
On the genus *Trachia* auct. (Gastropoda, Pulmonata, Camaenidae)

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ABSTRACT. Study of the reproductive tract of *Helix pseudomiara* Bavay et Dautzenberg, 1908, formally attributed to the genus *Trachia*, and its comparison with other anatomically studied species of the genus, made it necessary to reconsider the taxonomic structure of the taxon. It is shown that four species, whose anatomy is known, belong to four genera, differing both conchologically and anatomically. Descriptions and diagnoses (based on their type species) of genera *Trachia* Martens, 1860 (type species *Helix asperella* Pfeiffer, 1846), *Bellatrachia* gen. nov. (type species *Helix pseudomiara* Bavay et Dautzenberg, 1908), *Pseudotrachia* gen. nov. (type species *Helix vittata* Müller, 1774), and *Neotrachia* gen. nov. (type species *Helix duporti* Bavay et Dautzenberg, 1908) are presented.

tional Park Cat Tien, 11°25'N, 107°15'E, 119 m above sea level, tropical forest, December 2016, leg. I. Semenyuk, det. A. Schileyko. The anatomical study was performed by manual dissection under the stereomicroscope Olympus SZ. 2 specimens of this species were dissected. The material is deposited in the Zoological Museum of Moscow State University, No Lc-40514.

Abbreviations in figures: AG – albumen gland; E – epiphallus; F – flagellum; FO – free oviduct; HD – hermaphroditic duct; P – penis; Pil – pilasters in penis; PR – retractor of penis; RS – reservoir of spermatheca; SS – spermathecal stalk; Ut – uterus; VD – vas deferens.

Introduction

A number of species are traditionally attributed to the genus *Trachia* Martens, 1860. In particular, in the fauna of “British India” Gude [1914] listed 18 species of *Trachia*; in the fauna of Vietnam there are 12 species and subspecies, which are usually placed into this genus [Schileyko, 2011, 2013]. The shell variability of *Trachia* auct. is so great that it is impossible to place particular species to the genus without knowledge of its anatomy. Unfortunately, reproductive anatomy is known for 4 species only, which markedly differ from one another. Therefore, a preliminary attempt is made here to understand the taxonomic structure of the genus *Trachia* auct.

In the systematic part for each genus its diagnosis is provided, followed by a description of the type species. Diagnostic characters of the genera are in *italics*.

Material and methods

The material on *Helix pseudomiara* Bavay et Dautzenberg, 1908 was collected in Vietnam, Na-

Systematic part

Camaenidae Pilsbry, 1893

Camaeninae Pilsbry, 1893

Bellatrachia Schileyko, gen. nov.

Figs 1, 2

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Type species – *Helix pseudomiara* Bavay et Dautzenberg, 1908, here designated.

Diagnosis. Shell flattened-globular; umbilicus subcylindrical, narrowly open.

Flagellum rather long. *Penis long, convoluted. Internally penis with longitudinal folds.* Penial retractor evenly thin, rather long. Length of vagina approximately equal to length of free oviduct. *Spermathecal duct short, reservoir lies on lower half of spermoviduct.*

[**Диагноз.** Раковина уплощенно-шаровидная, с узким, открытым, почти цилиндрическим пупком.

Флагеллум довольно длинный. *Пенис длинный, извитой. Внутренняя поверхность пениса с чёткими продольными складками.* Retractor пениса равномерно тонкий,



FIG. 1. Shell of *Bellatrachia pseudomiara*.

РИС. 1. Раковина *Bellatrachia pseudomiara*.

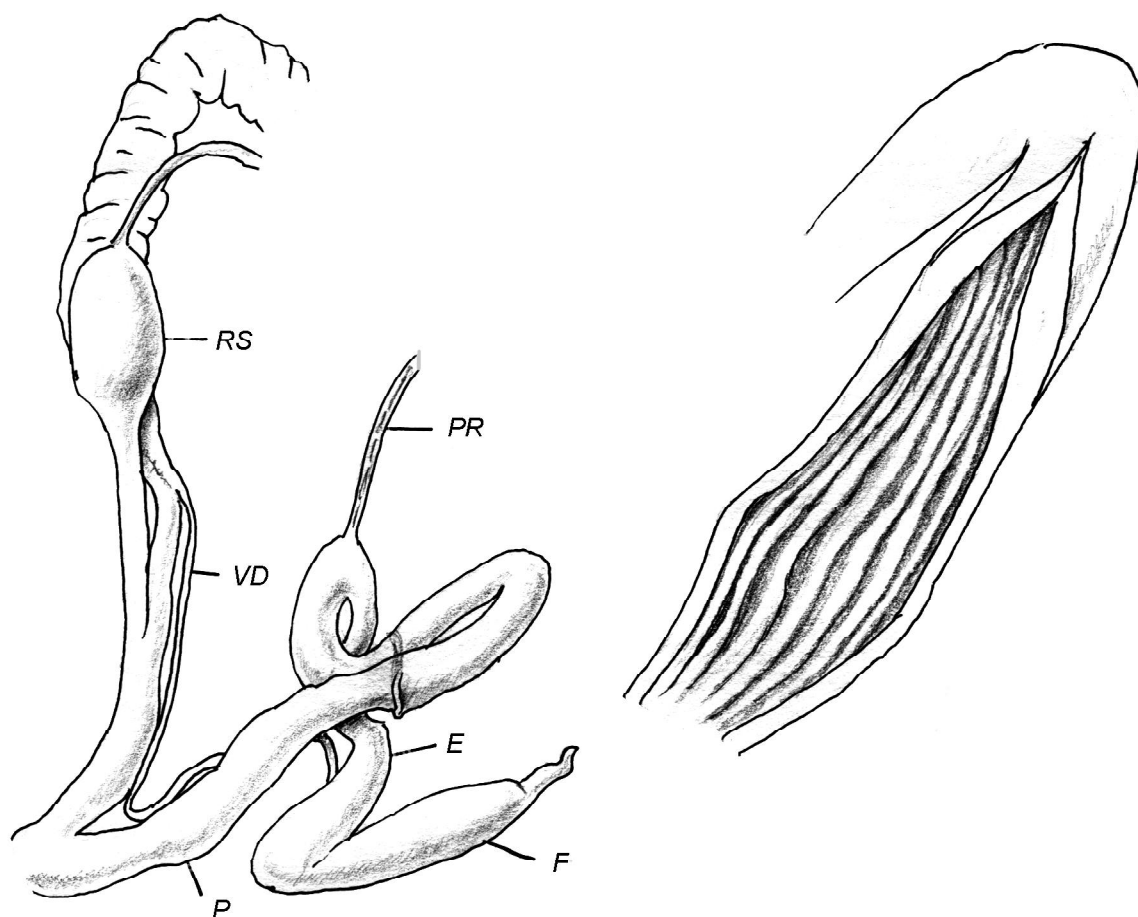


FIG. 2. *Bellatrachia pseudomiara*. Reproductive tract and inner structure of the penis.

РИС. 2. *Bellatrachia pseudomiara*. Репродуктивный тракт и внутреннее строение пениса.

довольно длинный. Длина вагины приблизительно равна длине свободного овидукта. Проток семеприемника короткий, резервуар прилегает к нижней половине спермовидукта].

Description of *Bellatrachia pseudomiara* (Bavay et Dautzenberg, 1908).

Shell is rather thin-walled, translucent, evenly rounded at periphery, of 4.5 slightly convex whorls. Apex rounded. Last whorl moderately descending in front. Color uniformly corneous or yellowish. Embryonic whorls with very delicate reticulate sculpture, surface of later whorls with very weak, much smoothed, irregular radial wrinkles. Aperture rounded, oblique, with reflexed, thickened margins. Umbilicus is cylindrical, narrowly open. Height 9-13, diameter 16-25; depicted shell: 13.0 and 23.2 mm correspondingly.

Vas deferens enters the flagellum/epiphallus junction laterally. Flagellum thick, with attenuated tip, about 2-2.5 times shorter than epiphallus. Boundary between epiphallus and penis is scarcely visible, marked by penial retractor attachment. Epiphallus is long, convoluted. Penis rather long, subcylindrical, its inner surface bears longitudinal pilasters.

Distribution and composition of the genus. Northern and SW Vietnam (National Park Cat Tien). Probably, one species.

Etymology: The genus is named in memory of Professor Bella Striganova, who for a long time was the head of the Laboratory of Soil Zoology and Experimental Entomology in A.N. Severtzov Institute of Ecology and Evolution of Russian Academy of Sciences.

Trachia Martens, 1860

Fig. 3

Helix (Trachia) Martens in Albers, 1860: 160.

Trachia. – Stoliczka, 1871: 223; Schileyko, 2003: 1516–1517.

Planispira (Trachia). – Gude, 1914: 53.

Type species – *Helix asperella* Pfeiffer, 1846, by original designation.

Diagnosis. *Shell much flattened; umbilicus broad, perspective.*

Flagellum short, slender. Penis short, slightly swollen (inner structure of penis is unknown). Penial retractor evenly thin, rather long. Length of vagina is approximately equal to those of free oviduct. Spermathecal duct very long, reservoir attending albumen gland.

[**Диагноз.** Раковина сильно уплощенная, с широким, развёрнутым, перспективным пупком.

Флагеллум короткий, тонкий. Пенис короткий, вздутый (внутреннее строение пениса неизвестно). Ретрактор пениса равномерно тонкий, довольно длинный. Длина вагины приблизительно равна длине свободного овидукта. Проток семеприемника очень длинный, резервуар достигает белковой железы].

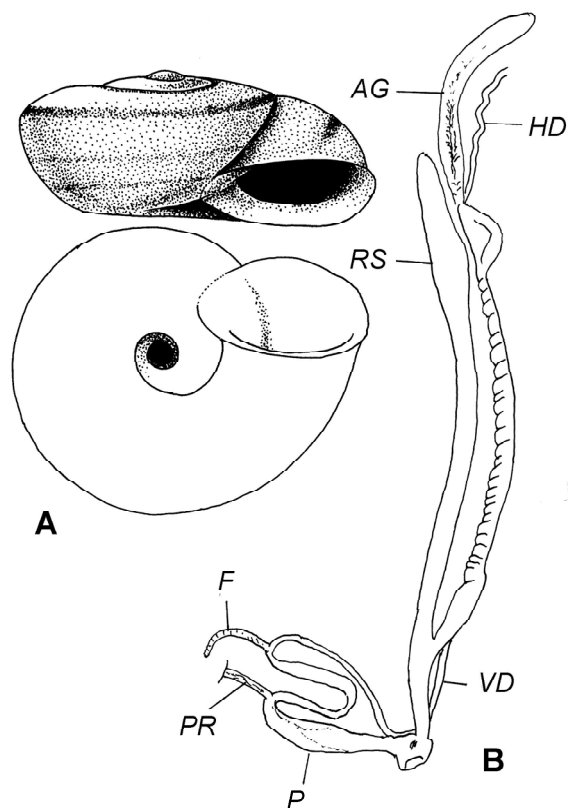


FIG. 3. A. Shell of *Trachia asperella* [after Schileyko, 2003]. B. Reproductive tract of *Trachia delibrata* [after Stoliczka, 1871].

РИС. 3. А. Раковина *Trachia asperella* [по Schileyko, 2003]. В. Репродуктивный тракт *Trachia delibrata* [по Stoliczka, 1871].

Description of shell of *Trachia asperella* (Pfeiffer, 1846).

Shell rather thin-walled, of 4-5 slightly convex whorls. Last whorl deeply and abruptly descending in front, with evenly rounded or slightly angulated periphery. Color whitish or yellowish, monotonous or with few dark narrow bands. Embryonic whorls smooth. Postapical sculpture of delicate radial wrinkles, weak spiral striae, and very fine granulation; periostracum sometimes with short, thin hairs. Aperture quite oblique to subhorizontal, margin insertions more or less approached; margins shortly to widely reflexed. Umbilicus is broad, perspective. Shell height 8.0-10.5, diameter 17-22 mm; depicted shell of *Trachia asperella*: 6.2 and 13.0 mm correspondingly.

Description of anatomy of *Trachia delibrata* (Benson, 1836) (after the data by Stoliczka [1871: 223, pl. XVI, fig. 1]).

Vas deferens enters epiphallus near its contact with penis. Flagellum thin, about two times shorter than epiphallus, enters at vas deferens/epiphallus junction. Epiphallus rather long, twisted, its bound-

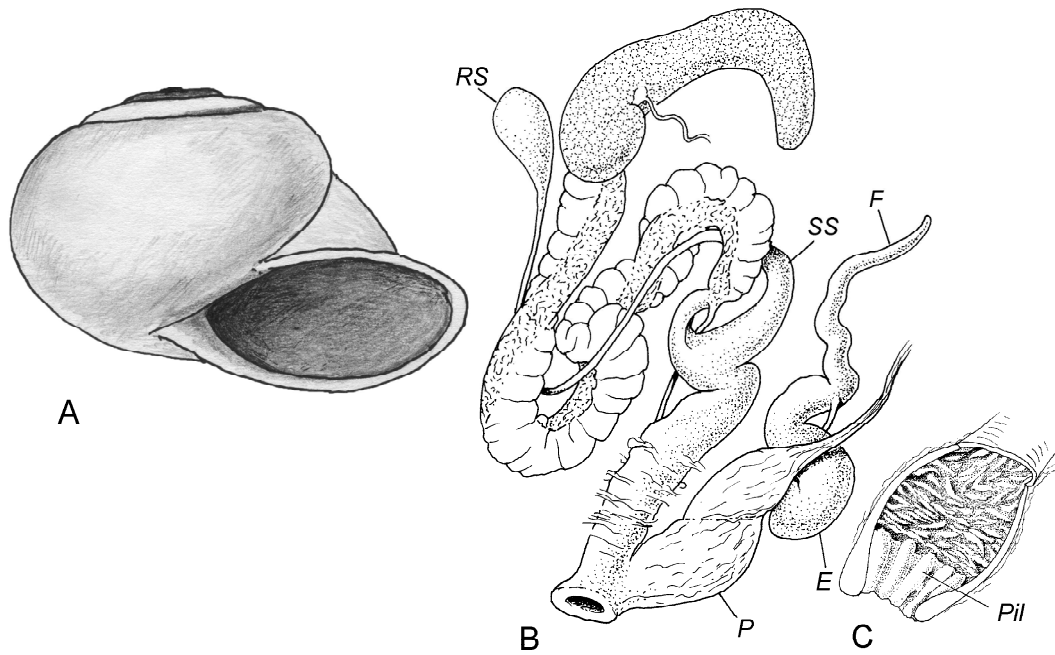


FIG. 4. *Pseudotrachia vittata*. A. Shell. Islet near Tuticorin, S India. B. Reproductive tract. C. Interior of penis [after Schileiko, 2003].

РИС. 4. *Pseudotrachia vittata*. A. Раковина. Остров близ порта Тутикорин, Ю. Индия. B. Репродуктивный тракт. C. Внутреннее строение пениса [по Schileiko, 2003].

ary with penis marked by rather thin penial retractor. Penis fusiform. Vagina slightly shorter than penis, but a little longer than free oviduct. Spermathecal stalk very long, reservoir slender, lies on upper section of spermoviduct and lower part of albumen gland.

Distribution and composition of the genus.

India, Myanmar, Sri Lanka, Mergui and Andaman Islands. Judging from conchological characters, following species should be included in the genus *Trachia* (generic names are given as in original descriptions): *Helix tuckeri* Pfeiffer, 1846; *albicositis* Pfeiffer, 1860; *Helix asperella* Pfeiffer, 1846; *Helix atkinsoni* Theobald, 1850; *Helix contracta* Benson, 1864; *Helix falliciosa* Férussac, 1821; *Helix crassicostata* Benson, 1848; *Helix colletti* Beddome, 1891; *Trachia footei* Stoliczka, 1873; *Helix nilagerica* Pfeiffer, 1845; *Helix nagporensis* Pfeiffer, 1860; *Helix ruginosa* Férussac, 1821; *Helix proxima* Férussac, 1821; *Helix armstrongi* Smith, 1895; *Helix fritillata* Benson, 1863.

Pseudotrachia gen. nov.

Fig. 4

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Eurystoma Albers, 1850: 126 (nom. praeocc., non Rafinesque, 1818; type species *Helix vittata* Müller, 1774 by subsequent monotypy; Martens in Albers, 1860: 129).

Trachia part. – Schileiko, 2003: 1516, fig. 1954 B,C.

Type species – *Helix vittata* Müller, 1774, here designated.

Diagnosis. Shell subglobose; umbilicus narrow, sometimes semicovered. Flagellum rather long. Penis short, swollen, internally with short, chaotically scattered elongated plicae; in distal part with rounded axial folds. Penial retractor with enlarge basal part. Vagina much longer than free oviduct. Spermathecal stalk long, thin, reservoir lies on lower part of albumen gland [Schileiko, 2003].

[**Диагноз.** Раковина прижато-шаровидная; пупок узкий, иногда полуприкрытый. Флагеллум довольно длинный. Пенис короткий, вздутый, его внутренняя поверхность с короткими, бессистемно расположенными удлиненными складочками, в дистальной части со сглаженными продольными складками. Базальная часть ретрактора пениса расширена. Вагина гораздо длиннее свободного овидукта. Проток семеприемника лежит на нижней части белковой железы].

Description of *Pseudotrachia vittata* (Müller, 1774).

Shell moderately solid, of 4-4.5 flattened whorls. Last whorl evenly rounded at periphery, abruptly descending at aperture. Color uniformly white (sometimes yellowish) or with 1-5 brown bands; aperture inside is brown to nearly black. Embryonic whorls glossy, with microscopic radial wrinkles. Later whorls without special sculpture. Aperture rounded, with thin, widely reflexed margins. Umbilicus narrow, semicovered. Shell height 14-19, diameter

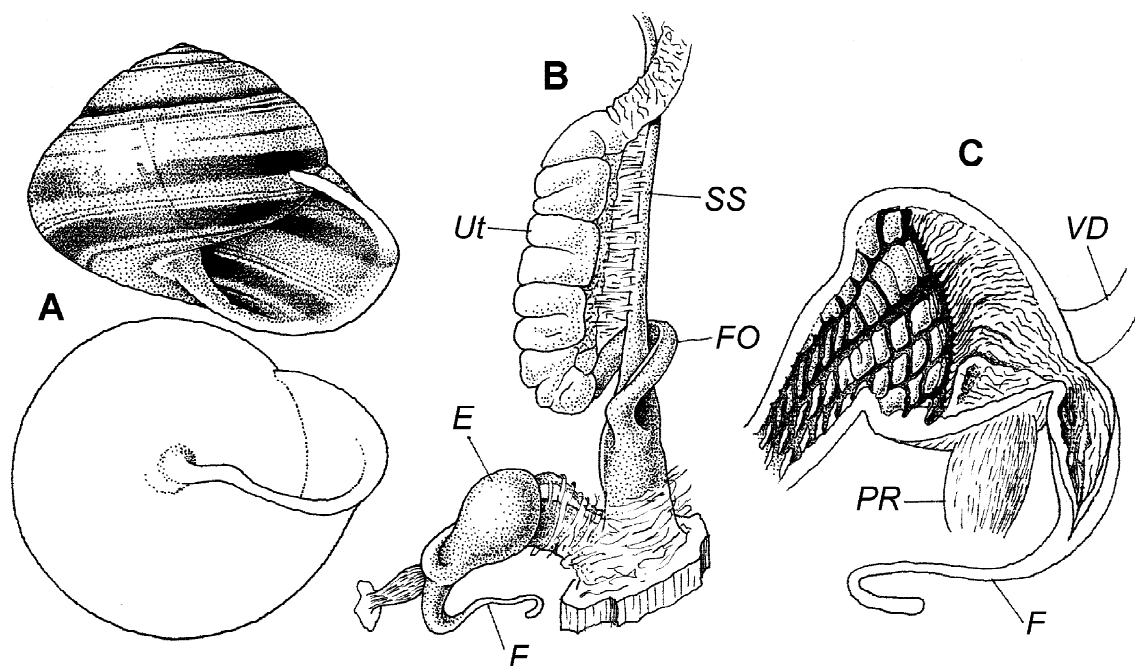


FIG. 5. *Neotrachia duporti*. A. Shell. B. Reproductive tract. C. Interior of penis [after Schileyko, 2013].

РИС. 5. *Neotrachia duporti*. А. Раковина. В. Репродуктивный тракт. С. Внутреннее строение пениса [по Schileyko, 2013].

22-32 mm; depicted shell 17.0 and 31.1 mm correspondingly.

Vas deferens enters at flagellum/epiphallus junction. Flagellum comparatively stout. Epiphallus not long, stout. Penis short, swollen, internally with relief of short, chaotically scattered elongate plicae; in distal part there are smoothed longitudinal pilasters. Basal part of penial retractor strongly expanded and incorporated into thin, fibrous penis sheath. Vagina long, stout. Free oviduct very short. Spermathecal stalk long, with expanded basal portion; reservoir reaching albumen gland.

Distribution and composition of genus. SE Asia, including India and Sri Lanka. In addition to *Helix vittata*, *Helix fallaciosus* Férussac, 1821 and *Helix balansai* Morlet, 1886 might be attributed to this genus.

Neotrachia Schileyko, gen. nov.

Fig. 5

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Type species *Helix duporti* Bavay et Dautzenberg, 1908, here designated.

Diagnosis. Shell subglobose; *umbilicus* closed. Flagellum rather long. Penis short, swollen, internally with longitudinal pilasters, which are broken into series of tubercles. These pilasters start in epiphallus, and become thinner toward the atrium.

Penial retractor short, stout. *Vagina* much swollen, shorter than free oviduct. *Spermathecal duct* long. [Schileyko, 2013: 163-164, fig. 1].

[**Диагноз.** Раковина почти шаровидная; пупок закрытый. Флагеллум довольно длинный. Пенис короткий, вздутый, внутри с продольными пиластрами, разбитыми на серии бугорков. Эти пиластры начинаются в эпифаллусе и истончаются к атриуму. Ретрактор пениса короткий и толстый. Вагина сильно вздутая, короче свободного яйцевода. Проток семеприемника длинный.]

Description of *Neotrachia duporti* (Bavay et Dautzenberg, 1908).

Shell globular, moderately thin-walled, slightly translucent, of 5-6 slightly convex whorls. Last whorl evenly rounded at periphery, scarcely descending at the very end. Colouration of white or yellowish background and series of dark bands of various widths, visible inside aperture. Embryonic whorls smooth. Sculpture of later whorls of weak, irregular radial foldlets and dense spiral striae; on last whorl locally may be malleate elements. Aperture subcircular, well oblique, with shortly reflexed, sometimes slightly thickened margins. Umbilicus closed. Height 26-34, diameter 36-43 mm; depicted shell: 26.5 and 36.2 mm correspondingly.

Distribution and composition of genus. N Vietnam, Hainan Island. In this genus might be attributed also *Helix gabriellae* Dautzenberg et d'Hamonville, 1887, and *Helix hainanensis* H. Adams, 1870.

Discussion

To date, the structure of the reproductive tract is known for four species conventionally attributed to the genus *Trachia*: *Helix pseudomiara* Bavay et Dautzenberg, 1908, *Helix delibrata* Benson, 1836 [Stoliczka, 1871: 223, pl. XVI, fig. 1], *Helix vittata* Müller, 1774 [Godwin-Austen, 1904: 49, pl. IV, figs 9-11; Schileyko, 2003: 163-164, fig. 1], and *Helix duporti* Bavay et Dautzenberg, 1908 [Schileyko, 2013: 2013: 163-164, Fig. 1].

The main problem is that the anatomy of the most species of the genus *Trachia* auct. including the type species, is still unknown. However, shell of “*Helix*” *delibrata* is very similar to *Helix asperella* Pfeiffer, 1846 which is a type species of the genus. Therefore, there is a reason to think that the information on anatomy of *Trachia delibrata*, given by Stoliczka [1871], is true for *Trachia asperella*. If so, the rest species traditionally included in this genus, must be attributed to other genera described above.

Anatomically, the Camaenidae of Southeast Asia are very poorly studied. Therefore, at present, it would be premature to put forward any hypotheses about possible historical connections among taxa. Judging by the conchological characters and scant information about anatomy, we can only assume that the Camaenidae in this region form a bouquet of taxa, the genealogical links between which are not yet traceable.

In addition, it should be borne in mind that in Southeast Asia exist at least 25 species (5 genera), which are usually attributed to conchologically similar family of Bradybaenidae, but in many cases the conchological characters do not provide reliable grounds for conclusions about the family or the genus of the species. Anatomical evidence of belonging of species to the family Bradybaenidae exist for a few representatives of the three genera (*Plectotropis* Martens, 1860, *Thaitropis* Schileyko, 2004, and *Aegista* Albers, 1850). It is possible that some species attributing now to the genus *Aegista* might be representatives of Camaenidae.

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О роде *Trachia* auct. (Gastropoda, Pulmonata, Camaenidae)

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РЕЗЮМЕ. Исследование репродуктивного тракта *Helix pseudomiara* Bavay et Dautzenberg, 1908, формально относимого к роду *Trachia* Martens, 1860, и сопоставление его с другими анатомически исследованными видами рода заставило пересмотреть таксономическую структуру таксона. Показано, что четыре анатомически изученных вида относятся к четырем разным родам, различающимся как конхологически, так и анатомически. Представлены диагностические описания родов *Trachia* Martens, 1860 (типовой вид *Helix asperella* Pfeiffer, 1846), ***Bellatrachia*** gen. nov. (типовой вид *Helix pseudomiara* Bavay et Dautzenberg, 1908), ***Pseudotrachia*** gen. nov. (типовой вид *Helix vittata* Müller, 1774), и ***Neotrachia*** gen. nov. (типовой вид *Helix duporti* Bavay et Dautzenberg, 1908).