



Revision of Palaearctic and Oriental *Necrophila* Kirby & Spence, part 1: subgenus *Deutosilpha* Portevin (Coleoptera: Silphidae)

JAN RŮŽIČKA¹ & JAN SCHNEIDER²

¹Department of Ecology, Faculty of Environmental Sciences, Czech University of Life Sciences Prague, Kamýcká 129, CZ-165 21 Praha 6, Czech Republic. E-mail: ruzickajan@fzp.czu.cz

²Lípová 15, CZ-120 00 Praha 2, Czech Republic. E-mail: microphorus@hotmail.com

Abstract

Taxonomic revision of the subgenus *Deutosilpha* Portevin, 1920 (of *Necrophila* Kirby & Spence, 1828) through south-eastern Asia is presented. Two species are recognised: (1) *N. (D.) rufithorax* (Wiedemann, 1823), comb. nov. (ex *Deutosilpha*), with *Oiceoptoma tetraspilotum* Hope, 1833 as confirmed junior subjective synonym, from India, Nepal and Sri Lanka; and (2) *N. (D.) luciae* Růžička & Schneider, **sp. nov.** from Thailand, Laos, Vietnam and China: Sichuan province. A lectotype is designated for *Silpha rufithorax* Wiedemann, 1823 and *Oiceoptoma tetraspilotum* Hope, 1833. Morphology-based diagnosis and key to adults of both species are produced. Georeferenced records for both species are mapped.

Key words: Coleoptera, Silphidae, *Necrophila*, *Deutosilpha*, taxonomy, new species, new combination, distribution, Oriental region

Introduction

Portevin (1920) erected *Deutosilpha* as a subgenus of *Eusilpha* Semenov, 1890, to accommodate only one species, originally described as *Silpha rufithorax* by Wiedemann (1823). Later, Portevin (1926) treated *Deutosilpha* as a separate genus, related to Oriental and Eastern Palaearctic *Calosilpha* Portevin, 1920, *Chrysilpha* Portevin, 1921 and *Eusilpha*, and redescribed all four genera. Hatch (1928) catalogued *Deutosilpha* as a subgenus of widely interpreted *Silpha* Linnaeus, 1758. Only recently, Peck (2001) and Sikes (2008) listed *Deutosilpha* along with *Calosilpha*, *Chrysilpha* and *Eusilpha* as subgenera of Nearctic *Necrophila* Kirby & Spence, 1828; following unpublished taxonomical revision of A.F. Newton, Jr. This classification is also accepted here, detailed phylogenetic relationships of all subgenera will be treated in a separate study (J. Růžička, unpublished).

Phylogenetic affinities of these five genera/subgenera are not clear. Recently, Ikeda *et al.* (2008) published phylogenetic reconstruction of Silphinae based on sequences of one mitochondrial (16S) and three nuclear genes (28S, wingless (Wg), and phosphoenolpyruvate carboxykinase (PepCK)). Both Bayesian and maximum parsimony analyses produced the following tree topology: *Necrophila* + (*Eusilpha* + (*Calosilpha* + *Chrysilpha*)) (Ikeda *et al.* 2008: 2072, fig. 1). However, *Deutosilpha* was not included into this analysis.

In another paper, Ikeda *et al.* (2007) studied flight capabilities and feeding habits of several species of Japanese carrion beetles of the subfamily Silphidae. *Necrophila (Calosilpha) brunnicollis* (Kraatz, 1877) and *N. (Eusilpha) jakowlewi* (Semenov, 1890) have fully developed flight muscles, but *N. (E.) japonica* (Motschulsky, 1861) showed flight muscle dimorphism. Comparing carbon and nitrogen stable isotope ratios based on the entire beetle body with other beetle predators and necrophages (Coleoptera: Carabidae and Silphidae), they concluded that *N. (C.) brunnicollis* is necrophagous, but *N. (E.) jakowlewi* and *N. (E.) japonica* are predaceous (interpreted as derived state from necrophagy; Ikeda *et al.* 2008: 2075, fig. 3).

The aim of this paper is to redescribe the subgenus *Necrophila (Deutosilpha)*, Oriental in distribution, and to name a new species, separate from the type species of *Deutosilpha*, based on study of material from the eastern part of the distributional range of the subgenus. Detailed distribution of both species is also summarized and mapped, based on material available from museums and private collection.

Material and methods

Specimens examined in this study are deposited in the following museums and private collections (acronyms according to Arnett *et al.* 1993):

BMNH	Natural History Museum, London (R. Booth, M.V.L. Barclay);
FMNH	Field Museum of Natural History, Chicago (A.F. Newton, J.H. Boone);
HNHM	Magyar Természettudományi Múzeum, Budapest (O. Merkl);
JHAC	collection of Jiří Háva, Únětice u Prahy, Czech Republic;
JMIC	collection of Jiří Mička, Praha, Czech Republic;
JRUC	collection of Jan Růžička, Praha, Czech Republic;
JSCC	collection of Jan Schneider, Praha, Czech Republic;
MHNG	Muséum d'Histoire Naturelle, Genève (G. Cuccodoro);
MNHN	Muséum national d'Histoire naturelle, Paris (†Nicole Berti, Azadeh Taghavian);
MNIC	collection of M. Nishikawa, Ebina, Japan;
MTDC	collection of Miloš Trýzna, Děčín, Czech Republic;
NHMB	Naturhistorisches Museum, Basel (M. Brancucci, Eva Sprecher-Uebersax);
NHMW	Naturhistorisches Museum, Wien (H. Schönmann);
NHRS	Naturhistoriska riksmuseet, Stockholm (B. Viklund);
NMPC	Národní museum, Praha (J. Jelínek, J. Hájek);
OUMNH	Oxford University Museum of Natural History, Oxford (D.J. Mann);
RMNH	National Museum of Natural History Naturalis, Leiden (A. von Assen);
SMFD	Forschungsinstitut Senckenberg, Frankfurt am Main (Andrea Vesmanis, D. Kovac);
SMLC	Severočeské muzeum, Liberec, Czech Republic (P. Vonička);
SMNS	Staatliches Museum für Naturkunde, Stuttgart (W. Schawaller);
TFUC	collection of T. Fukuzawa, Kanagawa, Japan;
WBAC	collection of W. Barries, Wien, Austria;
ZMAN	Zoölogisch Museum Amsterdam, Amsterdam (S.A. Ulenberg, W. Hogenes);
ZMAS	Russian Academy of Sciences, Zoological Institute, St. Petersburg (M.G. Volkovich);
ZMUC	Zoological Museum, University of Copenhagen, Copenhagen (A.Yu. Solodovnikov);
ZSM	Zoologische Staatssammlung, München (M. Balke).

Exact label data are cited only for the type material. Separate lines on labels are indicated (only for primary types) by “/”, separate labels by “//”. Authors' remarks and comments are enclosed in square brackets. [p] – preceding data are printed; [h] – preceding data are hand-written.

Photographs were taken using an Olympus SZX12 stereomicroscope with Olympus E-330 camera attached and multiple (5–23) layers of focus combined in the Helicon Focus 4.21 software. Male and female terminalia were studied after short clearing in hot KOH and mounted in temporal glycerine mounts for line drawings. Terminology of male genital segment follows mostly Blackburn (1936).

Microsoft Encarta Premium 2008 (Microsoft Corporation 2007), NGA GEONet Names Server (National Geospatial-intelligence Agency 2009; <http://earth-info.nga.mil/gns/html/index.html>), Google Earth (Google 2010; <http://earth.google.com>) and Fuzzy Gazetteer (Ch. Kohlschütter 2009; <http://isodp.fh-hof.de/fuzzyg/query/>) were used to find coordinates for most of the localities. Distribution map was produced using Online Map Creation (Weinelt 2006; www.aquarius.ifm-geomar.de).

Results

subgenus *Necrophila* (*Deutosilpha*) Portevin, 1920

Deutosilpha Portevin, 1920: 396 (description, as subgenus of *Eusilpha*, type species: *Silpha rufithorax* Wiedemann, 1823, by monotypy)

Deutosilpha: Portevin, 1926: 108, 151 (redescription, as separate genus, catalogue)

Silpha (Deuterosilpha): Hatch 1928: 112 (catalogue, subsequent misspelling of *Deutosilpha*, as subgenus of *Silpha*)

Necrophila (Deutosilpha): Peck 2001: 270 (catalogue, as subgenus of *Necrophila*)

Necrophila (Deutosilpha): Sikes 2008: 752 (catalogue, as subgenus of *Necrophila*)

Diagnostic description. Body flattened, length 17.5–22.5 mm. Head black with blue metallic lustre and yellow gula, antennae and mouthparts black. Pronotum orange with four black, glabrous spots, arranged in semi-circular position posteriorly on disc (Figs. 13–16). Scutellum, elytra, meso- and metathorax and legs black with blue metallic lustre. Abdomen black with metallic lustre, with pale posterior part of ventrite 8 and pale segments 9 and 10. Elytra dark blue to violet on outer lateral margins (on elytral epipleura), and light metallic blue on ventral surface (which is exposed probably only during flight).

Head flattened, with row of long erect black setae behind the eyes (Fig. 22). Frons with weakly indicated fovea between the eyes. Eyes small, not prominently protruding (Figs. 21–22). Antennae with loosely formed antennal club, consisting of 4 antennomeres (Fig. 15).

Pronotum hexagonal in shape (Figs. 21–22), with anterior margin only weakly emarginate, posterior margin straight medially (Figs. 21–22). Surface with uniformly dispersed, fine and dense, round punctures; more superficial on pronotal disc, without setation. Surface matt, with very fine isodiametrical microsculpture. Anterior and posterior margin with dense row of stout, short, yellow, ventrally oriented setae.

Scutellum large, with sinuous lateral margins (Figs. 13–16), densely covered by fine round punctures.

Elytra flattened with dorsally elevated, robust epipleural ridges on lateral margins. Each elytron with two weakly developed costae and abbreviated, outer third costa, which is only vestigial (Figs. 13–16). Elytral costae more distinctly delimited and elevated in females (Figs. 14, 16) than in males (Figs. 13, 15). Elytral epipleural ridge distinctly elevated along lateral margin, forming crest-like structures abruptly flattened postero-laterally in males (Figs. 13, 15; 17, 19), and gradually diminishing in females (Figs. 14, 16; 18, 20). Apex of elytron in males subtruncate to truncate with sinuous margin (Figs. 17, 19), in females elongate to slender, triangular or sinuate tip, sometimes with suture extended in distinct inner denticle (Figs. 18, 20). Dorsal surface with uniformly dispersed, fine and dense punctation, similar to that on pronotum; surface matt, with very fine, isodiametric microsculpture; without reticulate sculpture (which is present in *Necrophila* s. str.). Ventrally, elytra covered by densely arranged, large and strong punctures.

Hind wings fully developed, functional.

Metaventrite with dense, black pubescence and fine, transverse microsculpture.

Legs with bent tibia (more pronounced in males), tibia armed with several longitudinal rows of short, strong setae. Pro- and mesofemur with distal, ventrally oriented denticle in males (unmodified in females). Protarsomere 1–4 moderately expanded in males (unmodified in females). Metatarsal claws asymmetrical in males (Fig. 27), with inner claw distinctly longer and more robust than the outer one (almost symmetrical, of the comparable size in females, Fig. 28).

Abdomen very tightly fixed by ventrally expanded elytral epipleura.

Male. Genital segment with longitudinal ventrite 9, reaching anterior margin of tergum 9 (Figs. 3, 8); spiculum gastrale medium in size, relatively slender, slightly asymmetrical (Figs. 2–3, 7–8). Aedeagus small; with slender paramerae and median lobe regularly tapering to a triangular tip (Figs. 1, 6).

Female. Genital segment with tergum 10 hexagonal in shape in dorsal view (Figs. 4, 9, 11), with stylus inserted laterally, shorter than apex of coxite in ventral view (Figs. 5, 10, 12).

A key to the species of *Necrophila (Deutosilpha)*

- 1 Body wider (Figs. 15–16), with pronotum 1.63–1.78 times as wide as long (Fig. 22). Apex of elytron in male truncate, with posterior margin sinuous (Fig. 19); in female elongate with convex apex and small, but distinct inner denticle (Fig. 20). (India, Nepal, Sri Lanka; Fig. 33). *N. (D.) rufithorax*
- Body more slender (Figs. 13–14), with pronotum 1.35–1.57 times as wide as long (Fig. 21). Apex of elytron in male subtruncate, with regularly rounded posterior margin (Fig. 17); in female elongate, with triangular, flat apex, only with vestigial inner denticle or without denticle (Fig. 18). (Thailand, Laos, Vietnam, China: Sichuan province; Fig. 33). *N. (D.) luciae* **sp. nov.**

***Necrophila (Deutosilpha) rufithorax* (Wiedemann, 1823), comb. nov.**

(Figs. 1–5, 15–16, 19–20, 22–28, 33)

Silpha rufithorax Wiedemann, 1823: 71 (description, type locality “Bengalia”)

Silpha rufithorax: Harold 1877: 347 (senior subjective synonym of *Silpha tetraspilota*)

Eusilpha rufithorax: Portevin 1903: 332 (new combination, confirmed as senior subjective synonym of *Silpha tetraspilota*)

Eusilpha rufithorax: Portevin 1905: 51 (synonymy confirmed)

Silpha rufithorax: Arrow 1909: 190 (new combination, synonymy confirmed)

Eusilpha (Deutosilpha) rufithorax: Portevin 1920: 396 (new subgeneric assignment)

Deutosilpha rufithorax: Portevin 1926: 111, 151 (new combination, redescription, catalogue)

Silpha (Deutosilpha) rufithorax: Hatch 1928: 112 (catalogue)

Oiceoptoma tetraspilotum Hope, 1833: 61 (description, type locality “Indiâ Orientali circa Poona”)

Oiceoptoma tetraspilotum Hope, 1834: 93 (redescription)

Silpha tetraspilota: Harold 1877: 347 (new combination, junior subjective synonym of *Silpha rufithorax*)

Eusilpha tetraspilota: Portevin 1903: 332 (new combination, synonymy confirmed)

Eusilpha tetraspilota: Portevin 1905: 51 (synonymy confirmed)

Silpha tetraspilota: Arrow 1909: 190 (new combination, synonymy confirmed)

Deutosilpha tetraspilota: Portevin 1926: 151 (new combination, synonymy confirmed, catalogue)

Silpha (Deutosilpha) tetraspilota: Hatch 1928: 112 (new combination, catalogue)

Type material examined. Lectotype ♂ of *Silpha rufithorax* (ZMUC) (here designated), labelled (Fig. 23): “Mus. / Westerm. [p] // TYPE [p, red label] // S. rufithorax / Wied. / Bengal / May 1809 [hw] // LECTOTYPUS / Silpha rufithorax / Wiedemann, 1823 / Jan Růžička & / Jan Schneider des. 2009 [p, red label] // Necrophila (Deutosilpha) / rufithorax / (Wiedemann, 1823) [p] ♂ [hw] / Jan Růžička det. 200 [p] 9 [hw]”; paralectotype ♀ (ZMUC), labelled: “Mus. / Westerm. [p] // TYPE [p, red label] // PARALECTOTYPUS / Silpha rufithorax / Wiedemann, 1823 / Jan Růžička & / Jan Schneider des. 2009 [p, red label] // Necrophila (Deutosilpha) / rufithorax / (Wiedemann, 1823) / Jan Růžička det. 200 [p] 9 [hw]”.

Lectotype ♀ of *Oiceoptoma tetraspilotum* (BMNH) (here designated), labelled (Fig. 24): “Type [p, red rim, round label] // Duk= / hun [hw, round label] [= Deccan plateau] / Col. Sykes [hw, on underside] // Silpha / tetraspilota / Type. Hope. [hw] // Ind. Mus. / 79.64. [p] // LECTOTYPUS / Oiceoptoma / tetraspilotum Hope, 1833 / Jan Růžička & / Jan Schneider des. 2010 [p, red label] // Necrophila (Deutosilpha) / rufithorax / (Wiedemann, 1823) [p] ♀ [hw] / Jan Růžička det. 200 [p] 9 [hw]”; Paralectotypes: ♂ (OUMNH), labelled (Fig. 25): “TYPE / HOPE [p] / Trans. Zool. / Lond. 1. P.93 / T. 13 fig. 3 [hw] / Coll. Hope Oxon. [p, red frame] // Oiceoptoma / tetraspilotum / Hope J. Z. L [Hope’s hw, red label] // TYPE [p] COL : 237 1/2 / Oiceptoma [sic!] / tetraspilota Hope [hw] / HOPE DEPT. OXFORD [p, black frame] // PARALECTOTYPUS / Oiceoptoma / tetraspilotum Hope, 1833 / Jan Růžička & / Jan Schneider des. 2010 [p, red label] // Necrophila (Deutosilpha) / rufithorax / (Wiedemann, 1823) [p] ♂ [hw] / Jan Růžička det. 201 [p] 0 [hw]”; 1 ♀ (OUMNH), labelled (Fig. 26): “tetraspilotum / Hope [Hope’s hw] // TYPE [p] COL : 237 2/2 / Oiceptoma [sic!] / tetraspilota Hope [hw] / HOPE DEPT. OXFORD [p, black frame] // PARALECTOTYPUS / Oiceoptoma / tetraspilotum Hope, 1833 / Jan Růžička & / Jan Schneider des. 2010 [p, red label] // Necrophila (Deutosilpha) / rufithorax / (Wiedemann, 1823) [p] ♀ [hw] / Jan Růžička det. 201 [p] 0 [hw]”.

Additional material examined. 114 specimens – **India: Bihar state:** “Bengal”, Pusa [ca. 25°58'N 085°40'E], 1810, ex coll. Andrewes, 1 ♀ (BMNH); **Chhattisgarh state:** Barway [= Barway region, ca. 23°04'N 084°20'E], without date and collector’s name, 1 ♂ (NHRS); Chota-Nagpore [= Chota Nagpur Plateau], Barway, vi.–viii.1896, R. P. Cardon leg., 2 ♂♂ (BMNH); Chota-Nagpore [= Chota Nagpur Plateau], Nowatoli [ca. 23°20'N 083°44'E], vi.1897, R. P. Cardon leg., 2 ♂♂, 1 ♀ (coll. R. Oberthür, MNHN); **Karnataka state:** Bangalore [ca. 12°57'N 077°34'E], 1903, without collector’s name, 1 ♂ (BMNH); Belgaum [ca. 15°51'N 074°30'E], without date and collector’s name, 2 ♀♀ (BMNH); Bellary [ca. 15°08'N 076°55'E], 1896, de Morgan leg., 2 ♂♂, 2 ♀♀ (MNHN); Nnegarhole N. P. [= Nagarhole Wildlife Preserve, or Rajiv Gandhi National Park, ca. 12°00'N 076°10'E], x.–xi.1996, R. David leg., 2 ♂♂, 1 ♀ (WBAC); same data, 1 ♂, 2 ♀♀ (JSSC); Shimoga [= Shivamogga, ca. 13°55'N 075°34'E], without date and collector’s name, 1 ♀ (NMPC); same locality, without date and collector’s name, 1 ♀ (JHAC); same locality, without date and collector’s name, 2 ♀♀ (JSSC); same locality, without date and collector’s name, 1 ♂, 1 ♀ (coll. R. Oberthür, MNHN); same locality, vi.1897, without collector’s name, 5 ♂♂, 3 ♀♀ (coll. R. Oberthür, MNHN); **Madhya Pradesh state:** Rutlam [= Ratlam, ca. 23°19'N 075°02'E], without date and collector’s name [but before 1952], 1 ♀ (coll. R. Oberthür, MNHN); **Maharashtra state:** Bombay [= Mumbai, ca. 18°56'N 072°49'E], without date [but before 1947], ex coll. D. L. Uyttenboogaart, 1 ♀ (ZMAN); same locality, without date

and collector's name, 1 ♀ (ZMAN); same locality, without date and collector's name, 1 ♂, 1 ♀ (RMNH); same locality, "13748", without date [but before 1905], ex coll. Fry, 1 ♀ (BMNH); same locality, without date, ex coll. Mniszech, 1 ♂, 2 ♀♀ (coll. A. Grouvelle, MNHN); Poona [= Pune, ca. 18°31'N 073°50'E], 60.15 E.I.C., without date and collector's name [but before 1860], 1 ♂, 1 ♀ (BMNH); same locality, 26.viii.1944, D. Leston leg., 2 ♂♂, 1 ♀ (BMNH); Pune, without date [but before 1917] and collector's name, 1 ♀ (coll. A. Grouvelle, MNHN); same locality, viii.1984, [S.] Pokorný leg., 1 ♀ (JRUC); Meghalaya state: Khassia Hills [centroid ca. 25°30'N 091°30'E], 4000 ft [ca. 1220 m], 1892, Ex Musaeo H. W. Bates, 1 ♀ (coll. R. Oberthür, MNHN); Rajasthan state: Keoladeo National Park [ca. 27°10'N 077°30'E], 29.x.1997, J. Šťastný leg., semi-dry carrion of mongoose (*Herpestes* sp.), on dry soil trampled by cows, 4 ♂♂, 1 ♀ (JRUC); Union Territory of Puducherry: Pondichéry [= Pondicherry, ca. 11°56'N 079°50'E], without date and collector's name, 1 ♂ (coll. M. Pic, MNHN); Pondich.[erry], without date, Ex Musaeo Guér.-Menev. [= F.É. Guérin-Méneville], 3 ♂♂ (coll. R. Oberthür, MNHN); Uttarakhand state [= Uttaranchal]: Kumaon, Haldwani division [ca. 29°13'N 079°31'E], without date, H. G. C.[hampion] leg., 1 ♀ (BMNH); Dehra Dun [ca. 30°20'N 078°02'E], vi.1944, without collector's name, 1 ♂, 1 ♀ (ZSM); same data, 1 ♂ (JRUC); Uttar Pradesh state: Moradabad [ca. 28°50'N 078°46'E], without date and collector's name, 1 ♂ (coll. A. Grouvelle, MNHN); West Bengal state: "Bengale" [centroid ca. 23°00'N 087°40'E], without date [but before 1825], [A.] Duvaucel leg., 1 ♂ (MNHN);

Nepal: Bara district, Amelkhanj [ca. 27°17'N 084°59'E], 520 m, viii.1957, E.I. Coher leg., 1 ♀ (FMNH); Chitwan district, Chitwan National Park [ca. 27°30'N 084°20'E], Saura [= Sauraha], 23.v.1988, S. Bílý leg., 1 ♀ (JRUC); "Nepaul", without date and collector's name, Collection Laporte, 1 ♂ (coll. M. Pic, MNHN); "Nepaul", without date [but before 1922] and collector's name, 1 ♂ (coll. L. Bedel, MNHN); "Nepal", without date and collector's name, 1 ♂ (OUMNH);

Sri Lanka: "Ceylan" [without more detailed locality, centroid ca. 07°40'N 080°50'E], 1883, Chaper & de Morgan leg., 2 ♂♂, 4 ♀♀ (MNHN);

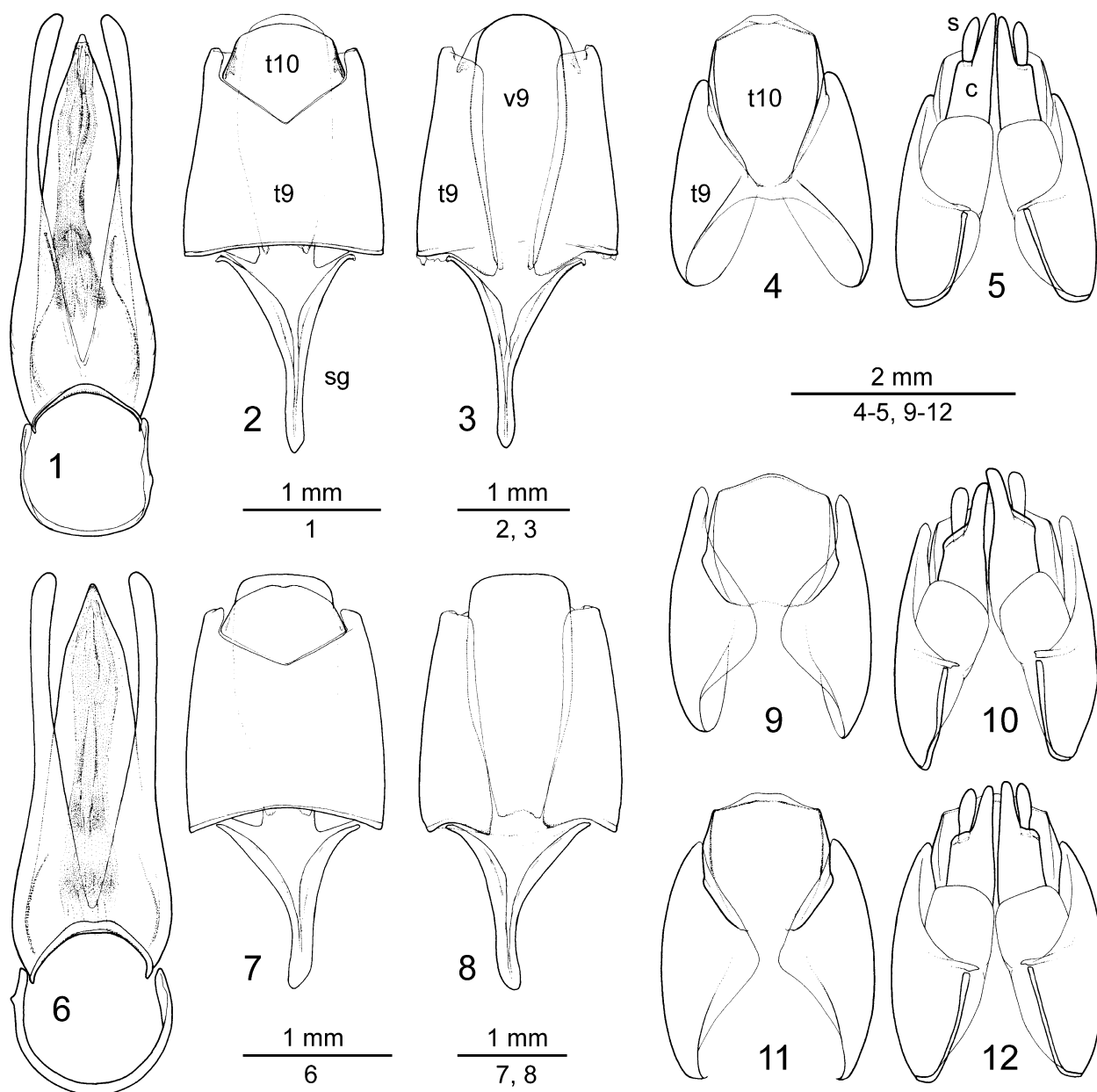
Not or imprecisely located: "Himalaya", without date and collector's name, 1 ♂ (coll. M. Pic, MNHN); "Himalaya", without date, ex coll. [E.] Koenig, 1 ♂ (ZMAS); "Thibet", without date and collector's name, 1 ♂ (MHNG); same data, 2 ♂♂, 4 ♀♀ (NHMW); "E Indies", 1 ♂ (BMNH); "1373", 1 ♀ (BMNH); "India", without date, Bowring leg., 63.47* [collected before 1863], 2 ♂♂ (BMNH); "India orient.", without date [but before 1905], ex coll. Fry, 1 ♂ (BMNH); "Ind. or.", without date, Stevens leg., 1 ♀ (NHRS); "Ind. or.", without date, Westwood leg., 1 ♀ (RMNH); "Indes or. inter.", without date, de Sauss.[ure] leg., 1 ♂ (MHNG); "Vorder Indien", without date and collector's name, 1 ♂ (SMFD); "Ostindien", without date and collector's name, 1 ♂, 1 ♀ (NHMB); "Inde", without date and collector's name, 3 ♂♂, 3 ♀♀ (coll. A. Grouvelle, MNHN); "Inde 43-97", Fauvel leg., 2 ♀♀ (MNHN); "Indes", without date, Boys leg., 1 ♂ (MHNG); "India", without date [but before 1895], Harsey leg., 1 ♂, 1 ♀ (OUMNH); "E Ind.a", without date and collector's name, (OUMNH); "India", without date [but before 1880], ex coll. J.W. Miers, 1 ♂ (OUMNH); "Ind. or.", without date, ex coll. Cl. Müller, 1 ♂ (ZSM); "Museum Natura, Artis Magistra, Patria Ignota", 1 ♂ (ZMAN); "56/149" [collected before 1856], 1 ♂, 2 ♀♀ (BMNH); "838", Asia, 1 ♂ (NMPC); "8341", 1 ♀ (MNHN).

Diagnostic description. Body length 17.5–22.3 mm (21.0 mm in the lectotype of *Silpha rufithorax*), maximum body width 8.9–11.6 mm (11.1 mm in the lectotype of *S. rufithorax*). Body much wider than in *N. luciae* sp. nov., widely rounded posteriorly in dorsal view (Figs. 15–16). Pronotum widely hexagonal in shape (Fig. 22), 1.63–1.78 times as wide as long. Ventrite 8 on abdomen black, with pale transverse line along posterior margin.

Male. Apex of elytron truncate, with posterior portion sinuous, suture extended in small, distinct inner denticle (Fig. 19). Genital segment in dorsal view with deeply notched suture between tergum 9 and 10, forming rectangular angle (Fig. 2); slender ventrite 9 with regularly rounded posterior margin (Fig. 3). Spiculum gastrale is slender, of equal length as tergum 9 (Figs. 2–3). Length of aedeagus 3.8 mm, median lobe more slender than in *N. luciae* sp. nov.; gently tapering to more elongated apical portion (Fig. 1). Parameres subapically more slender than in *N. luciae* sp. nov. (Fig. 1). Basal portion of aedeagus forming slender, sub-quadrate rim (Fig. 1).

Female. Elytron with elongate, convex apex, suture extended in small, but distinct inner denticle (Fig. 20). Tergum 10 elongate, tergum 9 reaching only two-thirds of tergum 10 length in dorsal view (Fig. 4).

Notes on taxonomy and nomenclature. *Oiceoptoma tetraspilotum* Hope, 1833 is confirmed here as conspecific junior subjective synonym of *Silpha rufithorax* Wiedemann, 1823. Two syntypes of *S. rufithorax* from ZMUC were designated here as lectotype (the male) and paralectotype (the female), in order to ensure the consistent application of the name, according to the Article 74.7.3 of the Code (ICZN 1999).

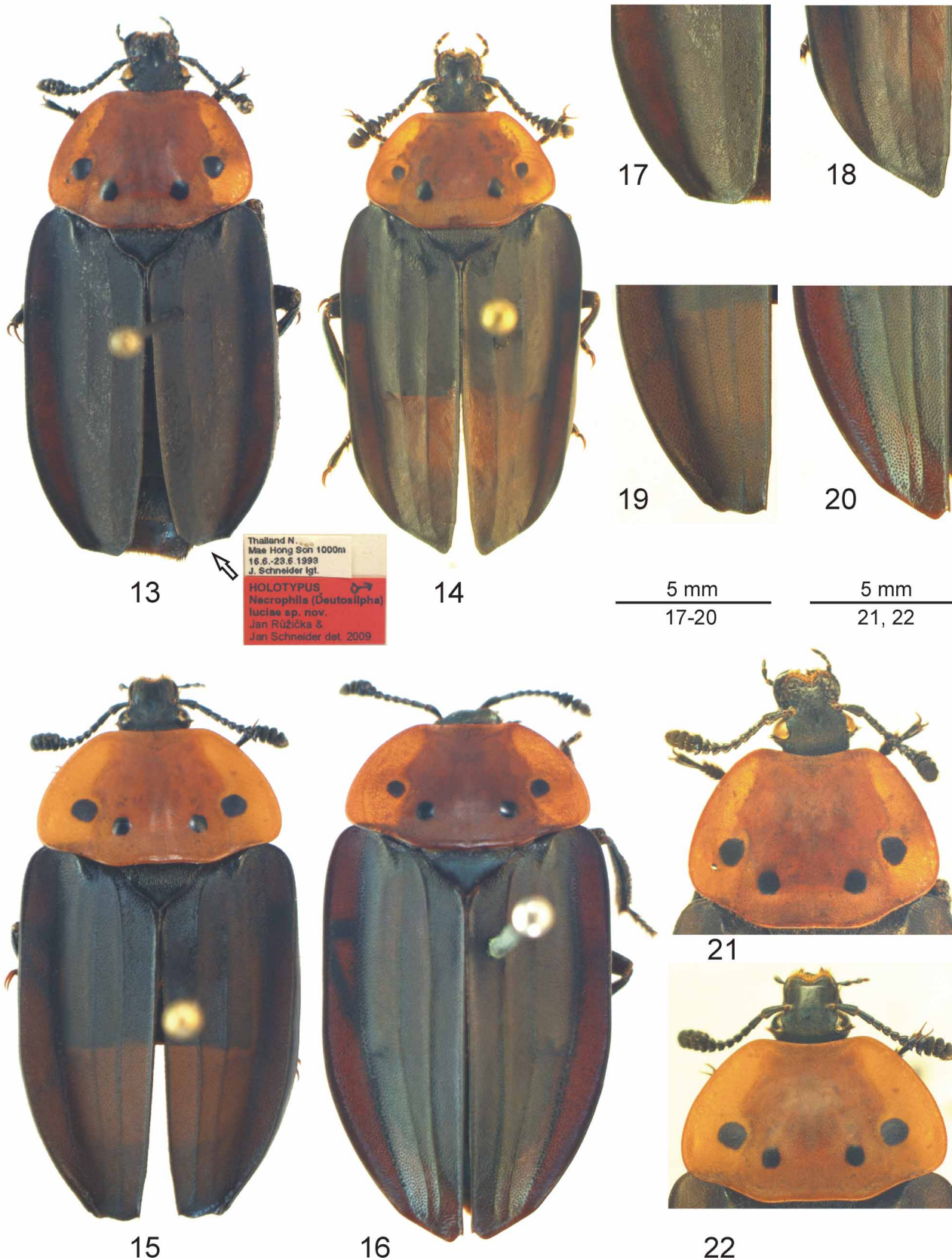


FIGURES 1–12. Genitalia of *Necrophila (Deutosilpha) rufithorax* (Wiedmann) (1–5, India: Keoladeo National Park, JRUC) and *N. (D.) luciae* Růžička & Schneider, **sp. nov.** (6–8, holotype ♂, BMNH, and 9–12, paratypes ♀♀, JRUC, from Thailand: Mae Hong Son), setae omitted. Aedeagus ventrally (1, 6); ♂ genital segments dorsally (2, 7) and ventrally (3, 8); ♀ genital segments dorsally (4, 9, 11) and ventrally (5, 10, 12). Abbreviations: c—coxite, s—stylus, sg—spiculum gastrale, t9—tergum 9, t10—tergum 10, v9—ventrite 9.

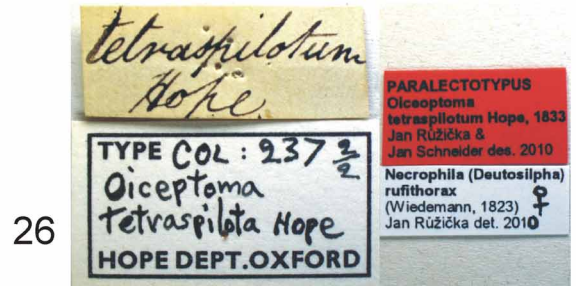
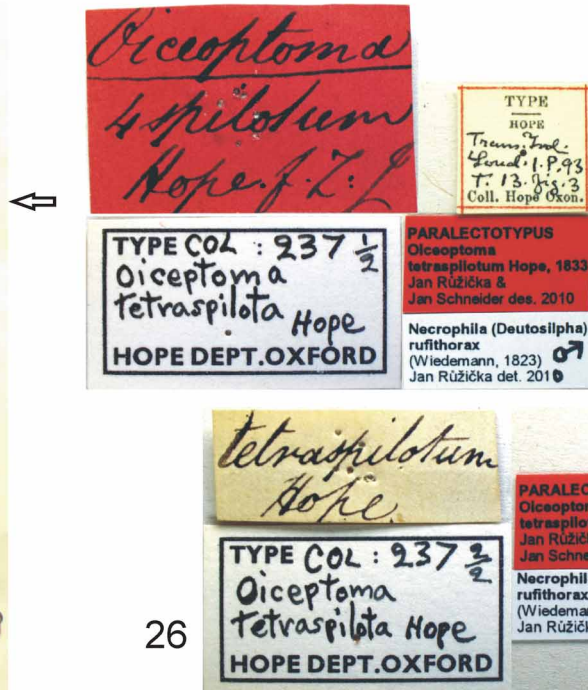
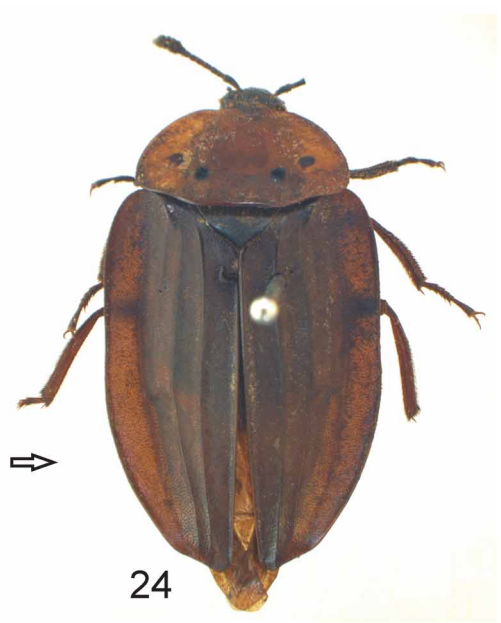
The syntype of *Oiceoptoma tetraspilotum* deposited in BMNH is designated here as a lectotype, in order to ensure the consistent application of the name, according to the Article 74.7.3 of the Code (ICZN 1999).

Additional two syntypes (a male and a female) from OUMNH are designated as paralectotypes. Hope (1934: 93) mentioned “circa Poona copiosè [= abundant] / Mus. Sykes”, not providing exact number of specimens examined. The lectotype specimen from BMNH bears the labels “Col. Sykes” and “Ind. Mus. / 79.64” (Fig. 24), which indicate that it was part of the W.H. Sykes collection in India and become part of the BMNH collection only in 1879. The additional two specimens from OUMNH were probably retained by Hope in his collection.

The nomenclature of *Oiceoptoma tetraspilotum* is interesting: the species was described twice. Preliminary (but valid) diagnosis was published by Hope (1833) in *Proceedings of the Zoological Society of London*, forming part of [W.H.] Sykes’ report of the Society meeting. Full description was published by Hope (1834) in *Transactions of the Zoological Society of London*, together with a colour habitus figure and details of the head and antenna. As the first



FIGURES 13–22. Habitus dorsally of *Necrophila (Deutosilpha) luciae* Růžička & Schneider, **sp. nov.** (13, 17, 21, holotype ♂, BMNH, and 14, 18, paratype ♀ from Thailand: Mae Hong Son, JRUC; body length 22.1 mm in ♂ and 22.7 mm in ♀) and *N. (D.) rufithorax* (Wiedmann) (15, 19, 22, ♂ from India: Keoladeo National Park, JRUC; and 16, 20, ♀ from India: Poona, BMNH; body length 20.6 mm in ♂ and 20.8 mm in ♀). Habitus dorsally (13–16), apex of left elytron dorsally (17–20), ♂ pronotum in orthogonal view (21–22).



FIGURES 23–28. Habitus dorsally and labels of ♂ lectotype of *Silpha rufithorax* Wiedemann (23, “circa Poona”, ZMUC), ♀ lectotype of *Oiceptoma tetraspilotum* Hope (24, “Dukhun”, BMNH) and ♂ paralectotype of *O. tetraspilotum* (25, OUMNH), and labels of ♀ paralectotype of *O. tetraspilotum* (26, OUMNH). Metatarsus in dorsal view of *Necrophila* (*Deutosilpha*) *rufithorax* (Wiedemann) (India, Keoladeo National Park, JRUC): male (27) and female (28).

paper is in fact only a report, which summarize the diagnoses (of several species of Coleoptera from Deccan plateau) and mentioned colour plates presented during the meeting and published a year later, we consider unnecessary treating both names of 1833 and 1834 as separate homonyms.

Collecting circumstances. Series of specimens from India: Keoladeo National Park was collected on semi-dry carcass of mongoose (*Herpestes* sp., Herpestidae) (Fig. 29), on dry soil trampled by cows, in the middle of field (J. Šťastný, pers. comm.).



FIGURES 29–32. Collecting habitat (29) of *Necrophila* (*Deutosilpha*) *rufithorax* (Wiedemann) in India: Keoladeo National Park, on carrion of mongoose (*Herpestes* sp.); landscape type (30) of *N. (D.) luciae* Růžička & Schneider, **sp. nov.** in Thailand: Mae Hong Son; landscape type (31) and collecting habitat (32) of *N. (D.) luciae* Růžička & Schneider, **sp. nov.** in Laos: Ban Thabok, construction with pitfall trap on its top is indicated by arrow (photo 29 by J. Šťastný, 30 by J. Schneider, 31–32 by J. Kantoh).

Distribution. Widely distributed through the Indian Peninsula, south of the main Himalayan mountain ridge. So far known from India, Nepal and Sri Lanka (the last one without more precise locality) (Fig. 33). Published records from Thailand (Růžička *et al.* 2000) and Laos (Růžička & Schneider 2003) concern the following species.

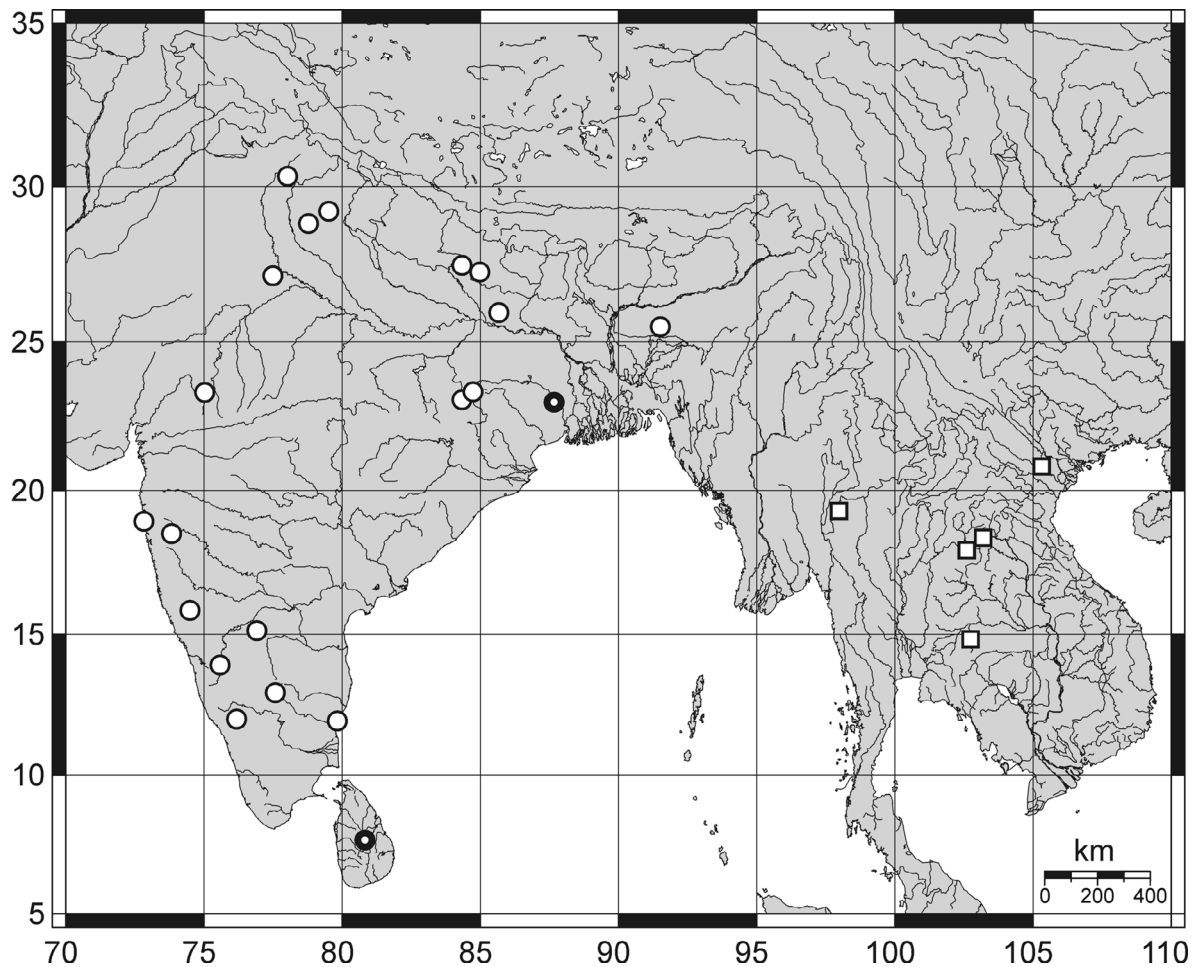


FIGURE 33. Known distribution of *Necrophila (Deutosilpha) rufithorax* (Wiedmann) (open circles; thick margins for state records only) and *N. (D.) luciae* Růžička & Schneider, *sp. nov.* (open squares; Chinese record from “Ouy-Sy” not figured) in Oriental region.

Necrophila (Deutosilpha) luciae* Růžička & Schneider, *sp. nov.

(Figs. 6–14, 17–18, 21, 33)

Deutosilpha rufithorax: Růžička *et al.* 2000: 382 (record from Thailand, misidentification)

Deutosilpha rufithorax: Růžička & Schneider 2003: 309 (record from Laos, misidentification)

Type locality. Thailand, Mae Hong Son, 1000 m.

Type material. 67 specimens—Holotype ♂ (BMNH), labelled (Fig. 13): “Thailand N / Mae Hong Son [ca. 19°18'N 097°58'E] 1000m / 16.6.–23.6. 1993 / J. Schneider lgt. [p] // HOLOTYPUS [p] ♂ [hw] / *Necrophila (Deutosilpha) / luciae sp. nov.* / Jan Růžička & / Jan Schneider det. 2009 [p, red label]”. Paratypes: 2 ♂♂, 2 ♀♀ (FMNH): same data as holotype, except for “PARATYPE [p]” and “♂ [hw]” or “♀ [hw]”; 4 ♂♂, 6 ♀♀ (JHAC): same data; 2 ♂♂ 2 ♀♀ (JMJC): same data; 4 ♂♂, 4 ♀♀ (JRUC): same data; 12 ♂♂, 6 ♀♀ (JSCC): same data; 1 ♀ (NMPC): same data; 1 ♀ (SMLC): same data; 1 ♂, 2 ♀♀ (MTDC): same data; 1 ♂, 1 ♀ (SMNS): same data; 2 ♂♂, 2 ♀♀ (WBAC): same data; 1 ♀ (SMNS), labelled: “Thailand 25.VIII.1996 / Pak Thong/Khao Yai / 14°50'N 102°44'E / leg. M. HAUSER [p] // PARATYPUS [p] ♀ [hw] / *Necrophila (Deutosilpha) / luciae sp. nov.* / Jan Růžička & / Jan Schneider det. 2009 [p, red label]”; 1 ♀ (coll. R. Oberthür, MNHN), labelled: “Sutchuen [= China: Sichuan province] / Ouy-Sy, / R. P. Mombelg [leg.] / 1911 [p] // MUSÉUM PARIS / 1952 / COLL. R. OBERTHUR [p] // PARATYPUS [p] ♀ [hw] / *Necrophila (Deutosilpha) / luciae sp. nov.* / Jan Růžička & / Jan Schneider det.

2009 [p, red label]"; 1 ♂ (NHMB), labelled: "CHINA [p, label with a black frame] // Sammlung / G. Schneider / Museumsverein [p] // Necrophila (Deutosilpha) / luciae sp. nov. / Jan Růžička & / Jan Schneider det. 2009 [p, red label]"; 1 ♂ (MNHN), labelled: "MUSEUM PARIS / TONKIN / RÉG: DE HOA BINH [= Vietnam, Hòa Bình, ca. 20°49'N 105°19'E] / A. DE COOMAN 1928 [p] // PARATYPUS [p] ♂ [hw] / Necrophila (Deutosilpha) / luciae sp. nov. / Jan Růžička & / Jan Schneider det. 2009 [p, red label]"; 1 ♂, 1 ♀ (HNHM), labelled "LAOS, Vientiane, / shore of Mekong River [ca. 17°57'N 102°36'E], / singled from faeces, // No. 4 / 12.–20.III. 1998 / leg. O. Merkl & G. Csorba [p] // Deutosilpha / rufithorax W. [hw] / det. Schawaller 1999 [p] // PARATYPUS [p] ♂ [hw] [or ♀] / Necrophila (Deutosilpha) / luciae sp. nov. / Jan Růžička & / Jan Schneider det. 2009 [p, red label]"; 1 ♂, 1 ♀ (MNIC), labelled: "Ban Tabok [= Laos, Ban Thabok, ca. 18°22'N 103°12'E, ca. 154 m in alt.], Boli Khamxai Pref., 17–III–2003, J. Kantoh leg. [p] // PARATYPUS [p] ♂ [hw] [or ♀] / Necrophila (Deutosilpha) / luciae sp. nov. / Jan Růžička & / Jan Schneider det. 2009 [p, red label]"; 1 ♀ (TFUC), same locality and date, but "Raichiro Katsuyama leg. // PARATYPUS [p] ♀ [hw] / Necrophila (Deutosilpha) / luciae sp. nov. / Jan Růžička & / Jan Schneider det. 2009 [p, red label]"; 1 ♂ (aedeagus mounted on a small card) (coll. M. Pic, MNHN), labelled: "Muséum Paris / Coll. Pic [p, yellow label] // genre / Deutosilpha Port. [hw, Pic's ms, orange label] // PARATYPUS [p] ♂ [hw] / Necrophila (Deutosilpha) / luciae sp. nov. / Jan Růžička & / Jan Schneider det. 2009 [p, red label]".

Diagnostic description. Body length 18.9–22.5 mm (22.1 mm in the holotype), maximum body width 8.9–10.6 mm (10.4 mm in the holotype). Body more slender than in *N. rufithorax*, elytra subquadrate in dorsal view (Figs. 13–14). Pronotum hexagonal in shape (Fig. 21), 1.35–1.57 times as wide as long. Ventricle 8 on abdomen black, with pale triangular macula medially in posterior third.

Male. Apex of elytron subtruncate, with regularly rounded posterior portion (Fig. 17). Genital segment in dorsal view with less deeply notched suture between tergum 9 and 10 than in *N. rufithorax*, forming obtuse angle (Fig. 7); ventrite 9 more stout than in *N. rufithorax*, with subquadrate posterior margin (Fig. 8). Spiculum gastrale is more stout than in *N. rufithorax*, distinctly shorter than the length of tergum 9 (Figs. 7–8). Length of aedeagus 3.5 mm, median lobe wider than in *N. rufithorax*, stout; with short, triangular apical portion (Fig. 6). Parameres more stout than in *N. rufithorax* (Fig. 6). Basal portion of aedeagus forming robust, regularly rounded rim (Fig. 6).

Female. Elytron with triangular, flat apex, suture extended in only with very vestigial inner denticle or without denticle (Fig. 18). Tergum 10 oval, tergum 9 reaching posterior margin of tergum 10 (Fig. 9); exceptionally, reaching only three-quarters of tergum 10 length (Fig. 11).

Collecting circumstances. The large series from the type locality was found on the periphery of the town, in a garden with sparse vegetation close to the slaughterhouse, individually collected on numerous decaying cow heads; the surrounding hills are covered by a dense forests (Fig. 30). The two specimens from Laos: Vientiane were collected from excrements, on the shore of Mekong river. The three specimens from Laos: Ban Thabok were caught by a carrion trap using the dead body of a small mammal resembling a squirrel as the bait; the baited trap was covered by a roof like dwarf' house at ca. 1.5 m above the ground (Fig. 32) inside the sparse grove along dry rice fields situated between a river and a private house; the trap site was relatively dry including its surroundings (Fig. 31). The beetles were found together with saprinine histerids, scarabaeids, trogids and *Diamesus osculans* (Vigors, 1825) (Silphidae) two days after the trap was set (J. Kantoh, pers. comm. to M. Nishikawa). It is no doubt that all three specimens from Laos: Ban Thabok perform active flight.

Etymology. Patronymic, named after Lucie Schneiderová, the older daughter of the second author.

Distribution. So far known from Thailand, Laos, Vietnam and China: Sichuan province (the last one with only unprecisely located, single record) (Fig. 33).

Acknowledgements

We are obliged to all colleagues listed in the Material and Methods section and to Svatopluk Bílý (Praha, Czech Republic), Svatopluk Pokorný (Praha, Czech Republic) and Jaroslav Šťastný (Liberec, Czech Republic) for the possibility to study collections under their care, or for loan/gift of *Necrophila (Deutosilpha)* material for our study. Jaroslav Šťastný (Liberec, Czech Republic) and Masaaki Nishikawa (Ebina, Japan) are also thanked for sharing unpublished field observation and for providing habitat photographs from India and Laos. Zbyněk Kejval (Domažlice, Czech Republic) executed the line drawings. We are grateful to Wolfgang Schawaller (SMNS) and an anonymous review for their comments which helped to improve our manuscript. The present study was partly supported by grant of the Grant Agency of the Czech Republic (206/07/1053) to Jan Růžička.

References

- Arnett, R.H., Jr., Samuelson, G.A. & Nishida, G.M. (1993) *The insect and spider collections of the world, 2. edition*. Sandhill Crane Press, Gainesville, vi + 309 pp.
- Arrow, G.J. (1909) Systematic Notes on Coleoptera of the Clavicorn Families. *The Annals and Magazine of Natural History*, (Eighth Series) 4, 190–196.
- Blackburn, N.D. (1936) Illustrations of external anatomy *Silpha americana* Linn. (Silphidae, Coleoptera). *Ohio Journal of Science*, 36, 284–299.
- Google (2010) *Google Earth*. Available from: <http://earth.google.com> (accessed: March 26, 2010).
- Hatch, M.H. (1928) Silphidae II, pp. 63–244. In: Schenkling, S. (Ed.), *Coleopterorum Catalogus, Pars 95*. W. Jung, Berlin, 244 pp.
- Harold, E. von (1877) Beiträge zur Käferfauna von Japan. (Zweites Stück.) Japanische Käfer des Berliner Königl. Museums. *Deutsche Entomologische Zeitschrift*, 21, 337–367.
- Hope, F.W. (1833) On the characters of several new genera and species of coleopterous insects. *Proceedings of the Zoological Society of London*, 1, 61–64.
- Hope, F.W. (1834) Characters and descriptions of several new genera and species of Coleopterous insects. *Transactions of the Zoological Society of London*, 1(1833), 91–112, pls 13–16.
- ICZN (1999) *International Code of Zoological Nomenclature, Fourth Edition, adopted by the International Union of Biological Sciences*. International Trust for Zoological Nomenclature, London, xxix + 305 pp.
- Ikeda, H., Kubota, K., Kagaya, T. & Abe, T. (2007) Flight capabilities and feeding habits of silphine beetles: are flightless species really “carrion beetles”? *Ecological Research*, 22, 237–241.
- Ikeda, H., Kagaya, T., Kubota, K. & Abe, T. (2008) Evolutionary relationships among food habit, loss of flight, and reproductive traits: life-history evolution in the Silphinae (Coleoptera: Silphidae). *Evolution*, 62, 2065–2079.
- Kirby, W. & Spence, W. (1828) *An introduction to entomology, or elements of the natural history of insects, with plates. Fifth Edition. Vol. 4*. Longman, Rees, Orme, Brown and Green, London, iv + 683 pp., pls. 21–30.
- Kohlschütter, Ch. (2009): *Fuzzy Gazetteer*. Available from: <http://isodp.fh-hof.de/fuzzyg/query/> (accessed: March 26, 2010).
- Kraatz, G. (1877) Beiträge zur Käferfauna von Japan, meist auf R. Hiller's Sammlungen basiert (Erstes Stück), Japanische Silphidae. *Deutsche Entomologische Zeitschrift*, 21, 100–108.
- Linnaeus, C. (1758) *Systema Naturae per Regna Tria Naturae, secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis. Tomus I. Editio Decima, Reformata*. L. Salvii, Holmiae, (4) + 823 + (1) pp.
- Microsoft Corporation (2007) *Microsoft Encarta Premium 2008*. Redmont, U.S.A.
- Motschulsky, V. de. (1861) Entomologie spéciale. Insectes du Japon. *Études Entomologiques*, 9[1860], 4–39.
- National Geospatial-intelligence Agency (2009) *NGA GEOnet Names Server*. Available from: <http://earth-info.nga.mil/gns/html/index.html> (accessed: March 26, 2010).
- Peck, S.B. (2001) 21. Silphidae Latreille, 1807, pp. 268–271. In: Arnett, R.H. & Thomas, M.C. (Eds), *American beetles, Volume 1: Archostemata, Myxophaga, Adephaga, Polyphaga: Staphyliniformia*. CRC Press, Boca Raton, London, New York & Washington, xv + 443 pp.
- Portevin, G. (1903) Remarques sur les Nécropages du Muséum et description d'espèces nouvelles. *Bulletin du Muséum National d'Histoire Naturelle de Paris*, 9, 329–336.
- Portevin, G. (1905) Notes synonymiques sur les Silphides. *Bulletin de la Société Entomologique de France*, 1905, 49–51.
- Portevin, G. (1920) Revision des Silphini et Necrophorini de la région Indo-Malaise. *Bulletin du Muséum National d'Histoire Naturelle de Paris*, 26, 395–401.
- Portevin, G. (1921) Note sur quelques Silphides et Liodides de la collection Grouvelle. *Bulletin du Muséum National d'Histoire Naturelle de Paris*, 27, 535–538.
- Portevin, G. (1926) *Les grands nécrophages du globe, Silphini-Necrodini-Necrophorini. Encyclopédie Entomologique (A), Vol. 6*. Paul Lechevalier, Paris, 270 pp.
- Růžicka, J., Háva, J. & Schneider, J. (2000) Taxonomical and distributional notes on Oriental Silphidae, with description of *Nicrophorus sausai* sp. n. (Insecta: Coleoptera). *Reichenbachia*, 33, 377–384.
- Růžicka, J. & Schneider, J. (2003) Interesting distributional records of Agyrtidae and Silphidae (Coleoptera) from the Palaearctic and Oriental region. *Klapalekiana*, 39, 307–311.
- Semenov, A. (1890) Diagnoses coleopterorum novorum ex Asia centrali et orientalis, III. *Horae Societatis Entomologicae Rossicae*, 25, 262–382.
- Sikes, D.S. (2008) Carrion Beetles (Coleoptera: Silphidae), pp. 749–758. In: Capinera, J.L. (Ed.), *Encyclopedia of Entomology, Second Edition*. Springer, London, 4346 pp.
- Vigors, N.A. (1825) Descriptions of some rare, interesting, or hitherto uncharacterized subjects of Zoology. *Zoological Journal*, 1, 409–418, 526–542, pl. 20.
- Weinelt, M. (2006) *Online Map Creation*. Available from: http://www.aquarius.ifm-geomar.de/make_map.html (accessed: March 26, 2010).
- Wiedemann, C.R.W. (1823) Zweihundert neue Käfer von Java, Bengalen und dem Vorgebirge der guten Hoffnung. *Zoologisches Magazin*, 2, 3–133.