

New species of bombardier beetles of the genera *Brachinus* and *Pheropsophus* (Coleoptera: Carabidae: Brachininae) from Vietnam

Новые виды жуков-бомбардиров родов *Brachinus* и *Pheropsophus* (Coleoptera: Carabidae: Brachininae) из Вьетнама

D.N. FEDORENKO

Д.Н. ФЕДОРЕНКО

A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, 33 Leninsky Pr., Moscow 119071, Russia. E-mail: dmitri-fedorenko@yandex.ru

Eight new species of bombardier beetles are described from Vietnam: *Brachinus dalatensis* sp. nov., *B. ovalipennis* sp. nov., *B. belyaevae* sp. nov. (all in the *melancholicus* species-group), *Pheropsophus (Stenaptinus) bidoupensis* sp. nov., *Ph. (S.) ngoclinhensis* sp. nov., *Ph. (S.) kalyakini* sp. nov., *Ph. (S.) similis* sp. nov. and *Ph. (S.) obliterated* sp. nov. (all in the *aptinoides* species-group). A key to species of the *Pheropsophus aptinoides* group of the Vietnamese fauna is provided.

Из Вьетнама описаны восемь новых видов жуков-бомбардиров: *Brachinus dalatensis* sp. nov., *B. ovalipennis* sp. nov., *B. belyaevae* sp. nov., *Pheropsophus (Stenaptinus) bidoupensis* sp. nov., *Ph. (S.) ngoclinhensis* sp. nov., *Ph. (S.) kalyakini* sp. nov., *Ph. (S.) similis* sp. nov. и *Ph. (S.) obliterated* sp. nov. Описанные виды *Brachinus* входят в состав группы *melancholicus*, виды *Pheropsophus* – в состав группы *aptinoides*. Для определения вьетнамских представителей последней группы предложена таблица.

Key words: bombardier beetle, taxonomy, distribution, Oriental Region, Vietnam, Coleoptera, Carabidae, Brachininae, *Brachinus*, *Pheropsophus*, new species

Ключевые слова: жуки-бомбардиры, таксономия, распространение, Ориентальная область, Вьетнам, Coleoptera, Carabidae, Brachininae, *Brachinus*, *Pheropsophus*, новые виды

INTRODUCTION

The subfamily Brachininae Bonelli, 1810 is a speciose group of ground beetles distributed over warmer regions of the world. In the Oriental Region and adjacent lands, more than 150 brachinine species have hitherto been reported, all in the tribe Brachinini, the genera *Brachinus* Weber, 1801, *Pheropsophus* Solier, 1833, *Styphlomerus* Chaudoir, 1875, and *Mastax* Fischer von Waldheim, 1828. Although many new species have been described from this region during the last two decades (Kirschenhofer, 1986, 2003, 2010, 2011; Tian & Deuve, 2007; Hrdlička, 2009 a,b; Gao & Tian, 2010), its fauna remains poorly known. No revision of the Oriental Brachinini have been undertaken since

Jedlička (1964) and Habu (1967) reviewed the truncatipenne carabids of Southeast Asia and Japan, respectively. Only a quarter of about 120 Oriental species of *Brachinus* and *Pheropsophus* have been recorded in Indochina so far. Numerous new species described below suggest that Indochina, including Vietnam, does support a rich bombardier fauna.

The purpose of this paper is to describe eight new species from Vietnam: three ones of the genus *Brachinus* (the *melancholicus* species-group) and six species of the genus *Pheropsophus* (the *aptinoides* species-group). All of these look similar, sharing the combination of a large body, uniformly dark pronotum and elytra, and shoulders obliterated due to the apterous condition.

MATERIAL AND METHODS

The material was collected over the course of several expeditions sponsored by the Russo–Vietnamese Tropical Center. The holotypes and some paratypes of the described new species are deposited in the Zoological Museum of the Moscow State University; the remaining paratypes, in the Author's synoptic collection at the A.N. Severtsov Institute of Ecology & Evolution, Moscow (SIEE).

The parameters used were measured as follows: total body length from mandible tips to elytral apices; elytral length from base to apex along suture; widths of the pronotum and elytra in their widest point; maximum width of the head including compound eyes; and pronotal length along midline. Unless otherwise indicated, the number of specimens measured (n) is only given for the first ratio in the description.

The aedeagi were examined in glycerin, after being boiled for two minutes or put for a day in a diluted KOH solution and then rinsed. To study inflated penial sacs, dry penes were first soften in water. Internal penile sacs were then everted, inflated to capacity using a syringe needle inserted into the basal orifice and afterwards dried in a hot-air flow. All measurements were done under the stereoscope using ocular-micrometer within the accuracy of two decimal places.

TAXONOMY

Order **COLEOPTERA**

Family **CARABIDAE**

Subfamily **BRACHININAE** Bonelli, 1810

Genus ***Brachinus*** Weber, 1801

The ***melancholicus*** species group

Diagnosis. Body large, 10.0–21.5 mm in length (may be a little smaller), uniformly dark, head usually with two oblong pale spots between eyes, or pale anteriorly; legs pale to dark, often bicolored, with pale femora and more or less infuscate tibiae and tar-

si; antennomeres 5–11 of the same colour as tarsi, usually somewhat paler or darker than the basal antennomeres.

Head mostly short and wide, with large and convex eyes. Labrum strongly transverse, four or more times as wide as long, antennomere 3 longer than 1 and 2 combined. Mentum as usual in the genus, neither median tooth nor any pits. Last labial palpomere subcylindrical, slightly dilated apicad, with apex obliquely truncate. Neck constriction usually weak laterally, deeper in the middle.

Pronotum rather wide and flat, pubescence varying from sparse to almost missing, mostly scarce or very scarce; (antero) lateral seta tending to be reduced. Male protarsi not or hardly dilated, with tarsomeres 1–3 ventrally with two longitudinal stripes of adhesive vestiture.

Macropterous to apterous. Elytra with shoulders distinct in winged species, reduced in wingless ones; apical membrane absent or very narrow, much shorter than sutural flange at apex; apical fringe dense and varying from short but distinct (*B. chinensis*) to hardly discernable. Elytral pubescence moderately long and dense to (usually) scarce and short, of two kinds, one dense and decumbent, the other erect, very sparse on disc, denser along sides and over an extensive posterolateral area. Elytral ridges mostly weak to obsolescent; interspaces varying from very narrow to much wider than ridges. Surface dull or feebly shining due to a rather sharp isodiametric microsculpture, often combined with a more or less dense punctation and dense strigae.

Internal sac of penis with virgae.

Remarks. This group first erected by Hrdlička (2009b) comprises about 30 described species widespread in the eastern parts of the Oriental Region, with general range extending from Myanmar and southern China south to the Sunda Isles and New Guinea. Several species have been described or reported from central Chinese provinces as well as from Japan (*B. nigradorsis* Nakane, 1962). Winged species, for example *B. chi-*

nensis Chaudoir, 1850, are mostly widespread. Wingless or brachypterous members of the group, including *B. cychroides* Hrdlička, 2009, *B. deuvei* Gao & Tian, 2010, *B. flores* Kirschenhofer, 2011, *B. hunanensis* Kirschenhofer, 2011, *B. jakli* Hrdlička, 2009, *B. nigridorsis*, and *B. turnai* Hrdlička, 2009, as well as the species described below seem to be local, primarily montane, derivatives of various ancestral species.

Hrdlička (2009b) defined the *melancholicus*-group without reference to any subgenus by merely listing its ten member species in addition to the five described in that paper. He, however, didn't include in the list the three species (*B. votrubai* Hrdlička, 2009, *B. jakli* Hrdlička, 2009 and *B. praestans* Andrewes, 1931) described or re-described by him a few pages before (Hrdlička, 2009a), even though they clearly belong to the same group, with no explanation. Furthermore, three species listed by Hrdlička (2009b) as members of the *melancholicus* group had been included by Kirschenhofer (2003) in the *orestes*-group of the subgenus *Brachinidius* Reitter, 1919, sunk into the subgenus *Brachinolomus* Reitter, 1919 decades before (Erwin, 1970).

The diagnosis of this *incertae sedis* group seems to better fit the subgenus *Neobrachinus* Erwin, 1970 than any other subgenus. However, the apical elytral membrane is very narrow to non-existent in all members of the *melancholicus*-group, which serves the feature to discriminate the African genera *Brachinulus* Basilewsky, 1958 and *Aptinoderus* Hubenthal, 1919 from *Brachinus* Weber, 1801 (Erwin, 1970). Clarification of the status of the *melancholicus*-group lies beyond the scope of the present paper.

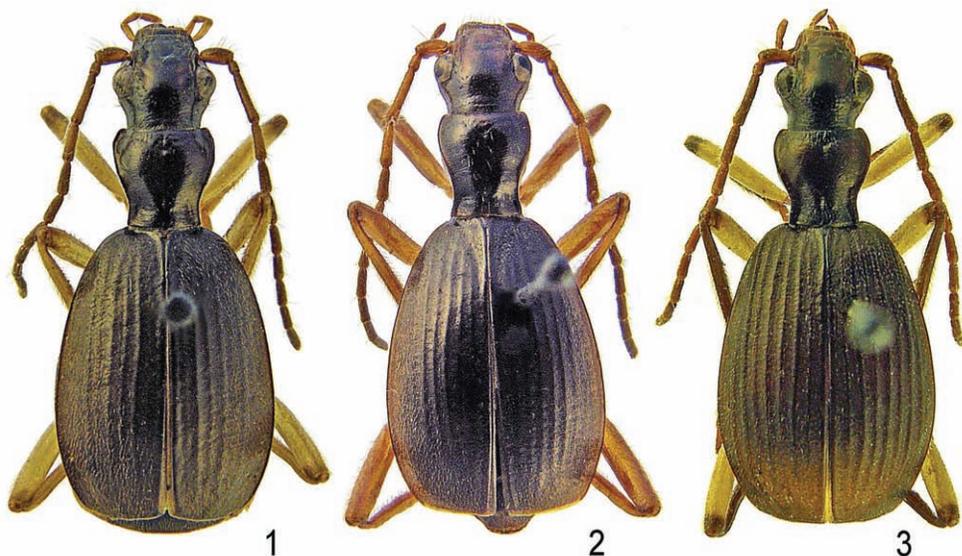
***Brachinus dalatensis* sp. nov.**

(Figs 1, 8, 9)

Holotype. Male, "S[outh] Vietnam, Lam Dong Prov., Bi Doup – Nui Ba [Nature] Reserve, 12°07' N 107°25'44''E, Bi Doup Mt., N[orthern]. slope, h = 1700–1900 m, 19–22. IV.2008, leg. D. Fedorenko".

Paratypes. Male and 6 females taken together with the holotype, as well as on 10 and 12 Apr. 2008, and 3 May 2009; same locality, but environs of Long Lanh, 12°10'44''N 108°40'44''E, h = 1400–1600 m, 31 March, 3–6 and 7–8 Apr. 2008, and 4 May 2009, 2 males, 2 females.

Additional material. Vietnam: Dak Lak Prov., Chu Yang Sin National Park, 12°22'40''N



Figs 1–3. *Brachinus*, general appearance: 1, *B. dalatensis* sp. nov.; 2, *B. ovalipennis* sp. nov.; 3, *B. belyaevae* sp. nov.

108°21'11''E, 1.5 km W of Chu Pan Phan Mt., h = 1650 m, 30 March – 14 Apr. 2012, leg. D. Fedorenko, 1 male (SIEE); Khanh Hoa Prov., Hon Ba Mt., ~1400 m, Apr. 2003, leg. A. Borisenko, 1 male (SIEE).

Diagnosis. The combination of pale legs, the absence of lateral seta on the pronotum, the missing shoulders, the subglabrous elytral disc, and odd elytral ridges being a little higher than even ones easily differentiates this species from the other members of the *melancholicus* group.

Description. Body (Fig. 1) 10.0–12.1 mm in length, dark brown; elytra brown to black, scutellum red or dark, appendages and two oblong spots between eyes reddish-yellow, sometimes knees slightly infuscate; often entire forehead pale, without or with a darker spot at the frontoclypeal border. Microsculpture reticulate, with meshes mostly conspicuous and isodiametric, slightly transverse on neck and sometimes also on each side of pronotal median line; elytra with slightly longitudinal, squamose reticulation, with meshes up to twice as long as wide.

Eyes convex but small, about as long as genae. Frons and vertex very convex, frontal sulci moderately deep and irregular, not quite reaching front margin of eye; a shallow to (mostly) deep, occasionally absent, V- or U-shaped furrow just behind frontoclypeal suture and sometimes also its mirror image on clypeus; neck constriction reduced to a rounded median depression varying between small and shallow to fairly large and deep. Dorsal surface smooth and glabrous along the middle, rather densely punctate close to eyes and, especially, on neck (except its middle); sometimes vertex punctate posteriorly; neck transversely rugulose, usually except in the middle. Clypeus and adjacent U-shaped area on frons shining, with weak microsculpture.

Pronotum cordate, 0.95–1.04 (mean 1.0, n = 7) times as wide as long, 0.88–1.00 (mean 0.93) times as wide as head, convex, broadest just behind front angles to a fourth from apex; base narrower than apex, straight to convex, apex straight to con-

cave; sides rather strongly rounded level to broadest part, sinuate and divergent in front of acute hind angles; front angles rectangular or slightly acute, with apices sharp to rounded, slightly, if at all, prominent. Lateral bead very narrow. Both front and basal transverse impressions moderately deep, the former mostly deeper, sometimes obsolete medially; basal foveae wide, long and rather shallow, each with a fine line at bottom; these lines converging from base to basal transverse impression, thence running forward parallel to side margins in basal 1/2–2/3 of the pronotum; lateral groove fairly wide in this basal area and behind front angles, while narrow in the second fourth. Median line moderately deep, shortly impressed both at the preapical impression and just in front of the basal one, often widely sulcate at base. Disc rather smooth, finely transversely rugulose and finely punctate between forward extensions of basal foveae, base and apex often longitudinally strigose, coupled with a few rugosities; larger punctures scarce; pubescence very scarce to absent at base, scarce to fairly dense in anterior half, including lateral groove. Lateral setae reduced or indistinguishable from pubescence. Propleura slightly tumid, not or hardly visible in dorsal view.

Elytra ovate, convex, 1.27–1.42 (mean 1.33) times as long as wide, 2.15–2.33 (mean 2.27) times as wide as pronotum, with a very narrow base and completely reduced shoulders, broadest at the apical third, apex truncate or barely concave; apical hairy fringe barely visible. Ridges very weak, odd ones slightly higher than even, some of even ridges (mostly 2 and 6) often reduced. Pubescence sparse and short, middle third of elytra between suture and ridge 5 usually glabrous or subglabrous. Wings absent.

Penis as in Figs 8 and 9, its apical lamella bifid.

Distribution. Dalat Plateau in southern Vietnam (Dak Lak, Lam Dong and Khanh Hoa provinces).

Etymology. The species name refers to the type locality, Dalat Plateau.

Bionomics. The species inhabits semi-deciduous, broad-leaved montane tropical forests at 1400–1900 m, sometimes co-occurring with *B. ovalipennis* sp. nov. and *Pheropsophus bidoupensis* sp. nov.

***Brachinus ovalipennis* sp. nov.**

(Figs 2, 10, 11)

Holotype. Male, “S[outh] Vietnam, Lam Dong Prov., Bi Doup – Nui Ba [Nature] Reserve, env. Long Lanh, 12°10′44″N / 108°40′44″E, h = 1400–1600 m, 1–2.IV.2008, leg. D. Fedorenko”.

Paratypes. 11 males and 8 females taken together with holotype, as well as on various dates between 31 March and 11 Apr. 2008, and between 27 Apr. and 7 May 2009; same locality, but 12°11′N 108°42′E, ~4 km SSE of Mt Hon Giao, h = 1500–1800 m, 2–3.IV.2008, 2 males.

Additional material. Vietnam: Khanh Hoa Prov., Mt Hon Ba, ~1400 m, Apr. 2003, leg. A. Borisenko, 3 males, 2 females (SIEE).

Diagnosis. Very similar to the previous species, but with body, especially pronotum, slightly slenderer; the elytral ridges of equal height; body, and especially the head, slightly paler; and the glabrous area on elytra more extensive. Penis in ventral view widely rounded apically.

Description. Same as previous, except as follows: body (Fig. 2) 8.4–12.7 mm in length, slightly paler in general, forehead predominantly pale, occasionally with a vague darker spot at the border between frons and vertex; sometimes head and pronotum entirely reddish-yellow except laterally. U-shaped furrow on frons moderately deep in general, a convex area between its arms and clypeus glossy because of very fine or obsolete microsculpture.

Pronotum long, 0.81–0.93 (mean 0.86, $n = 7$) times as wide as long, 0.82–0.93 (mean 0.87) times as wide as head, apex as wide as or slightly wider than base, sides very slightly rounded; front angles mostly acute and sharp, occasionally subrectangular or blunt; hind angles sharp, slightly acute to rectangular, base laterad barely emarginate to slightly oblique forwards accordingly. Both preapical and basal trans-

verse impressions mostly shallow, obsolete medially, the latter deepening laterad; basal foveae shallow to very shallow, with a line at bottom usually running close to side margin, lateral groove thus being rather narrow in basal half, narrower than in the preceding species. Propleura tumid, well visible from above. Dorsal surface largely smooth and almost glabrous, pubescence reduced to just a few setae.

Elytra 1.36–1.47 (mean 1.42) times as long as wide, 2.20–2.47 (mean 2.33) times as wide as pronotum; all ridges subequally weak, sometimes almost obliterated, only suture elevated at base; glabrous discal area tends to be more extensive; only elytral base, apical quarter, and sides laterad of ridge 6 pubescent.

Apical lamella of penis simple (Figs 10, 11).

Distribution. Dalat Plateau within Lam Dong and Khanh Hoa provinces, southern Vietnam.

Bionomics. Same as in *B. dalatensis* sp. nov.

Etymology. The species name refers to the shape of elytra.

***Brachinus belyaevae* sp. nov.**

(Fig. 3)

Holotype. Female, “South Vietnam, ~95 km SEE of Ho Chi Minh, Xuyen Moc Nature Reserve, 15.V.1991, leg. N. Belyaeva”.

Diagnosis. The species distinctly differs from the other species of the group in the combination of the lacking shoulders, bicolored legs and infuscate antennomeres 1–4. No other member of the group has bicolored legs combined with reduced shoulders.

Description. Habitus as in Fig. 3. Body length 11.8 mm, dorsum black, pronotal disc dark brown; two oblong spots between eyes, labrum, anterior 2/3 of clypeus, mouthparts, basal half of scape, antennomeres 5 to 11, and tarsi reddish; four basal antennomeres slightly infuscate, femora yellow, their apices and tibiae rather dark brown. Scutellum dark. Underside reddish-brown, paler medially. Dorsum dull because of the

heavy reticulation throughout (a little less heavy within a small U-shaped postclypeal area), with meshes isodiametric on head and pronotum, slightly longitudinal, somewhat squamose, on elytra.

Eyes convex, longer than genae; frons and vertex very convex, smooth and glabrous, with setigerous punctures sparse and coarse along sides while dense behind of the level of posterior supraorbital setae; neck rugulose, with a small, rounded, median depression.

Pronotum cordate, 1.05 times as wide as long, 0.96 times as wide as head, broadest about a fourth from apex; front margin slightly concave, sides strongly rounded anteriorly and strongly sinuate basad; base slightly narrower than apex, nearly straight; front angles subacute, hind angles acute, all with blunted apices; disc convex; preapical impression shallow, deep only at middle; basal transverse impression obsolete; median line entire, moderately deep, deeper in basal third, wide in basal fourth; lateral bead very narrow, lateral groove narrow, wider at front angles, very wide and merging with basal fovea behind middle; basal foveae deep and long, reaching mid-length, converging from base to basal transverse impression, thence running parallel to each other; each fovea anteriorly extended into a shallow line running parallel to lateral margin and ending near preapical impression. Disc transversely rugulose, base and apex densely longitudinally strigose; setigerous punctures rather minute but dense almost throughout; lateral seta short, twice as long as pubescence. Propleura invisible from above.

Elytra ovate, 1.37 times as long as wide, 2.26 times as wide as pronotum, broadest a third from apex, shoulders reduced, apical truncature transverse and straight. Ridges subequally well-developed, moderately convex, barely separated from and about as wide as or slightly wider than interspaces, subcostate in basal half, subcarinate in apical half, ridge 7 a little narrower and higher than others, ridge 2 almost reduced basally. Pubescence short and sparse, scarce in the middle of disc. Wings absent.

Distribution. Known only from the type locality, Xuyen Moc Nature Reserve near Binh Chau, southern Vietnam.

Etymology. Named after Dr. Natalia Belyaeva (Moscow), an Isoptera specialist, who collected the holotype.

Genus *Pheropsophus* Solier, 1833

Subgenus *Stenaptinus* Maindron, 1906

The *aptinoides* species-group

The members of this group from Vietnam share the following combination of characters: Body uniformly dark, antennae and legs yellow, femoral apices occasionally infuscate or with a darker spot on each side of knee. Labrum anteriorly truncate to convex (varying between individuals), with front angles widely rounded. Elytra at base not or just wider than base of pronotum, without shoulders, strongly widened backwards and broadest just before apex, apical margins recessed towards suture at a wide angle, sutural angles rounded; disc largely glabrous, very sparsely and almost indistinctly ciliate, with very short sparse erect setae that tend to be denser posterolaterally; interspace 1 with long dense pubescence throughout, interspace 2 with four long setae, interspace 5 with one seta in basal 1/4 to 1/3; an additional seta may be present in mid-length of the interval 4 and/or in interval 3 in front of the apex. Elytral ridges, especially outer ones, more or less strongly carinate; ridges 2 to 5 flattened and broadened basally, with ridge 4 not reaching base; ridge 8 often, and occasionally ridge 2, ending abruptly and not quite reaching apex. Prosternum rather densely pubescent. Abdominal tergite VII in female with 13–17 strong setae along apical margin. Apical lamella of penis large, mostly triangular and pointed (Figs 16–18); interspecific differences in its shape being mostly insufficient, if any. Internal sac of penis is rather simple in shape and often (*Ph. tamdaoensis* Kirschenhofer, 2010; *Ph. obliteratedus* **sp. nov.** and *Ph. kalyakini* **sp. nov.**, as well as *Ph. beckeri* Jedlička, 1930

from China) supplied with a long process below the apex of left sclerotized lobe of preputial field.

Secondary sexual differences are as in other *Stenaptinus*: in males the profemora are often incrassate, and the mesotibia with 24–34 spinules along the anterolateral margin, arranged into two or more irregular rows, versus a single row of 14–18 spinules in females.

Distribution. This group is widespread over the Oriental Region from Nepal and China south to Celebes; however, the member species tend to have vicariant ranges confined to a particular montane region – a pattern for which the apterous condition seems to be largely responsible.

Remarks. This group fits well into *Stenaptinus* in its original, strict, sense (Maindron, 1906). The long lateral process on the left side of the penile internal sac has been found to be characteristic of many consubgenera not only inside, but also outside the *aptinoides* group. These latter species are as follows: *Ph. javanus* (Dejean, 1825), *Ph. picicollis* Chaudoir, 1876 and *Ph. marginicollis* Motschulsky, 1854.

Diagnoses of the species described below are provided in the key couplets.

Key to Vietnam species of the *Pheropsophus aptinoides* group

- 1(4) Neck almost or completely smooth.
 2(3) Elytral ridges weak, subconvex (North Vietnam) *Ph. tamdaoensis*
 3(2) Elytral ridges prominent, outer ones sharply carinate; carinate sculpture obsolete before bases of ridges 3 to 5 (South Vietnam) ..
 *Ph. bidouensis* sp. nov.
 4(1) Neck rugose.
 5(8) Elytral ridges prominent, ridge 7 sharply carinate and reaching base.
 6(7) Pronotum broadest at about a fourth from apex, nearly parallel-sided basally
 *Ph. ngoclinhensis* sp. nov.
 7(6) Pronotum broadest at about a third from apex, sides more deeply sinuate in front of, and divergent towards, hind angles
 *Ph. similis* sp. nov.

8(5) Elytral ridges weak, ridge 7 either obliterate or (rarely) subcostate at base.

9(10) Pronotum subquadrate, sides faintly rounded in anterior half and slightly sinuate in front of base, both lateral bead and lateral groove wider, the latter broadened behind lateral seta; propleura very sparsely setulose; interspace 4 at mid-length with 10–13 irregular rows of longitudinal carinulae. Penis with apical lamella wide and rounded at tip (Fig. 19) *Ph. kalyakini* sp. nov.

10(9) Pronotum cordate, its sides well rounded in anterior half and sinuate in front of base, lateral bead and lateral groove both very narrow all along; propleura sparsely but distinctly punctate-pubescent; interspace 4 at mid-length with less than nine irregular rows of longitudinal carinulae. Penis with apical lamella as in Fig. 22
 *Ph. obliterated* sp. nov.

Pheropsophus bidouensis sp. nov.

(Figs 4, 12, 16, 21)

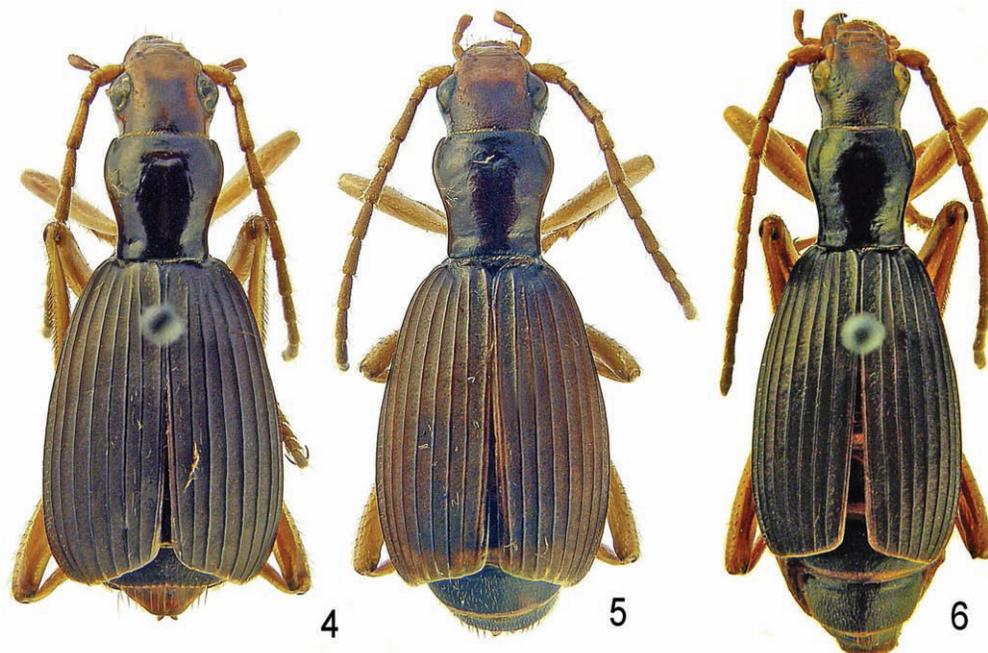
Holotype. Male, “S[outh] Vietnam, Lam Dong Prov., Bi Doup – Nui Ba [Nature] Reserve, env. Long Lanh, 12°10′44″N 108°40′44″E, h = 1400–1600 m, 20–21.IV.2008, leg. D. Fedorenko”.

Paratypes. 15 males and 13 females taken together with holotype, as well as on 31 March – 21 Apr. 2008 (pitfall traps), 5 May and 10 May 2009; same locality, but 12°11′N 108°42′E, ~4 km SSE of Hon Giao Mt, h = 1500–1800 m, 7–8 Apr. 2008, 1 male.

Additional material. **Vietnam:** Dak Lak Prov., Chu Yang Sin National Park, 12°22′40″N 108°21′11″E, 1.5 km W of Chu Pan Phan Mt., h = 1650 m, 30 March – 11 Apr. 2012, leg. D. Fedorenko, 7 males, 5 females (SIEE); same data, but leg. A. Abramov, 5 males, 4 females (Zoological Institute, Russian Academy of Sciences, St Petersburg) 5 km S of Dinh Kwo, 19–21 Apr. 2010, leg. P. Udovichenko, 2 females; Khanh Hoa Prov., Hon Ba Mt, ~1400 m, Apr. 2003, leg. A. Borisenko, 7 males, 5 females (SIEE).

Diagnosis. Similar to *P. tamdaoensis* sp. nov. in appearance, but distinguishable in having much stronger elytral ridges and acute hind pronotal angles. The two species are allopatric, with ranges widely separated.

Description. Body (Fig. 4) length 10.5–14.5 mm. Head reddish-yellow, with a large, subquadrate, sometimes vague, dark brown



Figs 4–6. *Pheropsophus*, general appearance: 4, *Ph. bidoupensis* sp. nov.; 5, *Ph. ngoclinhensis* sp. nov.; 6, *Ph. similis* sp. nov.

spot on vertex, fused to or barely separated from the dark brown area behind eyes; the spot is truncate or bifid anteriorly; pronotum dark brown, often reddish at apex and base; elytra brown to dark brown, densely speckled, with darker ridges.

Head smooth, neck rugosities obliterate or almost so, with several (2–7) setigerous punctures behind and sometimes also in front of supraorbital seta; a small longitudinal median depression at the border with pronotum. Eyes flattened, but still rather convex.

Pronotum cordate, 0.89–1.02 (mean 0.96, $n = 9$) times as wide as long, 1.0–1.14 (mean 1.05) times as wide as head, apex somewhat bisinuate, base slightly narrower than apex, tends to be slightly concave; sides moderately rounded in front, sinuate-divergent behind; both front and hind angles subacute, blunted at apices. Lateral bead extremely fine, lateral groove narrow; both preapical and basal transverse depressions indistinct, with a shallow median line in between; surface smooth and glabrous,

with two to six (up to ten) shallow setigerous punctures along front margin and occasionally 2–4 at base. Propleura impunctate.

Elytra 1.11–1.30 (mean 1.22) times as long as wide, 1.91–2.06 (mean 1.96) times as wide as pronotum, ridges rather strong, ridges 6 to 8 (especially 7 and 8) sharply carinate, much sharper towards base. Disc glabrous, carinate sculpture fine, obsolete towards and around bases of ridges 3 to 5, carinulae being rather short and mostly forming 10–12 (occasionally as few as seven) longitudinal rows in interspace 4 at mid-length.

Penis (Figs 12, 16, 21).

Variability. In individuals from northern populations (Chu Yang Sin National Park), the pronotum is slightly broader, on average 1.09 times as wide as long, with hind angles somewhat lobed and protruding a little beyond the straight base.

Distribution. Dalat plateau within Dak Lak, Lam Dong and Khanh Hoa provinces, Vietnam.

Etymology. The species name refers to the Bi Doup location.

Bionomics. The type series and the specimens collected by the author were taken by pitfall trapping or by hand in broad-leaved forests at 1400–1700 m, often near streams in their upper flows.

***Pheropsophus ngoclinensis* sp. nov.**
(Figs 5, 13, 17)

Holotype. Male, “Central Vietnam, Kon Tum Province, N[orthern] part., Ngoc Linh Nature Reserve, Ngoc Linh env., pitfall traps, V.2005, leg. A. Anichkin”.

Paratypes. 2 males and 4 females taken together with the holotype.

Description. Same as above, except as follows: body (Fig. 5) 12.3–14.4 mm in length, mostly brown, rather pale; vertex with a dark, often vague, spot with truncate anterior margin; either apical margins of elytra edged with pale or extreme apices of elytral ridges pale, yellow. Eyes hardly more convex, neck rugose, without depression, frontal foveae in posterior half densely and finely rugulose, punctures behind posterior supraorbital setae rather numerous. Pronotum barely shorter, cordate, 1.0–1.04 (mean 1.02, $n = 5$) times as wide as long, 1.02–1.07 (mean 1.06) times as wide as head, base conspicuously narrower than apex; front angles obtuse, hind angles very slightly acute, almost rectangular; sides well rounded anteriorly, sinuate and parallel behind, broadest at about a fourth from apex. Elytra 1.26–1.32 (mean 1.28) times as long as wide, 1.84–1.91 (mean 1.88) times as wide as pronotum, elytral ridges as in the previous species, ridges 2 to 5 mostly much less strongly flattened basally, ridge 6 occasionally widely interrupted just behind base. Carinulate microsculpture fine, very sparse at base; interspace 4 at mid-length with about ten rows of carinulae.

Penis as in Figs 13, 17.

Distribution. Known only from the type locality, Ngoc Linh Nature Reserve east of Dak Gle, Kon Tum Province, central Vietnam.

Etymology. The species name refers to the type locality.

***Pheropsophus kalyakini* sp. nov.**
(Figs 14, 19)

Holotype. Male, “Central Vietnam, Ha Tinh Prov., Vu Quang Nature reserve, $h = 1200$ m, 5–26.VIII.1997, leg. M. Kalyakin”.

Paratypes. 5 males and 5 females taken together with holotype, plus 1 female from the same location but $h = 400$ – 700 m, 27 Aug. – 4 Oct. 1997.

Description. As compared to *Ph. bi-doupensis* sp. nov.: Body length 13.6–15.6 mm. Dorsum dark, almost black, elytral speckles very faint; pale color on head confined to median or anterior part of frons. Eyes flat to moderately convex; frontal foveae rather deep and deepening anterad; fine longitudinal striations between eye and a smooth or finely rugulose frontal fovea; punctures behind supraorbital setae few; neck rugose.

Pronotum rectangular to subcordate, 0.82–0.88 (mean 0.84, $n = 5$) times as wide as long, 0.96–1.04 (mean 0.99) times as wide as head, sides faintly rounded in anterior half, only slightly sinuate in front of base; front angles blunt, hind angles acute to rectangular, with apices blunt. Lateral groove narrow anteriorly and posteriorly, rather wide, but shallow medially or behind lateral setigerous pore. Surface smooth and glabrous, base and apex each with 4–14 small and shallow setigerous punctures. Propleura finely and very sparsely punctate-pubescent.

Elytra 1.32–1.49 (mean 1.41, $n = 3$) times as long as wide, 1.92–2.40 (mean 2.12) times as wide as pronotum; ridges moderately convex, tend to fade basad, ridges 4 and/or 6 flattened or obliterate at base, ridge 7 never sharply carinate basally and usually not quite reaching base; pubescence sparse on disc, carinulae forming 10–13 rows in interspace 4 at middle of elytron, sculpture extending to elytral base and turning there from carinulate into aciculate.

Apical lamella of penis large and rounded at tip (Figs 14, 19).

Distribution. Known only from the type locality, Vu Quang Nature Reserve, Ha Tinh Province, Vietnam.

Etymology. Named after Dr Mikhail Kalyakin (Moscow), a reputed ornithologist, my friend and companion during several expeditions to Vietnam.

Remarks. Pinned after a long preservation in alcohol, many specimens of the type series show integument darkened to black and elytra deformed/twisted, which may have affected the accuracy of measurements. Several specimens, mostly females, show rather robust heads.

***Pheropsophus similis* sp. nov.**

(Figs 6, 15, 18)

Holotype. Male, "Central Vietnam, Ha Tinh Prov., Vu Quang Nature Reserve, h = 400–700 m, 27.VIII–4.X.1997, leg. M. Kalyakin".

Description. Hardly separable from the previous species based on external characters. Body (Fig. 6) 14.2 mm in length. Head pale before eyes, with pale area reaching mid-eye level medially. Eyes moderately convex. Pronotum cordate and shorter, 0.93 times as wide as long, 1.09 times as wide as head; disc and propleura glabrous. Elytra

1.4 times as long as wide, 1.92 times as wide as pronotum, ridges entire, carinate, sharply carinate laterally, ridges 6 and 7 reach elytral base and sharply carinate there. Carinulate sculpture reaches elytral base. Penile lamella narrow, with apex pointed, and smaller (Figs 15, 18).

Distribution. Same as in the previous species.

Remarks. In the holotype, both lateral pronotal setae are abraded, which suggests wear that might have also caused the lost of vestiture on the disc, thus making the latter look glabrous.

Etymology. The species name reflects great similarity in appearance between this species and the sympatric/syntopic *Ph. kalyakini* sp. nov.

***Pheropsophus obliteratus* sp. nov.**

(Figs 7, 20, 22)

Holotype. Male, "S[outh] Vietnam, Dak Lak province, Chu Yang Sin Natn. Park, 12°23'48"N 108°20'59"E, upper flow of Krong Kmar river, h = 1000 m, 30.III–14.IV.2012, leg. D. Fedorenko".

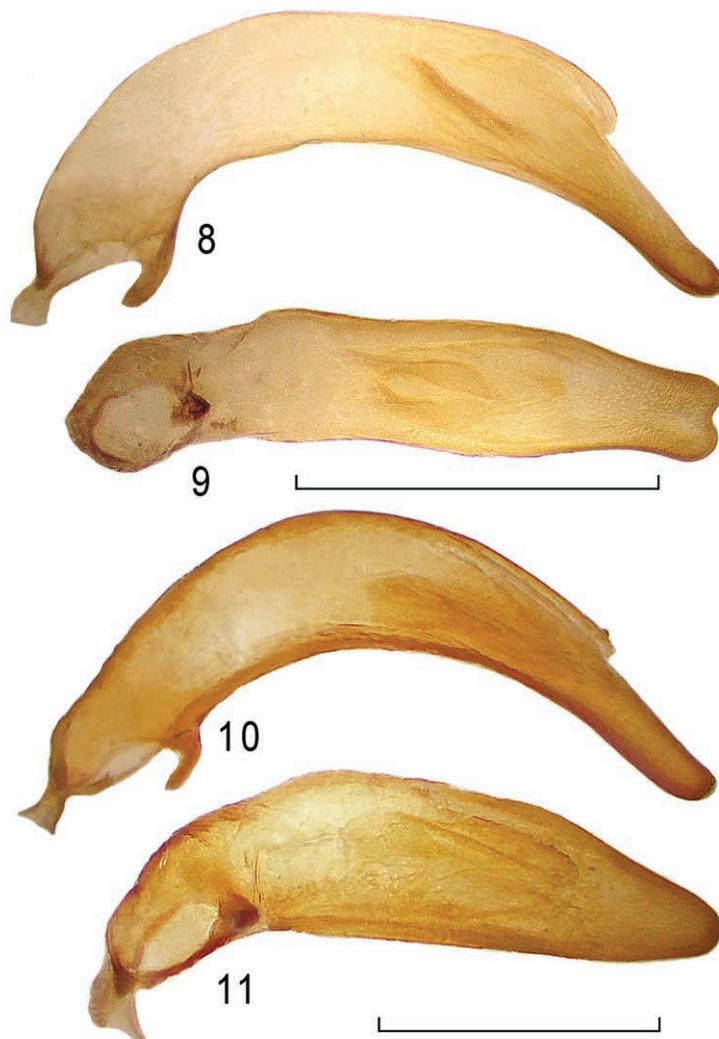
Description. Body (Fig. 7) 12.6 mm in length, dark brown, almost black, appendages, labrum, anterior half of clypeus, supra-antennal plates and a fairly small, transverse spot between anterior halves of eyes reddish-yellow; frons, base of clypeus, and mandibular apices infuscate to brown, rather dark, elytra dark brown, with a hint of darker speckles.

Eyes convex. Neck widely rugose, frons and vertex widely smooth along middle, with rather numerous but fine setigerous punctures and very fine longitudinal striations laterally; frontal foveae moderately deep, deeper at clypeus, with shallow U-shaped depression around pale spot on frons.

Pronotum cordate, 0.98 times as wide as long, 1.06 times as wide as head, broadest at the apical third, base about as wide as apex, much narrower than maximum width, base slightly concave, apex subtruncate, sides rather strongly rounded anteriorly, sinuate



Fig. 7. *Pheropsophus obliteratus* sp. nov., general appearance.



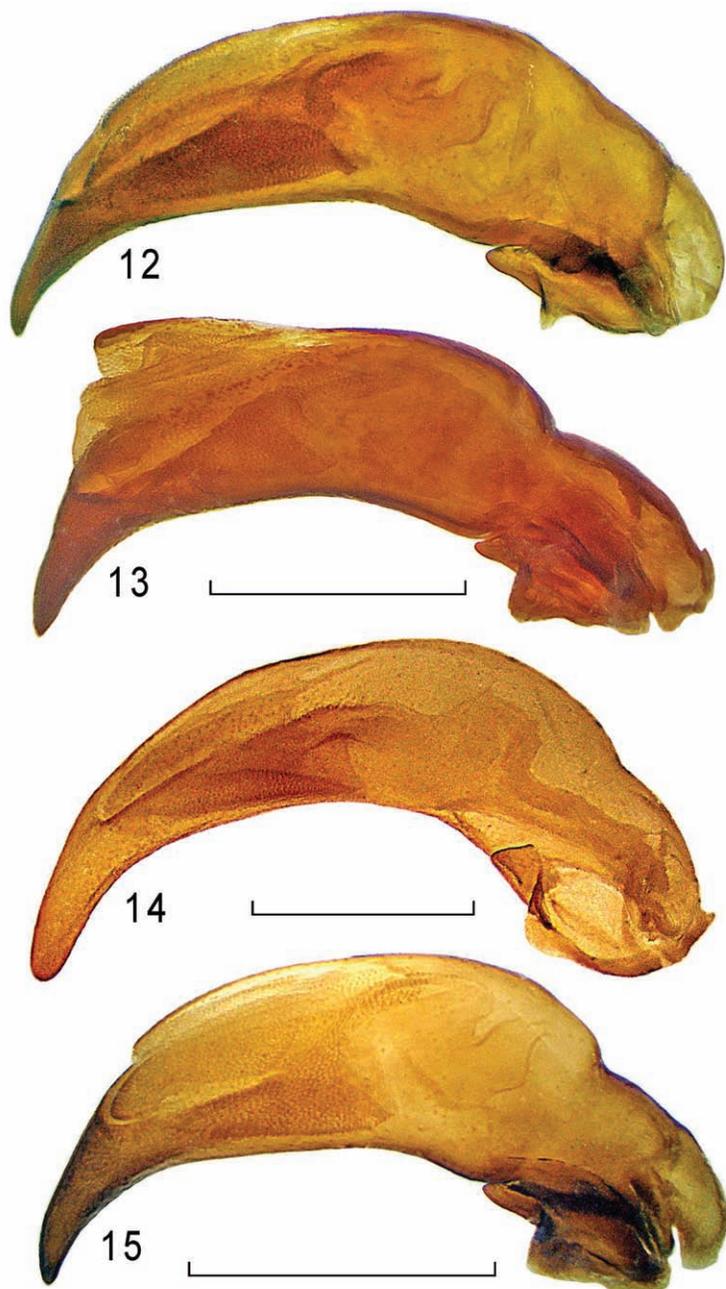
Figs 8–11. *Brachinus*, penis: **8, 9**, *B. dalatensis* sp. nov.; **10, 11**, *B. ovalipennis* sp. nov. Left lateral (8, 10) and posteroventral (9, 11) aspects. Scale bar 1 mm.

and barely divergent in front of base, front angles subrectangular, hind angles subacute, all prominent. Preapical and basal transverse depressions shallow; pronotum smooth, with several small setigerous punctures on each side of base as well as along the apical and side margins in anterior half. Propleura sparsely punctate-pubescent.

Elytra 1.26 times as wide as long, 1.85 times as wide as pronotum. Elytral ridges slightly convex and rather wide, ridges 3 to 5 at mid-length about twice as wide as

interspaces between them; ridges 7 and 8 carinate in apical two thirds, not reaching base and somewhat bent in basal third, where ridges 4 and 6 are fading or interrupted. Longitudinal carinulae in interspace 4 forming less than nine rows, carinulate sculpture turning into aciculate one at the scutellar level.

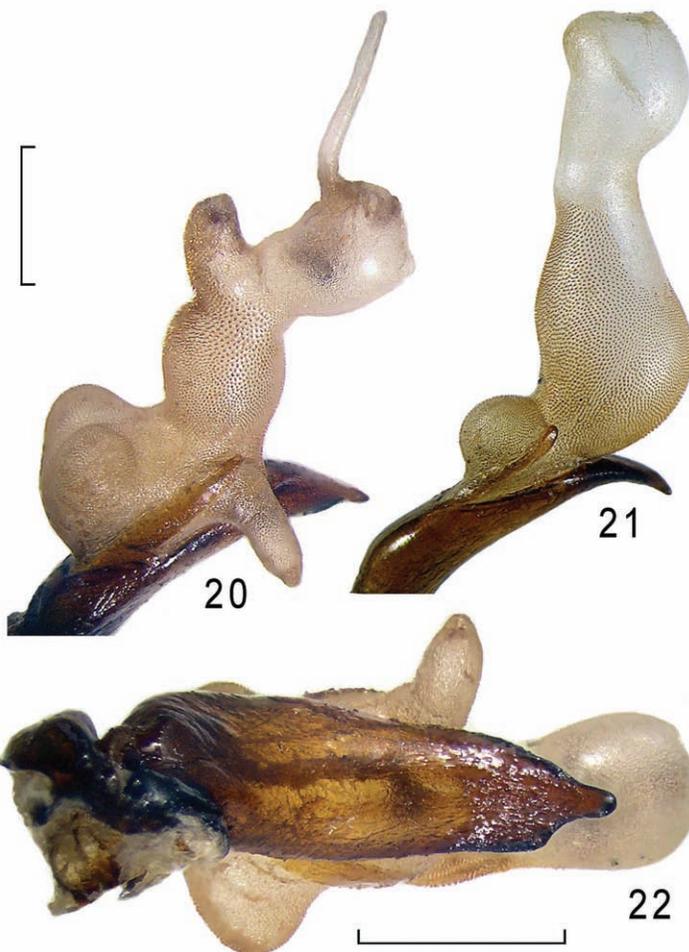
Penis (Figs 20, 22) with apical lamella large and widely emarginate on right side, its tip in dorsal view narrow, parallel-sided and apically rounded. Inflated endophallus



Figs 12–15. *Pheropsophus*, penis with right paramere, right lateral aspect: 12, *Ph. bidouensis* sp. nov.; 13, *Ph. ngoclinhensis* sp. nov.; 14, *Ph. kalyakini* sp. nov.; 15, *Ph. similis* sp. nov. Scale bar 1 mm.



Figs 16–19. *Pheropsophus*, apex of penis, ventral aspect: **16**, *Ph. bidoupensis* sp. nov.; **17**, *Ph. ngoclin-hensis* sp. nov.; **18**, *Ph. similis* sp. nov.; **19**, *Ph. kalyakini* sp. nov. Scale bar 1 mm.



Figs 20–22. *Pheropsophus*, inflated internal sac of penis: **20**, **22**, *Ph. obliteratus* sp. nov.; **21**, *Ph. bidoupensis* sp. nov. Left lateral (20, 21) and posteroventral (22) aspects. Scale bar: 1 mm.

with a long lateral process below the apex of left sclerotized lobe of preputial field.

Distribution. Known from the type locality only.

Etymology. The species name refers to elytral striae weakening or obliterated towards base.

Bionomics. The holotype was taken by hand near a tiny stream flowing into a tributary of Krong Kmar River in a tropical monsoon broadleaf forest.

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