
Campolaemus Pilsbry, 1892 is not a hypselostomatid, but a streptaxid (Gastropoda: Eupulmonata)

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ABSTRACT. The monotypic land snail genus *Campolaemus*, known only from Saint Helena Island, has been classified in the family Hypselostomatidae, a family occurring in the eastern Palearctic and in the Oriental region. Due to biogeographical reasons and morphological traits, especially the arrangement and morphology of apertural barriers, *Campolaemus* is moved to the family Streptaxidae, which is a pantropic family, being highly diverse in tropical Africa.

Campolaemus Pilsbry, 1892 относится не к Hypselostomatidae, а к Streptaxidae (Gastropoda: Eupulmonata)

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РЕЗЮМЕ. Монотипический род наземных улиток *Campolaemus*, известный только с о. Святой Елены, ранее относили к Hypselostomatidae, семейству, распространенному в восточной Палеарктике и в восточном регионе. Из-за особенностей биогеографии и морфологии, особенно в расположении и морфологии устьевого арматуры, *Campolaemus* перенесен в Streptaxidae, пантропическое семейство, весьма разнообразное в тропической Африке.

at that time). Schileyko [1998b] placed *Campolaemus* in the Hypselostomatidae together with *Boysidia* and *Hypselostoma*, which practically agrees with the original classification of Pilsbry [1892]. Although the systematics of the pupilloid snails is far from being resolved, and Hypselostomatidae is treated as a synonym of Gastrocoptidae by Bouchet *et al.* [2017], *Campolaemus* has always been treated as a member of the orthurethran Pupilloidea, and was considered a relative of *Hypselostoma*.

Examination of the type specimens of *Campolaemus perexilis* deposited in the Natural History Museum, London revealed that there are some conchological characters showing similarities with Streptaxidae from Africa and elsewhere, instead of with Southeast Asian and African Pupilloidea. The morphological differences, together with biogeographic information suggest that *Campolaemus* should be excluded from Pupilloidea, and reclassified in the Streptaxidae.

Introduction

Campolaemus Pilsbry, 1892 was introduced as a monotypic genus for *Tomigerus perexilis* E.A. Smith, 1892, which is an endemic species to Saint Helena Island, situated in the middle of the South Atlantic Ocean. In the original description of *Campolaemus*, Pilsbry [1892] mentioned that *Tomigerus perexilis* was most similar to *Boysidia* Ancey, 1881 and *Hypselostoma* Benson, 1856, both being known from Southeast Asia, and not to *Tomigerus* Spix, 1827 [described in Wagner, 1827], which was originally described from Brazil. *Tomigerus* was classified in the tribe Odontostomini (family Bulimulidae) by Schileyko [1999], which has more recently been treated as an independent family (Odontostomidae, see Bouchet *et al.*, 2017).

Later, Pilsbry and Cooke [1918–1920] placed *Campolaemus* in the Vertigininae (family Pupillidae

Materials and methods

Photographs were taken using a Keyence LHX5000 digital microscope. 10–30 photos were taken of each shell, and merged to create a single image using Photoshop.

Abbreviations.

NHM: The Natural History Museum (London, UK)

NHMUK: when citing NHM registered specimens

Results

The main reasons for transferring *Campolaemus* from the Hypselostomatidae to the Streptaxidae are the following.

Shell sculpture: The shell surface of *Campolaemus perexilis* is smooth without any notable sculp-

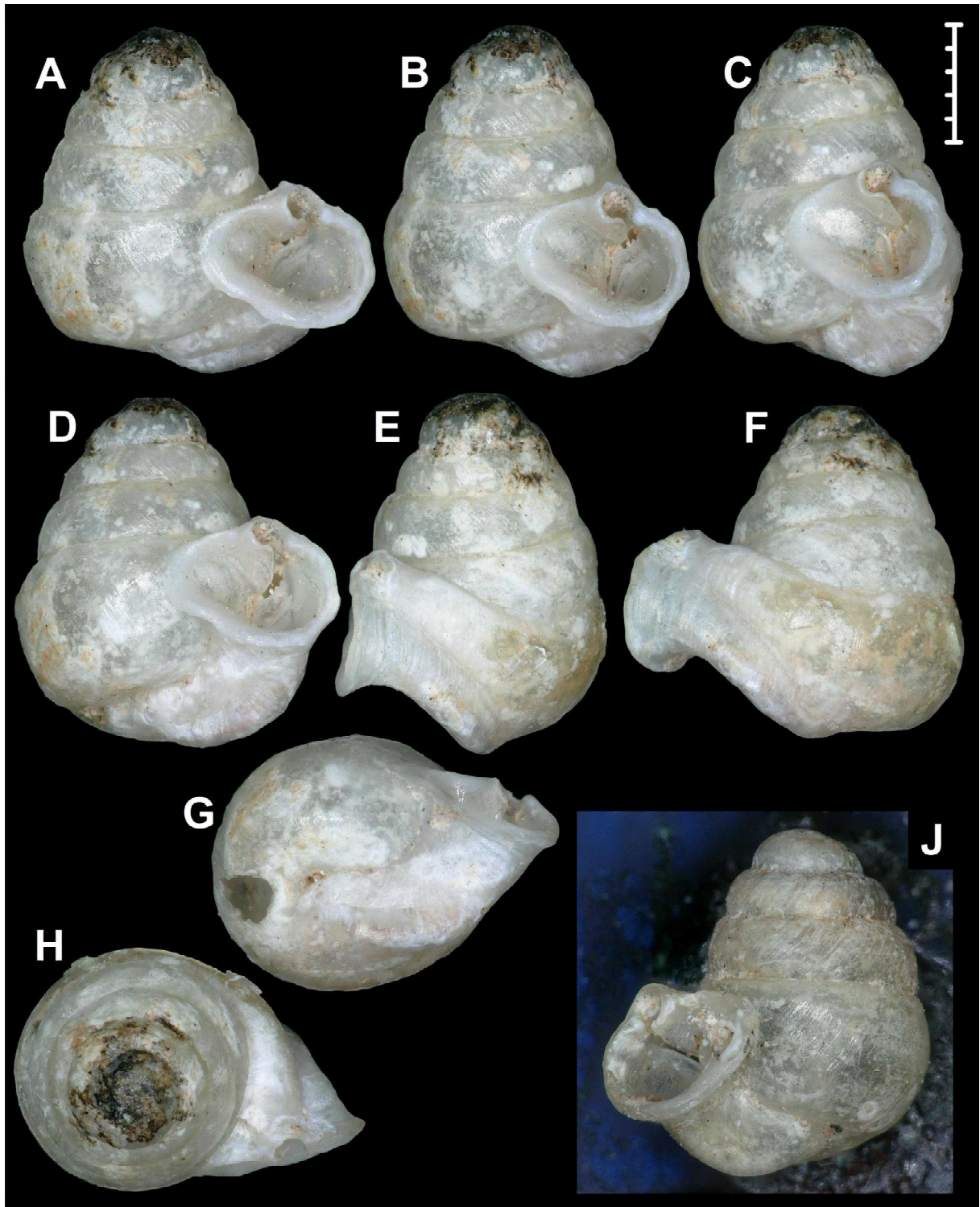


FIG. 1. Syntypes of *Campolaemus perexilis* (E.A. Smith, 1892). A–H. Dextral shell, St. Helena, Sugarloaf Ridge (specimen 1). J. Sinistral shell, St. Helena, Side Path. Inventory number for both shells: NHMUK 1892.2.24.150–161. Scale represents 0.5 mm. All photos: B. Páll-Gergely.

РИС. 1. Синтипы *Campolaemus perexilis* (Е.А. Смит, 1892). А–Н. Декстральная раковина, о. Св. Елены, хребет Шугарлоф (экз. 1). J. Синистральная раковина, о. Св. Елены, перевал Сайд. Инвентарные номера обеих раковин: NHMUK 1892.2.24.150–161. Масштабная линейка 0,5 мм. Фото: Б. Палл-Гергей.

tural elements. The shell is semitransparent, rather glossy, colourless. The tiny (smaller than 2 mm), colourless genera of Hypselostomatidae (*Acinolaemus* F. G. Thompson et Upatham, 1997, *Angustopila* Jochum, Slapnik et Páll-Gergely, 2014, *Clostophis* Benson, 1860, *Dentisphaera* Páll-Gergely et Jochum, 2017, *Tonkinospira* Jochum, Slapnik et Páll-Gergely, 2014) mostly possess some spiral striation and/or radial ribbing [see Panha, Burch, 2005; Jochum *et al.*, 2014; Páll-Gergely *et al.*, 2017, 2019, under review]. In contrast, glossy, colourless, transparent shells are not unusual among African Streptaxidae [Rowson, 2009, Fig. 1.2 therein].

Palatal fold: The palatal fold of *Campolaemus perexilis* corresponds with an external furrow, a trait not uncommon in African Streptaxidae [e.g. de Winter, de Gier, 2019]. In some cases the parietal lamella runs in parallel with the palatal fold in Hypselostomatidae, but the palatal fold has no indication on the external shell surface [e.g. Páll-Gergely *et al.*, 2015].

Denticle inside the sinulus: *Campolaemus perexilis* possesses a tiny denticle inside the sinulus. I have examined similar ones in some species of *Sinoennea* Kobelt, 1904. This tiny denticle is developed when the parietal lamella “divides” the palatal tooth into two, i.e. the denticle inside the sinulus is homologous with the upper part of the palatal tooth. I have not found any such denticles situated inside the sinulus in the Hypselostomatidae.

Biogeography: All genera of the Hypselostomatidae inhabit the Oriental Region with some species reaching the eastern Palaearctic (Japan) and Australia [Solem, 1981; Schileyko, 1998b]. It would be highly unlikely that a monotypic genus from an island in the middle of the Atlantic Ocean would belong to a family known from these regions but not Africa.

Systematics and Taxonomy

Family Streptaxidae Gray, 1860
Genus *Campolaemus* Pilsbry, 1892
Campolaemus Pilsbry, 1892: 96.

Type species. *Tomigerus perexilis* E.A. Smith, 1892, by monotypy.

Campolaemus perexilis (E.A. Smith, 1892)
(Figs 1–2)

Tomigerus (?) *perexilis* E.A. Smith, 1892: 267, plate 22, figs 19–19b.

Type material examined: 1 syntype in the type collection, NHMUK 1892.2.24.162, St. Helena, Sugarloaf Ridge; 11 dextral + 1 sinistral syntype in the general collection, NHMUK 1892.2.24.150–161, St. Helena, Side Path (sinistral), Sugarloaf Ridge (dextral).

Remarks: The apertural barriers of this species

has not been properly described and illustrated previously. In a straight view into the aperture three prominent lamellae are visible as follows: a parietal lamella, which is strongly curved towards the palatal lamella, forming a large, rounded sinulus. The third conspicuous lamella, which is probably homologous with the inner part of the parietal lamella of other streptaxids and diapherids, is strongly descending and deeply running from the inner end of the parietal lamella. A fourth, shorter, but elevated lamella is situated on the columella, between the inner part of the parietal lamella and the basal-columellar meeting point. A knob-like palatal tooth is situated anterior to the palatal lamella on the peristome edge. An additional, small, but rather pointed denticle, probably homologous with the upper part of the palatal tooth, is situated inside the sinulus, in some distance from the peristome edge (Fig. 2).

The superfamily Streptaxoidea, especially the family Streptaxidae is probably the richest land snail family in terms of shell shape types [Rowson, 2009, Fig. 1.2 therein]. *Campolaemus*, with its ovoid shell and strongly protruding and ascending last whorl further enriches the morphological variability of Streptaxidae.

The genus *Boysia* L. Pfeiffer, 1849 (type species: *Tomogeres boysii* L. Pfeiffer, 1846), which was characterized as a “toothless *Campolaemus*” [Schileyko, 1998b], probably belongs to Pupilloidea, although its taxonomic position is highly uncertain. The similar shell shape with *Campolaemus perexilis* is probably due to convergent evolution. *Boysia boysii* is known from Pakistan, India and Saudi Arabia [Neubert, 1998; Pokryszko *et al.*, 2009 and references therein].

The genera of the family Fauxulidae Harl et Páll-Gergely, 2017 (*Afriboysidia* Zilch, 1939, *Anisoloma* Ancy, 1901, *Fauxulella* Pilsbry, 1917, *Fauxulus* Schaufuss, 1869, *Tomigerella* L. Pfeiffer, 1879), which are distributed in South, Southwest and Southeast Africa and Madagascar, are all characterized by parallel angular and palatal teeth [Schileyko, 1998a]. This is a common trait in orthurethran genera, and suggests that *Campolaemus* is not closely related to them.

This species was already declared extinct in the original description, and assessed as such in IUCN (Mollusc Specialist Group 1996). It is unknown on which bases this statement was made.

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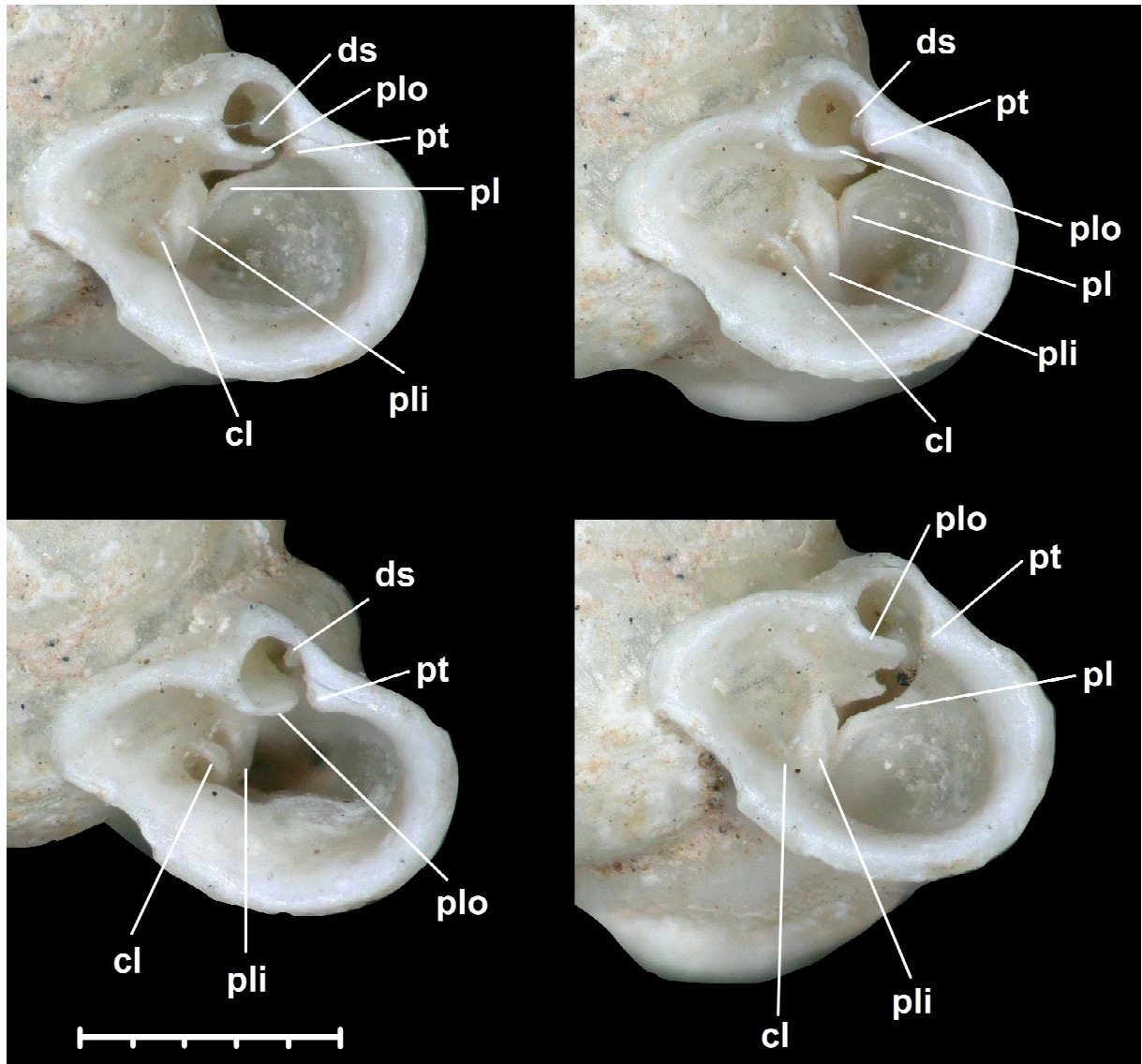


FIG. 2. Apertural barriers of a syntype of *Campolaemus perexilis* (E.A. Smith, 1892). St. Helena, Sugarloaf Ridge (specimen 2), NHMUK 1892.2.24.150–161. Abbreviations: cl: columellar lamella; ds: denticle inside the sinulus; pli: inner part of the parietal lamella; plo: outer part of the parietal lamella; pl: palatal lamella; pt: palatal tooth. Scale bar = 0.5 mm. Note that the incision of the parietal lamella is the result of some damage, normally it is continuous. All photos: B. Páll-Gergely.

РИС. 2. Устьевая арматура синтипа *Campolaemus perexilis* (Е.А. Смит, 1892). о. Св. Елены, хребт Шугарлоф (экз. 2), NHMUK 1892.2.24.150–161. Обозначения: cl: колумеллярная пластинка; ds: зубец внутри синулуса; pli: внутренняя часть париетальной пластинки; plo: внешняя часть париетальной пластинки; pl: палатальная пластинка; pt: палатальный зуб. Масштабная линейка 0,5 мм. Замечание – рассечение париетальной пластинки является результатом повреждения, в норме она цельная. Фото: Б. Палл-Гергей.

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