

Descriptions and key to larvae of Central European *Dineura* (Hymenoptera: Symphyta: Tenthredinidae)

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Abstract. The larvae of three Central European species of *Dineura* Dahlbom, 1835 (Hymenoptera: Symphyta: Tenthredinidae: Nematinae) are described, figured and keyed: *Dineura stilata* (Klug, 1816), *D. testaceipes* (Klug, 1816) and *D. virididorsata* (Retzius, 1783). The larval biology and host plants of those species are summarized and evaluated; *Crataegus* is the only verified host plant for *D. stilata*.

Key words. Hymenoptera, Symphyta, Tenthredinidae, Nematinae, *Dineura*, larva, host plant, Czech Republic, Palearctic Region

Introduction

Dineura Dahlbom, 1835 is a small Palearctic genus of sawflies including only nine described species, of which five occur in Europe (TAEGER et al. 2010) and four of them in the Czech Republic (BENEŠ 1989). However the occurrence in the Czech Republic of the fourth species, *Dineura parvalvis* (Konow, 1901), recorded by LINDQVIST (1955), has not been confirmed. The known host plants of *Dineura* are trees and shrubs of the families Rosaceae, Betulaceae and Fagaceae (TAEGER et al. 1998, TOGASHI 1997). In the comprehensive work of LORENZ & KRAUS (1957) the larvae of three species of *Dineura*, i.e. *D. stilata* Klug, 1816, *D. testaceipes* Klug, 1816 and *D. virididorsata* Retzius, 1783, are mentioned. However, only *D. stilata* was described in detail, whereas the remaining two species were only briefly diagnosed.

When collecting the larvae of *Dineura* on *Crataegus* in the territory of the Czech Republic, I found two distinct morphotypes differing from each other by the form of setation. Rearing larvae in captivity to the adult stage confirmed my presumption that each morphotype belongs to a different species. The larvae with short and scattered setation were assigned to *D. stilata*, and those with long and dense setation to *D. testaceipes*. As a result, the existing descriptions of the larva of *D. stilata* as given by BRISCHKE (1883), LORENZ & KRAUS (1957) and VERZHUTSKII (1981) can be stated to refer without doubt to *D. testaceipes*, so that the larva of *D. stilata* remained unknown.

This article is a part of the planned series of papers dealing with so far unknown or undescribed sawfly larvae, and thus follows the author's preceding contributions (e.g., MACEK 2013, 2014) on the same subject. The main aim of this article is to provide improved descriptions of larvae of the three Central European *Dineura* species to enable their easy identification. Unlike the larvae, however, the correct recognition of the adults of *D. stilata* and *D. testaceipes* is a long-standing problem, because the diagnostic characters used in the keys (e.g., BENSON 1958, MUCHE 1970) are based only on the colour pattern, which varies considerably in both species. As a result, some controversial views on the taxonomic status of both species have arisen (see CONDE 1938, LINDQVIST 1955, HELLÉN 1960) which have not so far been clarified. To avoid any future confusion I here also provide photographs of adults reared from the described larvae.

Material and methods

The larvae of all studied species were collected in the field in the Czech Republic and reared in captivity to adulthood in order to verify both their host plants and species identity. Larvae were photographed and all pictures saved in a digital image archive maintained by the National Museum, Prague, Czech Republic (= NMPC). The material was collected and identified by the author of the current paper. The reared and collected adults, and also larvae preserved in alcohol, are deposited in NMPC. Morphological terms are based on a comprehensive study by VIITASAARI (2002). Map field codes follow the grid mapping system according to PRUNER & MIKA (1996).

Abbreviations used in the text are: D – dorsal setae; G – glandubae; L – lateral setae; PLA – Protected Landscape Area; SD – subdorsal setae.

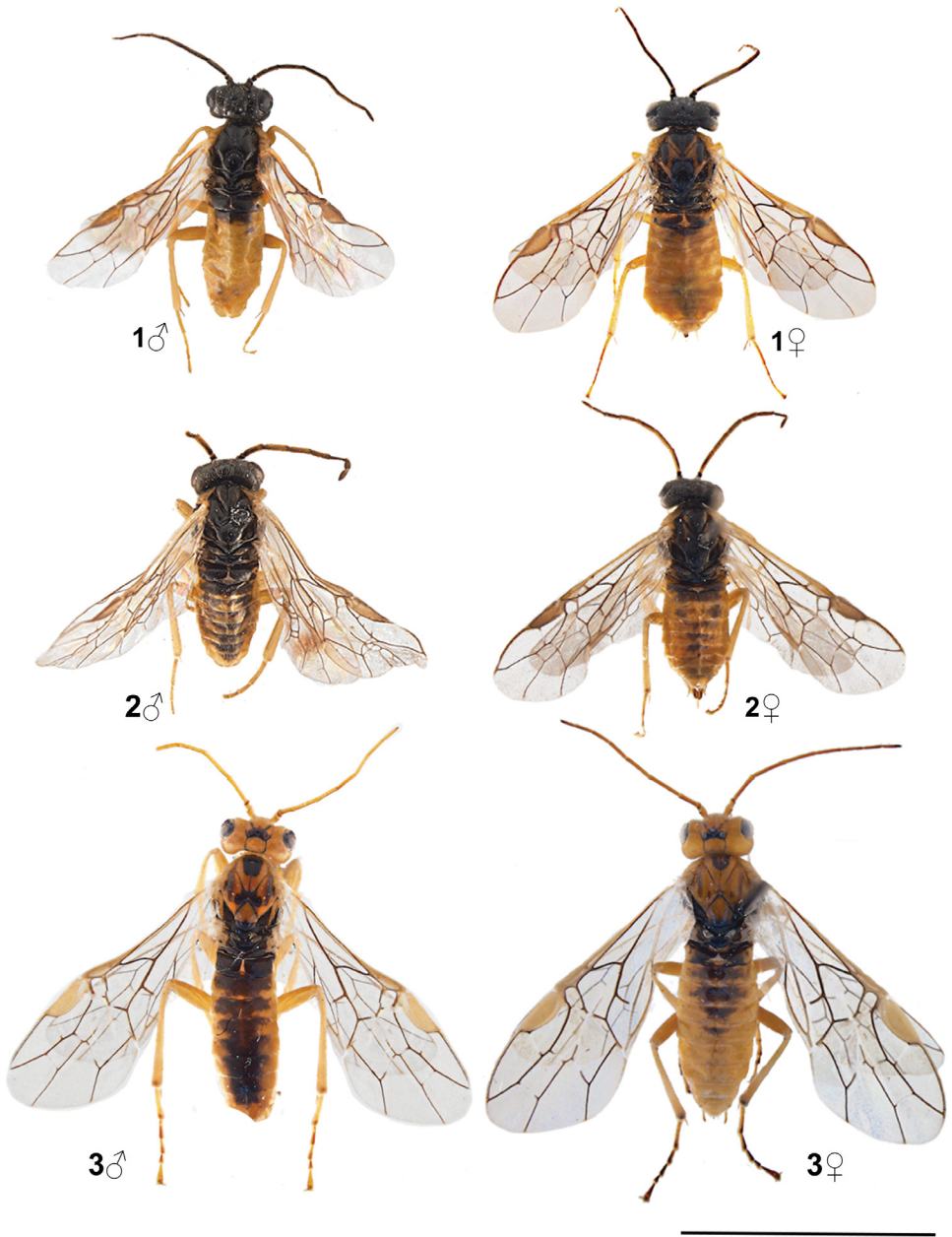
Results

Dineura Dahlbom, 1835

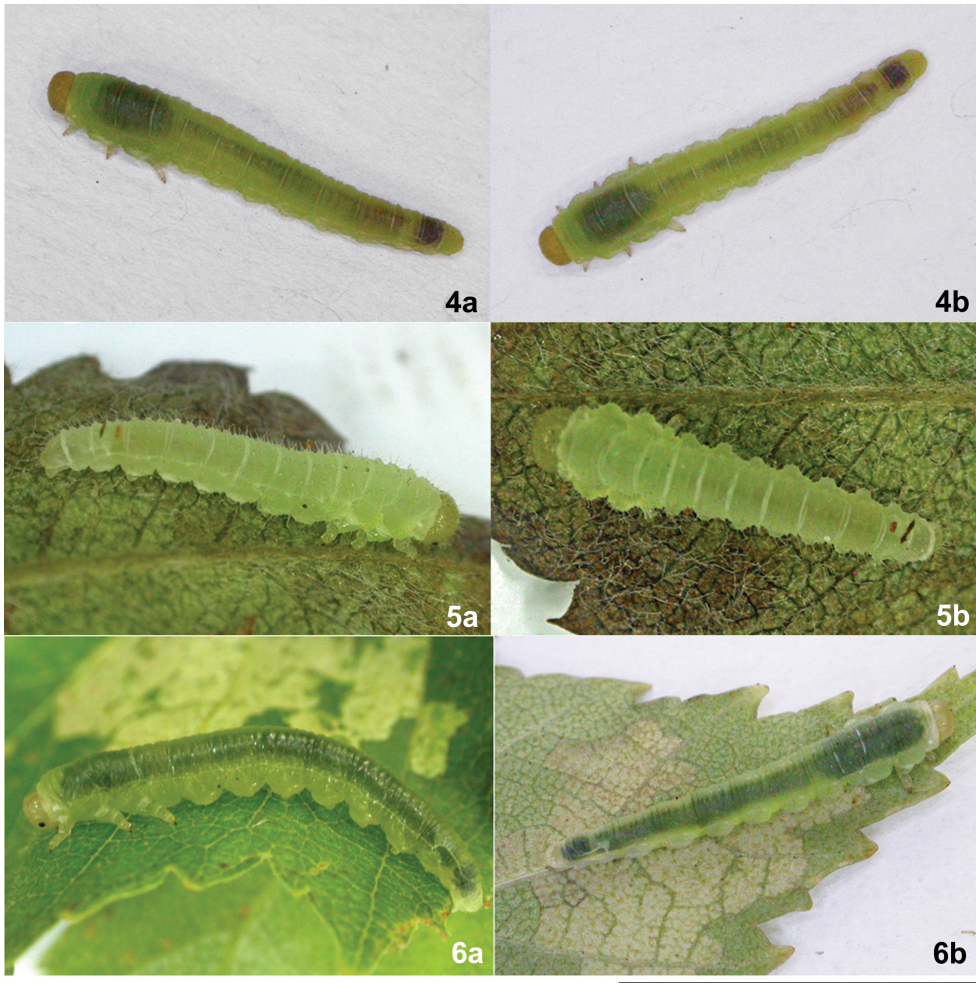
Dineura Dahlbom, 1835: Type species: *Tenthredo degeeri* Klug, 1817 [= *Dineura virididorsata* (Retzius, 1783)], by subsequent designation of WESTWOOD (1839).

Diagnosis of the larvae. Colour. Head amber yellow to green; body green with blackish transparent dorsal vessel; two last annulets of each abdominal segment whitish.

Morphology. Head spherical, densely covered with erect long setae; vertex (including parietal areas and occiput between lateral sutures) with network of granular texture; diameter of ocularium shorter than malar space; antennae flat, not prominent; clypeus with four setae, labrum symmetrical, slightly emarginated anteriorly, with four setae; mandibles with one seta on the lateral side; maxillae with one seta on stipes, palpifer with two to three setae. Body from thorax tapering posteriorly with flattened ventral side; thorax widened and convex with enlarged lateral lobes of meso- and metathorax; abdomen with prominent subspiracular and surpedal lobes; cuticle with fine granular texture; abdominal segments with six annulets, the first, second and fourth annulets with paired and single setae combined, mostly on more or less prominent warts; anal segment with long setae, prolegs on the inner side with two to three short setae.



Figs 1–3. *Dineura* Dahlbom, 1835, adults: 1 – *D. stilata* (Klug, 1816), 2 – *D. testaceipes* (Klug, 1816), 3 – *D. viridorsata* (Retzius, 1783). Scale bar: 5 mm.



Figs 4–6. *Dineura* Dahlbom, 1835, larvae (a – lateral view, b – dorsal view): 4 – *D. stilata* (Klug, 1816), 5 – *D. testaceipes* (Klug, 1816), 6 – *D. virididorsata* (Retzius, 1783). Scale bar: 10 mm.

Bionomics. Univoltine, flight period from May to July according to the climatic conditions and location. Larval period from July to October. The larval food plants are trees or shrubs of Rosaceae, Betulaceae and Fagaceae. The larval development is very slow, extending over 3 months. Larvae graze on the upper leaf epidermis, and rest with the body stretched on the lower side of the host leaf. Eonymphs burrow into upper soil layers, debris, or bore in rotten wood, branches or tree stumps, where they spin a firm cocoon in which the praepupa hibernates. Pupation takes place in the spring of the next year (BRISCHKE 1883, LORENZ & KRAUS 1957, VERZHUTSKII 1981).

Key to the larvae of Central European *Dineura*

- 1 The setae on annulets trichoid, very short, shorter than width of the annulet; warts absent (Fig 9a). Setae on subspiracular lobe very short (Fig. 9b). Host plants: *Betula* spp. *D. virididorsata* (Retzius, 1783)
- The setae on annulets truncate, bifid or spatulate, placed on more or less prominent warts. Setae on subspiracular lobe long (Figs 7b, 8b). Host plants: Rosaceae (shrubs and trees). 2
- 2 The setae on annulets truncate, shorter than the length of the annulets, placed on the inconspicuous, flat warts (Figs 7a). Subspiracular lobe with 3 setae and one glanduba (Fig. 7b). *D. stilata* (Klug, 1816)
- The setae on annulets emarginate or spatulate, longer than the length of the annulets, placed on prominent conical warts (Figs 8a). Subspiracular lobe with 5–6 setae and one glanduba (Fig. 8b). *D. testaceipes* (Klug, 1816)

Dineura stilata (Klug, 1816)

(Figs 1, 4, 7)

Tenthredo (*Allantus*) *stilata* Klug, 1816: 82–83 (original description).

Dineura stilata: HARTIG (1837: 227), TAEGER et al. (1998).

Material examined. CZECH REPUBLIC: BOHEMIA CENTR.: Praha – Černý Most (5953), 3.x.2004, 26 larvae on *Crataegus* sp.; Praha – Hlubočepy (5952), 12.ix.2013, 3 larvae on *Crataegus* sp.; all J. Macek lgt. & det. (NMPC).

Description of the last instar larva. Body length 7–10 mm. **Colour.** Head amber yellow, trunk green excluding whitish last two annulets of each abdominal segment and dark transparent dorsal vessel; spiracles white.

Morphology. Head orthognathous with long, slightly curved, stiff, trichoid setae; upper part of head with darker reticulate texture; labrum symmetrical, with straight anterior margin; labrum and clypeus with four setae; stipes with one seta; palpifer with two setae.

Trunk dorsoventrally flattened with thorax distinctly broader than abdomen; subspiracular lobe of second and third thoracic segments enlarged and prominent, bearing short truncate setae; trochanter as long as femur; femur with two setae; tibiae with 6 setae; abdominal segments with six annulets; first, second and fourth annulets with simple and paired, short, truncate setae placed on inconspicuous flat warts; length of setae is shorter than width of the annulet; postspiracular lobes prominent, the first one with two paired truncate setae, the second one with two truncate setae; subspiracular lobe with three trichoid setae and one glanduba; suprapedal lobe with four trichoid setae; anal segment with scattered long trichoid setae; prolegs on inner side with two to three tiny trichoid setae.

Differential diagnosis. Compared to the *D. testaceipes*, the larvae of *D. stilata* are easily distinguished by the short and truncate setae, placed on flat, inconspicuous warts (see the Key above).

Bionomics. Univoltine; flight period from May to July; larval period from July to October. Food plant: *Crataegus* sp. (new record). Based on the recent collecting data the species prefers the xeric shrubby habitats (shrubby forest margins, shrubby meadows, and shrubby steppes) with hawthorn stands.

Discussion. Due to the difficulties with identification of adults of *D. stilata* and *D. testaceipes*, the larvae of these species has not been properly recognized before. The first description of the larva of *D. stilata* by BRISCHKE's (1883) refers without doubt to *D. testaceipes*. The same is true for the characterisations of *D. stilata* larvae given by LORENZ & KRAUS (1957) and VERZHUTSKII (1981). Accordingly, the larva of *D. stilata* actually remained unknown. The current study, based on field collections and rearing larvae to the adult stage enabled me to correctly associate both larval morphotypes with the corresponding adults.

Dineura testaceipes (Klug, 1816)

(Figs 2, 5, 8)

Tenthredo (*Allantus*) *testaceipes* Klug, 1816: 84 (original description).

Dineura testaceipes: HARTIG (1837: 227), ENSLIN (1918), TAEGER et al. (1998).

Dineura stilata (misidentification): BRISCHKE (1883), LORENZ & KRAUS (1957), KONTUNIEMI (1960), VERZHUTSKII (1981), PSCHORN-WALCHER & ALTENHOFFER (2000).

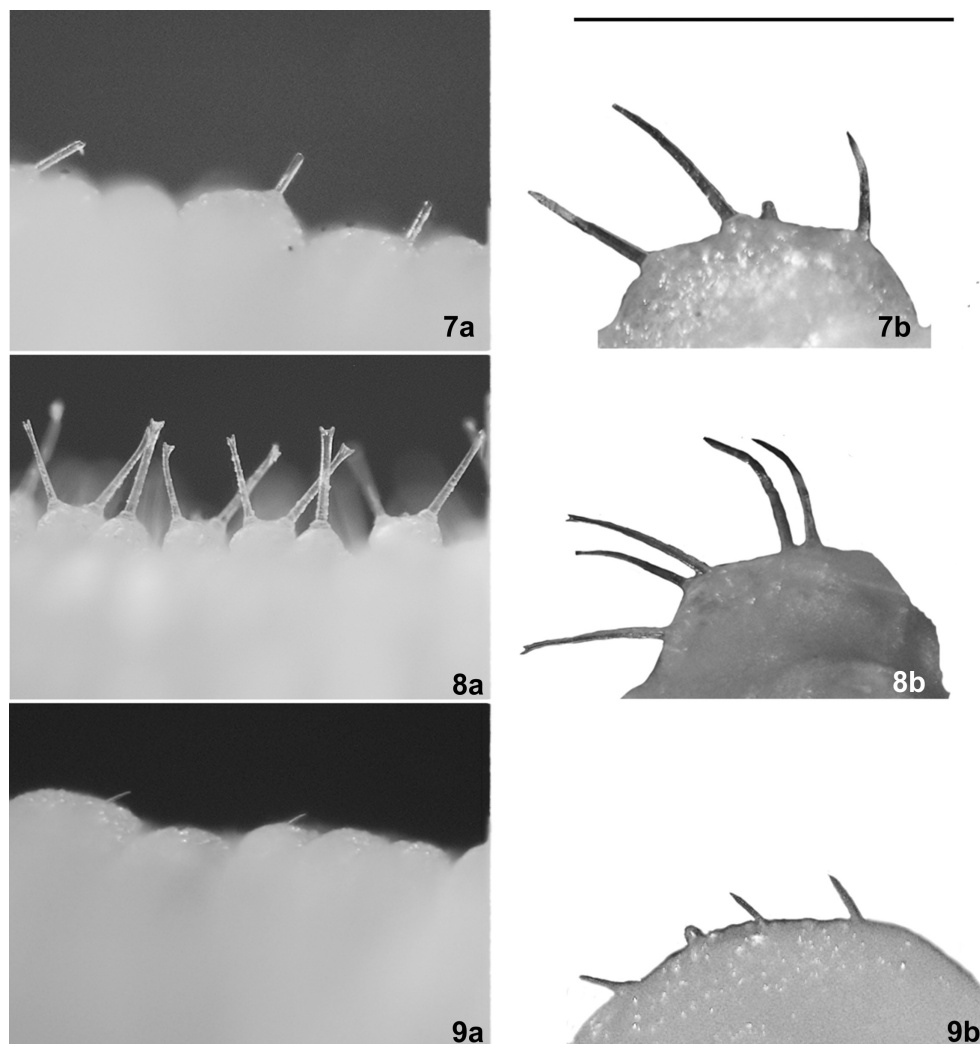
Material examined. CZECH REPUBLIC: BOHEMIA BOR.: Děčínský Sněžník Mt. (5250), 771 m a.s.l., 26.viii.2010, 2 larvae on *Sorbus aucuparia*, J. Macek lgt. & det. (NMPC). BOHEMIA CENTR.: Příbram env., Lazec (6349), 21.ix.2002, 8 larvae on *Sorbus aucuparia*; Příbram – Hatě (6350), 18.ix.2005, 5 larvae on *Sorbus aucuparia*; Příbram env., Květná hill (6250), 5.ix.2009, 5 larvae on *Crataegus* sp.; Kokofínsko PLA, Nosálov (5554), 6.ix.2005, 4 larvae on *Sorbus aucuparia*; all J. Macek lgt. & det. (NMPC). BOHEMIA OCC.: Vřesová env., Liščí kopec (hill) (5742), 2.ix.2010, 3 larvae on *Sorbus aucuparia*, J. Macek lgt. & det. (NMPC).

Redescription of the last instar larva. Body length 7–10 mm. **Colour.** Head green; trunk green with transparent dark gut content; two last annulets of each abdominal segment pale; spiracles white.

Morphology. Head orthognathous with prominent reticulate texture and long slightly curved stiff setae; labrum symmetrical with straight anterior margin; labrum and clypeus with four setae; stipes with one seta; palpifer with two setae.

Trunk dorsoventrally flattened; thorax broader than abdomen; subspiracular lobe of second and third thoracic segment enlarged and prominent with long stiff emarginate and trichoid setae combined; trochanter as long as femur; femur with two setae; tibiae with six setae; abdominal segments with six annulets; the first, second and fourth annulets with long emarginate (in mature larvae), spatulate (in immature larvae) and trichoid setae; the emarginate and spatulate setae occur mostly above the spiracular line and arise from prominent conical warts; setae below spiracular line mostly trichoid; arrangement of setae on annulets above the spiracular line as follows: the 1st annulet: (2D), (1SD); the 2nd annulet: (1D), (2SD), (1L); the 4th annulet: (2D+1G), (2SD), (2L+1G); the postspiracular lobes prominent, the first one with two paired trichoid setae and one glanduba on the conical wart, the second one with two separated trichoid setae; subspiracular lobe prominent, with 5–6 long, slightly curved, trichoid and slightly emarginate setae combined; suprapedal lobe with three trichoid setae and one glanduba; anal segment with long simple stiff setae; prolegs on inner side with two to three short trichoid setae.

Differential diagnosis. Compared to their congeners, the larvae of *D. testaceipes* are characteristic in presence of long and slightly emarginate (in last instar) or spatulate (in younger instars) dorsal setae growing up on the prominent conical warts.



Figs 7–8. *Dineura* Dahlbom, 1835, 3rd abdominal segment of larvae (a – dorsal section, b – subspiracular lobe): 7 – *D. stilata* (Klug, 1816), 8 – *D. testaceipes* (Klug, 1816), 9 – *D. virididorsata* (Retzius, 1783). Scale bar: 0.05 mm.

Bionomics. Univoltine; flight period from May to July; larval period from July to October. Food plants: *Crataegus*, *Sorbus*, *Cotoneaster* (BRISCHKE 1883, LORENZ & KRAUS 1957, KONTUNIEMI 1960, VERZHUTSKII 1981, TAEGER et al. 1998, PSCHORN-WALCHER & ALTENHOFER 2000). Habitat: deciduous and mixed forests, shrubby forest margins, shrubby meadows.

Discussion. The larva of *D. stilata* described by BRISCHKE (1883) is in fact that of *D. testaceipes*, a fact pointed out already by ENSLIN (1918) and now also confirmed here. The later

descriptions of larvae of *D. stilata* by LORENZ & KRAUS (1957) and VERZHUTSKII (1981) followed BRISCHKE's (1883) interpretation, so that these descriptions can without doubt also be assigned to *D. testaceipes*. The same is true for the vaguely diagnosed larva of *D. testaceipes* by LORENZ & KRAUS (1957), which does not differ substantially from their description of the larva of *D. stilata*. The purpose of the redescription provided here is completeness, so as to make easy the comparison with the descriptions of the larvae of the other *Dineura* species.

Dineura virididorsata (Retzius, 1783)

(Figs 3, 6, 9)

Tenthredo viridi-dorsata [sic!] Retzius, 1783: 73 (original description).

Dineura virididorsata: ANDRÉ (1880: 90), ENSLIN (1918), LORENZ & KRAUS (1957), KONTUNIEMI (1960), VERZHUTSKII (1966, 1981), TAEGER et al. (1998), PSCHORN-WALCHER & ALTENHOFER (2000).

Dineura degeeri (Klug, 1817): DALLA-TORRE (1894: 281, 282), BRISCHKE (1883).

Material examined. CZECH REPUBLIC: BOHEMIA BOR.: Děčínský Sněžník Mt. (5250), 26.viii.2010, 3 larvae on *Betula carpatica*, E. Kula lgt., J. Macek det. (NMPC). BOHEMIA CENTR.: Milovice (5755), 6.ix.2004, 1 larva on *Betula pendula*, 12.ix.2008, 1 larva on *Betula pendula*; both J. Macek lgt. & det. (NMPC).

Redescription of the last instar larva. Body length 10–14 mm. **Colour.** Head yellow green, trunk green, upper side above the spiracular line dark green with more or less dark transparent gut content.

Morphology. Head orthognathous with long, slightly curved trichoid setae; labrum symmetrical, with straight anterior margin; labrum and clypeus with four setae; stipes with one seta; palpifer with two setae.

Trunk slightly flattened dorsoventrally with the thorax a little broader than abdomen; subspiracular lobe of second and third thoracic segment more or less enlarged and prominent; setation of body trunk inconspicuous, the setae small, trichoid, distinctly shorter than length of the annulet; the first annulet with two setae; the second annulet with four setae; the fourth annulet with four setae and two glandubae; first postspiracular lobe with one seta and one glanduba; second postspiracular lobe with two setae; subspiracular and surpedal lobes with three setae and one subconical glanduba; suranal lobe with long upcurved dense setae on posterior margin.

Differential diagnosis. The larvae of *D. virididorsata* are easily identified by their exclusive association with birches, as well as by the inconspicuous body setation (see Key above).

Bionomics. Univoltine; flight period from May to July; larval period from July to October. Food plants: birches (*Betula* spp.) (BRISCHKE 1883, LORENZ & KRAUS 1957, KONTUNIEMI 1960, VERZHUTSKII 1981, TAEGER et al. 1998, PSCHORN-WALCHER & ALTENHOFER 2000). Habitat: deciduous and mixed forests, birch stands.

Discussion. Larva was described briefly by BRISCHKE (1883) under the name *D. degeeri* (Klug, 1817), a junior synonym of *D. virididorsata*. The bionomics, reproduction and development were treated in detail by VERZHUTSKII (1966).

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