly supported in his work by Claus Clausen.

Ecology. *Axysta claussemi* lives in various wetland habitats such as artificial ponds, lakesides and temporary or permanently wet places in forests or fens. Unlike many other shore-flies, adults of *A. claussemi* tend to be swept from dense vegetation and not found on bare wetland banks, which lack or have only sparse vegetation. Most records are from early spring, with a lesser number from late summer and an obvious gap between these two peaks. This probably indicates either two generations per annum or overwintering by adults. In all aspects of its known ecology, *A. claussemi* appears very similar to *A. cesta*. The two species occur sympatrically in Germany and Great Britain.

Distribution. The available records suggest that *A. claussemi* is not rare in northwest Germany and it has also been found at two widespread locations in Finland (Fig. 10). The similarity of this species to *A. cesta* may mean that many existing records of the latter in fact belong to *A. claussemi*. The concentration of records in Lower Saxony reflects the collecting maximum of the author in this region at the earlier time of the year (May).

Axysta coeruleiventris (Macquart, 1835)

Trimerina coeruleiventris Macquart, 1835: 529; type-locality: „Du nord de la France“; no information available about type material which might be deposited in Muséum National d’Histoire Naturelle, Paris (MATHIS & ZATWARNICKI 1995).

Remarks. The type of *A. coeruleiventris* should be in Muséum National d’Histoire Naturelle (MATHIS & ZATWARNICKI 1995) but is not included in the type specimens listed by the MUSÉUM NATIONAL D’HISTOIRE NATURELLE (2021). Therefore, the synonym introduced by HALIDAY (1839) and repeated by all later authors, is herewith accepted.

Axysta punctulata (Stenhammar, 1844)

Notiphila (Philygria) punctulata Stenhammar, 1844: 241–242; type-locality: „in Uplandia ad Holmiam, Ostrothia passim etiam in litore marino, Scania“ [Sweden]; Syntypes 2 ♂, 1 ♀, 1 specimen with sex unidentified, deposited in Museum of Evolution, Uppsala University, Sweden.

Primary type material examined. 4 syntypes, all with only a modern museum label: 1 ♂ syntype: “UPS7TY 185096 / *Notiphila punctulata* / Type collection, U.U.”; 1 ♂ syntype: “UPS7TY 185097 / *Notiphila punctulata* / Type collection, U.U.”; 1 ♀ syntype: “UPS7TY 185100 / *Notiphila punctulata* / Type collection, U.U.”; 1 syntype without abdomen: “UPS7TY 185101 / *Notiphila punctulata* / Type collection, U.U.”.

The examination of the four available syntypes of *A. punctulata* confirms the synonymy of this taxon with *A. cеста*. Since HALIDAY (1856) all subsequent authors have placed *A. punctulata* as a junior synonym to *A. cеста*. Because the identity of all of the available male specimens is unquestionable, and there is no hint of any additional type material, there is not considered to be any need to designate a lectotype.

Hyadina viridula (Robineau-Desvoidy, 1830)

Hydrina viridula Robineau-Desvoidy, 1830: 795; locus typicus not given [presumably France]; no information available about type material, type missing from coll. Robineau-Desvoidy (MATHIS & ZATWARNICKI 1995).

Remarks. *Hydrina viridula* was described only very briefly by ROBINEAU-DESVOIDY (1830): “Longueur, 2/3 de ligne. Petite; noire; un peu de cendré sur les côtés du corselet; abdomen d’un noir verdoyant; face d’un brun flavescent; pattes noires; ailes claires et sans tache.» This description does not allow any definitive diagnosis, but HALIDAY (1856) nevertheless identified this species as a synonym of *Axysta cеста*. This was corrected by LOEW (1860), who placed

Axysta viridula sensu Haliday as a synonym to *A. cesta* and stated that *Hydrina viridula* Robineau-Desvoidy, 1830 cannot belong to *Axysta*. LOEW (1860) did not attempt to place *Hydrina viridula* Robineau-Desvoidy, 1830, however, and consequently, it should be treated as a *nomen dubium* of the genus *Hyadina* (**stat. rev.**). SCHINER (1863) presumably overlooked the work of LOEW (1860) when he placed *Hyadrina viridula* as synonym of *A. cesta*. This was adopted, for example, by MATHIS and ZATWARNICKI (1995).

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REFERENCES

- CLAUSEN, P. J. (1983): The genus *Axysta* and a new genus of Nearctic Ephydriidae (Diptera). – *Transactions of the American Entomological Society* **109**: 59–76.
- CUMMING, J. M. & WOOD, D. M. (2017): Adult morphology and terminology. – Pp 89–133. In: KIRK-SPRIGGS, A.H. & SINCLAIR, B. J. (eds.): *Manual of Afrotropical Diptera. Volume 1. Introductory chapters and keys to Diptera families.* – *Suricata* **4**: xiii + 1–425; Pretoria.
- DE COURCY WILLIAMS, M. & O'CONNOR, J. P. (1989): The Ephydriidae (Diptera) relating to species descriptions by A. H. Haliday (1806–1870) in the National Museum of Ireland with notes on the collection. – *Proceedings of the Royal Irish Academy. Section B* **89**: 59–70.
- FOOTE, B. A. (1977): Utilization of blue-green algae by larvae of shore flies. – *Environmental Ecology* **6**: 812–814. <https://doi.org/10.1093/ee/6.6.812>
- HALIDAY, A. H. (1839): Remarks on the generic distribution of the British Hydromyzidae (Diptera). – *Annals and Magazine of Natural History* **3**: 217–224, 401–411. <https://doi.org/10.1080/03745483909443252>
- HALIDAY, A. H. (1856): Errata. – Pp 342–346. In: WALKER, F. (ed.): *Insecta Britannica. Diptera. Vol. III*: xxiv + 352 pp; Reeve and Benham, London.
- KRIVOSHEINA, M. G. & MATHIS, W. N. (2010): A review of the shore-fly genus *Axysta* Haliday (Diptera: Ephydriidae) with description of new species from Australia, India, and Thailand. – *Entomological News (News and the Proceedings of the Entomological Section of the Academy of Natural Sciences of Philadelphia)* **121**: 369–390. <https://doi.org/10.3157/021.121.0412>
- LOEW, H. (1860): Neue Beiträge zur Kenntnis der Dipteren. Siebenter Beitrag. Die europäischen Ephydriidae und die bisher in Schlesien beobachteten Arten derselben. – *Programm der Königlichen Realschule zu Meseritz* **1860**: 1–46.
- MATHIS, W. N. & ZATWARNICKI, T. (1995): World catalog of shore flies (Diptera: Ephydriidae). – *Memoirs on Entomology, International* **4**: 1–423.
- ROBINEAU-DESVOIDY, J. B. (1830): Essai sur les Myodaires. – *Mémoires présentés par divers savants à l'académie royale des sciences de l'institut de France et imprimés par son ordre [sciences mathématiques et physiques]* **2**: 1–813.

- SCHINER, I. R. (1863): *Fauna Austriaca. Die Fliegen (Diptera). Nach der analytischen Methode bearbeitet von J. Rudolf Schiner. Theil II. Heft 9/10.* – B. K. Gerold's Sohn, Wien, pp. 81–288.
- ZATWARNICKI, T. & RYCZKO, I. (2014): Phylogeny of Hyadinini (Diptera: Ephydriidae) with an emphasis on structures of the proboscis. – *Annales Zoologici* **64**: 485–515. <https://doi.org/10.3161/000345414X684821>

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