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Description of fully inflated endophallus in some *Cassida* Linnaeus (Coleoptera: Chrysomelidae: Cassidinae)

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The fully inflated endophalli of *Cassida denticollis* Suffrian, 1844, *C. prasina* Illiger, 1798, *C. sanguinolenta* O.F. Müller, 1776, and *C. viridis* Linnaeus, 1758 are illustrated and described for the first time. The endophallus in these species is membranous, symmetrical and divided in three parts (basal, medial and apical). Borders between parts are indistinct, without strong constrictions. Fully inflated endophalli of these species show distinct differences in: shape of apical sclerite; possessing or lacking of basal sclerites; and shape and location of protuberances.

Key words: internal sac, endophallus, aedeagus, Chrysomelidae

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INTRODUCTION

The structure of the endophallus or internal sac of aedeagus and its characters were studied and used in Chrysomelidae taxonomy: Sagrinae (Sharp & Muir 1912; Mann & Crowson 1991), Bruchinae (Sharp & Muir 1912; Mann & Crowson 1996), Donaciinae (Sharp & Muir 1912; Askevold 1987, 1988, 1990), Criocerinae (Mann & Crowson 1996; Bukejs 2010; Bukejs & Ferenca 2010; Bezděk & Baselga 2015; Schmitt & Uhl 2017), Cassidinae (Mann 1988a; Mann & Crowson 1996), Chrysomelinae (Sharp & Muir 1912; Mann & Crowson 1996; Bontems 2013), Galerucinae (Grobbelaar 1993; Mann & Crowson 1996), Cryptocephalinae (Mann 1988b; Mann & Crowson 1996; Leonardi & Sassi 2001; Sassi 2001a, 2001b; Bukejs & Barševskis 2008; Moura 2009), Eumolpinae (Sharp & Muir 1912; Mann & Crowson 1996), and Synetinae (Mann & Crowson 1981). In many cases, sclerotized structures (e.g. sclerites, flagellum, spines, spiculas) were examined only. The shape and location of membranous structures have been poorly studied. Recently, characters of a fully inflated endophallus were studies in *Timarcha* Samouelle, 1819 (Petitpierre & Anichtchenko 2018). The significance of this method in Coleoptera taxonomy was discussed previously (Arzanov 2003; Kasatkin 2006; Janovska et al. 2013).

In the current paper, the structure of a fully inflated endophallus in *Cassida denticollis* Suffrian, 1844, *C. prasina* Illiger, 1798, *C. sanguinolenta* O.F. Müller, 1776, and *C. viridis* Linnaeus, 1758 is described and illustrated.

MATERIAL AND METHODS

The examined material was collected in Latvia and deposited in the collection of the Daugavpils University (Daugavpils, Latvia) [DUBC]. The method for preparation of a fully inflated endophallus was according to Janovska et al. (2013).

Abbreviations for endophallic structures:
ADP – apical-dorsal protuberance
ADS – apical-dorsal swelling
AVS – apical-ventral swelling
AP – appendix
AS – apical sclerite
BDP – basal-dorsal protuberance
BLP – basal-lateral protuberance
BVP – basal-ventral protuberance
BVS – basal-ventral sclerites
BDS – basal-dorsal sclerites
MDP – medial-dorsal protuberance
MDS – medial-dorsal swelling
MLP – medial-lateral protuberance
MVP – medial-ventral protuberance

RESULTS AND DISCUSSION

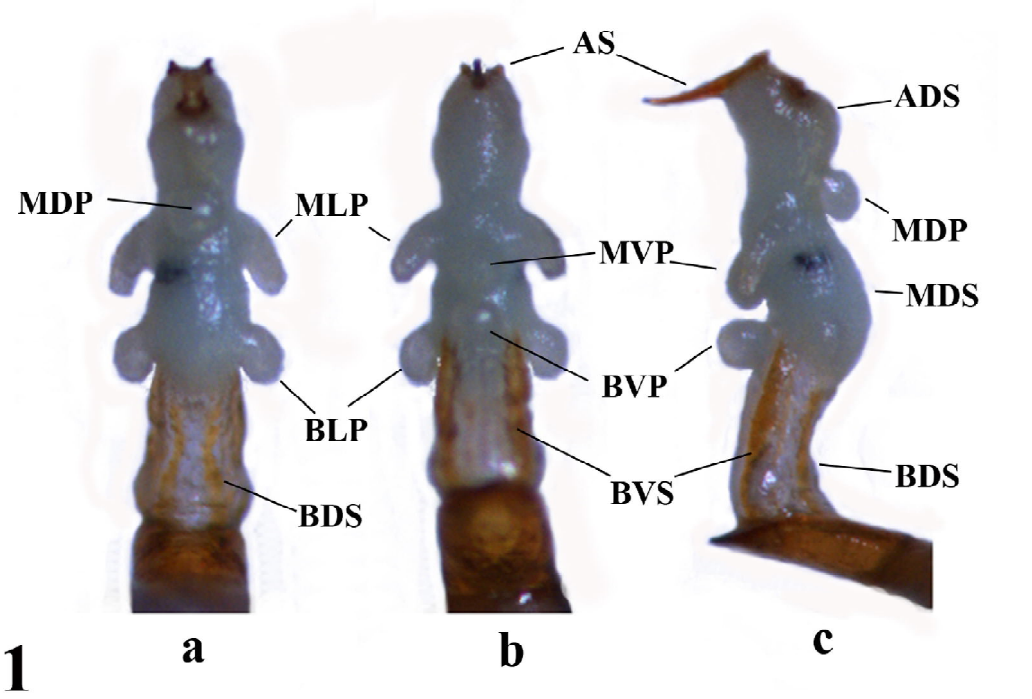
The structure of a fully inflated endophallus was studied in four *Cassida* species. The endophallus is membranous, symmetrical and divided in three parts (basal, medial and apical). Borders between these parts are indistinct, without strong constrictions.

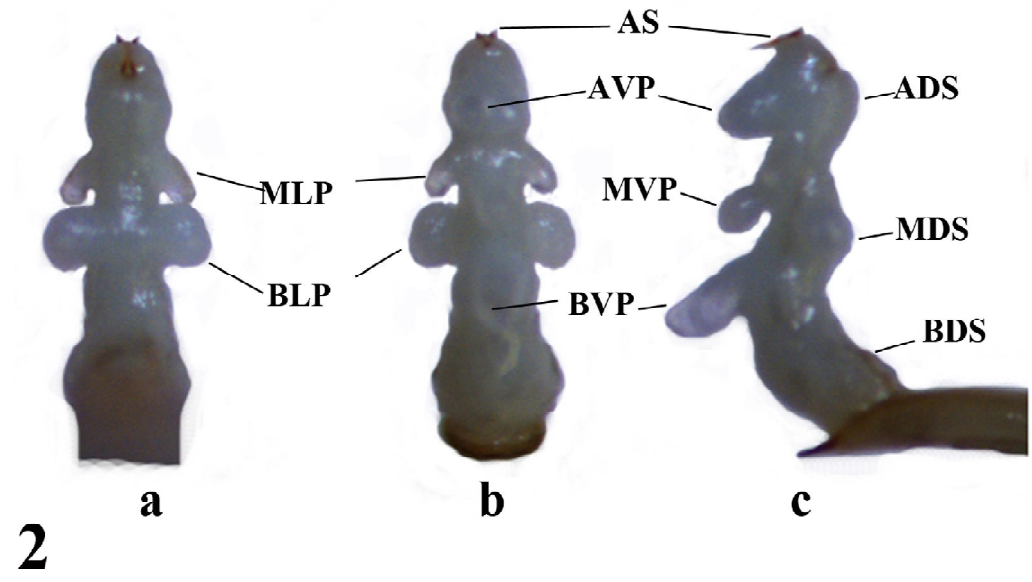
Cassida denticollis Suffrian, 1844 (Fig. 1)
Basal part elongate, cylindrical; with distinct longitudinal ventral (BVS) and dorsal (BDS) sclerites; with small lateral protuberances (BLP) located in apical half; and with short ventral protuberance (BVP) in apical half. Medial part elongate, subcylindrical, slightly curved; with wide swelling (MDS) dorsally in basal two-third, and small dorsal protuberance (MDP) at apex; with small lateral protuberances (MLP); and with small ventral protuberance (MVP) medially. Apical part subcylindrical, with swelling dorsally (ADS); apical sclerite (AS) narrow, moderately long, slightly curved.

C. sanguinolenta O.F. Müller, 1776 (Fig. 2)
Basal part elongate, cylindrical; with dorsal sclerites (BDS); with moderately large lateral protuberances (BLP) located in apical half; and with long ventral protuberance (BVP) in apical half. Medial part elongate, subcylindrical, slightly curved; with swelling (MDS) dorsally in basal two-third, and small dorsal protuberance (MDP) at apex; with small lateral protuberances (MLP); and with small ventral protuberance (MVP) medially. Apical part subcylindrical, with dorsal swelling (ADS), and with large ventral protuberance (AVP); apical sclerite (AS) narrow, short, almost straight.

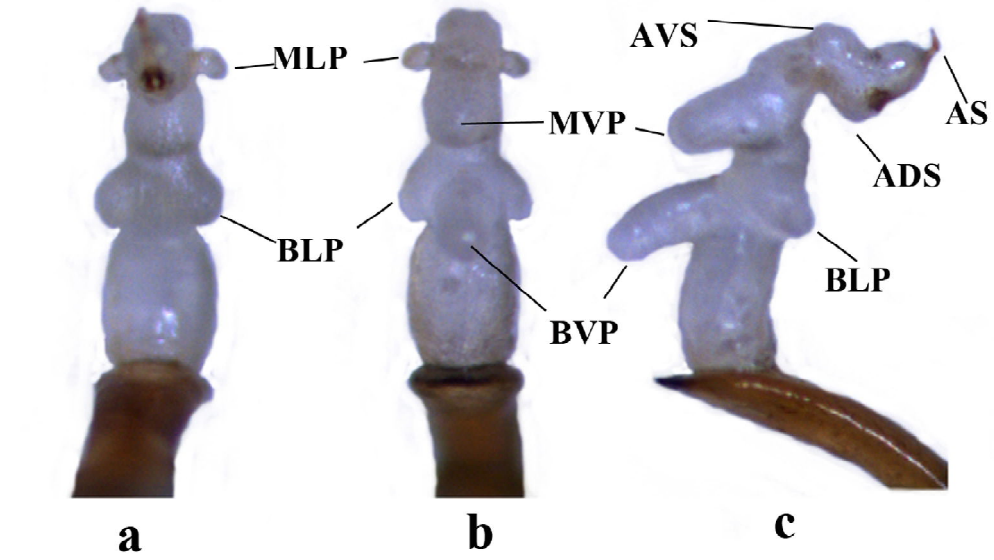
C. prasina Illiger, 1798 (Fig. 3)
Basal part elongate, cylindrical; without sclerites; with small lateral protuberances (BLP) located in apical half; and with long ventral protuberance (BVP) in apical half. Medial part elongate, cylindrical; with small lateral protuberances (MLP); and with moderately large ventral protuberance (MVP) medially. Apical part elongate, strongly curved; with dorsal (ADS) and ventral (AVS) swellings; apical sclerite (AS) narrow, short, strongly curved.

C. viridis Linnaeus, 1758 (Fig. 4)
Basal part elongate, cylindrical; with distinct longitudinal ventral (BVS) and dorsal (BDS) sclerites; with two small lateral protuberances (BLP) located in apical half; with large ventral protuberance (BVP) medially, and with moderately large dorsal protuberance (BDP) in apical half. Medial part cylindrical, swollen; lateral protuberances (MLP) large, with large sclerotized thorn apically; and with moderately large ventral protuberance (MVP) in basal half. Apical part hemispherical, lateral sides with minutely





Figs 1–2. Fully inflated endophallus of *Cassida* sp.: 1 – *C. denticollis*; 2 – *C. sanguinolenta*; a – dorsal view, b – ventral view, c – lateral view



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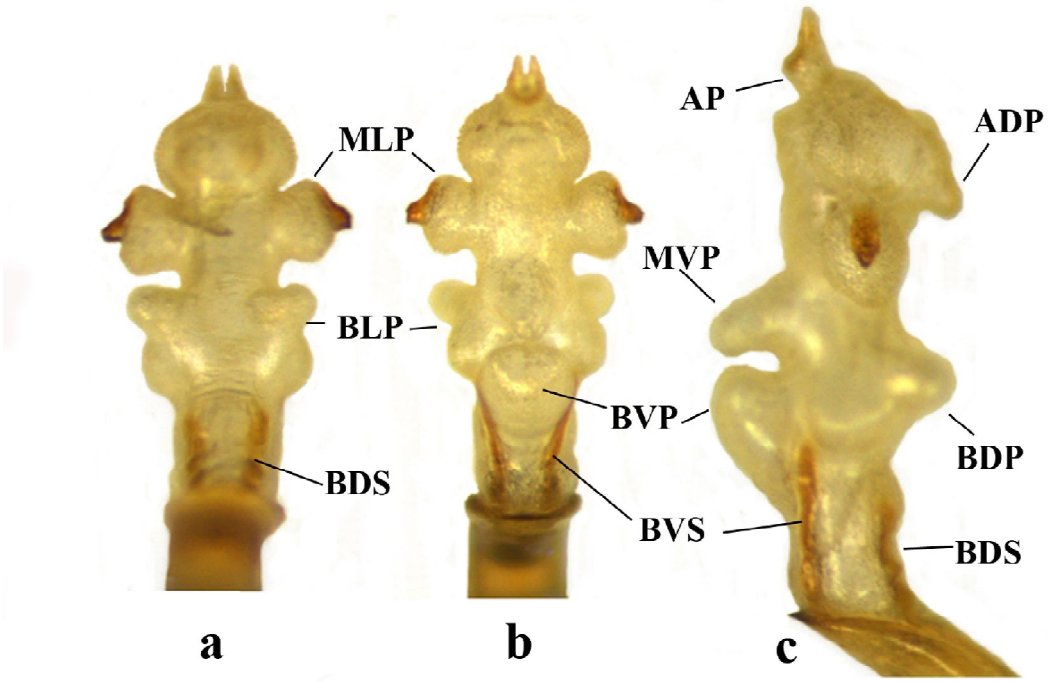

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Figs. 3–4. Fully inflated endophallus of *Cassida* sp.: 3 – *C. prasina*; 4 – *C. viridis*; a – dorsal view, b – ventral view, c – lateral view.

spiculiferous fields; dorsal protuberance (ADP) small; appendix bilobed, and sclerotized apically; apical sclerite (AS) missing.

The species *Cassida denticollis*, *C. sanguinolenta*, and *C. prasina* are very similar morphologically and poorly distinguishable. According to Bieńkowski (2009) they are sibling-species. An examination of fully inflated endophallus in these species showed distinct difference in: (1) shape of apical sclerite, (2) possessing or lacking of basal sclerites, and (3) shape and location of protuberances. This method can be helpful in *Cassida* taxonomy, especially in case of morphologically close species.

REFERENCES

Arzanov Yu.G. 2003. Use of endophallic characters in the systematics of the rhynchophorous beetles (Coleoptera, Curculionoidea). Entomologicheskoe obozrenie 82 (3): 701-719.

Askevold I.S. 1987. The identity of *Donacia cuprea* Kirby, l837 and *Donacia quadricollis* Say, 1827, with a taxonomic revision of members of the Donacia subtilis Kunze-group (Coleoptera, Chrysomelidae, Donaciinae). The Canadian Entomologist l19: 629-645.

Askevold I.S. 1988. The genus *Neohaemonia* Szekessy in North America (Coleoptera, Chrysomelidae, Donaciinae): Systematics, reconstructed phylogeny and geographic history. Transactions of the American Entomological Society 113: 360-430.

Askevold, I.S. 1990. Reconstructed phylogeny and reclassification of the genera of Donaciinae (Coleoptera, Chrysomelidae). Quaestiones entomologicae 26: 601-664.

Bieńkowski A.O. 2009. Sibling species in the fauna of leaf-beetle (Coleoptera, Chrysomelidae) in European Russia. Bulletin of Moscow Society of Naturalists, Biological series 114 (3): 11-16.

Bezděk J., Baselga A. 2015. Revision of western Palaearctic species of the *Oulema melanopus* group, with description of two new species from Europe (Coleoptera: Chrysomelidae: Criocerinae). Acta entomologica Musei Nationalis Pragae 55 (1): 273-304.

Bontems C. 2013. Le procedé Berti-Vachon d'évagination du sac interne. Nouvelle Revue d'Entomologie, New Series 29: 85-91.

Bukejs A., Barševskis A. 2008. New leaf-beetle species, *Cryptocephalus solivagus* Leonardi & Sassi, 2001 (Coleoptera: Chrysomelidae) in the Lithuanian fauna. Acta Zoologica Lituanica 18 (4): 267-269.

Bukejs, A. 2010. Leaf-beetles *Oulema septentrionis* (Weise, 1880) and *O. erichsonii* (Suffrian, 1841) (Coleoptera: Chrysomelidae) in Latvian fauna. Baltic Journal of Coleopterology 10 (1): 65-69.

Bukejs A., Ferenca R. 2010. The first record of *Oulema duftschmidi* (Redtenbacher, 1874) (Coleoptera: Chrysomelidae) in the Lithuanian fauna. *Acta Zoologica Lituanica*, 20 (4): 229-231.

Grobbelaar E. 1993. A revision of the southern African species of *Megalognatha* Baly (Coleoptera, Chrysomelidae). Entomology Memoir, Department Agriculture, Republic of South Africa 86: l-85.

Janovska M., Anichtchenko A.V., Erwin T. 2013. Significant new taxonomic tool for Carabidae (Insecta: Coleoptera): endophallus inflation method. Caucasian Entomological Bulletin 9: 39-42.

Kasatkin D.G. 2006. The internal sac of aedeagus of longhorned beetles (Coleoptera: Cerambycidae): morphology, nomenclature of structures, taxonomic significance. Caucasian Entomological Bulletin 2 (1): 83-104.

Leonardi C., Sassi D. 2001. Studio critico sulle specie di *Cryptocephalus* del gruppo *hypochaeridis* (Linné, 1758) e sulle forme ad esse

attribuite (Coleoptera Chrysomelidae). Atti della Societą Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano 142 (1): 3-96.

Mann J.S. 1988a. Male genitalia of Chrysomelidae (Coleoptera) I. Subfamilies Cassidinae and Hispinae. Journal of Animal Morphology and Physiology 35 (2): 123-130.

Mann J.S. 1988b. Male genitalia of genus *Cryptocephalus* Geoffroy (Col., Chrysomelidae, Cryptocephalinae). Annals of Biology 4 (1-2): 38-42.

Mann J.S., Crowson R.A. 1981. The systematic position of *Orsodacne* Latr. and *Syneta* Lac. (Col., Chrysomelidae), in relation to characters of larvae, internal anatomy and tarsal vestiture. Journal of Natural History, London 15: 729-749.

Mann J.S., Crowson R.A. 1991. Some observations on the genitalia of Sagrinae (Coleoptera, Chrysomelidae). In: Advances in Coleopterology, Zunino M., Bellés X., Blas M. (Eds.). European Association of coleopterology, Barcelona: pp. 35-60.

Mann J.S., Crowson R.A. 1996. Internal sac structures and phylogeny of Chrysomelidae. In: Chrysomelidae biology, Volume 1: The Classification, phylogeny and genetics, Jolivet P.H.A., Cax M.L. (Eds.). SPB Academic Publishing, Amsterdam, the Netherlands. pp. 291-316.

Moura L. 2009. Morfologia comparada da genitįlia masculina de Galerucini (Coleoptera, Chrysomelidae, Galerucinae). Revista Brasileira de Entomologia 53 (1): 15-22.

Petitpierre E., Anichtchenko A.V. 2018. Endophallus structure: a promising tool for cryptic species identification in *Timarcha* Samouelle, 1819 (Coleoptera: Chrysomelidae: Chrysomelinae). Zootaxa 4446 (3): 361-383.

Sassi D. 2001a. *Cryptocephalus convergens*, nuova specie dell'Europa sud occidentale (Coleoptera Chrysomelidae). Atti della Societa italiane di Scienze naturali e Museo cķvico di Storia naturale di Milano 142: 135-146.

Sassi D. 2001b. Nuove specie del genere *Cryptocephalus vicine* a *Cryptocephalus marginellus* (Coleoptera Chrysomelidae). Memorie della Societą Entomologica Italiana 80: 107-138.

Sharp D., Muir F. 1912. The comparative anatomy of the male genital tube in Coleoptera. Transactions of the Entomological Society of London 3: 477-642.

Schmitt M., Uhl G. 2017. *Oulema septentrionis* and *O. erichsonii* are neither conspecific nor melanic variants of *O. melanopus* as assessed by micro CT analysis of their lectotypes (Insecta, Coleoptera, Chrysomelidae, Criocerinae). Zookeys 720: 121-130.

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