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Designation of the lectotype of *Phyllopertha orientalis* Waterhouse, 1875 (Coleoptera: Scarabaeidae)

Обозначение лектотипа *Phyllopertha orientalis* Waterhouse, 1875 (Coleoptera: Scarabaeidae)

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KEY WORDS: *Exomala orientalis*, lectotypus, pest, invasive species, aedeagus, endophallus.

КЛЮЧЕВЫЕ СЛОВА: *Exomala orientalis*, лектотип, инвазивный вид, вредитель, эдеагус, эндофаллус

ABSTRACT: The lectotype is designated based on syntypes series of *Phyllopertha orientalis* Waterhouse, 1875. Type specimens and their labels are illustrated. The images of the endophallus and the aedeagus of *Exomala orientalis* (Waterhouse, 1875) and *E. pallidipennis* (Reitter, 1903) are presented.

РЕЗЮМЕ: Обозначен лектотип *Phyllopertha orientalis* Waterhouse, 1875 из серии синтипов. Типовые экземпляры и их этикетки проиллюстрированы. Представлены сравнительные изображения эдеагуса и эндофаллуса *Exomala orientalis* (Waterhouse, 1875) и *E. pallidipennis* (Reitter, 1903).

Introduction

Exomala orientalis (Waterhouse, 1875) is a well-known invasive pest of many vegetable, flower and turfgrasses. Some authors assume that the species was originally distributed in Japan regions with a temperate climate [Dunlap et al., 2009] and possibly in the Philippines [Reding, Klein, 2007]. Currently, *E. orientalis* is widely distributed in the northeastern United States and Hawaii and in Korean Peninsula, some regions of China (Guangdong, Liaoning) and India (Kerala, Dzhamu and Kashmir), Taiwan and Micronesia [CABI, 2022]. This species also was recorded for the Russian Far East (Primorsky Kray, Khasan), but this record was not confirmed later [Bezborodov, 2016].

Waterhouse [1875] originally described *E. orientalis* as *Phyllopertha orientalis* based on three specimens from Japan (Figs 4–6). The species was compared by this author with the west Palaearctic species *Ph. horticola* (L., 1758) and *Ph. campestris* (Latreille, 1804b). Interesting, that for each specimen of the type series, separate varieties were designated (with letter designations — a, b, c), that indicates a high degree of the morphological variability of the species in the body coloration. But these names clearly have an infrasubspecific rank, and not available according to Articles 10.2, 45.5 of the International Code of Zoological Nomenclature. The type locality according to the original description is Japan, Kawachi; Nagasaki; Hakodadi. The only Kawachi is indicated as a type locality in the revision of the Micronesian lamellicorn beetles [Cartwright, Gordon, 1971]. The number of type specimens was not indicated in this paper, and the lectotype was not designated. At the same time, only "Japan" is written on the labels of all three syntypes.

Subsequently *Ph. orientalis* was reclassified as *Anomala orientalis* [Heyden, 1887], and later it was placed in the subgenus *Exomala* Reitter, 1903 of the genus *Blitopertha* Reitter, 1903 [Reitter, 1903]. It should be noted that in the Japanese and Korean literature, the target species was often listed as *Blitopertha orientalis* [Alm *et al*., 1995; Choo *et al*., 2002], while in the review of beetles of Micronesia, the Cartwright, Gordon [1971] interpreted it as a member of the genus *Anomala* Samouelle, 1819. This is not the only case of such combinations after of the Reitter's [1903] work [Baker, 1986; Dunbar, Beard 1975; Hardy, 1991; Staines, 1986; Bai et al., 1991; Arnett *et al*., 2002; Jameson *et al*., 2003]. The status of *Exomala*, was raised to a genus in the work of Baraud [1991] based on the morphology of the aedeagus and according to the latest taxonomic reports [Zorn, Bezdek, 2016]. The combination of the name *Exomala orientalis* is

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quite widespread, but not generally accepted. Thus, both combinations *Anomala orientalis* [Zhang *et al*., 1994; Cowles, Villani 1996; Koppenhofer *et al*. 1999] and *Exomala orientalis* [e. g. Leal *et al*., 1994; Alm *et al*. 1999; Facundo *et al*.; 1999; Choo *et al*., 2002] has been used almost equally frequently since the Baraud's publication.

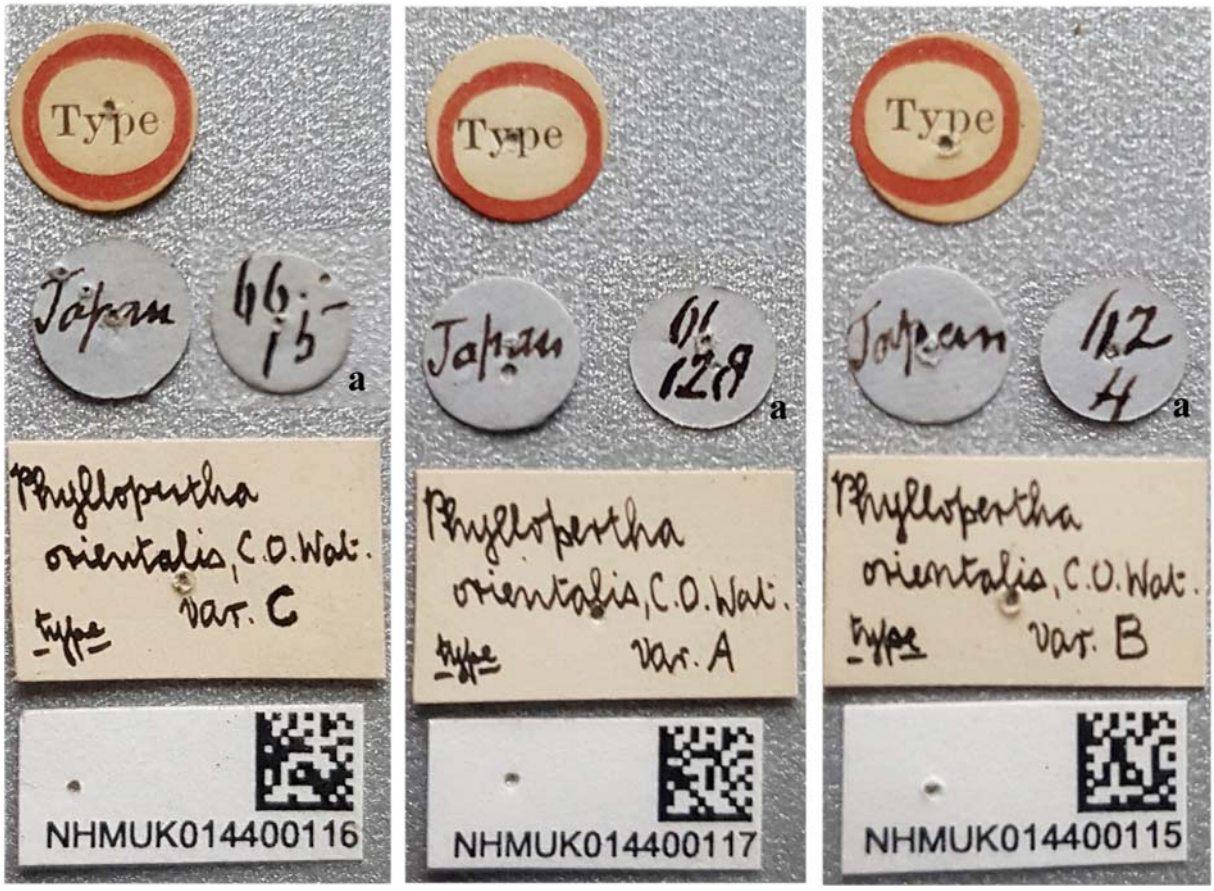
Taxonomic account

Exomala orientalis (Waterhouse, 1875)
Figs 1–7, 11–13, 16–17.

MATERIAL. "Lectotypus, Phyllopertha orientalis (Waterhouse, 1875), des. Kasatkin D., 2022", "Phyllopertha orientalis O.C. Wat., type, var. B.", "type (circle label with red ring)", "Japan (f.v. 112 4)", NHMUK014400115".

Figs 1–4. *Phyllopertha orientalis*: 1–3 — habitus; 4 — pronotum; 1 — lectotype, 2–4 — paralectotypes. Photo by K. Matsumoto.

Рис. 1–4. *Phyllopertha orientalis*: 1–3 — внешний вид; 4 — переднеспинка; 1 — лектотип, 2–4 — паралектотипы. Фото К.Матсумото.



5 6 7

Figs 5–7. Labels of type specimens of *Phyllopertha orientalis*: 5–6 — paralectotypes, 7 — lectotype; a — reverse side of circle labels. Photos by D. Telnov.

Рис. 5–7. Этикетки типовых экземпляров *Phyllopertha orientalis*: 5–6 — паралектотипы, 7 — лектотип; a — обратная сторона круглой этикетки. Фото Д. Тельнова.

Paralectotypus, Phyllopertha orientalis (Waterhouse, 1875), des. Kasatkin D., 2022", "Phyllopertha orientalis O.C. Wat., type, var. A.", "type (circle label with red ring)", "Japan (f.v. 61 128)", NHMUK014400117".

Paralectotypus, Phyllopertha orientalis (Waterhouse, 1875), des. Kasatkin D., 2022", "Phyllopertha orientalis O.C. Wat., type, var. C.", "type (circle label with red ring)", "Japan (f.v. 66 15)", NHMUK014400116".

The lectotype of *Phyllopertha orientalis* is designated here. We designated as a lectotype the specimen marked as var. B as the most consistent with the typical coloration of this species. All types are deposited in the collection of Natural History Museum, London, the United Kingdom (NHM).

In the Palearctic catalogue, the nominative subgenus *Exomala* includes also *E. ohdaiensis* (Sawada, 1941), *E. pallidipennis* (Reitter, 1903) and *E. okiwaensis* (Ohaus, 1925) [Zorn *et al*., 2016]. Both editions of the Palaearctic Catalogue indicate that *E. okiwaensis* is endemic to Okinawa and has never been found outside the island, but according to the original description of this species [Ohaus, 1925], it comes from Formosa (now Taiwan). In the publication about the subgeneric structure of *Exomala* and related genera [Baraud, 1991], *E. okiwaensis* and *E. ohdaiensis* were not mentioned. Probably, the author did not have material available for studying the male genitalia (Baraud's system is based mainly on the structure of the aedeagus). The study the male genitalia is necessary to clearly understand whether these species really belong to the nominative subgenus *Exomala* (and genus *Exomala* in generally). The imperfection of the genus system is supported by the fact that *Blithopertha tarowana* (Sawada, 1941) was assigned to the genus *Exomala* in the first edition of the Palaearctic catalogue [Zorn, 2006] and then was included in *Anomala* in the second one [Zorn, Bezdek, 2016]. The endophallus of *E. orientalis* was briefly described and illustrated by Shokhin [2017]. We publish here comparative images of the endophallus and the aedeagus of *E. pallidipennis* and *E. orientalis* here (Figs 8–17).

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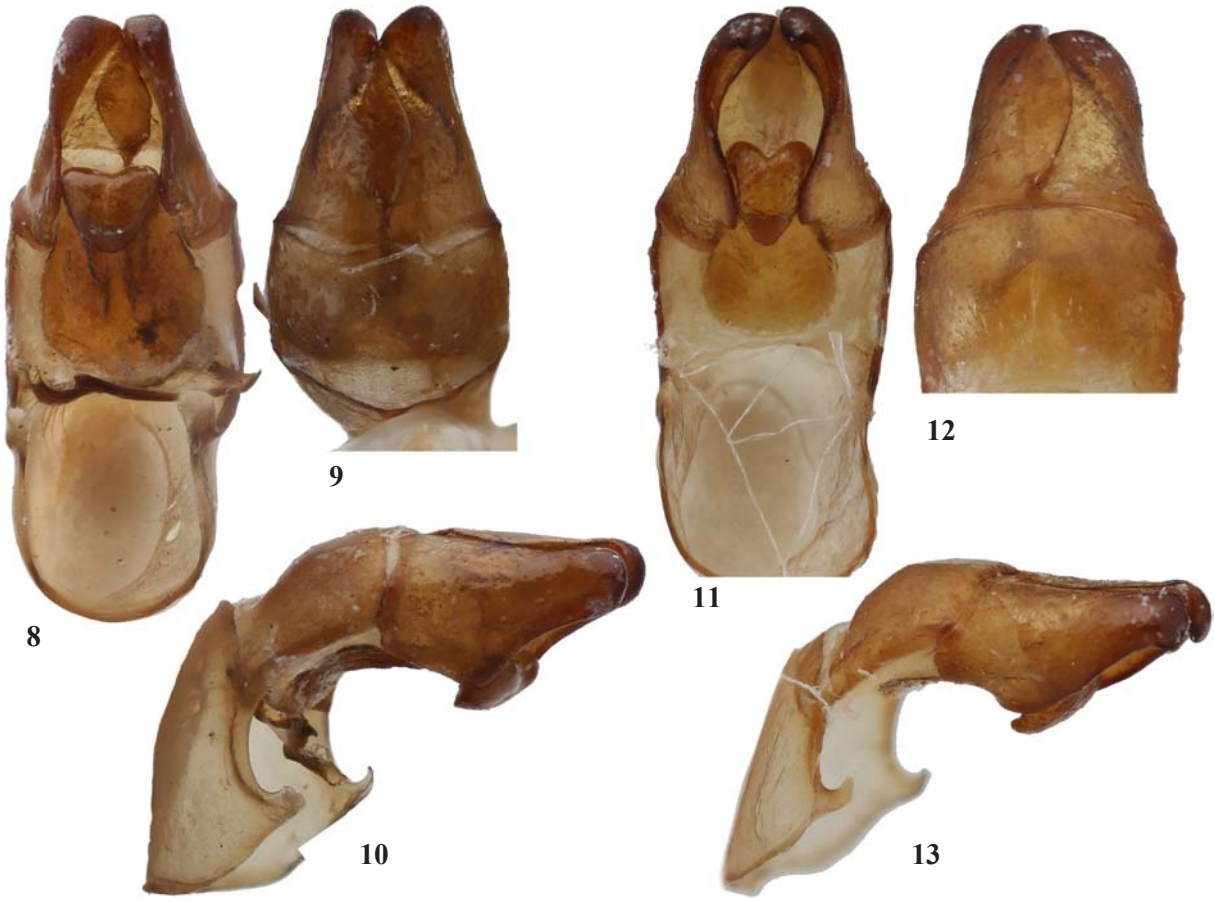

Figs 8–13. Aedeagus of *Exomala* spp: 8–10 — *E. pallidipennis*; 11–13 — *E. orientalis*; 8, 11 — ventral view; 9, 12 — dorsal view; 10, 13 — lateral view.

Рис. 8–13. Эдеагус *Exomala* spp: 8–10 — *E. pallidipennis*; 11–13 — *E. orientalis*; 8, 11 — снизу; 9, 12 — сверху; 10, 13 — сбоку.

Figs 14–17. Endophallus of *Exomala* spp: 14–15 — *E. pallidipennis*; 16–17 — *E. orientalis*; 14, 16 — lateral view; 15, 17 — dorsal view.

Рис. 14–17. Эндофаллус *Exomala* spp: 14–15 — *E. pallidipennis*; 16–17 — *E. orientalis*; 14, 16 — сбоку; 15, 17 — сверху.

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