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## *Pyramidula kuznetsovi* sp. nov. – a new species of land molluscs from Nepal (Pulmonata, Pyramidulidae)

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**ABSTRACT.** An illustrated description of the shell and reproductive tract of *Pyramidula kuznetsovi* sp. nov. is given. The presence of a distinct peripheral angle distinguishes this species from all known species of the genus. Both anatomically studied specimens had well-developed embryos in the uterus, whereas distal parts of the male section of reproductive tract were much reduced. Therefore it is hard to judge about anatomical differences of *P. kuznetsovi* from other species of the genus, in particular, the question on the presence of penial caecum remains open.

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In the collection of Zoological Museum of Moscow State University (ZMMU) four samples of mollusks from Nepal determined by A.G. Kuznetsov as *Pyramidula humilis* (Hutton, 1838) are housed. However the comparison of these shells with original description [Hutton, Benson, 1838] has shown that actually they are not *P. humilis* [see also Tryon, 1887; Gude, 1914; Pilsbry, 1935], but it is a new species.

*Pyramidula kuznetsovi* Schileyko et  
Balashov, sp. nov.  
Fig. 1, 2, 3

**Derivatio nominis:** The species is named in memory of Andrey Kuznetsov, who collected the material.

**Locus typicus** – Nepal, Dhaulagiri zone, Mustang district, Muktinath-Himal ridge, NE of Muktinath settlement, along the trail from the settlement to Vishnu Temple of Sinala Mayi, in rock-slide among grass roots, 3750-3800 m a.s.l.

**Material.** All the material was collected by Andrey Kuznetsov, and deposited in ZMMU, except for 3 shells (see below).

Holotype (ZMMU, No. Lc-39482) and 74 paratypes from type locality, 23.04.1998 (ZMMU, No. Lc-38830, 71 shells),

3 of them have been passed to Naturhistorisches Museum Wien (NMW, No. 108108).

– 4 paratypes (ZMMU, No. Lc-38829) from W Nepal, Dhaulagiri zone, Mustang district, 2.5 km SE of Thinigaon, left side of river Langpoghyun-Khola, along trail Thinigaon-Kaisang, 3000-3100 m a.s.l., 23 & 25.09.1997.

– 14 paratypes (ZMMU, No. Lc-38828) from W Nepal, Dhaulagiri zone, Mustang district, Pholang-Dara ridge, right side of Kali-Gandaki river valley, 200-700 m NE of Khobang settlement, on rocks, 2600 m a.s.l., 7 & 11.05.1996.

– 28 paratypes (2 in alcohol, ZMMU, No. Lc-39316, and 26 shells, No. Lc-38827) from W Nepal, Dhaulagiri zone, Mustang district, right side of Syang-Khola river gorge, 1-2 km of Syang settlement, above trail, on the slope of NE exposition, in *Juniperus* bushes, under stones, 3100-3200 m a.s.l., 26.09.1997.

Shell turbinate to wide-conic, moderately thin-walled, somewhat opaque, of 5.5-5.75 whorls. Ratio height/diameter at 5.5 whorls is 0.8-1.0. Last whorl straight, its height (with aperture) is about 0.5-0.7 of its width. Periphery of last whorl with distinct angle, which may be slightly rounded or quite sharp; in majority of shells this angle can be traced on earlier whorls. Spire outlines from dome-shaped to subconical. Color uniformly dark corneous. Embryonic whorls smooth, subsequent whorls sharply radially striated. Aperture rounded, comparatively small, with sharp, simple margins; upper part of columellar margin reflexed. Umbilicus open, subcylindrical, its width is about 0.25 (1/3.5-1/4.5) of shell diameter. Dimension: shell height 2.1-2.3, diameter 2.2-2.6 mm; holotype: height 2.3, diameter 2.6 mm.

Cephalopodium, except for the sole, pigmented with numerous, tiny black dots.

Albumen gland in studied individuals was markedly reduced. Hermaphroditic duct is thin, dark-colored. Talon not located. Prostate is extremely small, being represented by a few hardly visible acini at inner surface of uterus below albumen gland. Vas deferens is very thin, entering sharp bent of



FIG. 1. *Pyramidula kuznetsovi* sp. nov. Holotype (photo by J. Harl).

РИС. 1. *Pyramidula kuznetsovi* sp. nov. Голотип (фото Дж. Харла).

penis. Latter forms another sharp bent at boundary with penis. In studied specimens, since the male section is much reduced, it is hard to establish if penial caecum is present, unless the vague thickening on curvature of penis is a remnant of the caecum. Uterus in both specimens contained 6 well-developed embryos with dark-brown shells consisting of 1.5-1.75 rounded whorls. Walls of uterus are very thin and transparent. Free oviduct and vagina are not long, of about equal length. Spermathecal duct is long, thin, reservoir roughly triangular, lying on upper half of uterus and containing some whitish amorphous substance.

**[Диагноз.** Раковина от кубаревидной до ширококонической, умеренно тонкостенная, слабо просвечивающаяся, состоящая из 5,5-5,75 оборотов. Отношение высоты раковины к диаметру при 5,5 оборотах составляет 0,8-1,0. Последний оборот прямой, его высота (с устьем) составляет около 0,5-0,7 его ширины. Периферия последнего оборота с четким углом, который может быть слегка закругленным или острым; у большинства раковин этот угол прослеживается на более ранних оборотах. Контур завитка – от куполовидного до почти конического. Окраска одноцветно темнороговая. Эмбриональные обороты гладкие, последующие обороты резко радиально исчерчены. Устье округлое, сравнительно маленькое, с острыми простыми краями; верхняя часть колумеллярного края отворнута. Пулук открытый, почти цилиндрический, ширина его составляет около 0,25 (1/3.5-1/4.5) диаметра раковины. Размеры: высота раковины 2,1-2,3, диаметр 2,2-2,6 мм; голотип: высота раковины 2,3, диаметр 2,6 мм.

Цефалоподиум, кроме подошвы, пигментирован многочисленными крошечными черными точками.

Белковая железа у исследованных особей заметно редуцирована. Гермафродитный проток тонкий, темной окраски. Квадривий не выявлен. Простата очень маленькая, представлена небольшим числом слабо различимых ацинусов на внутренней поверхности матки под белковой железой. Семепровод очень тонкий, впадает в пенис

апикально. Пенис образует 3 резких изгиба. Пениальный ретрактор крепится к верхнему изгибу пениса близ его контакта с семяпроводом. У изученных экземпляров, поскольку мужской отдел сильно редуцирован, трудно установить, имеется ли пениальный цэкум, если не считать рудиментом цэкума неясное утолщение на самом дистальном изгибе пениса. Матка у обоих экземпляров содержала 6 хорошо развитых эмбрионов с темнокоричневой раковиной, составленной 1,5-1,75 округлыми оборотами. Стенки матки очень тонкие, прозрачные. Свободный овидукт и вагина недлинные, приблизительно одной длины. Проток семеприемника длинный, тонкий; резервуар округло-треугольный, располагается на верхней половине матки и содержит беловатую аморфную субстанцию].

**Remark.** It should be taken into consideration that the reproductive tract of both studied specimens was in female phase therefore distal parts of male section were much reduced.

**Terminological note.** The segment of the male division, located between the vas deferens and penial retractor, Schileyko (1984: 237, Fig. 155; 1998: 120, 121, Fig. 139 B) have termed “epiphallus” (for *Pyramidula rupestris*, actually *P. pusilla*). However epiphallus is an organ, in which spermatophore or its anterior part is formed. Since spermatophore in *Pyramidula* is absent, it would be more correct to consider the entire duct from vas deferens to the atrium as penis, consisting of three sections.

**Distribution and habitats.** All 4 samples were found in the Himalaya between mountain peaks Dhaulagiri (8167 m above sea level) and Annapurna I (8091 m) in the basin of the Kali Gandaki River. The distance between the most distant of these 4 findings is about 27 air km, the rest two are in between them. The findings were made around Jomosom town at the distance no more than 14 km from the centre of the town.

The snails were found under stones, on rocks,

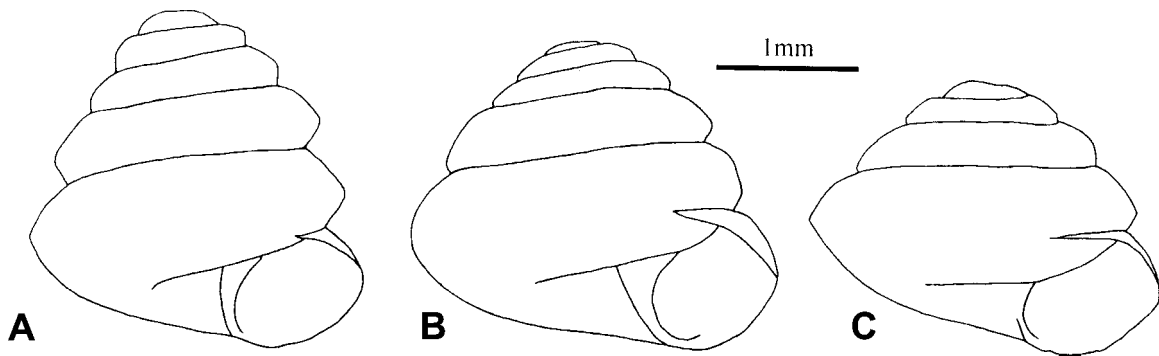


FIG. 2. *Pyramidula kuznetsovi* sp. nov. Paratypes: A – from the type locality; B – from the vicinities of Khobang settlement; C – subadult specimen (4.5 whorls) from the vicinities of Syang settlement.

РИС. 2. *Pyramidula kuznetsovi* sp. nov. Паратипы: А – из типового местонахождения; В – из окр. пос. Кхобянг; С – субдефинитивный экз. (4.5 оборота) из окр. пос. Сьянг.

among grass roots on open places and among *Juniperus* bushes at the elevation 2600-3800 m above sea level.

### Discussion

Gude [1914] indicates 3 species of the genus *Pyramidula* from India and adjacent countries: *P. humilis* (Hutton, 1838) (India: Simla, Landour, Murree, Tandiana); *P. euomphalus* (Blanford, 1861) (India: near Pykara, Nilgiri Hills); *P. habyi* (Jousseume, 1894) (Sri Lanka: Nuwara Elyia). *Pyramidula kuznetsovi* differs from any of them by the presence of distinct peripheral angle. In all probability, the closest relative of *P. kuznetsovi* is *P. humilis* (and Kuznetsov himself determined the species as *P. humilis*) but in latter "... anfractibus quinque rotundatis, ultimo subangulato ..." [Hutton in Hutton et Benson, 1838: 217], whereas in *P. kuznetsovi* there is a very distinct, rather sharp peripheral angle which can be traced on earlier whorls.

So far as we know, 5 species of *Pyramidula* have been studied anatomically: Japanese species *Pyramidula conica* Pilsbry et Hirase, 1902 [Habe, 1956] (Fig. 4 A); *P. rupestris* (Draparnaud, 1801) sensu many authors (Fig. 4 B), widely distributed over western and southern Europe, Crimea, Caucasus and Central Asia; European *P. jaenensis* (Clessin, 1882) and *P. umbilicata* (Montagu, 1803) [Martínez-Ortí *et al.*, 2007].

The structure of reproductive tract of *P. rupestris* has been described and illustrated by Soós [1917], Hesse [1918], Watson [1920], and Schileyko [1984, 1998]. It should be mentioned that some (if not all) of these descriptions may apply to *P. pusilla* (Vallot, 1801) since the name *pusilla* has traditionally been considered for a long time as a juniorsynonym of *rupestris* [see Gittenberger, Bank,

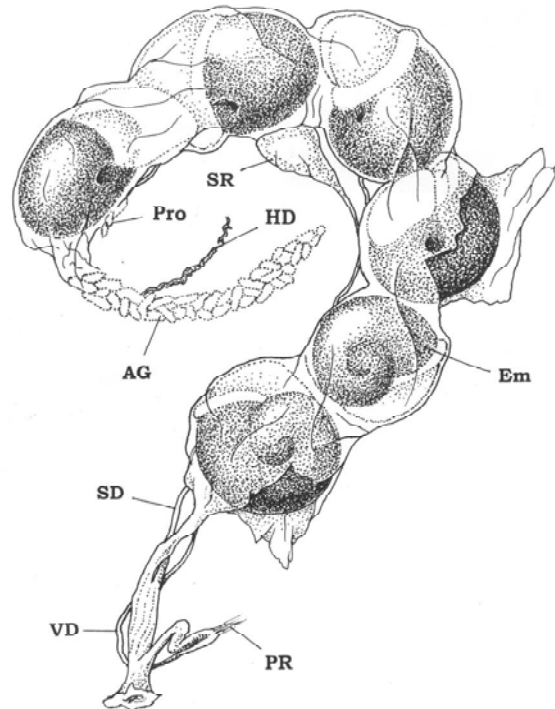


FIG. 3. *Pyramidula kuznetsovi* sp. nov. Reproductive tract of paratype from W Nepal, Dhaulagiri zone, Mustang district, right side of Syang-Khola river gorge, 1-2 km of Syang settlement, 26.09.1997.

AG – albumen gland; Em – embryos in uterus; HD – hermaphroditic duct; PR – penial retractor; Pro – prostate; SD – spermathecal duct; SR – spermathecal reservoir; VD – vas deferens.

РИС. 3. *Pyramidula kuznetsovi* sp. nov. Репродуктивный тракт паратипа из Западного Непала, зона Дхаулагери, р-н Мустанг, правый борт ущелья р. Сьянг-Хола, 1-2 км от пос. Сьянг, 26.09.1997.

AG – белковая железа; Em – эмбрионы в матке; HD – гермафродитный проток; PR – пениальный ретрактор; Pro – простата; SD – проток семеприемника; SR – резервуар семеприемника; VD – семепровод.

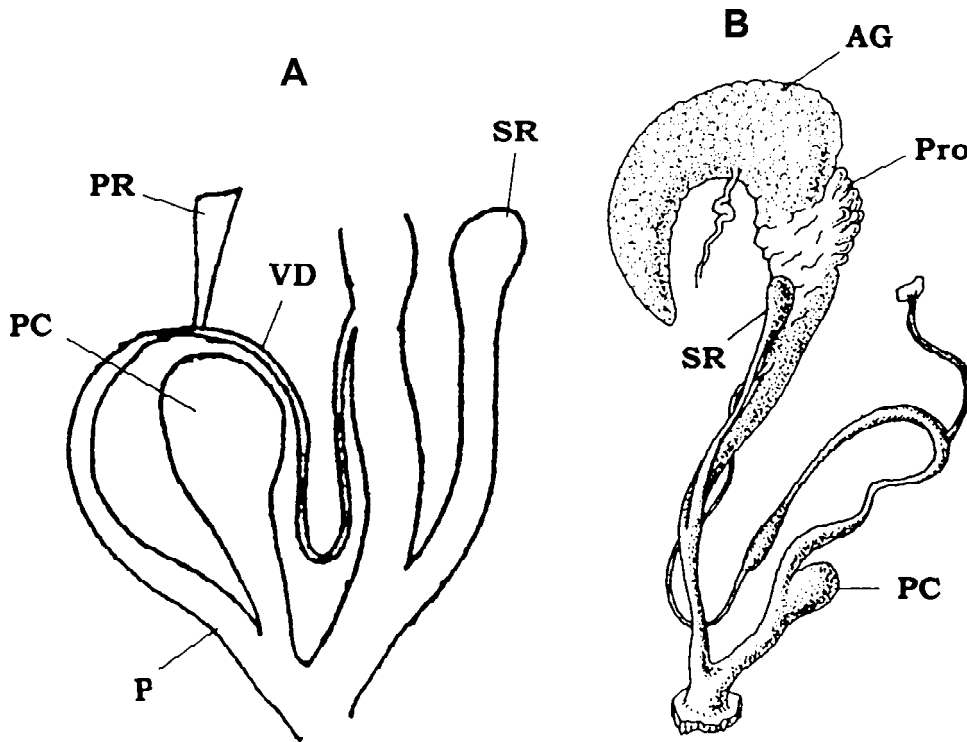


FIG. 4. Reproductive tract of *Pyramidula conica* Pilsbry et Hirase (A) and *Pyramidula pusilla* (Vallot) (B). PC – penial caecum. Other abbreviations as in Fig. 2. A – after Habe, 1956, B – after Schileiko, 1998.

РИС. 4. Репродуктивный тракт *Pyramidula conica* Pilsbry et Hirase (A) и *Pyramidula pusilla* (Vallot) (B). PC – пениальный цекум. Другие обозначения как на Рис. 3. А – по Habe, 1956, В – по Schileiko, 1998.

1996]. Since the degree of development of the distal parts of male section is strongly depends on the physiological condition of the animal, comparing the data presented by different authors sometimes could be incorrect.

Basically, the structure of reproductive tract of all *Pyramidula* species is simple and quite similar. Anatomically they could be split into two groups differing by the following characters: penis of *P. conica* (eastern group) markedly shorter and penial caecum is much larger than in European species (western group), has a short stalk and sits very close to the atrium. These differences gave Habe [1956] the basis to establish a separate subgenus *Pyramidulops* for *P. conica*.

Since the male section in studied specimens of *P. kuznetsovi* was strongly reduced and penial caecum as such was practically absent, it is hard to say, to which species it is closer, but we could suggest that it belongs to the western group, because it is hard to imagine that so big caecum as in *P. conica* could be reduced to such a degree as we observe in *P. kuznetsovi*. In this regard it should be noted that the specimens of *P. jaenensis*, *P. rupestris*, *P. pusilla*, and *P. umbilicata*, which have embryos in uterus (as in *P. kuznetsovi*), despite the fact that male section is also strongly reduced, penial caecum is

clearly developed [Martínez-Ortí *et al.*, 2007, p. 81, Figs 12, 17, 14, 18]. One can therefore assume that in *P. kuznetsovi* the penial caecum is absent.

Based on the foregoing, we join Japanese authors [Minato, 1988; Azuma, 1995] which consider it appropriate to revive the subgeneric name *Pyramidulops* and divide the genus *Pyramidula* into two subgenera: *Pyramidula* s. str. (type species *Helix rupestris* Draparnaud, 1801) with huge area from Europe to Central Asia and Himalaya, and *Pyramidulops* Habe, 1956 (type species *Pyramidula conica* Pilsbry et Hirase, 1902), distributed in Japan.

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- Pyramidula kuznetsovi** sp. nov. – новый вид наземных моллюсков из Непала (Pulmonata, Pyramidulidae)
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- Иллюстрированное описание раковины и репродуктивного тракта *Pyramidula kuznetsovi* sp. nov. Наличие хорошо развитого угла на периферии оборотов чётко отличают новый вид от всех известных представителей рода. Оба анатомически исследованных экземпляра находились в женской фазе, с хорошо развитыми эмбрионами в матке, тогда как дистальные части мужского отдела были сильно редуцированы. Поэтому судить об анатомических отличиях от близких видов не представляется возможным, в частности, остаётся открытым вопрос о наличии пениального цэкума.

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