

Revision of the taxonomic structure of the tribe Dorcadionini (Coleoptera: Cerambycidae) on the base of endophallic morphology

Ревизия таксономической структуры трибы Dorcadionini (Coleoptera: Cerambycidae) на основе анализа строения эндофаллюса

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КЛЮЧЕВЫЕ СЛОВА: Cerambycidae, Dorcadionini, *Dorcadion*, *Iberodorcadion*, *Neodorcadion*, *Eodorcadion*, эндофаллюс, морфология, таксономия, филогения, новые подроды.

ABSTRACT: The morphology of everted and inflated endophallus is described and figured on the base of dry constant samples of 127 species and subspecies of four genera: *Neodorcadion*, *Eodorcadion*, *Iberodorcadion* and *Dorcadion* of all subgenera. The homology of different endophallus parts is established. The original terminology is proposed. All genera and subgenera of Dorcadionini are clearly delimited on the base of endophallic structures. New compositions of *Dorcadion* (s.str.) and *Eodorcadion* (s.str.) are proposed. Two new subgenera are described on the base of endophallic structures: *Eodorcadion* (*Humerodorcadion*, subgen.n.) — type species: *Dorcadion humerale* Gebler, 1823; *Dorcadion* (*Acutodorcadion*, subgen.n.) — type species: *D. acutispinum* Motschulsky, 1860. The unique taxonomical position of *D. (Politorcadion)* is demonstrated; possible generic level of the taxon is supposed. Five synonyms are proposed: *Dorcadion* (s.str.) = *D. (Compsodorcadion)*; *D. (Cribridorcadion)* = *D. (Pedestredorcadion)*, syn.n. = *D. (Dzhungarodorcadion)*, syn.n. *Dorcadion* (s.str.) consists of 8 species: *D. glycyrrhizae*, *D. crassipes*, *D. cephalotes*, *D. gebleri*, *D. ganglbaueri*, *D. alakoliense*, *D. abakumovi*, *D. tenuelineatum*; other species, which were traditionally included in *Dorcadion* (s.str.), are placed in *D. (Acutodorcadion* subgen.n.). *Eodorcadion* (*Humerodorcadion* subgen.n.) consists of two species: *E. humerale* and *E. lutshniki*. *E. quinquevittatum*, *E. leucogrammatum*, *E. tuvense*, *E. ptyalopleurum* and *E. maurum*, as well as *E. sifanicum* and *E. glaucopteron* are placed in *Eodorcadion* (s.str.). A key for 4 genera and all subgenera is

proposed on the base of endophallic characters. *D. klavdiae* is transferred from *D. (Carinatodorcadion)* to *D. (Cribridorcadion)*. *D. turkestanicum* is placed in *D. (Cribridorcadion)*. The endophallus morphology of *D. tschitscherini*, *D. mystacinum rufogenum* and *D. optatum matthieseni* (all three taxa were sometimes regarded as *Pedestredorcadion*) is typical for *D. (Acutodorcadion*, subgen.n.). *D. danczenkoi*, stat.n. is raised to the species rank. The phylogenetic relations inside the tribe are discussed. Several taxons are proposed to be accepted as subspecies: *Eodorcadion carinatum blessigi* (Ganglbauer, 1884), *E. c. bramsoni* Pic, 1901, *E. c. altaicum* (Suvorov, 1909), stat.n., *Dorcadion cinerarium caucasicum* Küster, 1847, stat.n., *D. sareptanum euxinum* Suvorov, 1915, stat.n., *D. sulcipenne goektschanum* Suvorov, 1915, stat.n.

РЕЗЮМЕ: Описано и проиллюстрировано строение вывернутого и надутого эндофаллюса по постоянным сухим препаратам 127 видов и подвидов 4 родов *Neodorcadion*, *Eodorcadion*, *Iberodorcadion* и *Dorcadion* со всеми подродами. Установлена гомология различных частей эндофаллюса, для обозначения которых применена оригинальная терминология. Все роды и подроды трибы Dorcadionini имеют очень чёткие границы по строению эндофаллюса. Предложен новый состав подродов *Dorcadion* (s.str.) и *Eodorcadion* (s.str.). На основе структур эндофаллюса описаны два новых подрода: *Eodorcadion* (*Humerodorcadion*, subgen. n.) с типовым видом: *Dorcadion humerale* Gebler, 1823 и *Dorcadion*

(*Acutodorcadion*, subgen.n.) с типовым видом: *D. acutispinum* Motschulsky, 1860. Показана обособленная таксономическая позиция *D. (Politodorcadion)*, заслуживающего, вероятно родового ранга. Предложено пять синонимов: *Dorcadion* (s.str.) = *D. (Compsodorcadion)*; *D. (Cribridorcadion)* = *D. (Pedestredorcadion)*, syn.n. = *D. (Dzhungarodorcadion)*, syn.n. *Dorcadion* (s.str.) рассматривается в составе 8 видов: *D. glycyrrhizae*, *D. crassipes*, *D. cephalotes*, *D. gebleri*, *D. ganglbaueri*, *D. alakoliense*, *D. abakumovi* и *D. tenuelineatum*; другие виды, традиционно относившиеся к *Dorcadion* (s.str.), помещены в *D. (Acutodorcadion* subgen.n.). *Eodorcadion* (*Humerodorcadion* subgen.n.) включает два вида: *E. humerale* и *E. lutshniki*. *E. quinquevittatum*, *E. leucogrammum*, *E. tuvense*, *E. ptyalopleurum* и *E. maurum*, как и *E. sifanicum* и *E. glaucopterum* помещены в *Eodorcadion* (s. str.). Составлена определительная таблица для всех 4 родов со всеми подродами на основе структур эндофаллюса. *D. klavdiae* перенесён из *D. (Carinatodorcadion)* в *D. (Cribridorcadion)*. *D. turkestanicum* помещён в *D. (Cribridorcadion)*. Строение эндофаллюса *D. tschitscherini*, *D. mystacinum rufogenum* и *D. optatum matthieseni* (все три таксона иногда рассматривались в *Pedestredorcadion*) вполне типично для *D. (Acutodorcadion*, subgen.n.). *D. danczenkoi*, stat.n. признан самостоятельным видом. Обсуждаются родственные отношения таксонов внутри трибы. Несколько таксонов приняты в качестве подвидов: *Eodorcadion carinatum blessigi* (Ganglbauer, 1884), *E. c. bramsoni* Pic, 1901, *E. c. altaicum* (Suvorov, 1909), stat.n., *Dorcadion cinerarium caucasicum* Kьster, 1847, stat.n., *D. sareptanum euxinum* Suvorov, 1915, stat.n., *D. sulcipenne goektschanum* Suvorov, 1915, stat.n.

Introduction

The utilization of endophallic structures in Cerambycidae taxonomy is traditionally limited because of exceptionally big problems with preparation of constant, dry patterns of everted and inflated very thin membranous tube in the position close to the natural erection of endophallus. Several works used Cerambycidae males, which were collected during copulation with naturally everted endophallus [Danilevsky, 1987, 1988a, b; Danilevsky, Dzhavelidze, 1990], were published. M. Kuboki [1980, 1981] described everted endophallus of some Lepturinae as well as S.W. Lingafelter and R.E. Hoebeke [2002] studied everted *Anoplophora* Hope, 1839 endophallus. Both investigations did not use the inflation of endophallic tube, so its natural shape remained unknown. No authors have published up to now any taxonomic investigations on the base of everted and inflated Cerambycidae endophallus. But the method of preparation was already described [Rubenyan, 2002]. The detail study of everted and inflated Cerambycidae endophallus was conducted by D.G. Kasatkin [2002, 2003].

We have studied 127 Dorcadionini species and subspecies of four genera (*Eodorcadion*, *Iberodorcadion*, *Neodorcadion*, *Dorcadion*), choosing the representatives of different subgenera and group of species. Endophallic structures in Dorcadionini clearly show the limits of genera, subgenera and species groups and allow to clarify their natural connections. Usually several specimens of each species were used for preparation to realize the rate of individual variability, which was not very high.

Usually we studied more than one specimen of each taxon (up to 20), so our morphology conclusions are well representative. But some species were poorly represented in our collections, and we were not able to study more than one specimen (*Dorcadion glabrofaciatum*, *Eodorcadion sifanicum* and some others). Individual variability of endophallus morphology is not significant, so it was not always necessary to use many specimens of a taxon for study. The general form of everted endophallus more or less depends on the air-pressure during preparation.

Morphology of endophallus

Dorcadionini endophallus is represented by thin, transparent membrane partly covered with different cuticula elements: very small and short spicules (Fig. 87), strongly elongated microtrichiae (Fig. 100), relatively wide spines (Figs. 55, 112) and with more or less distinct sclerites. Endophallus generally is relatively long, usually much longer than abdomen, sometimes longer than body, specially, in *Dorcadion (Carinatodorcadion)* (Figs. 43, 47, 49) and *D. (Maculatodorcadion)* (Fig. 110), usually if long then more or less "S"-shaped; or relatively short, shorter than abdomen, specially in *Eodorcadion (Humerodorcadion, subgen.n.)* (Figs. 25–28). In the most complicated cases: *Dorcadion (Carinatodorcadion)* (Figs. 43–49), *D. (Maculatodorcadion)* (Fig. 110), *D. (Megalodorcadion)* (Fig. 109), *D. (Cribridorcadion, sensu nov.)* (Figs. 50–108) it consists of several distinctly limited parts of different length and shape. In others groups: *Neodorcadion* (Figs. 1–3), *Eodorcadion* (Figs. 4–29), *Iberodorcadion* (Figs. 30–38), *Dorcadion (Politodorcadion)* (Figs. 39–42) different elements of endophallus can be partly or totally fused. We distinguish two main endophallus divisions, which are very distinct in all groups of Dorcadionini. Basal phallomer — "bp" (consists of basal tube — "bt", medial tube — "mt", central trunk — "ct" and preapical bulb — "pb") and apical phallomer — "ap" (consists of apical bulb — "ab" and apical bubble — "bb") with apical furrow — "af" in between. Basal tube — "bt" (from the apex of aedeagus — "ae" to a pair of ventral plates — "vp") is always more or less straight or curved ventrally, sometimes glabrous, but usually partly covered with microspicules. Ventral plates (vp) are represented in all Dorcadionini as two (often semicircular) sclerites (Fig. 10) situated on the ventral side not far from the apex of aedeagus. They can be large and

strongly sclerotized, or small, less sclerotized and nearly indistinct. Medial tube (mt) (from ventral plates to central bend — “bd”) is also more or less straight, usually partly covered with microspicules, usually widened distally before distinct curvature in dorsal direction (bd). Only in *D. (Carinatodorcadion)* (Figs. 43–49) medial tube behind ventral plates with a longitudinal row of big granules — ventral saw (sw). The region before central bend (bd) can be strongly swollen forming central bladder (cb) of different shape, specially in *Dorcadion (Cribridorcadion, sensu nov.)* (Fig. 50 and others) and *Iberodorcadion* (Figs. 30–38). Central bladder usually with dorsal (ds) and/or ventral (vs) swellings, in *D. (Megalodorcadion)* (Fig. 109) it is “S”-like curved, in *Dorcadion (s.str.)* (Fig. 116) — with ventral tubercle (vt). Very rare central bladder with lateral appendages (la) (*Iberodorcadion amorii segurense*, Fig. 34) or with lateral tubercles (lt) (*I. spinolae*, Fig. 32; *I. suturale*; *I. nigrosparsum*, Fig. 36). Central bladder and usually central bend are indistinct in *Neodorcadion* (Figs. 1–3), *E. (Ornatodorcadion)* (Figs. 17–21, 23–24), *E. (Humerodorcadion, subgen.n.)* (Figs. 25–28), *D. (Politodorcadion)* (Figs. 39–42). Central trunk (ct) connects medial tube (mt) with preapical bulb (pb), usually tapering distally and limited apically by distinct constriction. Central trunk can be fused with preapical bulb without distinct limits, as in *Neodorcadion* (Figs. 1–3), or totally absent, as in *Eodorcadion (Humerodorcadion)* (Figs. 25–29). Central trunk is totally or partly covered with spicules or long and dense microtrichiae (Figs. 87, 100). In *I. (Baeticodorcadion)* central trunk with ventral pair of small basal swellings (Figs. 33–36 — bs); in *Dorcadion (Carinatodorcadion) fulvum* (Fig. 47) central trunk strongly swollen basally and so connected with medial tube (mt) by distinct constriction. In *Dorcadion (Carinatodorcadion) carinatum* central trunk with a basal pair of large dorsal tubercles (Fig. 43 — dt), which are transformed in *D. (C.) aethiops* in a big longitudinal teats (Fig. 49 — dt). Preapical bulb (pb) often more or less spherical, but in *Neodorcadion* (Figs. 1–3) more or less elongated; always limited distally by distinct apical furrow (af) and here often with a deep constriction. The constriction absent in *Neodorcadion*, all *Eodorcadion* and *Dorcadion (Politodorcadion)*. Sometimes (*Dorcadion s.str.*) preapical bulb at the base of dorsal part enlarged and slightly swollen, forming a subapical area (Figs. 111, 115–116 — sa). In *Neodorcadion* (Figs. 1–3) and *Iberodorcadion* (Figs. 30–38) preapical bulb fused with central trunk without distinct limits. Preapical bulb usually totally or partly covered by microspicules; in *Eodorcadion (Humerodorcadion)* with large dorsal sclerite (Fig. 29). Only in *D. (Megalodorcadion)* (Fig. 109) preapical bulb is distinctly divided in two parts: basal part in form of “S”-like curvature (cr) is covered with microspicules and similar to preapical bulb of other *Dorcadion*, but apical part is covered with same big spines as apical bulb, that is not known in any other Dorcadionini. Apical furrow (af) is usually connected with internal membrane (absent or very narrow in *Eodorcadion*), with a wide or narrow

round opening (for ductus ejaculatorius) in the middle (Fig. 46 — apical phallomer was removed), which sometimes can be totally closed. Apical phallomer usually consists of two divisions with very distinct limits: apex of endophallus represented by glabrous thin-walled apical bubble (bb), bearing paired gonopores; apical bulb (ab), covered with microspines, connected apical bubble with apical furrow. The borderline between apical bubble and apical bulb often looks like a furrow. In *D. (Politodorcadion)* (Figs. 39–42) both divisions are fused, but the limit of basal spined area (ab) is distinct. In all *Eodorcadion* apical bulb is totally absent, so apical phallomer is represented by glabrous apical bubble only, which is directly connected with apical furrow. Gonopores are situated near apical furrow at dorsal side of apical bubble. In *E. (Ornatodorcadion)* apical bubble usually with very long appendix (Figs. 17–23), or (in *E. brandti*, Fig. 24) strongly elongated. Apical bulb (ab) is usually spherical or hemispherical, sometimes elongated or conical like in *D. (Acutodorcadion subgen.n.)* (Figs. 117, 119–121); in *D. (Carinatodorcadion)* and *D. (Cribridorcadion, sensu nov.)* often with apical sclerotization. Apical bubble usually smaller than apical bulb, but sometimes rather big. In *D. (Carinatodorcadion)*, *D. (Cribridorcadion, sensu nov.)* and *D. (Maculatodorcadion)* gonopores are usually accompanied with more or less distinct sclerites. In *D. (Carinatodorcadion)* gonopores are situated near base of the ventral side of bubble; in *D. (Cribridorcadion, sensu nov.)* gonopores are situated near middle of dorsal side of bubble (as in *Eodorcadion*). Apical bubble in *Dorcadion (s.str.)* and in *D. (Acutodorcadion subgen.n.)* can hardly be everted from the apical bulb, which is always very narrow apically with very strong apical sclerotization (111–112, 115–117, 119–121), and gonopores are situated near base of ventral side of apical bubble (Figs. 113, 121) — as in *D. (Carinatodorcadion)*. Apical bubble in *Dorcadion (s.str.)* is always with long and narrow sclerites, which are sometimes so big (*D. crassipes*, Fig. 113–114), that apical bubble is unable to be everted. In *D. (Acutodorcadion subgen.n.)* apical bubble without sclerites. In *Eodorcadion* and *Dorcadion (Politodorcadion)* all apical structures situated distally from the apical constriction of central trunk are fused forming more or less spherical unit — apical mace, which consists of preapical bulb and apical phallomer with distinct furrow in between. Gonopores are always paired in all Dorcadionini as ejaculatory ducts are also paired (Fig. 118).

The constation and the origin of paired gonopores is a subject of a special attention. According to S.L. Tuxen [1970: 273]: “In Prot., Ephem., some Derm., and certain Plec. the gonopore is paired in all other unpaired.” According to R. Matsuda [1976: 247] with his reference to R.F. Heberdey, [1928]: “Exceptionally, in *Hydroporus* the ejaculatory duct is paired”. Still already D. Sharp and F. Muir [1912] observed paired gonopores in *Gnoma* Fabricius, 1801 and *Monochamus* Dejean, 1821. According to S. Ehara [1954]: “Judging from the knowledge, the species possessing the paired

ejaculatory ducts are limited at present in the scope of the tribes, Lamiini, Monochamini, Batocerini and Gnomini". We can add here Dorcadionini.

One of us (D.G. Kasatkin) was able to follow ejaculatory ducts from gonopores to testis and both ducts were never totally fused though closely united inside the body and became independent diverging to gonopores only distally. Similar situation was described by S. Ehara [1954]: "The author observed also that the double ejaculatory ducts of *Dihammus luxuriosus* are united with each other near the base of internal sac".

Apical portions of ejaculatory ducts are usually widened (Figs. 96, 113–114). Sometimes both (or only one) distal widened portions of paired ejaculatory ducts are also everted from gonopores, if the pressure during preparation was too big. They look like conical tubercles at the apical mace (ee). It usually happens with endophallus of *Eodorcadion* (*Ornatodorcadion*) (Fig. 17–21, 23–24), but can be in all groups (Fig. 26, 29, 72, 83–85) with the exception of *Dorcadion* (s.str.) and *D. (Acutodorcadion)* subgen.n.). Such positions of ducts we regard as artefacts and do not specially describe.

The position of endophallus inside male abdomen was reliably described by S.W. Lingafelter and E.R. Hoebeke [2002] for *Anoplophora* Hope, 1839 and in general agree with Dorcadionini. At rest (before copulation) apical bulb (ab) is situated inside preapical bulb in everted (ready to copulation) position, so the apex of "packed" endophallus inside abdomen is represented by distal part of preapical bulb — apical furrow (af), and internal membrane (if presents) is slightly exposed into abdominal cavity. Apical bubble (bb) at rest is inside apical bulb; often apical portion of apical bubble is inside basal portion in everted (ready to copulation) position.

We do not use the names of endophallus parts introduced by W. Wu and S. Chiang (1989) for *Anoplophora* and accepted by S.W. Lingafelter and E.R. Hoebeke (2002) as we regard the general segmentation of endophallus in another way.

"Basal segment" of W. Wu and S. Chiang [1989] is our basal phallomer (bp), "medial segment" is our apical bulb (ab), "intersegmental membrane" + "terminal segment" is our apical bubble (bb) divided in basal and apical portions. Our apical phallomer (ap) consists of "medial segment" + "intersegmental membrane" + "terminal segment".

Morphology details on the pictures:

- aa — appendix of apical bubble
- ab — apical bulb
- ae — aedeagus
- af — apical furrow
- am — apical mace
- ap — apical phallomer
- as — sclerite of apical bubble
- bb — basal bubble
- bd — central bend
- bp — basal phallomer
- bs — basal swelling of central trunk
- bt — basal tube
- cb — central bladder

- cr — basal curvature of preapical bulb
- cs — conjugate spherical areas of preapical bulb
- ct — central trunk
- ds — dorsal swelling of central bladder
- dt — dorsal tubercle of central trunk
- ej — ejaculatory duct
- ee — everted distal portion of ejaculatory duct
- fl — flagelliform process of apical bubble
- gn — gonopores
- la — lateral appendage of central bladder
- mt — medial tube
- pb — preapical bulb
- sa — subapical area of preapical bulb
- sw — ventral saw
- tb — dorsal tubercle of bubble appendix
- vp — ventral plate
- vs — ventral swelling of central bladder
- vt — ventral tubercle of central bladder
- vc — ventral tubercle of central trunk

Neodorcadion Ganglbauer, 1884

Figs. 1–3.

Three taxa were investigated:

- N. bilineatum* (Germar, 1824) (Fig. 1)
- N. exornatum* (Frivaldsky, 1835) (Fig. 2)
- N. virleti* (Brullé, 1832) (Fig. 3)

Endophallus is relatively long, about as long as elytra. Basal tube (bt) about 1.5–2 times shorter than aedeagus, straight, with regular diameter, with glabrous dorsal side. Ventral side of basal tube bears two rows of transverse rugae. Distal pair of rugae is wider and longer, a little more sclerotized and represent the ventral plates (vp). Medial tube (mt) is about as long as aedeagus or longer, straight, widened or narrowed apically with hardly visible microspicules along dorsal surface, which are much denser basally. Central bend (bd) is poorly developed (*N. bilineatum*, Fig. 1), or rather distinct (Fig. 2–3). Central bladder indistinct, without any appendages. Central trunk (ct) can be turned to the medial tube at the angle of about 45° (Fig. 2). Central trunk can be exceptionally short (*N. virleti*, Fig. 3), about as long as wide (*N. exornatum*, Fig. 2) or rather long (*N. bilineatum*, Fig. 1), dorsally and ventrally covered with microspicules, dorsal microspicules are much more distinct. Distally trunk is hardly delimited from preapical bulb (pb), which is about same in width, cylindrical, strongly elongated partly covered with microspicules, connected with apical bulb (ab) by deep constriction — apical furrow (af) with distinct membrane inside. Apical bulb densely covered with microspines. Apical bubble (bb) well developed, cone-shaped, without any sclerites, connected with apical bulb without constriction. In *N. bilineatum* with distinct flagelliform process similar to *Iberodorcadion*.

An additional generic character based on the male genitals can be the truncate apex of aedeagus.

Eodorcadion Breuning, 1947

Figs. 4–29.

Endophallus relatively long and narrow — *E. (Ornatodorcadion)* (Figs. 17–22, 24), or very short and thick — *E. (Humerodorcadion)* subgen.n.) (Figs. 25–28). Basal

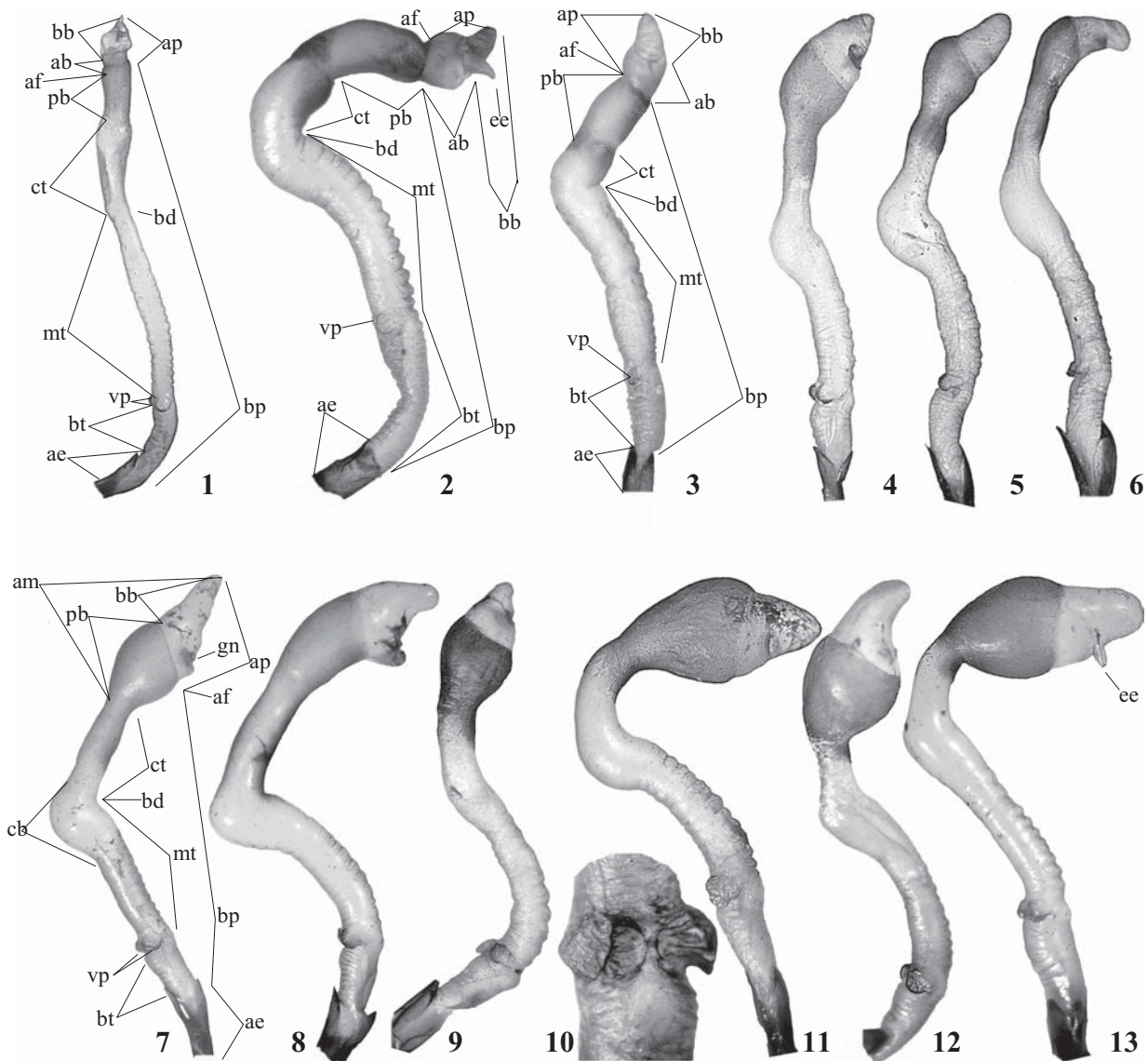


Fig. 1–13. Endophallus morphology of Dorcadionini: 1 — *Neodorcadion bilineatum*; 2 — *N. exornatum*; 3 — *N. virleti*; 4 — *Eodorcadion* (s.str.) *c. carinatum*; 5 — *E. (s.str.) c. altaicum*, **stat.n.**; 6 — *E. (s.str.) c. blessigi*; 7 — *E. (s.str.) c. bramsoni*; 8 — *E. (s.str.) c. involvens*; 9–10 — *E. (s.str.) quinquevittatum*; 11 — *E. (s.str.) leucogrammum*; 12 — *E. (s.str.) tuvense*; 13 — *E. (s.str.) ptyalopleurum*. 1–9, 11–13 — endophallus, lateral view; 10 — ventral plates.

Fig. 1–13. Строение эндофаллуса Dorcadionini: 1 — *Neodorcadion bilineatum*; 2 — *N. exornatum*; 3 — *N. virleti*; 4 — *Eodorcadion* (s.str.) *c. carinatum*; 5 — *E. (s.str.) c. altaicum*, **stat.n.**; 6 — *E. (s.str.) c. blessigi*; 7 — *E. (s.str.) c. bramsoni*; 8 — *E. (s.str.) c. involvens*; 9–10 — *E. (s.str.) quinquevittatum*; 11 — *E. (s.str.) leucogrammum*; 12 — *E. (s.str.) tuvense*; 13 — *E. (s.str.) ptyalopleurum*. 1–9, 11–13 — эндофаллус, сбоку; 10 — вентральные склериты.

Обозначения: aa — придатки апикальной камеры; ab — апикальная камера; ac — эдеагус; af — апикальная борозда; am — апикальная булава; ar — апикальный фалломер; as — склериты апикальной камеры; bb — базальная камера; bd — центральная перетяжка; bp — базальный фалломер; bs — базальный выступ центрального ствола; bt — базальная трубка; cb — центральный канал; ct — центральная камера; cs — conjugate spherical areas преапикальной камеры; ds — дорсальный выступ центральной камеры; dt — дорсальный бугор центрального ствола; ee — семяизвергательный канал; ee — вывернутая дистальная часть семяизвергательного канала; fl — флагеллем; gn — гонопор; la — боковые придатки центральной камеры; mt — медиальная трубка; pb — преапикальная камера; sa — субапикальная область преапикальной камеры; sw — вентральная пила; tb — дорсальный бугорок придатка камеры; vt — вентральный склерит; vs — вентральный выступ центральной камеры; vt — вентральный бугор центральной камеры; vc — вентральный бугор центрального ствола.

tube (bt) short, never longer than its twice width. Ventral plates rather (vp) big, long and wide, trapezoidal. In *Eodorcadion* (s.str.) central bladder (cb) can be well developed (*E. carinatum*, Figs. 4–8) hardly delimited (*E. tuvense*, *E. ptyalopleurum*, Figs. 12–13) or indistinct (*E. quinquevit-*

tatum, Fig. 9); in *E. (Ornatodorcadion)* (Figs. 17–21, 23–24) and *E. (Humerodorcadion subgen.n.)* (Figs. 25–28) — more or less indistinct. Central trunk (ct) in *Eodorcadion* (s.str.) longer or shorter (Figs. 4–8, 11–13), though fused with medial tube in *E. (s.str.) quinquevittatum* (Fig.

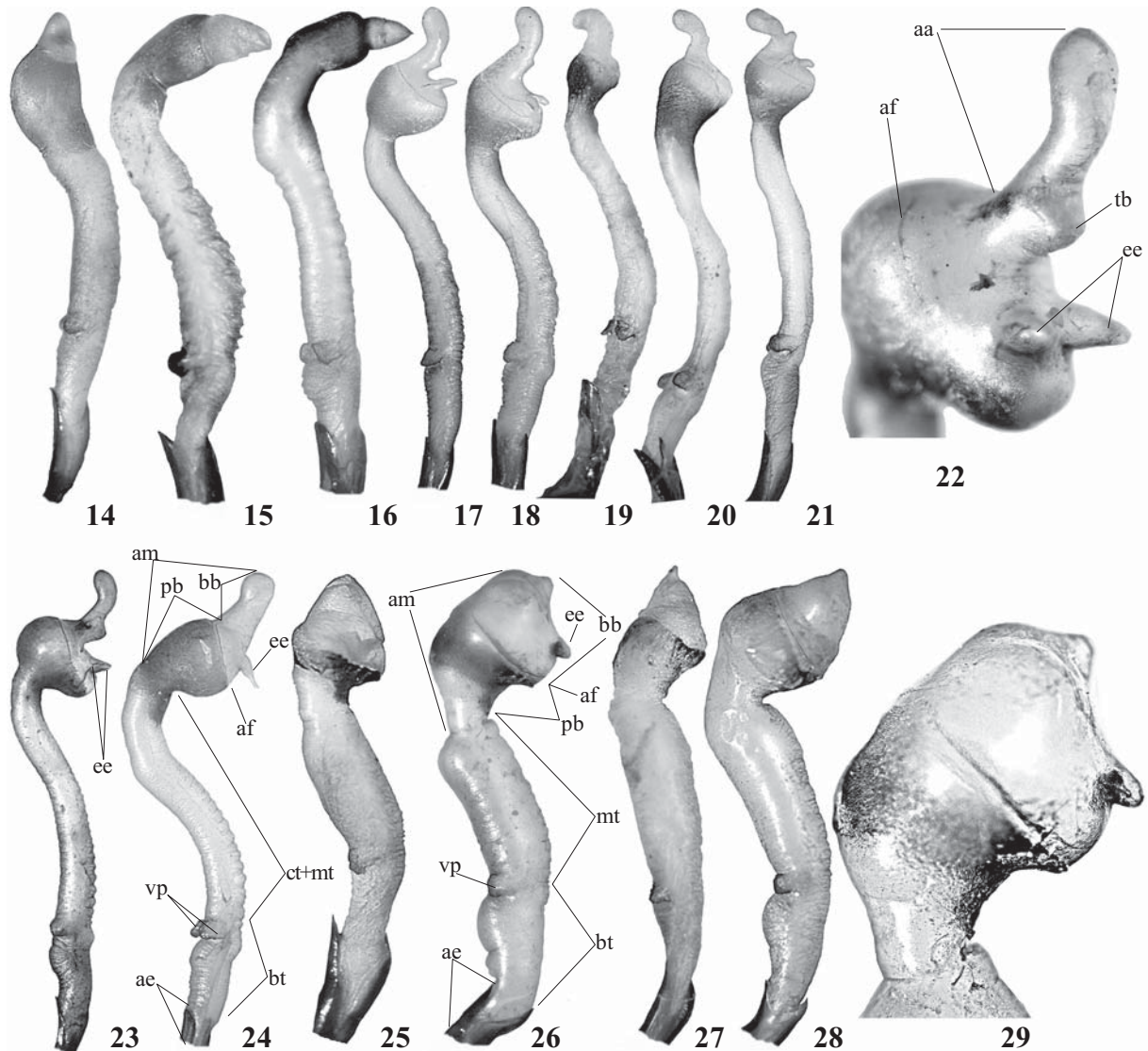


Fig. 14–29. Endophallus morphology of Dorcadionini: 14 — *E. (s.str.) virgatum*; 15 — *E. (s.str.) sifanicum*; 16 — *E. (s.str.) glaucopterum*; 17 — *E. (O.) argali argali*; 18 — *E. (O.) a. rugipenne*; 19 — *E. (O.) novitzkyi*; 20 — *E. (O.) intermedium kozlovi*; 21 — *E. (O.) zichyi*; 22–23 — *E. (O.) consentaneum*; 24 — *E. (O.) brandti*; 25 — *E. (H.) humerale humerale*; 26, 29 — *E. (H.) b. impluviatum*; 27 — *E. (H.) lutsbniki*; 28 — *E. (H.) lutsbniki ab. bicoloratum*. 14–21, 23–28 — endophallus, lateral view; 22, 29 — apical mace.

Fig. 14–29. Строение эндофаллуса Dorcadionini: 14 — *E. (s.str.) virgatum*; 15 — *E. (s.str.) sifanicum*; 16 — *E. (s.str.) glaucopterum*; 17 — *E. (O.) argali argali*; 18 — *E. (O.) a. rugipenne*; 19 — *E. (O.) novitzkyi*; 20 — *E. (O.) intermedium kozlovi*; 21 — *E. (O.) zichyi*; 22–23 — *E. (O.) consentaneum*; 24 — *E. (O.) brandti*; 25 — *E. (H.) humerale humerale*; 26, 29 — *E. (H.) b. impluviatum*; 27 — *E. (H.) lutsbniki*; 28 — *E. (H.) lutsbniki ab. bicoloratum*. 14–21, 23–28 — эндофаллус, сбоку; 22, 29 — апикальная булава.

9), as well as in *E. (s.str.) virgatum* (Fig. 14); in *E. (Ornatodorcadion)* also fused with medial tube (Figs. 17–21, 23–24); in *E. (Humerodorcadion subgen.n.)* (Fig. 25–29) central trunk nearly absent, and preapical bulb (pb) is connected directly with medial tube. Central bend (bd) indistinct in *E. (Ornatodorcadion)* and usually in *E. (Humerodorcadion)*, or well developed (often in *Eodorcadion s.str.* — Figs. 4–8, 11–13). Preapical bulb (pb) is always strongly widened and densely covered with distinct microspicules or microtrichiae; normally without apical constriction along apical furrow (af), forming together with apical phallomer (ap) an apical mace (am). Only in

E. (s.str.) glaucopterum (Fig. 16) apical constriction of preapical bulb is very distinct. Apical furrow without internal membrane, or with very narrow membrane in *E. (O.) brandti*. Apical phallomer (ap) without apical bulb. Apical bubble (bb) well developed; in *E. (Ornatodorcadion)* (Figs. 17–22) with very long appendix (aa), or just strongly attenuated in *E. (O.) brandti* (Fig. 24). Paired gonopores (gn) are situated near middle of the dorsal side of apical phallomer or even moved basally (Fig. 7); internal distal parts of ejaculatory ducts can be easily everted in form of paired appendages (ee), specially in *E. (Ornatodorcadion)* (Fig. 22).

Eodorcadion (Eodorcadion s.str.)

Figs. 4–16.

Thirteen taxa were investigated:

- E. carinatum carinatum* (Fabricius, 1781) (Fig. 4)
E. c. altaicum (Suvorov, 1909), **stat.n.** (Fig. 5)
E. c. blessigi (Ganglbauer, 1884) (Fig. 6)
E. c. bramsoni (Pic, 1901) (Fig. 7)
E. c. involvens (Fischer-Waldheim, 1823) (Fig. 8)
E. quinquevittatum (Hammerström, 1893) (Fig. 9–10)
E. leucogrammum (Suvorov, 1909) (Fig. 11)
E. maurum (Jakovlev, 1889)
E. tuvense Plavilstshikov, 1958 (Fig. 12)
E. ptyalopleurum (Suvorov, 1909) (Fig. 13)
E. virgatum (Motschulsky, 1854) (Fig. 14)
E. sifanicum (Suvorov, 1912) (Fig. 15)
E. glaucopterum (Ganglbauer, 1884) (Fig. 16)

Endophallus long and narrow, usually about as long as elytra; or in *E. (s.str.) virgatum* (Fig. 14) relatively short. Basal tube (bt) short about 2 times longer than wide or shorter, glabrous, often transversely rugose. Ventral plates (vp) rather big, long and wide, trapezoidal. Medial tube (mt) is about as long as aedeagus, curved ventrally, widened distally, often forming hardly delimited relatively glabrous central bladder (cb) (Figs. 4–8, 11–13). Central bend (bd) is usually developed (in *E. carinatum involvens* often about 90°, Fig. 7–8), more or less distinct (*E. leucogrammum*, *E. tuvense*, *E. ptyalopleurum*, Figs. 11–13) or indistinct (*E. quinquevittatum*, Fig. 9; *E. virgatum*, Fig. 14). Central trunk (ct) often long (*E. carinatum*, Figs. 4–8), or very short (*E. glaucopterum*, *E. virgatum*, *E. sifanicum*, Figs. 14–16), totally or apically covered with microspicules. In *E. c. involvens* spicules are arranged along dorsal side of central trunk in so dense stripe, that it often looks like a sclerite. Central trunk fused with cone-shaped preapical bulb (pb) without (or with very small) constriction. Preapical bulb strongly widened (*E. quinquevittatum*, *E. leucogrammum*, *E. tuvense*, *E. ptyalopleurum*, Figs. 9, 11–13), or less widened (*E. carinatum*, Figs. 4–8), or hardly widened (*E. virgatum*, *E. sifanicum*, *E. glaucopterum*, Figs. 14–16) and densely covered with microspicules. Apical bubble (bb) more or less cone-shaped, big or (in *E. virgatum*, Fig. 14; *E. glaucopterum*, Fig. 16) small; joined to preapical bulb (pb) without constriction and without internal membrane in between; only in *E. glaucopterum* (Fig. 16) with distinct constriction. Paired gonopores (gn) is situated near middle of the dorsal side of phallosome or moved basally; each pore can be supplied (*E. carinatum*) with small sclerite.

Aedeagus apex is more or less sharp or rounded.

Eodorcadion (Ornatodorcadion Breuning, 1947)

Figs. 17–24.

Eight taxa were investigated:

- E. argali argali* (Jakovlev, 1889) (Fig. 17)
E. a. rugipenne Heyrovsky, 1967 (Fig. 18)
E. novitzkyi (Suvorov, 1909) (Fig. 19)
E. intermedium kozlovi (Suvorov, 1912) (Fig. 20)
E. zichyi (Csiki, 1901) (Figs. 21)

E. dorcas dorcas (Jakovlev, 1901)*E. consentaneum* (Jakovlev, 1899) (Fig. 22–23)*E. brandti* (Gebler, 1841) (Fig. 24)

Endophallus long and narrow about as long as elytra. Basal tube (bt) short about 1.5 times longer than wide, widened distally, glabrous, transversely rugose. Ventral plates (vp) rather big, long and wide, trapezoidal. Medial tube very long, much longer than aedeagus, straight or curved ventrally, narrowed distally, with hardly visible spicules, fused with central trunk (mt+ct); central bend absent. Apical mace (am) big and well pronounced, connected with the area of central trunk without constriction. Apical mace often more or less compressed laterally and sometimes longitudinally. Preapical bulb (pb) cone-shaped, always strongly widened and covered with microspines or elongated microtrichiae (*E. brandti*). Apical bubble (bb) big, depressed or cone-shaped; joined to preapical bulb without constriction and without (or with vestigial in *E. brandti*) internal membrane in between, usually with very long wide appendix (Fig. 22, aa), which is supplied with more or less distinct dorsal tubercle near base (dt); only in *E. brandti* (Fig. 24) apical bubble long, cone-shaped without distinct appendix. Paired gonopores is situated near middle of the dorsal side of apical bubble; apical portions of distal parts of ejaculatory ducts can be easily everted (Fig. 22, ee).

Aedeagus apex is rounded.

Eodorcadion (Humerodorcadion, subgen.n.)

Figs. 25–29.

Type species: *Dorcadion humerale* Gebler, 1823

Three taxa were investigated:

- E. h. humerale* (Gebler, 1823) (Fig. 25)
E. h. impluviatum (Faldermann, 1833) (Fig. 26, 29)
E. lutshniki (Plavilstshikov, 1937) (Fig. 27)
E. lutshniki ab. *bicoloratum* Plavilstshikov, 1958 (Fig. 28)

Endophallus short and thick, shorter than elytra. Basal tube short about 1.5 times longer than distal width, widened distally, glabrous, transversely rugose. Ventral plates (vp) rather big, long and wide, trapezoidal. Medial tube (mt) very short and wide, about only two times longer than wide, widened distally (*E. lutshniki*, Figs. 27–28) or about cylindrical (*E. humerale*, Figs. 25–26). Central trunk absent. Preapical bulb (pb) is connected directly to medial tube. Medial tube is constricted before fusion with cone-shaped preapical bulb. Short glabrous narrow curved area of constriction between preapical bulb and medial tube is homologous to central trunk. Preapical bulb is always strongly widened and covered with microspines, which are concentrated on dorsal and ventral sides; dorsal spined area looks like a sclerite (Fig. 29). Apical bubble (bb) semi-spherical or cone-shaped; joined to preapical bulb without constriction and without internal membrane in between, with three small protuberances (Fig. 29): central (longer) and two lateral. Paired gonopores are situated near middle of the dorsal side of apical bubble.

Aedeagus apex is more or less sharp or rounded.

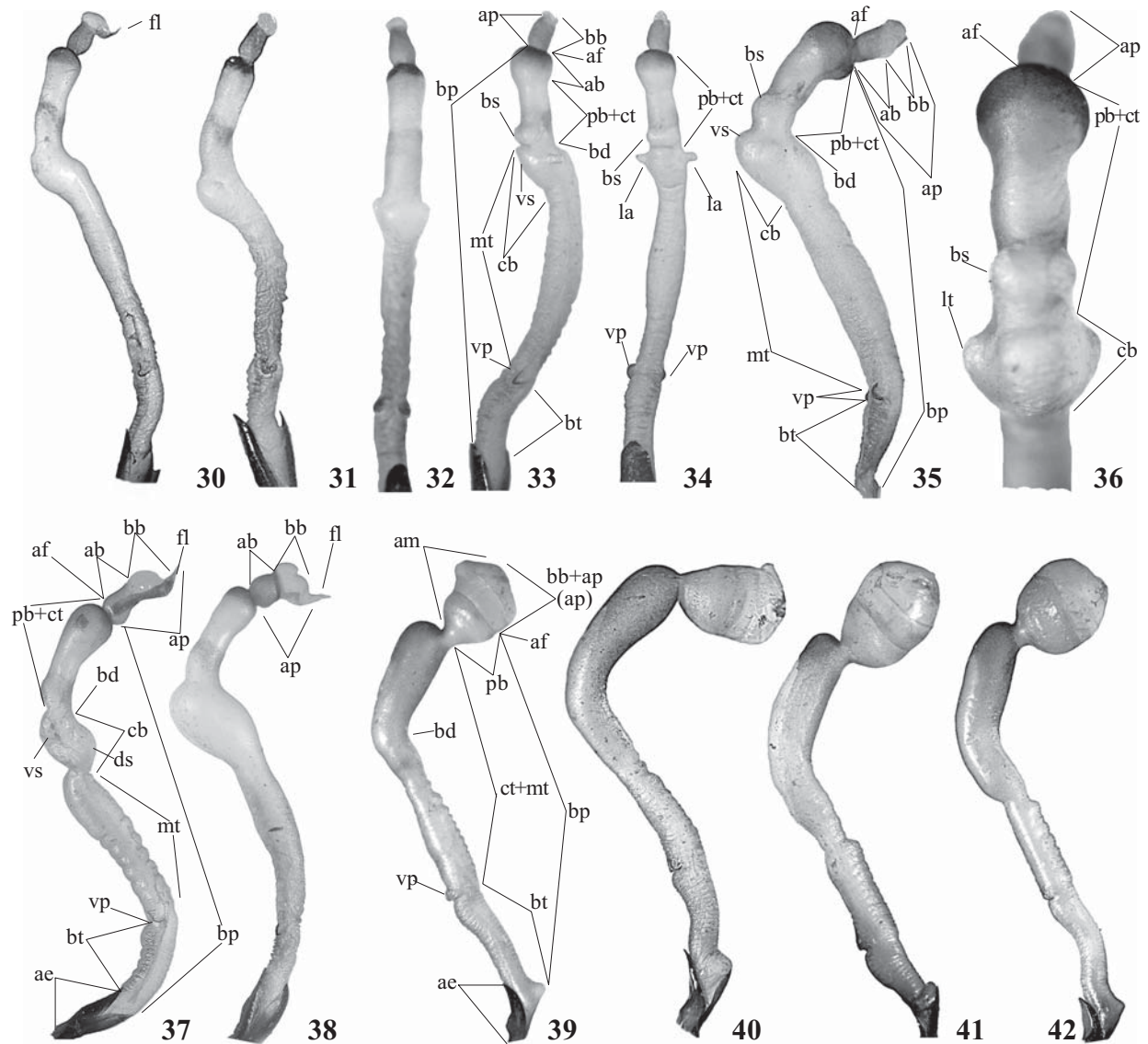


Fig. 30–42. Endophallus morphology of Dorcadionini: 30 — *Iberodorcadion* (s.str.) *fuliginator andianum*; 31–32 — *I.* (s.str.) *spinolae spinolae*; 33, 34 — *I.* (B.) *amorii segurense*; 35–36 — *I.* (B.) *nigrosparsum*; 37 — *I.* (H.) *neilense*; 38 — *I.* (H.) *segovianum dejeani*; 39 — *Dorcadion* (P.) *r. ribbei*; 40 — *D.* (P.) *politum akmolense*; 41 — *D.* (P.) *balchashense betpakdalense*; 42 — *D.* (P.) *archarlense*. 30, 31, 33, 35, 37–42 — endophallus, lateral view; 32, 34 — ventral view; 36 — ventral side of the distal half.

Fig. 30–42. Строение эндофаллуса Dorcadionini: 30 — *Iberodorcadion* (s.str.) *fuliginator andianum*; 31–32 — *I.* (s.str.) *spinolae spinolae*; 33–34 — *I.* (B.) *amorii segurense*; 35–36 — *I.* (B.) *nigrosparsum*; 37 — *I.* (H.) *neilense*; 38 — *I.* (H.) *segovianum dejeani*; 39 — *Dorcadion* (P.) *r. ribbei*; 40 — *D.* (P.) *politum akmolense*; 41 — *D.* (P.) *balchashense betpakdalense*; 42 — *D.* (P.) *archarlense*. 30, 31, 33, 35, 37–42 — эндофаллус, сбоку; 32, 34 — снизу; 36 — дистальная часть эндофаллуса, снизу.

Iberodorcadion Breuning, 1943

Figs. 30–38.

Seven taxa were investigated:

- I.* (s. str.) *fuliginator andianum* (Pic, 1917) (Fig. 30)
- I.* (s. str.) *spinolae spinolae* (Dalman, 1817) (Figs. 31–32)
- I.* (*Baeticodorcadion*) *amorii segurense* (Escalera, 1911) (Figs. 33–34)
- I.* (*Baeticodorcadion*) *nigrosparsum* Verdugo, 1993 (Fig. 35–36)
- I.* (*Baeticodorcadion*) *suturale* (Chevrolat, 1862)
- I.* (*Hispanodorcadion*) *neilense* (Escalera, 1902) (Fig. 37)
- I.* (H.) *segovianum dejeani* (Chevrolat, 1862) (Fig. 38)

Endophallus long and narrow, about as long as abdomen. Basal tube (bt) long and narrow, glabrous, about as long as aedeagus, often with numerous deep transverse rugae along ventral surface, which are sclerotized laterally forming two rows of sclerites, well developed in *Hispanodorcadion*; ventral plates (vp) small (*Hispanodorcadion*) or relatively large (*Iberodorcadion* s.str.). Medial tube (mt) is usually longer than aedeagus, straight or slightly curved ventrally and a little widened distally, slightly sclerotized in basal two-thirds and here transversally rugose with hardly visible microspecules or glabrous (*Baeticodorcadion*). Central bend (bd) always distinct

(very strong in *Hispanodorcadion*). Central bladder (cb) distinct, rather big (*Hispanodorcadion*) with ventral (vs) and dorsal (ds) swellings; or small (*Iberodorcadion* s.str., *Baeticodorcadion*); in *I. (B.) amorii segurensis* central bladder with long lateral appendages (Fig. 34 — la); in *I. (s.str.) s. spinolae*, in *I. (B.) nigrosparsum* and *I. (B.) suturale* with short lateral tubercles (Figs. 32, 36 — la) Central trunk fused with preapical bulb without any traces of constriction, the joined tube (pb+ct) is turned to the medial tube at the angle from about 90° (*Hispanodorcadion*), but usually less. The region of central trunk densely covered with microspecules near base and here more or less swollen; in *Baeticodorcadion* with rather distinct basal swelling at ventral side (Figs. 33–36 — bs); the region of fusion with preapical bulb glabrous; the region of preapical bulb is a little wider, densely covered with long and distinct microspecules. Apical bulb joined to the fused preapical bulb and central trunk by very deep constriction — apical furrow (af) with well developed internal membrane inside. Apical bulb (ab) cylindrical, a little narrowed apically, regularly covered with very distinct microspines. Apical bubble (bb) well developed, big and wide, joined to apical bulb without constriction, often divided in two portions, often (or always?) with long flagelliform process (fl), which was clearly seen in *I. (Hispanodorcadion)* (Figs. 37–38 — fl).

Aedeagus apex is always rounded.

***Dorcadion* Dalman, 1817**
Figs. 39–121.

Endophallus long and narrow, partly covered with different type of asperities: the smallest microspecules can be hardly seen on basal and medial tube; microspecules of preapical bulb are a little bigger, but still hardly visible; specules of central trunk are very distinct and often are modified in long microtrichiae; apical bulb covered with relatively big regular spines. Basal tube (bt) usually long and narrow, glabrous or with microspecules, with numerous transverse rugae all around the tube. Ventral plates (vp) usually small, semicircular. Medial tube (mt) long, straight or slightly curved ventrally and widened distally, with microspecules. Central bladder (cb) more or less distinct, central bend (bd) present or not. Central trunk always covered with distinct microspecules (Fig. 87) or longer microtrichiae (Fig. 100). Preapical bulb (pb) clearly delimited from central trunk by strong constriction, always strongly widened and densely covered with long and distinct microspecules. Only in *D. (Megalodorcadion)* (Fig. 109) preapical bulb is distinctly divided in two parts: basal part in form of “S”-like curvature (cr) is covered with microspecules and similar to preapical bulb of other *Dorcadion*, but apical part is covered with same big spines as apical bulb, that is not known in any other Dorcadionini. Apical phallomer (ap) always delimited from preapical bulb by internal membrane (Fig. 46 — apical phallomer removed). Apical phallomer usually with distinct apical bulb (ab), covered with distinct spines and glabrous apical bubble (bb); only in *Politodorcadion* apical bulb is fused with apical bubble. Apical bubble usually joined to apical bulb by dis-

tinct constriction, which sometimes is rather shallow (*D. semenovi*, *D. equestre* — Figs. 71–75). Apical bubble usually with distinct sclerites (Figs. 48, 84–85, 96, 113–114) near paired gonopores (absent in *Politodorcadion* and in *Acutodorcadion*); gonopores are situated near apex of apical bubble (*Politodorcadion*) or on its dorsal side (*Cribridorcadion*, **sensu nov.**, *Megalodorcadion*, *Maculatodorcadion*), or near base of its ventral side (*Carinatodorcadion*, *Dorcadion* s.str., *Acutodorcadion subgen.n.*). Sometimes (because of the narrow apical sclerotization of apical bulb) apical bubble can be hardly exposed during preparation (*Dorcadion* s.str., *Acutodorcadion subgen.n.*) and possibly rests inside apical bulb during copulation. In certain *Dorcadion* s.str. (*D. crassipes*) elongated sclerites of apical bubble are so big (Figs. 113–114), that bubble is unable to be everted and sure rests inside bulb during copulation; but even in such case gonopores will be at the top of aedeagus as they are situated just at base of bubble.

***Dorcadion (Politodorcadion)* Danilevsky, 1993**
Figs. 39–42.

Four taxa were investigated:

- D. (P.) ribbei ribbei* Kraatz, 1878 (Fig. 39)
- D. (P.) politum akmolense* (Suvorov, 1911) (Fig. 40)
- D. (P.) balchashense betpakdalense* Danilevsky, 1996 (Fig. 41)
- D. (P.) archarlense* Danilevsky, 1996 (Fig. 42)

Endophallus long and narrow, about as long as abdomen. Basal tube (bt) long and narrow, glabrous, with numerous transverse rugae all around the tube, which are not arranged in two ventral rows, ventral plates (vp) small, circular. Medial tube (mt) is more or less fused with central trunk (ct) so central bend (bd) is poorly developed. Medial tube about as long as aedeagus, straight, widened distally, slightly sclerotized in basal two-thirds and here strongly transversally rugose with microspecules; central bladder indistinct, without any swellings or appendages. Central trunk is turned to medial tube at the angle of about 30°. Central trunk densely covered with microspecules and looks dark-brown. Preapical bulb (pb) clearly delimited from central trunk by strong constriction, always strongly widened and densely covered with long and distinct microspecules. Apical phallomer (ap) joined to preapical bulb without constriction, but with well developed membrane in between. Apical bulb (as a belt of microspecules) hardly pronounced, fused with apical bubble, which is hemispherical, glabrous without any appendages; paired gonopores situated near its apex, without sclerites.

Aedeagus apex is more or less sharp or rounded.

***Dorcadion (Carinatodorcadion)* Breuning, 1943**
Figs. 43–49.

Five taxa were investigated:

- D. carinatum carinatum* (Pallas, 1771) (Fig. 43–46)
- D. c. cylindraceum* Reitter, 1886
- D. fulvum fulvum* (Scopoli, 1763)
- D. fulvum canaliculatum* (Fischer-Waldheim, 1823) (Fig. 47–48)
- D. aethiops* (Scopoli, 1763) (Fig. 49)

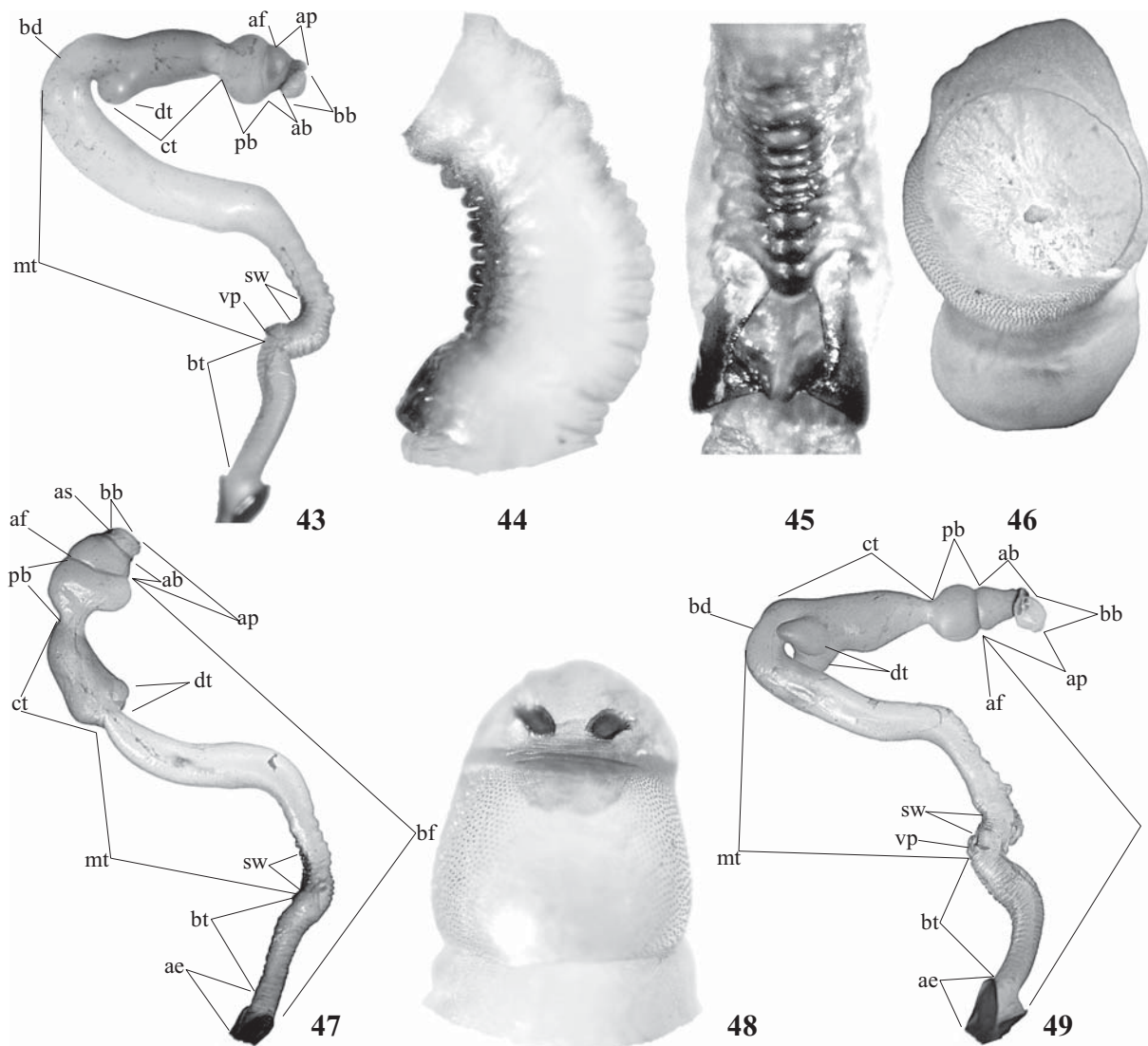


Fig. 43–49. Endophallus morphology of Dorcadionini: 43–46 — *D. (C.) c. carinatum*; 47–48 — *D. (C.) fulvum canaliculatum*; 49 — *D. (C.) aethiops*. 43, 47, 49 — endophallus, lateral view; 44–45 — ventral plates and saw (44 — lateral view, 45 — ventral view); 46 — internal membrane (apical phallomer removed); 48 — sclerites of apical bubble.

Fig. 43–49. Строение эндофаллуса Dorcadionini: 43–46 — *D. (C.) c. carinatum*; 47–48 — *D. (C.) fulvum canaliculatum*; 49 — *D. (C.) aethiops*. 43, 47, 49 — эндофаллус, сбоку; 44–45 — вентральные склериты и гофр (44 — сбоку, 45 — снизу); 46 — внутренняя мембрана (вершина эндофаллуса удалена); 48 — склериты апикальной камеры.

Endophallus very long and narrow, about as long as elytra and pronotum combined or longer than body. Basal tube (bt) long and narrow, more or less straight or curved ventrally, glabrous, with numerous transverse rugae along ventral side, often arranged in two ventral rows, ventral plates (vp) very big and strongly sclerotized in form of longitudinal sclerites (Figs. 44–45) of complicated shape. Medial tube (mt) is much longer than aedeagus, nearly straight or slightly curved ventrally and widened distally, glabrous; near base just behind the ventral plates with a row of strongly sclerotized granules — ventral saw (sw) (Figs. 44–45). Dorsal surface of basal tube from its base to the saw region with more or less distinct transverse rugae. Central bend (bd) without any morphological structures and marked just

by the dorsal curvature (absent in *D. fulvum*, Fig. 47); central bladder indistinct. In *D. carinatum* (Fig. 43) and *D. aethiops* (Fig. 49) central trunk (ct) turned to the medial tube at the angle of more than 90°; in *D. fulvum* (Fig. 47) it is swollen at base with a pair of small dorsal tubercles; in *D. carinatum* (Fig. 43) with a pair of big tubercles, which are specially long in *D. aethiops* (Fig. 49); along all its length regularly covered with microspecules. Preapical bulb (pb) clearly delimited from central trunk by strong constriction, always strongly swollen in form of big spherical structure, covered with extremely small microspecules. Apical bulb (ab) joined to preapical bulb by distinct constriction, also strongly swollen, spherical, with a narrow sclerotized band distally. Spherical apical bubble (bb) with a pair of round

sclerites (as) near base of ventral side (where paired gonopores are situated, Fig. 48); sclerites of apical bubble usually very big, but in some populations of *D. carinatum* (from near Orenburg, South Urals) bubble sclerites are small and partly fused, which can be the evidence of subspecific rank of Orenburg population.

An additional subgeneric character based on the male genitals can be the divided apex of aedeagus (less pronounced in *D. fulvum*).

Dorcadion

Figs. 50–108.

Dorcadion (Cribridorcadion Pic, 1901), **sensu nov.**

= *Pedestredorcadion* Breuning, 1943, **syn.n.**

= *Dzhungarodorcadion* Danilevsky, 1993, **syn.n.**

Fifty six taxa were investigated:

- D. mniszewi* Kraatz, 1873 (Fig. 50)
- D. pedestre* (Poda, 1761) (Fig. 51)
- D. decipiens* (Germar, 1824) (Fig. 52)
- D. sericatum* Sahlberg, 1853 (Fig. 53)
- D. pusillum pusillum* Küster, 1847 (Fig. 54–55)
- D. pusillum tanaiticum* Kasatkin, 2002 (Fig. 56)
- D. elegans* Kraatz, 1873
- D. auratum* Tournier, 1872 (Fig. 57)
- D. ciscaucasicum* Jakovlev, 1900 (Fig. 58)
- D. komarowi* Jakovlev, 1887 (Fig. 59)
- D. sareptanum euxinum* Suvorov, 1915, **stat.n.** (Fig. 60)
- D. cinerarium cinerarium* (Fabricius, 1787) (Fig. 61)
- D. cinerarium caucasicum* Küster, 1847, **stat.n.** (Fig. 62)
- D. kasikoporanum* Pic, 1902 (Fig. 63)
- D. kalashiani* Danilevsky, 1992 (Fig. 64)
- D. sulcipenne goektschanum* Suvorov, 1915, **stat.n.** (Fig. 65)
- D. demokidovi* Suvorov, 1915 (Fig. 66)
- D. maljushenkoi* Pic, 1904 (Fig. 67)
- D. holosericeum holosericeum* Krynicki, 1832 (Fig. 68)
- D. holosericeum tristriatum* Suvorov, 1913 (Fig. 69)
- D. striolatum* Kraatz, 1873 (Fig. 70)
- D. equestre* (Laxmann, 1770) (Fig. 71)
- D. semenovi semenovi* Ganglbauer, 1884 (Fig. 72)
- D. semenovi issykkulense* Pic, 1906 (Fig. 73)
- D. semenovi uruktensis* Danilevsky, 2002 (Fig. 74)
- D. semenovi thaisiae* Danilevsky, 2002 (Fig. 75)
- D. semenovi kuvakensis* Danilevsky, 2002
- D. rufogenum* Reitter, 1895 (Fig. 76)
- D. dokhtouroffi* Ganglbauer, 1886 (Fig. 77)
- D. jacobsoni* Jakovlev, 1899 (Fig. 78)
- D. morozovi* Danilevsky, 1992 (Fig. 79)
- D. semiargentatum* Pic, 1905 (Fig. 80)
- D. laeve* Faldermann, 1837 (Fig. 81)
- D. talyshense* Ganglbauer, 1884 (Fig. 82)
- D. scabricolle scabricolle* Dalman, 1817 (Fig. 83–85)
- D. scabricolle sevangense* Reitter, 1889 (Fig. 86–87)
- D. klavdiae* Danilevsky, 1992 (Fig. 88)
- D. niveisparsum* Thomson, 1865 (Fig. 89)
- D. wagneri* Küster, 1846 (Fig. 90)
- D. indutum* Faldermann, 1837 (Fig. 91)
- D. cineriferum* Suvorov, 1909 (Fig. 92)
- D. nitidum* Motschulsky, 1838 (Fig. 93)
- D. danczenkoi* Danilevsky, 1996, **stat.n.** (Fig. 94)

D. dimidiatum Motschulsky, 1838 (Fig. 95–96)

D. bistriatum Pic, 1898 (Fig. 97)

D. seminudum Kraatz, 1873 (Fig. 98)

D. apicerufum Breuning, 1943 (Fig. 99–100)

D. shestopalovi Danilevsky, 1993

D. tauricum Walth, 1838 (Fig. 101)

D. septemlineatum Walth, 1838 (Fig. 102)

D. margheritae Breuning, 1964 (Fig. 103)

D. turkestanicum Kraatz, 1881 (Fig. 104)

D. beckeri Kraatz, 1873 (Fig. 105)

D. lugubre Kraatz, 1873 (Fig. 106)

D. valonense Breit, 1923 (Fig. 107)

D. sturmi Frivaldsky, 1837 (Fig. 108)

Endophallus usually long and narrow, sometimes as long as body or longer. Basal tube (bt) long and narrow, straight, usually with certain areas covered with microspecules or glabrous, more or less transversely rugose or relatively smooth; ventral plates usually relatively small, or big and strongly sclerotized (*D. auratum*, Fig. 57). Medial tube (mt) usually longer than aedeagus, nearly straight or slightly curved ventrally, usually with certain areas covered with microspecules or glabrous; distally strongly swollen forming big and longitudinal central bladder (cb), which often has rather special shape (“S”-shaped in *D. wagneri*, Fig. 90), usually with dorsal (ds) and ventral (vs) swellings. Central bend (bd) usually more or less distinct; central trunk (ct) turned to the central bladder at the angle of about 90° or less or more, usually a little swollen behind middle, or nearly cylindrical (*D. wagneri*, Fig. 90; *D. dimidiatum*, Fig. 95; *D. nitidum*, Fig. 93), or more or less tapering apically (*D. bistriatum*, Fig. 97; *D. septemlineatum*, Fig. 102; *D. turkestanicum*, Fig. 104; *D. seminudum*, Fig. 98; *D. apicerufum*, Fig. 99–100), sometimes with small tubercle near base (*D. dimidiatum*, Fig. 95; *D. cinerarium danczenkoi*, Fig. 94 — vc), always covered with very distinct microspecules (Fig. 87) or, sometimes, with rather long microtrichiae (*D. apicerufum*, Fig. 100; *D. turkestanicum*, *D. septemlineatum*, *D. semenovi*, *D. rufogenum*). Often central bend indistinct, so central trunk is disposed in one line with medial tube (*D. pedestre*, Fig. 51; *D. sareptanum*, Fig. 60; *D. sulcipenne* with its relatives, Figs. 65–67). Preapical bulb (pb) big, wider than central trunk (*D. scabricolle*, Fig. 83, 86; *D. talyshense*, Fig. 82; *D. laeve*, Fig. 81; *D. nitidum*, Fig. 93; *D. wagneri*, Fig. 90; *D. pedestre*, Fig. 51; *D. holosericeum*, Fig. 68–69; *D. striolatum*, Fig. 70 and others), or small, narrower than trunk (*D. septemlineatum*, Fig. 102; *D. turkestanicum*, Fig. 104; *D. beckeri*, Fig. 105; *D. apicerufum*, Fig. 99; *D. bistriatum*, Fig. 97). Preapical bulb clearly delimited from central trunk by strong constriction, usually strongly swollen in form of big spherical structure, totally or partly covered with microspecules but sometimes looks glabrous. Sometimes preapical bulb long and narrow (*D. lugubre*, Fig. 106; *D. valonense*, Fig. 107; *D. sericatum*, Fig. 53; *D. tauricum*, Fig. 101; *D. indutum*, Fig. 91; *D. bistriatum*, Fig. 97); very rare long and narrow preapical bulb distinctly curved (*D. cineriferum*, Fig. 92; *D. seminudum*, Fig. 98; *D. apicerufum*, Fig. 99; *D.*

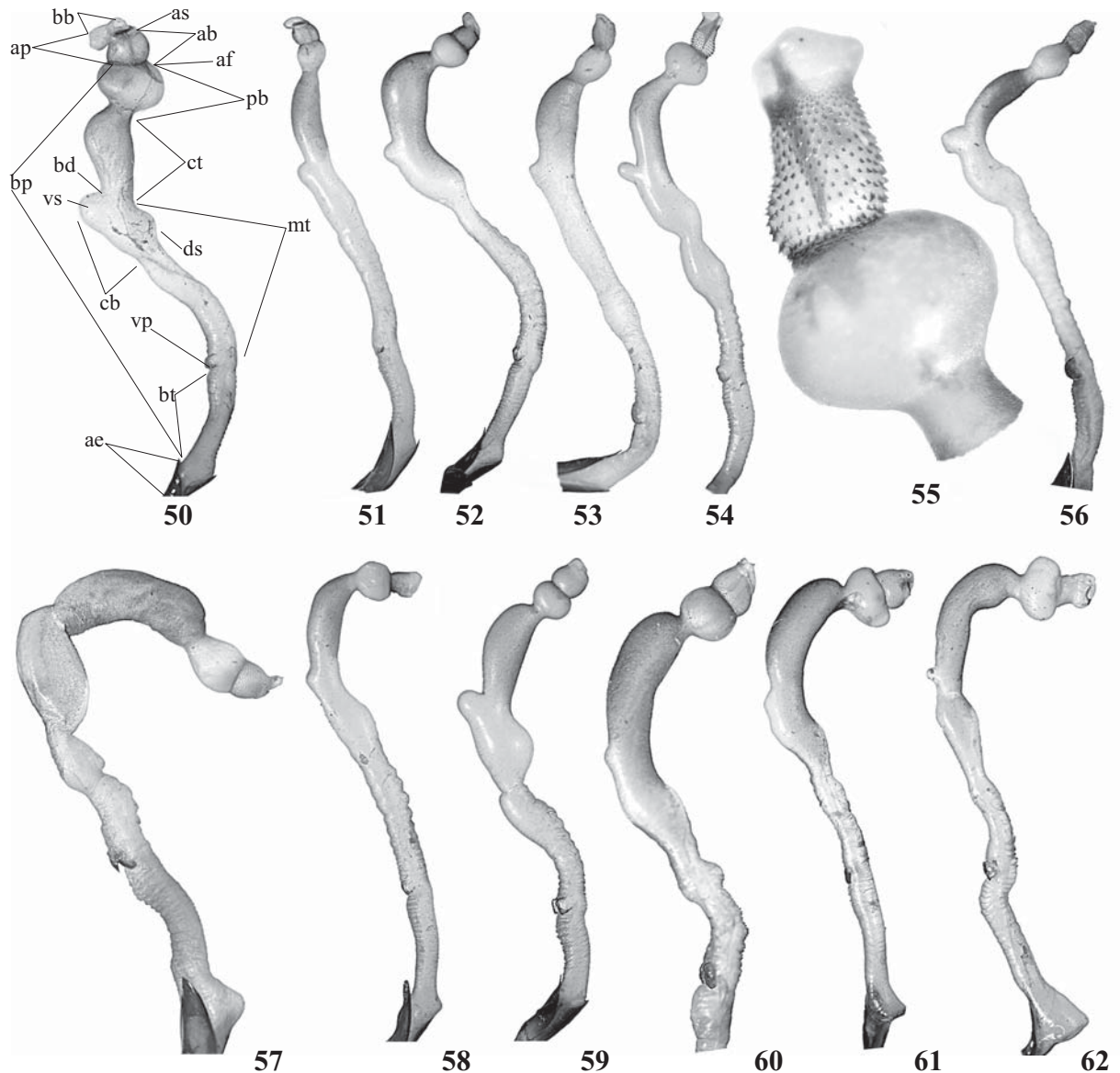
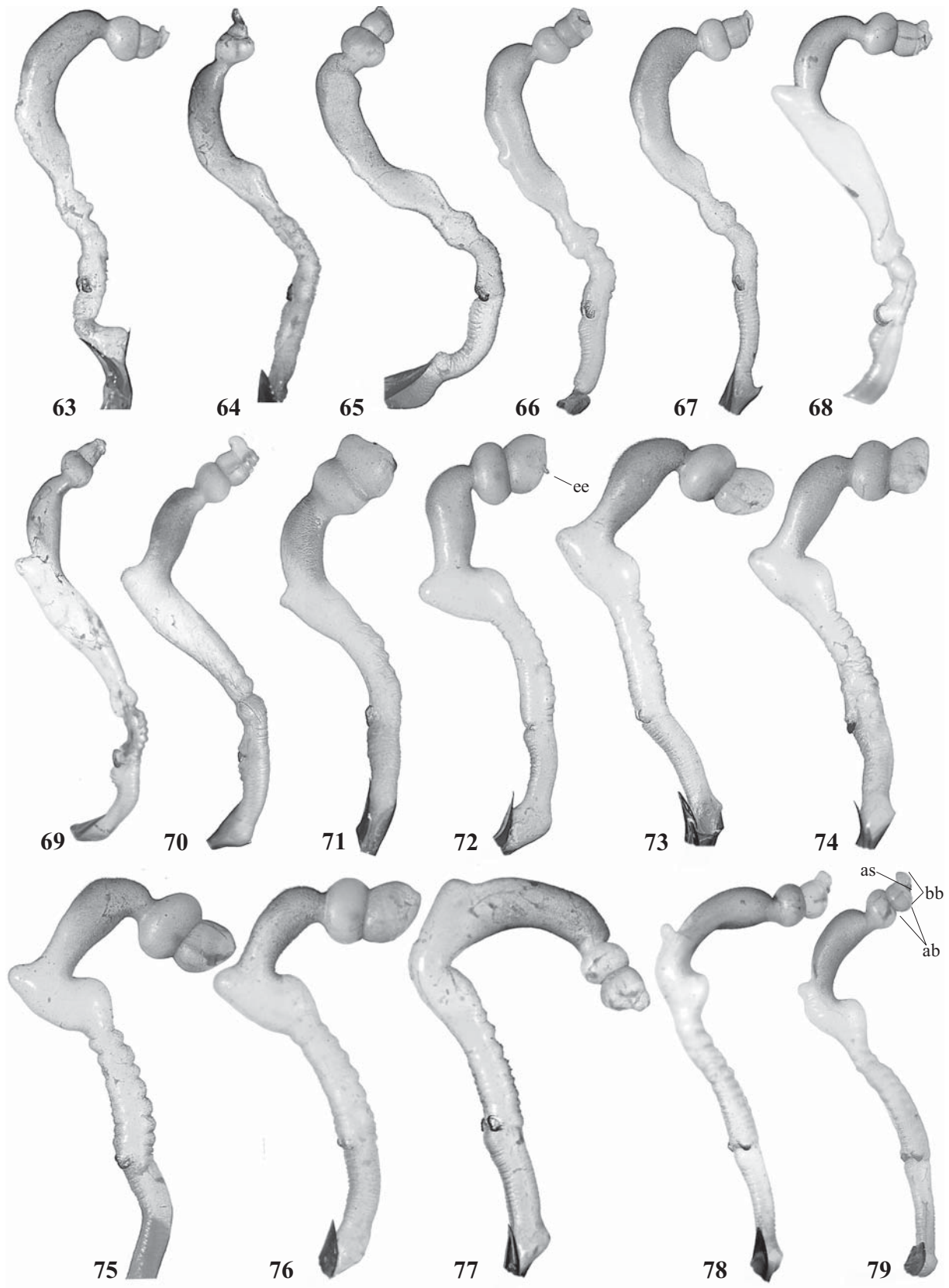


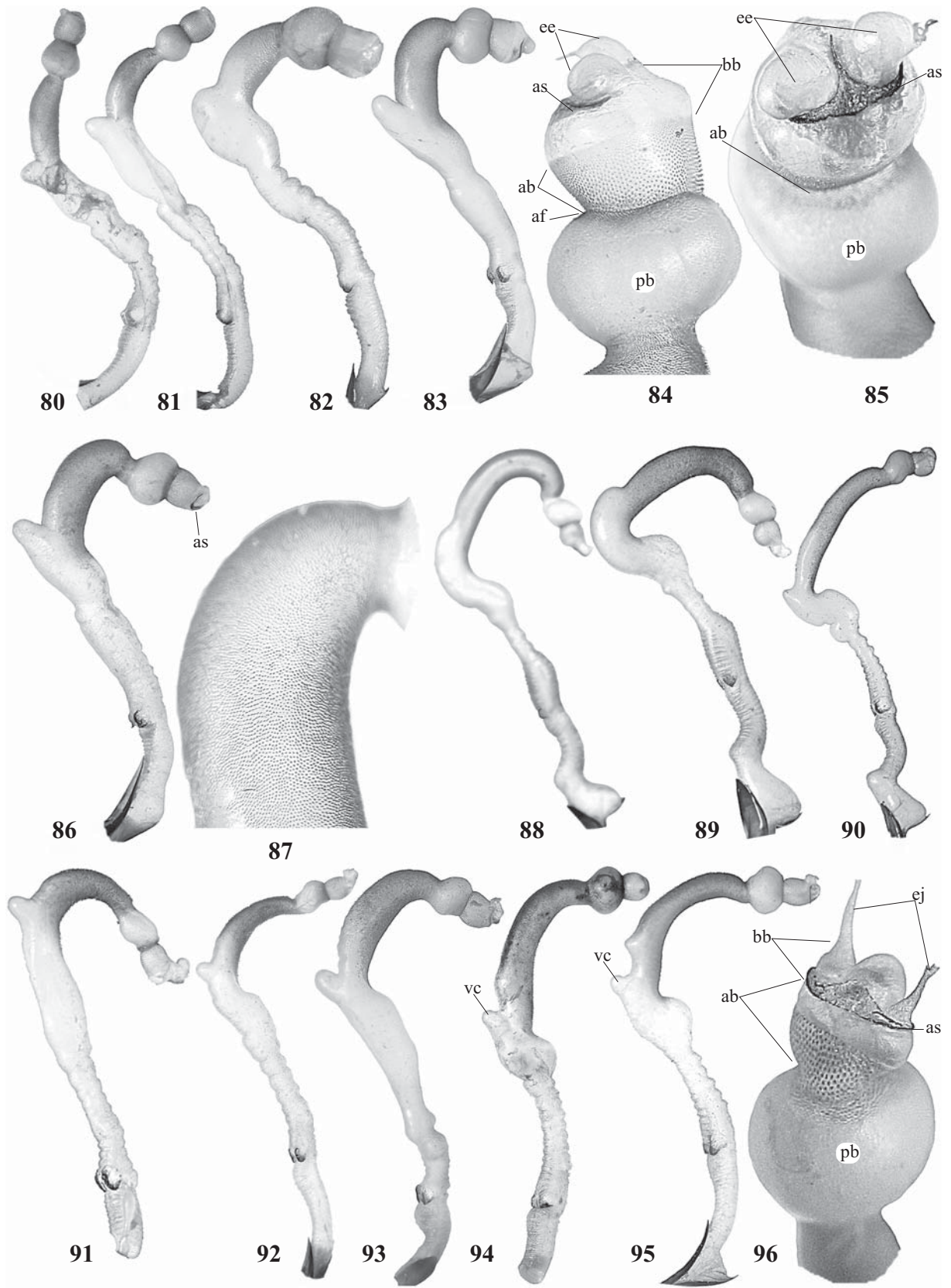
Fig. 50–62. Endophallus morphology of Dorcadionini: 50 — *D. (Cribridorcadion) mniszeczi*; 51 — *D. (Cr.) pedestre*; 52 — *D. (Cr.) decipiens*; 53 — *D. (Cr.) sericatum*; 54–55 — *D. (Cr.) p. pusillum*; 56 — *D. (Cr.) p. tanaiticum*; 57 — *D. (Cr.) auratum*; 58 — *D. (Cr.) ciscaucasicum*; 59 — *D. (Cr.) komarowi*; 60 — *D. (Cr.) sareptanum euxinum*, **stat.n.**; 61 — *D. (Cr.) c. cinerarium*; 62 — *D. (Cr.) c. caucasicum*, **stat.n.** 50–54, 56–62 — endophallus, lateral view; 55 — preapical bulb and apical phallomer.

Fig. 50–62. Строение эндофаллуса Dorcadionini: 50 — *D. (Cribridorcadion) mniszeczi*; 51 — *D. (Cr.) pedestre*; 52 — *D. (Cr.) decipiens*; 53 — *D. (Cr.) sericatum*; 54–55 — *D. (Cr.) p. pusillum*; 56 — *D. (Cr.) p. tanaiticum*; 57 — *D. (Cr.) auratum*; 58 — *D. (Cr.) ciscaucasicum*; 59 — *D. (Cr.) komarowi*; 60 — *D. (Cr.) sareptanum euxinum*, **stat.n.**; 61 — *D. (Cr.) c. cinerarium*; 62 — *D. (Cr.) c. caucasicum*, **stat.n.** 50–54, 56–62 — эндофаллус, сбоку; 55 — преапикальная камера и апикальный фалломер, сбоку.

Fig. 63–79. Endophallus morphology of Dorcadionini: 63 — *D. (Cr.) kasikoporanum*; 64 — *D. (Cr.) kalashiani*; 65 — *D. (Cr.) sulcipenne goektschanum*, **stat.n.**; 66 — *D. (Cr.) demokidovi*; 67 — *D. (Cr.) maljushenkoi*; 68 — *D. (Cr.) b. holosericeum*; 69 — *D. (Cr.) b. tristriatum*; 70 — *D. (Cr.) striolatum*; 71 — *D. (Cr.) equestre*; 72 — *D. (Cr.) s. semenovi*; 73 — *D. (Cr.) s. issykkulense*; 74 — *D. (Cr.) s. uruktensis*; 75 — *D. (Cr.) s. thaissiae*; 76 — *D. (Cr.) rufogenum*; 77 — *D. (Cr.) dokhtouroffi*; 78 — *D. (Cr.) jacobsoni*; 79 — *D. (Cr.) morozovi*. 63–79 — endophallus, lateral view.

Fig. 63–79. Строение эндофаллуса Dorcadionini: 63 — *D. (Cr.) kasikoporanum*; 64 — *D. (Cr.) kalashiani*; 65 — *D. (Cr.) sulcipenne goektschanum*, **stat.n.**; 66 — *D. (Cr.) demokidovi*; 67 — *D. (Cr.) maljushenkoi*; 68 — *D. (Cr.) b. holosericeum*; 69 — *D. (Cr.) b. tristriatum*; 70 — *D. (Cr.) striolatum*; 71 — *D. (Cr.) equestre*; 72 — *D. (Cr.) s. semenovi*; 73 — *D. (Cr.) s. issykkulense*; 74 — *D. (Cr.) s. uruktensis*; 75 — *D. (Cr.) s. thaissiae*; 76 — *D. (Cr.) rufogenum*; 77 — *D. (Cr.) dokhtouroffi*; 78 — *D. (Cr.) jacobsoni*; 79 — *D. (Cr.) morozovi*. 63–79 — эндофаллус, сбоку.





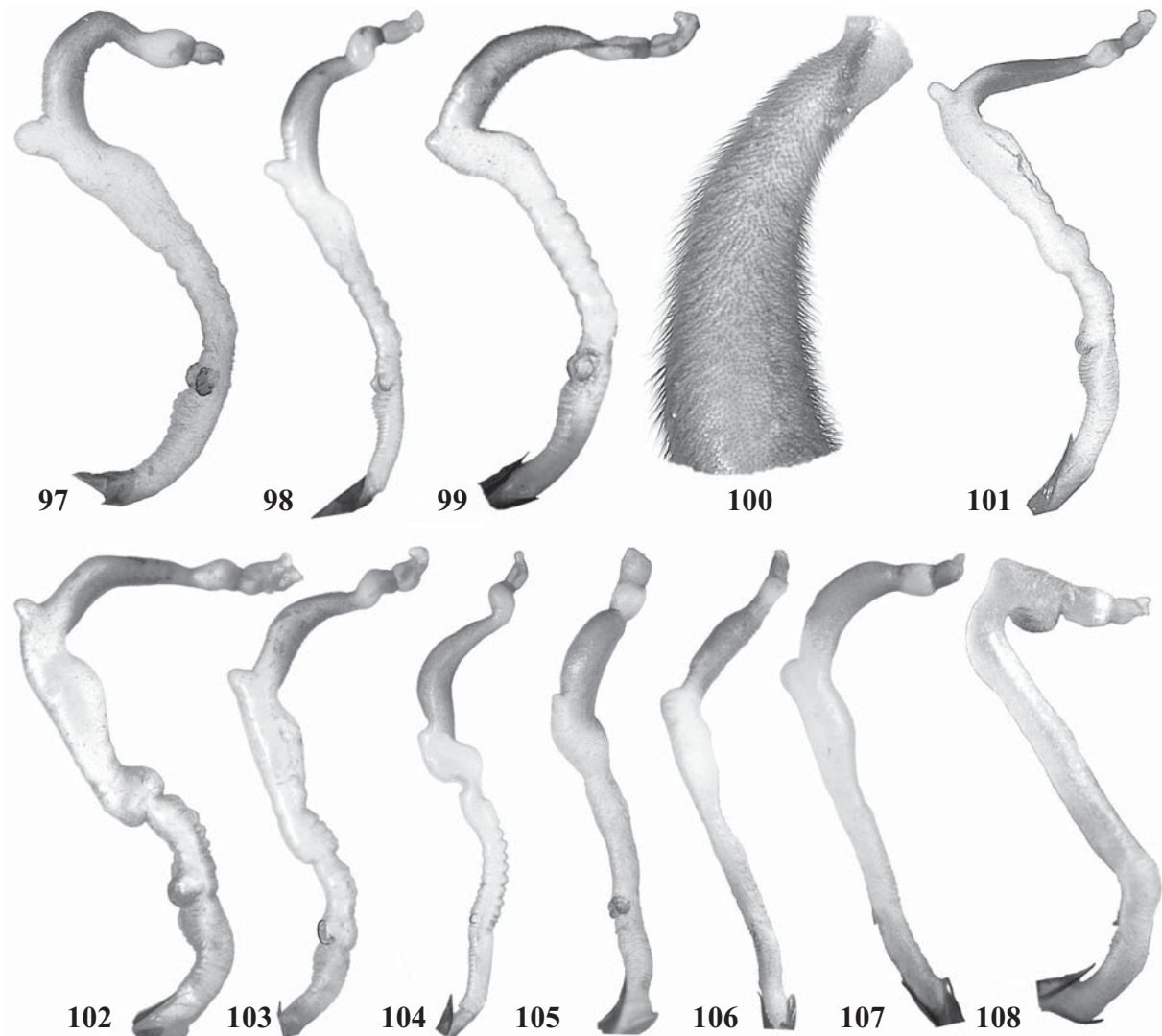


Fig. 97–108. Endophallus morphology of Dorcadionini: 97 — *D. (Cr.) bistriatum*; 98 — *D. (Cr.) seminudum*; 99–100 — *D. (Cr.) apicerufum*; 101 — *D. (Cr.) tauricum*; 102 — *D. (Cr.) septemlineatum*; 103 — *D. (Cr.) margheritae*; 104 — *D. (Cr.) turkestanicum*; 105 — *D. (Cr.) beckeri*; 106 — *D. (Cr.) lugubre*; 107 — *D. (Cr.) valonense*; 108 — *D. (Cr.) sturmi*. 97–99, 101–108 — endophallus, lateral view; 100 — central trunk.

Fig. 97–108. Строение эндофаллуса Dorcadionini: 97 — *D. (Cr.) bistriatum*; 98 — *D. (Cr.) seminudum*; 99–100 — *D. (Cr.) apicerufum*; 101 — *D. (Cr.) tauricum*; 102 — *D. (Cr.) septemlineatum*; 103 — *D. (Cr.) margheritae*; 104 — *D. (Cr.) turkestanicum*; 105 — *D. (Cr.) beckeri*; 106 — *D. (Cr.) lugubre*; 107 — *D. (Cr.) valonense*; 108 — *D. (Cr.) sturmi*. 97–99, 101–108 — эндофаллус, сбоку; 100 — центральный ствол.

turkestanicum, Fig. 104; *D. septemlineatum*, Fig. 102). Apical bulb always covered with distinct regular spines, joined to preapical bulb by distinct constriction, sometimes the constriction nearly absent (*D. equestre*, Fig. 71). Apical bubble (bb) is represented by rather differ-

ent structures in different species. The form of apical bubble can be the base for future separation of species-groups (subgenera?) inside *D. (Cribridorcadion, sensu nov.)*. We can separate two main type of apical bubble. Apical bubble of first type bears a crescent-like sclerite

Fig. 80–96. Endophallus morphology of Dorcadionini: 80 — *D. (Cr.) semiargentatum*; 81 — *D. (Cr.) laeve*; 82 — *D. (Cr.) talysbense*; 83–85 — *D. (Cr.) s. scabricolle*; 86–87 — *D. (Cr.) s. sevangense*; 88 — *D. (Cr.) klavdiae*; 89 — *D. (Cr.) niveiparsum*; 90 — *D. (Cr.) wagneri*; 91 — *D. (Cr.) indutum*; 92 — *D. (Cr.) cineriferum*; 93 — *D. (Cr.) nitidum*; 94 — *D. (Cr.) danczenkoi*, **stat.n.**; 95–96 — *D. (Cr.) dimidiatum*. 80–83, 86, 88–95 — endophallus, lateral view; 84–85 — apex (84 — lateral view, 85 — dorsal view); 87 — apical part of central trunk; 96 — apex (not everted).

Fig. 80–96. Строение эндофаллуса Dorcadionini: 80 — *D. (Cr.) semiargentatum*; 81 — *D. (Cr.) laeve*; 82 — *D. (Cr.) talysbense*; 83–85 — *D. (Cr.) s. scabricolle*; 86–87 — *D. (Cr.) s. sevangense*; 88 — *D. (Cr.) klavdiae*; 89 — *D. (Cr.) niveiparsum*; 90 — *D. (Cr.) wagneri*; 91 — *D. (Cr.) indutum*; 92 — *D. (Cr.) cineriferum*; 93 — *D. (Cr.) nitidum*; 94 — *D. (Cr.) danczenkoi*, **stat.n.**; 95–96 — *D. (Cr.) dimidiatum*. 80–83, 86, 88–95 — эндофаллус, сбоку; 84–85 — вершина эндофаллуса (84 — сбоку, 85 — сверху); 87 — дистальная часть центрального ствола; 96 — вершина эндофаллуса (не вывернута).

consisting of two narrow lateral sclerites fused in the middle. Gonopores in form of narrow slits are situated along inner side of each sclerite. The natural position of gonopores with accompanying sclerites can be clearly seen (Fig. 96), if endophallus is inflated without evertion, but with preliminary extraction of internal membrane. In *D. mniczechi* (Fig. 50), *D. lugubre* (Fig. 106), *D. valonense* (Fig. 107), *D. pedestre* (Fig. 51), *D. beckeri* (Fig. 105), *D. sulcipenne* (Fig. 65), *D. cinerarium* (Figs. 61–62), *D. sareptanum* (Fig. 60), *D. holosericeum* (Figs. 68–69), *D. sericatum* (Fig. 53), *D. komarowi* (Fig. 59), *D. auratum* (Fig. 57) apical portion of bubble more or less protrudes dorsally (in certain populations of rather variable *D. komarowi* crescent-like sclerite is hardly visible). In *D. ciscaucasicum* (Figs. 58), *D. decipiens* (Fig. 52) apical bubble is similar, but crescent-like sclerite indistinct. In *D. dimidiatum* (Fig. 96), *D. scabricolle* (Fig. 84–85), *D. auratum* (Fig. 57), *D. nitidum* (Fig. 93) crescent-like sclerite strongly widened in the middle with central appendage (point), forming “ω”-shaped three pointed figure. In *D. talyshense* (Fig. 82), *D. laeve* (Fig. 81), *D. semiargentatum* (Fig. 80) apical bubble is relatively flat, with rather long crescent-like sclerite. In *D. equestre* (Fig. 71) apical bubble is very big, with wide base and a single small apical three-pointed sclerite.

Apical bubble of second type is elongated and equipped with strong and wide dorsal sclerite, with a longitudinal furrow along middle; gonopores are situated on along both sides of wide sclerite. Strong longitudinal sclerite is well developed in *D. turkestanicum* (Fig. 104), *D. septemlineatum* (Fig. 102), *D. wagneri* (Fig. 90), *D. indutum* (Fig. 91), *D. niveisparsum* (Fig. 89), *D. klavdiae* (Fig. 88), *D. apicerufum* (Fig. 99). Similar situation is in *D. seminudum* (Fig. 98) with wide sclerotization of dorsal side of apical bubble portion and in *D. bistriatum* (Fig. 97) with poorly developed sclerite. Apical bubble of second type can be regarded as the derivation of the first type, as the result of the reduction of the lateral portions of “ω”-shaped structure and strong development of its central point.

In both types apical bubble is often (but not always) clearly divided in two portions by transverse circular furrow, which indicates the line of pleat at rest (before erection).

In *D. jacobsoni* (Fig. 78), *D. morozovi* (Fig. 79), *D. dokhtouroffi* (Fig. 77) apical bubble consists of two units distinctly separated by deep circular furrow with a single wide sclerite (sometimes slightly elongated) at dorsal side; gonopores are situated before sclerite. This structure seems to be the result of sclerite reduction.

In *D. striolatum* (Fig. 70) three-pointed sclerite is rather thick and strongly elongated forming a structure similar to the sclerite of *Dorcadion* (s.str.).

Apical bubble of *D. semenovi* (Figs. 72–75) and *D. rufogenum* (Fig. 76) is very big without any traces of sclerotization and without furrows; small gonopores are situated near middle of dorsal side and widely separated.

Aedeagus with sharp apex.

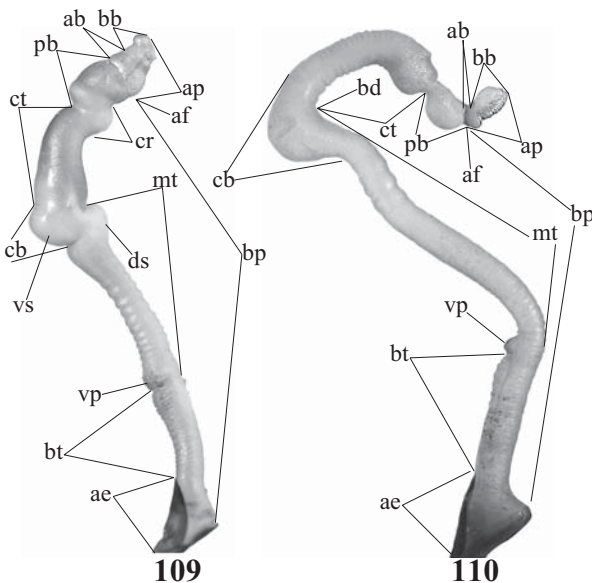


Fig. 109–110. Endophallus morphology of Dorcadionini: 109 — *D. (Meg.) glabrofasciatum*; 110 — *D. (Mac.) quadrimaculatum*. 109–110 — endophallus, lateral view.

Fig. 109–110. Структура эндофаллуса Dorcadionini: 109 — *D. (Meg.) glabrofasciatum*; 110 — *D. (Mac.) quadrimaculatum*. 109–110 — эндофаллус, сбоку.

Endophallus of *D. sturmi* (Fig. 108) looks very strange, and one of us was ready to propose a new subgenus for this species. In fact it is just a special modification of general *D. (Cribridorcadion, sensu nov.)* type, with very short, transverse central trunk. Preapical bulb is elongated and not delimited from central trunk by distinct constriction, but such situation is not exceptional in the subgenus (see *D. lugubre*, Fig. 106 or *D. valonense*, Fig. 107).

Dorcadion (Megalodorcadion

Pesarini, Sabbadini, 1998)

Fig. 109.

One taxon was investigated:

D. glabrofasciatum Daniel, 1901 (Fig. 109)

Endophallus long and narrow, about as long as body. Basal tube (bt) long and narrow, straight, glabrous, transversely rugose; several rugae near ventral plates are sclerotized laterally forming two rows of small sclerites; ventral plates (vp) very distinct with strong sclerotization. Medial tube (mt) about as long as aedeagus, nearly straight, covered with microspecules; distally strongly swollen forming wide “S”-shaped central bladder (cb) with large dorsal (ds) and ventral (vs) swellings. Central bend (bd) very distinct of about 90°, but central trunk (ct) lays in about same direction as medial tube because of strong curvature of central bladder. Central trunk relatively thin, densely covered with microspecules, a little tapering apically and here with strong “S”-shaped curvature, which is not known in any Dorcadionini. Preapical bulb (pb) looks to be consisting of two parts: basal part covered with very small specules is delimited from apical part regularly covered with microspines by distinct shal-

low constriction. Apical bulb (ab) joined to preapical bulb by distinct but wide constriction, slightly smaller than preapical bulb, covered with distinct regular spines. Apical bubble (bb) wide, without sclerites, consists of two portions; apical portion in form of small tubercle; two gonopores in form of narrow slits are situated between basal and apical portions.

Aedeagus with sharp apex.

Dorcadion (*Maculatodorcadion* Breuning, 1943)
Fig. 110.

Two taxa were investigated:

D. quadrimaculatum Küster, 1848 (Fig. 110)

D. triste Frivaldszky, 1845

Endophallus long and narrow, about as long as elytra and thorax combined. Basal tube (bt) narrow, but not very long, much shorter than aedeagus, straight, glabrous, transversely rugose; ventral plates (vp) very small, without sclerotization. Medial tube (mt) is much longer than aedeagus, nearly straight, glabrous; distally a little swollen forming feebly pronounced central bladder (cb); which is never exposed dorsally. Central bend (bd) very distinct; central trunk (ct) turned to the medial tube with the angle of about 90°; central trunk relatively thin, strongly curved dorsally, never swollen at middle or behind middle, a little swollen only at distal end and only here densely covered with hardly visible microspecules. Preapical bulb (pb) clearly delimited from central trunk by strong constriction, always strongly swollen with about same diameter as apical part of trunk, covered with hardly visible microtrichiae, with narrow sclerotized distal ring. Apical bulb (ab) joined to preapical bulb (pb) by distinct constriction, small and very short, covered with distinct regular spines, not constricted apically, joined with big elongated apical bubble (bb) without constriction. Apical bubble longer than apical bulb, with wide rugose sclerite along its whole dorsal length.

Aedeagus with narrow rounded apex.

Dorcadion (*Dorcadion* s.str.)
Figs. 111–116.

= *Compsodorcadion* Ganglbauer, 1884

Eight taxa were investigated:

D. glycyrrhizae striatum (Goeze, 1777) (Figs. 111–112)

D. crassipes crassipes Ballion, 1878 (Figs. 113–114)

D. cephalotes Jakovlev, 1890

D. gebleri gebleri Kraatz, 1873 (Fig. 115)

D. gebleri lukhtanovi Danilevsky, 1996 (Fig. 116)

D. ganglbaueri Jakovlev, 1895

D. alakoliense Danilevsky, 1988

D. abakumovi Thomson, 1865

Endophallus very long, about as long as elytra, relatively straight. Basal tube (bt) cylindrical, long and narrow, about as long as aedeagus or shorter, glabrous, without deep transverse rugae, never with two rows of transverse sclerotized plates. Ventral plates (vp) small, semicircular, sometimes nearly indistinct. Medial tube (mt) of about same length as basal tube, with hardly distinguished microspecules; distally a little swollen forming hardly pronounced glabrous central bladder. Central

bladder (cb) often without any tubercles (*D. alakoliense*, *D. abakumovi*), or with small ventral tubercle (*D. crassipes*, *D. ganglbaueri*, *D. gebleri*, Figs. 115–116), or with wider ventral tubercle (*D. glycyrrhizae*, Fig. 111) or with longer ventral tubercle curved basally (*D. cephalotes*). Central bend indistinct. Central trunk (ct) disposed in one line with medial tube, covered with dense microspecules, which sometimes (*D. alakoliense*) totally hide cuticula. Preapical bulb (pb) very big, clearly delimited from central trunk by strong constriction, always strongly swollen laterally and often transversely widened, so sometimes (specially in *D. glycyrrhizae*, Fig. 111) looks like two conjugate spherical areas (cs); basal third of preapical bulb covered with very small indistinct specules, apical two thirds with distinct microspines; dorsal part of spined area usually enlarged and slightly swollen, forming a subapical area (sa), which is hardly pronounced in *D. ganglbaueri*. In *D. alakoliense* subapical area with two small lateral protuberances, and *D. abakumovi* with two distinct tubercles. Apical bulb (ab) joined to preapical bulb (pb) by very deep constriction, usually in form of small depressed sphere (only in *D. ganglbaueri* and *D. crassipes* cone-shaped and without deep constriction at base), always regularly covered with relatively big spines, strongly constricted and sclerotized apically. Apical bubble in is always with long and narrow sclerites, which are sometimes so big (*D. crassipes*, Fig. 113–114), that apical bubble is unable to be everted. Probably, in other species with smaller sclerites apical bubble also rests inside apical bulb during copulation. Gonopores are situated near the base of ventral side of apical bubble; so when the bubble is inside bulb of erected endophallus gonopores are still at the top of endophallus. The natural position of gonopores with accompanying sclerites can be clearly seen (Figs. 113–114), if endophallus is inflated without everted, but with preliminary extraction of internal membrane.

Aedeagus with sharp apex.

Dorcadion (*Acutodorcadion* subgen.n.)
Fig. 117–121.

Type species: *D. acutispinum* Motschulsky, 1860

Seventeen taxa were investigated:

D. acutispinum Motschulsky, 1860

D. absinthium Plavilstshikov, 1937

D. irinae Danilevsky, 1997

D. pantherinum desertum Danilevsky, 1995

D. urdzhagicum Plavilstshikov, 1937

D. tibiale (Jakovlev, 1890) (Fig. 121)

D. arietinum zhalanash Danilevsky, 1996 (Fig. 117–118)

D. suvorovi suvorovi (Jakovlev, 1906)

D. suvorovi taldykurganus Danilevsky, 1996

D. songaricum Ganglbauer, 1884

D. mystacinum rufidens Jakovlev, 1906

D. tschitscherini Jakovlev, 1900

D. kapchagaicus Danilevsky, 1996

D. kastekus Danilevsky, 1996

D. tianshanskii radkevitchi Suvorov, 1910

D. optatum optatum Jakovlev, 1906 (Fig. 119)

D. optatum matthiesseni Suvorov, 1910 (Fig. 120)

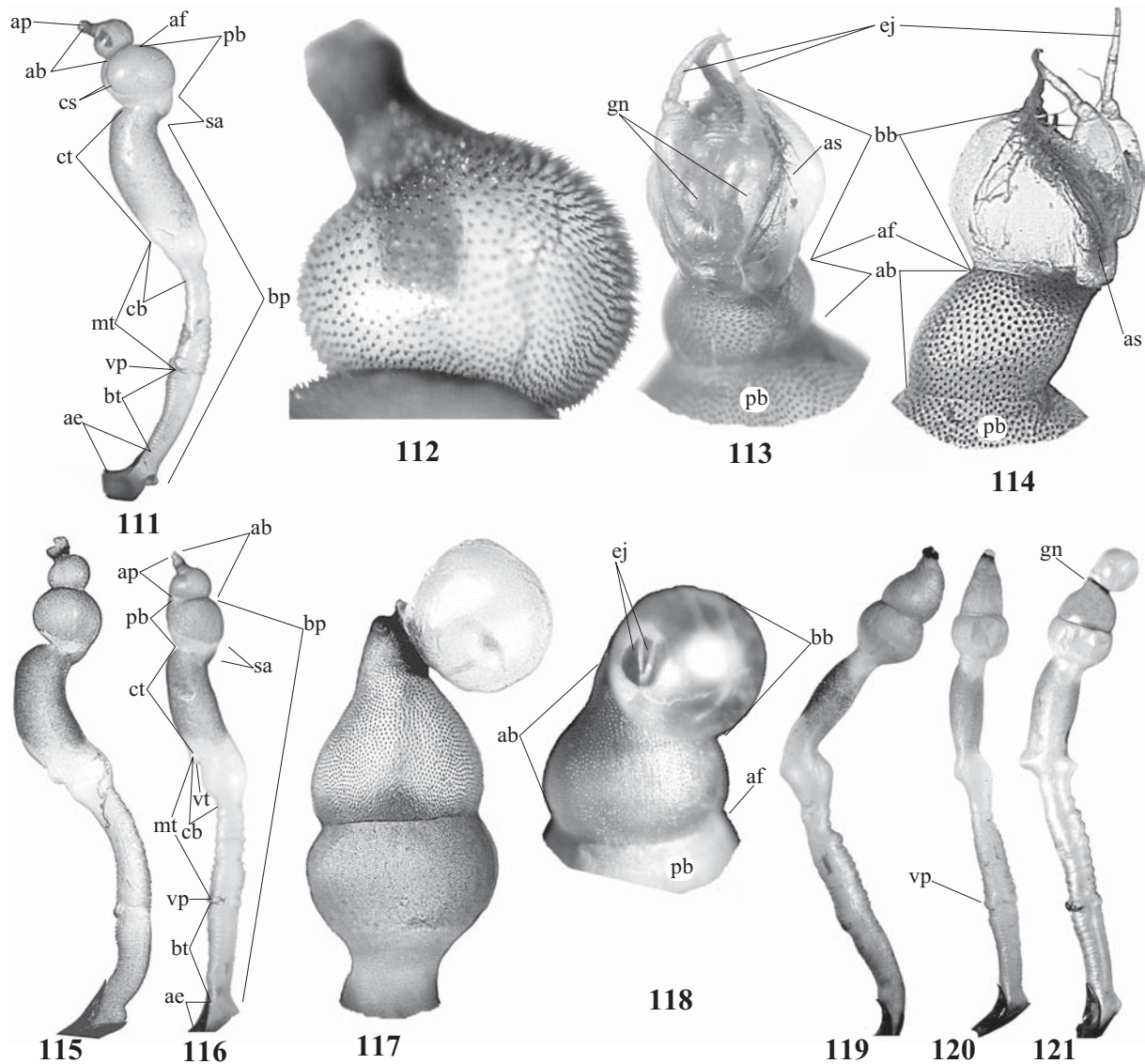


Fig. 111–121. Endophallus morphology of Dorcadionini: 111–112 — *D. (s. str.) glycyrrhizae striatum*; 113–114 — *D. (s. str.) c. crassipes*; 115 — *D. (s. str.) g. gebleri*; 116 — *D. (s. str.) gebleri lukhtanovi*; 117–118 — *D. (A.) arietinum zhalanash*; 119 — *D. (A.) o. optatum*; 120 — *D. (A.) o. matthiesseni*; 121 — *D. (A.) tibiale*. 111, 115–116, 119–121 — endophallus, lateral view; 112 — apical bulb; 113–114 — apex, not everted (113 — ventral view; 114 — lateral view); 117 — apex, lateral view; 118 — apex, latero-dorsal view.

Fig. 111–121. Строение эндофаллуса Dorcadionini: 111–112 — *D. (s. str.) glycyrrhizae striatum*; 113–114 — *D. (s. str.) c. crassipes*; 115 — *D. (s. str.) g. gebleri*; 116 — *D. (s. str.) gebleri lukhtanovi*; 117–118 — *D. (A.) arietinum zhalanash*; 119 — *D. (A.) o. optatum*; 120 — *D. (A.) o. matthiesseni*; 121 — *D. (A.) tibiale*. 111, 115–116, 119–121 — эндофаллус, сбоку; 112 — апикальная камера; 113–114 — вершина, не вывернута (113 — снизу; 114 — сбоку); 117 — вершина, сбоку; 118 — вершина, лсбоку и сверху.

Endophallus very long, often more or less “S”-shaped, sometimes about as long as body length. Basal tube (bt) cylindrical, long and narrow, about as long as aedeagus, glabrous, with more or less distinct transverse ventral rugae, never with two distinct rows of transverse pleats. Ventral plates (vp) small, often nearly indistinct, semicircular. Medial tube (mt) usually longer than aedeagus, slightly curved ventrally, nearly straight; with hardly distinguished microspecules; distally a little swollen forming central bladder (cb); which is always distinctly exposed ventrally and dorsally; ventral tubercle

of central bladder in *D. pantherinum*, *D. urdzharicum* and *D. s. taldykurganus* relatively long and in *D. urdzharicum* and *D. s. taldykurganus* in form of appendages turned anteriorly. Central bend (bd) more or less distinct; central trunk (ct) turned to central bladder from very small angle to about 90°, a little swollen behind middle, covered with dense microspecules, which are especially long and dense in *D. pantherinum* and *D. urdzharicum*. Preapical bulb (pb) clearly delimited from central trunk by strong constriction, but never strongly constricted apically, always strongly swollen, with the

area of specules near base and densely covered with specules in apical half or two thirds. Apical bulb (ab) joined to preapical bulb (pb) by less pronounced constriction, in form of big cone always regularly covered with larger spines, strongly constricted and sclerotized apically, that is why, apical bubble could hardly be exposed and only sometimes visible (Figs. 117, 118, 121). Probably, apical bubble rests inside apical bulb during copulation. Gonopores are situated near the base of ventral side of apical bubble (Figs. 118, 121), so when the bubble is inside bulb of erected endophallus gonopores are still at the top of endophallus.

Aedeagus with sharp or rounded apex, but in *D. tibiale* and *D. arietinum zhalanash* with divided apex.

External characters are not so definite: in general external dorsal elytral carinae less developed, then in *Dorcadion* (s. str.) (but in *D. mystacinum* rather strong), internal dorsal elytral stripe often present (but in *D. urdzharicum*; *D. tibiale*, often in *D. grande* and some other species — absent), pronotum in many species swollen posteriorly.

On the base of taxonomical relations we include in the new subgenus totally 31 species:

1. *Dorcadion (A.) pantherinum* Jakovlev, 1900
2. *absinthium* Plavilstshikov, 1937
3. *ninae* Danilevsky, 1995
4. *irinae* Danilevsky, 1997
5. *mystacinum* Ballion, 1878
6. *songaricum* Ganglbauer, 1884
7. *urdzharicum* Plavilstshikov, 1937
8. *acutispinum* Motschulsky, 1860
9. *nivosum* Suvorov, 1913
10. *leopardinum* Plavilstshikov, 1937
11. *borochorense* Breuning, 1944
12. *suvorovi* (Jakovlev, 1906)
13. *nikolaevi* Danilevsky, 1995
14. *arietinum* Jakovlev, 1897
15. *suvorovianum* Plavilstshikov, 1916
16. *unidiscale* Danilevsky, 1996
17. *tschitscherini* Jakovlev, 1900
18. *kapchagaicus* Danilevsky, 1996
19. *profanifuga* Plavilstshikov, 1951
20. *globithorax* Jakovlev, 1895
21. *tianshanskii* Suvorov, 1910
22. *kastekus* Danilevsky, 1996
23. *alexandris* Pic, 1900
24. *optatum* Jakovlev, 1906
25. *danilevskyi* Dolin et Ovtshinnikov, 1999
26. *darjae* Danilevsky, 2001
27. *phenax* Jakovlev, 1899
28. *grande* Jakovlev, 1906
29. *pelidnum* Jakovlev, 1906
30. *toropovi* Danilevsky, 1999
31. *tibiale* (Jakovlev, 1890)

The area of the subgenus includes: Kazakhstan — westwards to Kzyl-Orda, northwards to about source of Sary-Su River in Dzhezkazgan Region and from here to the north environs of Balkhash Lake and to Tarbagai Ridge, south border of the area in Kazakhstan goes along state border; Kirghizia — in the west part of the

Republic southwards to Talassky Alatau, then Chu River Valley with south and east slopes of Kirgiz Ridge to Boam Canyon and south slopes of Zailiisky Alatau, Kemin River Valley between Zailiisky and Kungei Alatau, in central Kirghizia the taxon is distributed in Sussamyr Valley and in the environs of Dolon Pass, then from here to Naryn River Valley and Atbashi Ridge. The species of the taxon absent in Issyk-Kul Lake depression and in east Kirghizia; China — north part of Xinjiang along state border from about Muzart River to about Chernyi Irtysh River. The representatives of the subgenus most probably totally absent in Russia; the record of a mysterious species *D. phenax* for “Kolyvan” (near Zmeinogorsk in Altai Region?) is very doubtful.

ENDOPHALLUS KEY FOR GENERA AND SUBGENERA OF DORCADIONINI

- 1(6). Apical phallomer (ap) glabrous, without microspines; internal membrane between basal (bp) and apical phallomers absent or vestigial *Eodorcadion* (Figs. 4–29)
- 2(5). Central trunk (ct) present (long or short); endophallus long and narrow.
 - 3(4). Apical phallomer without long narrow appendage, never strongly elongated with apical dilation; apical mace not depressed laterally *E. (Eodorcadion s.str.)* (Figs. 4–16)
 - 4(3). Apical phallomer with long and narrow appendage, only in *E.brandti* (Fig. 24) without narrow appendage, but than elongated and widened apically; apical mace depressed laterally *E. (Ornatodorcadion)* (Figs. 17–24)
- 5(2). Central trunk absent, preapical bulb (pb) connected directly with medial tube (mt) *E. (Humerodorcadion, subgen.n.)* (Figs. 25–29)
- 6(1). Apical phallomer (ap) at least basally with microspines; internal membrane between basal (bp) and apical phallomers well developed.
 - 7(14). Central trunk (ct) fused with preapical bulb (pb) without constriction.
 - 8(9). Apical bulb (ab) irregularly covered with microspines only near base; central bladder indistinct *Neodorcadion* (Figs. 1–3)
 - 9(8). Apical bulb (ab) regularly totally covered with microspines; central bladder (bd) distinct *Iberodorcadion* (Figs. 30–38)
 - 10(11). Central trunk (ct) swollen near base (bs); central bladder (cb) with lateral appendages (la) (*I. amorii segurense*) or lateral tubercles (la) (*I. suturale, I. nigrosparsum*) *I. (Baeticodorcadion)* (Figs. 33–36)
 - 11(10). Central trunk (ct) without swelling near base.
 - 12(13). Central bladder (cb) large *I. (Hispanodorcadion)* (Figs. 37–38)
 - 13(12). Central bladder (cb) small *I. (Iberodorcadion s.str.)* (Figs. 30–32)
 - 14(7). Central trunk (ct) delimited from preapical bulb (pb) by deep constriction *Dorcadion* (Figs. 39–121)
 - 15(24). Apical bulb (ab) without strong apical constriction, without wide circular sclerotization; apical bubble (bb) easily exposal.
 - 16(17). Preapical bulb (pb) strongly widened apically forming inverted cone-shaped structure; apical bulb (ab) (or better apical phallomer — ap) joined with preapical bulb without constriction; apical bubble without sclerites; gonopores are situated near apex of apical bubble *D. (Politodorcadion)* (Fig. 39–42)

- 17(16). Preapical bulb (pb) usually in form of spherical structure always with distinct constriction before apical bulb (ab).
- 18(19). Central tube (ct) without central bladder; ventral plates (vp) in form of very thick longitudinal wide sclerites with internal appendages, followed by ventral saw (sw); gonopores are situated near base of ventral side of apical bubble with a pair of small sclerites; aedeagus with divided apex *D. (Carinatodorcadion)* (Figs. 43–49)
- 19(18). Central tube (ct) more or less swollen distally forming central bladder (cb); ventral plates (vp) in form of semi-circular (or irregular) small sclerites; ventral saw absent; gonopores are situated on the dorsal side of apical bubble, usually with rather distinct sclerites; aedeagus apex never divided.
- 20(21) Central trunk (ct) nearly totally glabrous, covered with hardly visible microspecules only at apical swelling; central bladder (cb) hardly pronounced, always without dorsal swelling; apical bubble (bb) much longer than apical bulb (ab), with big dorsal sclerite *D. (Maculatodorcadion)* (Fig. 110)
- 21(20). Central trunk (ct) always totally covered with distinct microspecules; central bladder (cb) well developed, usually with distinct dorsal swelling (ds).
- 22(23). Preapical bulb (pb) divided in two portions: basal in form of “S”-shaped curvature (cr), covered with very small microspecules and distal, covered with same big spines as apical bulb (ab) *D. (Megalodorcadion)* (Fig. 109)
- 23(22). Preapical bulb (pb) never divided in two portions, never with big spines similar to spines of apical bulb (ab) *D. (Cribridorcadion, sensu nov.)* (Figs. 50–108)
= *D. (Pedestredorcadion), syn.n.*
= *D. (Dzhungarodorcadion), syn.n.*
- 24(15). Apical bulb (ab) with strong apical constriction, with wide circular sclerotization; apical bubble (bb), can hardly be exposed and only sometimes visible; gonopores are situated near the base of ventral side of apical bubble.
- 25(26). Apical bubble with well developed elongated sclerites (which are usually or always unable to be exposed); preapical bulb (pb) extremely big and wide, often bilobed, always with subapical area (sa); apical bulb (ab) much smaller in form of depressed sphere (conical in *D. crasipes* and *D. ganglbaueri*), shorter than preapical bulb; central bend indistinct; central bladder hardly pronounced without appendages *D. (Dorcadion s. str.)* (Fig. 111–116)
= *D. (Compsodorcadion)*
- 26(25). Apical bubble without sclerites; preapical bulb (pb) always without subapical area; central bladder (cb) more or less distinct, usually with dorsal (ds) and ventral (vs) swellings; central bend (bd) usually distinct *D. (Acutodorcadion subgen. n.)* (Fig. 117–121)

Taxonomic conclusions

1. In general endophallic morphology indicates well the limits of all Dorcadionini genera (much better than external imaginal or larval characters): *Neodorcadion*, *Eodorcadion*, *Dorcadion* and *Iberodorcadion*. So, generic divisions of Dorcadionini must be accepted as very natural with only one exception; endophallus of *Dorcadion (Politodorcadion)* is in general of *Eodorcadion* type and strongly differs from all *Dorcadion*, so *Politodorcadion* could be regarded as a separate genus.

2. The closest relatives of Dorcadionini inside Lamiinae are Lamiini and Monochamini. The level of structural complexity of endophallus of Lamiini and Monochamini is very high and in general is corresponding with the level of *D. (Cribridorcadion, sensu nov.)* — with similar differentiation of basal and apical phallomers: endophallus of *Morimus* Brullé, 1832 is about same as in *D. (Cribridorcadion, sensu nov.)*; endophallus of *Lamia* Fabricius, 1775. is very similar to endophallus of *Iberodorcadion*. Endophallus of more ancient Monochamini (*Anoplophora* Hope, 1839) is even more complicated, than in *D. (Cribridorcadion, sensu nov.)*, but in young Monochamini (*Monochamus* Dejean, 1821) — is of about *Iberodorcadion* level. The main stream of endophallus evolution in Lamiinae looks to be directed to the fusion and reduction of different parts of both phallomers. In higher Lamiinae (Saperdini, Phytoeciini, Agapanthiini) medial tube is a simple unit with hardly distinguished parts; apical phallomer without any divisions, though often with some appendages and sclerites.

The complicated structure of endophallus in *Dorcadion (Cribridorcadion, sensu nov.)*, *D. (Maculatodorcadion)* and *D. (Megalodorcadion)* is one of the most ancient condition in the tribe. The next evolution level is in *Iberodorcadion* and then in *Neodorcadion*. The phylogenetically youngest Dorcadionini are two groups with simplest endophallus: *D. (Politodorcadion)* — without differentiation of apical phallomer and then *Eodorcadion* — without apical membrane. All this line is characterized by gonopores position near the apex or at dorsal side of apical bubble.

The second line of relatives in the tribe is represented by three subgenera with ventral position of gonopores near the base of apical bubble. Evolutionary level of *Dorcadion (s.str.)* and *D. (Carinatodorcadion)* is about similar, more over they look to be relatives. Both groups have big apical bulb with strong distal sclerotization and similar structure of apical bubble. We suppose, that *D. (Acutodorcadion)* is a derivation from *Dorcadion (s.str.)* because of the absence of sclerites of apical bubble in *D. (Acutodorcadion)*.

We are not ready to declare the direct relative connections between other groups of Dorcadionini. The origin of each group could be more or less independent. For example, *Iberodorcadion* could be descended from another Lamiinae than other Dorcadionini.

3. Subgenera division of *Eodorcadion* was originally based on the presence [in *E. (Ornatodorcadion)*] or absence [in *Eodorcadion (s.str.)*] of a short transverse ridge (cicatrix) near apex of 1st antennal joint (scape). Often this character does not work as cicatrix is hardly visible in certain species traditionally attributed to *Eodorcadion (s. str.)* or *E. (Ornatodorcadion)*. So, subgenera divisions of *Eodorcadion* was not accepted by N.N. Plavilstshikov [1958].

Endophallic structures allow to divide the genus at least in three clearly delimited subgenera: *Eodorcadion (s.str.)*, *E. (Humerodorcadion subgen. n.)* and *E. (Ornatodorcadion)*.

E. quinquevittatum, *E. leucogrammum*, *E. maurum*, *E. tuvense* and *E. ptyalopleurum*, were traditionally attributed to *Ornatodorcadion*. Endophallic structures of all 5 species show no connection with *Ornatodorcadion*, but are in general similar to *E. carinatum*. We preliminarily include this group in *Eodorcadion* (s.str.).

Three China species: *E. virgatum*, *E. sifanicum* and *E. glaucopterum* are rather similar in endophallic structures because of short central trunk and could be delimited in a separate subgenus. But the general form of endophallus of this group is close to the nominative subspecies, so we prefer now to regard all 3 species as *Eodorcadion* (s.str.), though *E. sifanicum* and *E. glaucopterum* were regarded before as *Ornatodorcadion*.

Eodorcadion humerale and *E. lutshniki* compose a very distinct natural group, which is characterized by short and thick endophallus without central trunk; preapical bulb is connected directly to medial tube. The group is described as a new subgenus *E. (Humerodorcadion subgen.n.)*, type species: *Dorcadion humerale* Gebler, 1823.

We accept the possibility of natural separation of one more subgenus for *E. quinquevittatum*, *E. leucogrammum*, *E. tuvense*, *E. maurum* and *E. ptyalopleurum*. First, apical mace of endophallus in the group is exceptionally big, while central trunk is relatively short. Morphological data are supplied with zoogeographical information. In general, *Eodorcadion* species of one subgenus can not be sympatric. But the species of the *quinquevittatum*-group are often sympatric with *E. carinatum involvens* — also the member of *Eodorcadion* (s.str.). *E. c. involvens* can be also sympatric with *E. humerale* or *E. lutshniki*, which belong to another subgenus — *E. (Humerodorcadion, subgen.n.)*; and with *E. novitzkyi* — the member of *Ornatodorcadion*.

4. The group of species, which was included by M. Danilevsky [1996] in *Dorcadion (Compsodorcadion)*: *D. gebleri*, *D. cephalotes*, *D. crassipes* and *D. ganglbaueri* must be enlarged with at least three more species: *D. glycyrrhizae*, *D. alakoliense* and *D. abakumovi*. It is characterized first of all by the presence of elongated sclerites of apical bubble and subapical area at the dorsal side of the base of preapical bulb; besides, apical bulb is big, spherical (with two exceptions — *D. ganglbaueri* and *D. crassipes*), connected with preapical bulb by very deep constriction.

As far as *D. glycyrrhizae* is a type species of the genus *Dorcadion*: *Dorcadion* (s.str.) = *D. (Compsodorcadion)*. Other species, which were included before in *Dorcadion* (s.str.), are delimited in a new subgenus *D. (Acutodorcadion subgen.n.)*, type species: *D. acutispinum* Motschulsky, 1860, which is characterized by the absence bubble sclerites, absence of preapical area on subapical bulb and by smaller cone-shaped apical bulb connected with preapical bulb without deep constriction. We did not study the endophallus of *D. tenuelineatum* Jakovlev, 1895 but it is very close to *D. abakumovi* and must be also included in *Dorcadion* (s.str.).

The supposition [Danilevsky, 1999] of vicariant connection between *D. glycyrrhizae* and *D. pantherinum* was wrong. In fact *D. glycyrrhizae* is replaced in South Kazakhstan by *D. crassipes*, *D. ganglbaueri* and other *Dorcadion* (s.str.). So, now the data of sympatric occurrence of *D. (Acutodorcadion subgen.n.) pantherinum sabulosum* Danilevsky, 1995 and *D. (s. str.) glycyrrhizae obtusipenne* Motschulsky, 1860 near Kzyl-Orda in Kazakhstan look more reliable.

5. Endophallic structures of *D. mniszehi* (type species of *Cribridorcadion*) and *D. jacobsoni* (type species of *Dzhungarodorcadion*) show no differences from the corresponding structures of *Pedestredorcadion*. External characters of both look also not very special, so: *Cribridorcadion* Pic, 1901 = *Pedestredorcadion* Breuning, 1943, **syn.n.** = *Dzhungarodorcadion* Danilevsky, 1993, **syn.n.**

Other members of former *Dzhungarodorcadion* can also be regarded as *Cribridorcadion*, **sensu nov.**, though are distinctly delimited in two morphological types: *D. jacobsoni*-group with small apical bubble, delimited in two parts and bearing distinct sclerites (*D. jacobsoni*, *D. morozovi*, *D. musarti* Pic, 1907, *D. obtusicolle* Pic, 1926) and *D. semenovi*-group with large apical bubble without sclerites (*D. semenovi*, *D. kuldshanum* Pic, 1908, *D. rufogenum*).

6. Several species with questionable subgenera position are now clearly placed. *D. turkestanicum* belongs to *D. (Cribridorcadion, sensu nov.)*. Its endophallus looks close to endophallus of *D. septemlineatum*.

The attribution of *D. tschitscherini* to *D. (Acutodorcadion)* is very clear because of its close relation to *D. tianshanskii* Suvorov, 1910, though the species was placed to *Pedestredorcadion* by S. Breuning [1962]; as well as his *D. rufidens* and *D. matthieseni* — in fact both are just subspecies of *D. (Acutodorcadion)* species: *D. mystacinum rufidens* and *D. optatum matthieseni*. All positions are proved by endophallic structures.

D. klavdiae, described as *D. (Carinatodorcadion)* has an endophallus without any special *Carinatodorcadion* characters, which looks very similar to endophallus of *D. niveisparsum*, so the original subgeneric position of *D. klavdiae* was wrong, and the species belongs to *D. (Cribridorcadion, sensu nov.)*.

7. *Dorcadion danczenkoi* Danilevsky, 1996, **stat.n.**, described as *D. cinerarium danczenkoi*, must be regarded as a species. Its endophallus morphology looks close to endophallus of *D. dimidiatum*, because of small ventral tubercle of central trunk (Fig. 94 — vc) and form of central trunk, which is not dilated apically as in *D. cinerarium*; besides, central bladder in *D. danczenkoi*, **stat.n.** is much wider, than in *D. cinerarium*. Among external characters of *D. danczenkoi*, **stat.n.** we can note the unique sculpture of its pronotum, which is extremely rough, that is not known in any representative of “*cinerarium*-group” of species.

In general, Caucasian members of “*cinerarium*-group” are not close to *D. c. cinerarium* and most probably represent a group of vicariant species.

8. In general, our data are not sufficient for natural delimitation of *D.* (*Cribridorcadion*, **sensu nov.**) in groups of species. Several groups, based on external features, are proved by endophallic characters: “*holosericeum*-group” with *D. striolatum*, “*laeve*-group” with *D. talyshense* and *D. semiargentatum*, “*indutum*-group” with *D. cineriferum*; “*sulcipenne*-group” with *D. demokidovi*, *D. maljushenkoi*. The similarity of “*sulcipenne*-group” to “*cinerarium*-group” with *D. c. caucasicum* and to “*kasikoporanum*-group” with *D. kalashiani* looks natural.

In several cases the demonstrated relations are not so evident: *D. septemlineatum* looks close to *D. margheritae*, to *D. tauricum* and to (!)*D. turkestanicum*; *D. sericatum* looks close to *D. pusillum*; *D. mnizsechi* seems to be not very far from *D. pedestre*.

From the other hand several species seem to have no close relatives in the subgenus. *D. equestre* with its very big apical mace is closer to *D. semenovi*, than to any other of its geographical neighbours. *D. sturmi* also looks rather unique, possibly its closest relatives are the members of “*lugubre*-group” with *D. valonense*.

9. The supposition of relations of *D. beckeri* with *D. carinatum* by N.N. Plavilstshikov [1958: 44] was wrong. Endophallus of *D. beckeri* is very typical for *D.* (*Cribridorcadion*, **sensu nov.**).

10. Endophallic structures of *D.* (*Maculatodorcadion* Breuning, 1943) and *D.* (*Megalodorcadion* Pesarini, Sabbadini, 1998) are in general of *D.* (*Cribridorcadion*, **sensu nov.**) type, but differs by well marked characters (see the key), so now we prefer to accept both as subgenera.

11. Endophallic characters of *Iberodorcadion* subgenera (s.str., *Baeticodorcadion*, *Hispanodorcadion*) described above, must be regarded as preliminary because of too small number of analyzed species.

12. *Eodorcadion carinatum* (Fabricius, 1781) was described (as *Lamia*) after one specimen from “Siberia”. We do not know the type and attribute to the nominative subspecies *E. c. carinatum* the populations of the species from West Siberia and North Kazakhstan, as far as the specimens from the region are agree with traditional interpretation of the species. The taxon is characterized by relatively flat elytra with special puncturation; without dorsal white stripes, but humeral stripe usually complete.

E. carinatum altaicum (Suvorov, 1909), **stat.n.** was described (as *Neodorcadion*) from Naryn River Valley (right tributary of Irtysh southwards Zyrianovsk: Bolshe-narymskaia, Altaiskaia), as a species, but later (Plavilstshikov, 1958) was treated as a synonym of *E. carinatum*. In fact it is a very special taxon, which can be in fact a good species. It is characterized by very large and wide body with strongly convex elytra usually without any white stripes or with strongly reduced humeral white stripes.

E. carinatum blessigi (Ganglbauer, 1884), described as *Neodorcadion involvens* var. *blessigi* from Altai, was already regarded as a subspecies distributed in Altai Region: *Neodorcadion involvens blessigi*, Suvorov,

1909. The subspecies is characterized by the presence of irregular white dorsal elytral stripes. It is known from Shebalino environs and southwards to Chermal, and probably (according to Suvorov, 1909) as far eastwards as Minusinsk.

E. carinatum bramsoni (Pic, 1901), described as *Neodorcadion carinatum* var. *bramsoni* from Altai, was regarded as a species *E. gassnery*, Plavilstshikov, 1958. The synonymy: *Neodorcadion carinatum* var. *bramsoni* Pic, 1901 = *Neodorcadion gassnery* Breit, 1917 was established by S. Breuning [1962]. In fact it is a very local subspecies of *E. carinatum* (elytral stripes are always regular) with only one known population in Altai near Chermal. The holotype of *Neodorcadion carinatum* v. *bramsoni* is preserved in Hungarian Museum of Natural History, Budapest and was checked by M.L. Danilevsky.

The described above subspecies structure of *Eodorcadion carinatum* was proposed by M.L. Danilevsky [2002: #260; 2003: #260], but never published.

We also accepted the restoration of *E. zichyi* (Cziki, 1901) and a combination *E. intermedium kozlovi* (Suvorov, 1912) proposed by M. Danilevsky [2004].

13. As it was shown long ago [Danilevsky, 2002: #224; 2003: #224] after study of type series, *Dorcadion kubanicum* Plavilstshikov, 1934 is a synonym of *Dorcadion euxinum* Suvorov, 1915, which must be regarded as a subspecies of *D. sareptanum* Kraatz, 1873: *D. sareptanum euxinum* Suvorov, 1915. Still the synonyms were never published, so *Dorcadion sareptanum euxinum* Suvorov, 1915, **stat.n.** = *D. kubanicum* Plavilstshikov, 1934, **syn.n.**

14. We preliminari include in *D. cinerarium caucasicum* Küster, 1847, **stat.n.**, several populations of *D. cinerarium* (Fabricius, 1787) from Transcaucasia (Armenia and Karabakh) and from the north slope of the Main Caucasian Ridge (Teberda, Karachaevo-Cherkessia). This position was stated several years ago [Danilevsky, 2002: #213; 2003: #213], but seems never published. Our *D. c. caucasicum* were collected near Sisiyan Pass in Armenia.

15. *Dorcadion goektschanum* Suvorov, 1915, described as a species from Sevan lake environs (Armenia) was regarded as a “morpha” of *D. sulcipenne* by N.N. Plavilstshikov [1958], but it is a distinct Armenian subspecies *D. sulcipenne goektschanum* Suvorov, 1915, **stat.n.**, which characters (small size and well developed white stripes in females) were reliably described by N.N. Plavilstshikov. The taxon is known from several localities around Sevan Lake. This position was stated several years ago [Danilevsky, 2002: #216; 2003: #216], but seems never published.

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