

**THE LANDSNAIL FAMILY Subulinidae
(Gastropoda: Pulmonata) FROM SON LA, VIETNAM,
WITH DESCRIPTION OF TWO NEW SPECIES**

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ABSTRACT: The paper provided data on the landsnail family Subulinidae in Son La province, northwestern Vietnam. A total of nine species in three genera, viz., *Allopeas* Baker, 1935; *Prosopeas* Mörch, 1876 and *Tortaxis* Pilsbry, 1906 were recorded. Two new species are described, namely *Prosopeas muongbuensis* sp. n. from Muong Bu commune, Muong La district and *Tortaxis comaensis* sp. n. from Co Ma commune, Thuan Chau district. *Prosopeas muongbuensis* sp. n. is diagnosed by a cylindrical, medium-sized, thin, dextral, yellowish-brown shell; whorls convex and separated by an indented, relatively deep suture; callus thick and continued. *Tortaxis comaensis* sp. n. is recognized by a cylindrical, very large-sized, thick, yellowish-brown shell; whorls flattened and more coarsely ribbed; aperture subovate, oblique, with a thick peristome.

Keywords: Subulinidae, new species, landsnail, Son La, Vietnam.

INTRODUCTION

The pulmonate gastropod family Subulinidae Fischer & Crosse, 1877 is widely distributed in Central and South America, Africa, Central and South Asia. Not only be found in lands, members of the family are still found in islands in the Pacific and Atlantic Oceans [12, 25]. The family Subulinidae diagnosed by shell's size, specified cylindrical shapes, uniform colors and few decorations. They are one of the most diverse terrestrial gastropods with a wide variety of lifestyles, from ground dwelling species living hidden in the soil to tree climbing, arboreal species living in the canopy, gardens, orchards, residential areas [12].

In Vietnam, seven genera, viz., *Opeas* Albers, 1850; *Allopeas* Baker, 1935; *Curvella* Chaper, 1885; *Paropeas* Pilsbry, 1906; *Prosopeas* Mörch, 1876; *Subulina* Beck, 1837; and *Tortaxis* Pilsbry, 1906 are already known. Since 1950, however, no any species of the Subulinidae have been added to the list of 22 species previously reported from Vietnam [6, 15, 25].

Son La is a province in the northwestern

Vietnam, with a territory of 14,125 km². Son La topography is deeply differentiated and splitted forming many valleys, basins and alternating mountains with an average elevation of 600-700 m a.s.l. and variety of different kinds of habitats, e.g. natural forest, limestone mountains, plantation, gardens. Thus, it is believed that Son La will have a rich fauna of landsnails, which are very little known so far. At present, 32 species and subspecies in nine families of pulmonate landsnails are known from Son La [25]. The paper aims to provide faunistic data of subulinid species in Son La, with descriptions of two new species.

MATERIALS AND METHODS

Specimens were collected by hands from June 2012 to July 2014 in 34 localities from different habitats including limestone forests, caves, limestone karst and residential areas. Material was fixed and preserved in ethanol 70%. Empty shells were preserved in dry storage.

Description format, see Bavay et Dautzenberg (1903, 1908, 1909), Pilsbry (1906), and Pferffer (1861) [2, 3, 4, 22, 23]. Taxonomic terms follow Schileyko (2011) [25].

Shell height, shell width, aperture height, aperture width and whorls, were measured for identification.

A total of 2,750 specimens was examined. All specimens are deposited in Soil Organism Research Center (SORC) of Hanoi National University of Education (HNUE), Vietnam National Museum of Nature (VNMN), and Hanoi National University of Education Museum of Biology (HNUEM).

Abbreviations used in this paper are as follows: H=shell height; D=shell width; HA=aperture height; DA=aperture width; ag=albumin gland; hd=hermaphroditic duct; uv=oviduct; sd=vas deferens; pd=gametolytic sac; gm=multifid gland; v=vagina; og=atrium; p=penis; fl=flagellum; di=diverticulum; n=appendix; ss=sperm sac; SORC=Soil Organism Research Center; HNUE=Hanoi National University of Education.

RESULTS AND DISCUSSION

Family Subulinidae Fischer et Crosse, 1877

Subfamily Subulininae Fischer et Crosse, 1877

Genus *Allopeas* Baker, 1935

Allopeas Baker, 1935: 84.

Type species: *Bulimus gracilis* Hutton, 1834.

Allopeas gracile (Hutton, 1834) (Fig. 1A)

Bulimus gracilis Hutton, 1834: 84; *Bulimus oparanus* - Pfeiffer, 1846: 34; *Bulimus oparanus* - Reeve, 1848 (1848-1849): pl. 69, fig. 495; *Opeas gracilis* - Morlet, 1891: 232; *Opeas gracile* - Möllendorff, 1900: 134; *Opeas gracilis* - Fischer & Dautzenberg, 1904: 22; *Opeas indicus* - Dautzenberg & Fischer, 1905: 102; *Opeas indicus* - Ehrmann, 1922: 17; *Stenogyra gracilis* - Martens, 1867: 83, 375, pl. 19, fig. 5, pl. 22, fig. 13; *Allopeas gracile* - Schileyko, 2011: 9.

Type locality: India, Mirzapur [14].

Material examined: 20 shells (SORC 1401): Bon village, Bon Phang commune, Thuan Chau district (21°23'04.5"N; 103°46'39.1"E; 595 m a.s.l.), limestone mountain, 06.8.2013, coll. Do Duc Sang; 20

shells (SORC 1402): Lech village, Co Noi commune, Mai Son district (21°7'31"N; 104°9'18"E; 685 m), limestone mountain, 02.11.2013, coll. Do Duc Sang & Phung Thi Ngoc.

Diagnosis: Shell subcylindrical, small and yellow. Shell surface with very fine growth lines to nearly smooth. Last whorl accounting for 1/2 shell height, suture deep. Apex acute, aperture ovate, lip simple. Callus thin, transparent. Umbilicus narrow.

Measurements: H 10.2-13.5 mm, D 3.0-3.5 mm, H/D 3.5-3.9, W 8-9.

Previous records: Bac Giang [8].

Remarks: The species is widely distributed in Asia, Center and South America, and Pacific islands [25]. In Son La, it has been found in disturbed habitats, e.g. gardens, orchards and residential areas.

Genus *Prosopeas* Mörch, 1876

Bulimus (Prosopeas) Mörch, 1876: 358.

Type species: *Bulimus (Prosopeas) reopstorfi* Mörch, 1876.

Prosopeas anceyi Pilsbry, 1906 (Fig. 1B)

Prosopeas anceyi Pilsbry, 1906: 33, pl. 6, figs. 72, 73, nom. nov. Pro; *Prosopeas macilentum* - Ancey, 1903 (in Bavay & Dautzenberg, 1903: 220, pl. 9, figs. 23, 24., which had been pre-occupied; *Prosopeas* - Jaekel, 1950: 17; *Prosopeas anceyi* - Schileyko, 2011: 10.

Type locality: Vietnam, Bac Kan [23].

Material examined: 20 shells (SORC 1403): Na Loong village, Muong Bu commune, Muong La district (21°23'28.1"N; 104°02'48"E; 679 m), limestone mountain, 07.8.2012, coll. Do Duc Sang & Bui Ngoc Cuong; 15 shells (SORC 1404), Na An village, Xuan Nha commune, Van Ho district (20°43'59.6"N; 104°46'56"E; 346 m), natural forest, 10.11.2013, coll. Do Duc Sang.

Diagnosis: Shell subcylindrical, small and opaque white. Whorls slowly increasing, last whorl accounting for 1/2 shell height. Suture

shallow. Apex blunt. Aperture conic-ovate. Umbilicus narrow.

Measurements: H 14.5-17.0 mm, D 3.2-3.6 mm, H/D 4.5-4.8, W 9-10.

Previous records: Bac Kan [23].

Remarks: This species is similar to the *Prosopeas lavillei*, but can be distinguished by the smaller shell, H/D 4.7 (versus 3.5). The species has been known only from Vietnam (Bac Kan) [23].

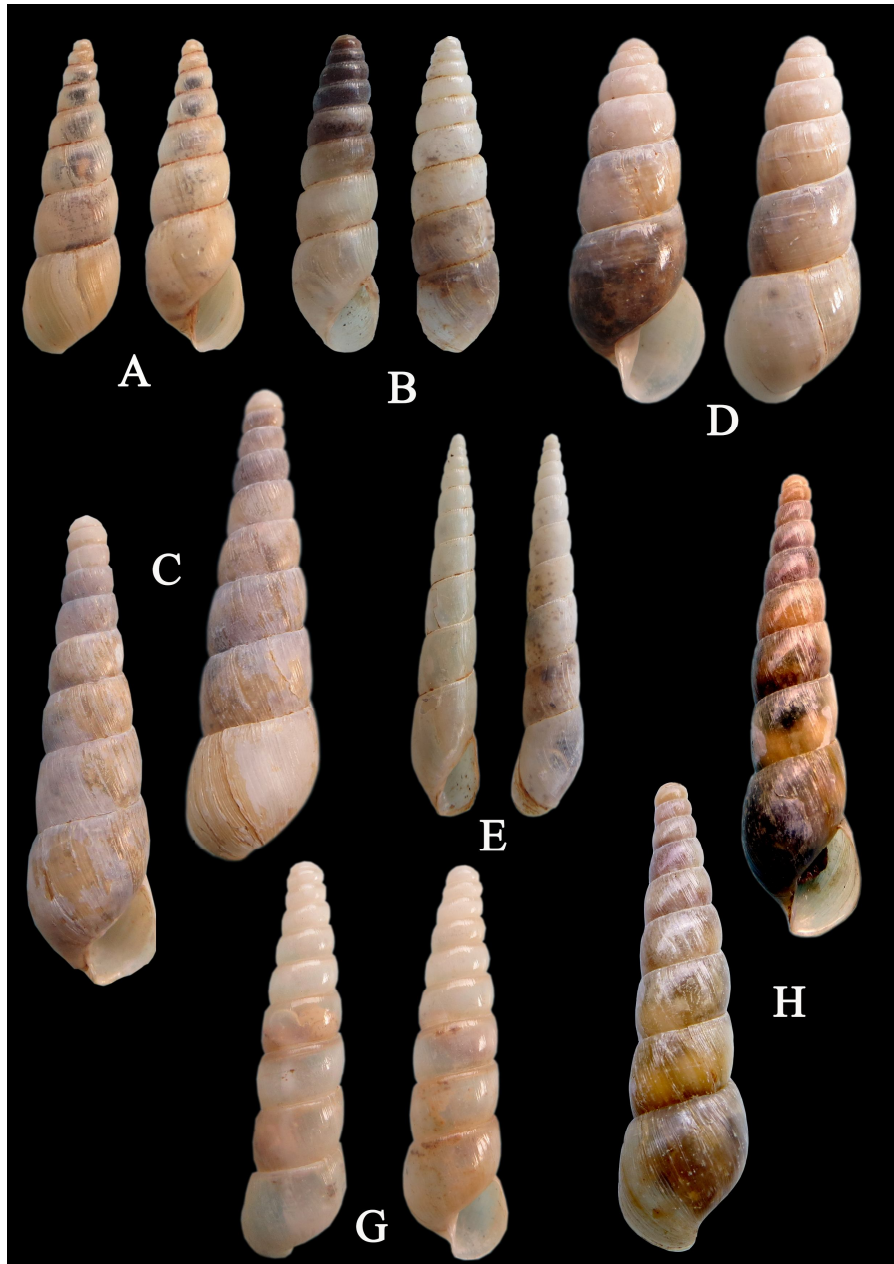


Figure 1. Shell of Subulinidae in Son La

A. *Allopeas gracile*; B. *Prosopeas anceyi*; C. *Prosopeas excellens*; D. *Prosopeas ventrosulum*;
E. *Tortaxis elongatissimus*; G. *Tortaxis lubricus*; H. *Tortaxis papillosa*.

Prosopeas excellens Bavay et Dautzenberg, 1908 (Fig. 1C)

Prosopeas excellens Bavay & Dautzenberg, 1908: 247; *Prosopeas excellens* - Bavay & Dautzenberg 1909: 182, pl. 10, figs. 11, 12; *Prosopeas excellens* - Jaeckel, 1950: 17; *Prosopeas excellens* - Schileyko, 2011: 10.

Type locality: Vietnam, Lai Chau, Phong Tho [3].

Material examined: 15 shells (SORC 1405): Co My village, Chieng Bom commune, Thuan Chau district (21°22'19.8"N; 103°37'27"E; 1,457 m), natural forest, 13.06.2013, coll. Do Duc Sang & Nguyen Thi Huyen; 10 shells (SORC 1406): Pa Cop village, Van Ho commune, Van Ho district (20°45'56"N; 104°44'30"E; 1,013 m), limestone mountain, 26.10.2013, coll. Do Duc Sang & Nguyen Thanh Lap.

Diagnosis: Shell cylindrical, large and pale yellow. Whorls slowly increasing, last whorl accounting for 2/5 shell height. Suture shallow and wide. Shell surface with very fine growth lines. Apex smooth, glossy, more or less rounded. Aperture conic-ovate; parietal callus thin, translucent. Umbilicus narrow.

Measurements: H 38.2-41 mm, D 9.2-10.4 mm, H/D 4.0-4.2, W 9-10.

Previous records: Lai Chau (Phong Tho, Muong Te) [3].

Remarks: This species differs from the *Prosopeas lavillei* by the larger shell, whorls 9-10 (versus 11). The species is mainly distributed in limestone forests, and only known from Vietnam (Lai Chau) [3].

Prosopeas ventrosulum Bavay et Dautzenberg, 1908 (Fig. 1D)

Prosopeas ventrosulum Bavay & Dautzenberg, 1908: 248; *Prosopeas ventrosulum* - Bavay & Dautzenberg, 1909: 283, pl. 10, figs. 13, 14; *Prosopeas ventrosulum* - Jaeckel, 1950: 17; *Prosopeas ventrosulum* - Schileyko, 2011: 10.

Type locality: Vietnam, Lai Chau, Phong Tho [3].

Material examined: 10 shells (SORC 1407): Na Luong village, Chieng Pac commune, Thuan Chau district (21°26'6"N; 103°45'44.5"E; 549 m), limestone mountain, 12.5.2014, coll. Do Duc Sang; 15 shells (SORC 1408): Na Ha village, Chieng Mung commune, Mai Son district (21°14'16.3"N; 104°00'51.7"E; 667 m), limestone mountain, 16.10.2012, coll. Doan Thi Hoa.

Diagnosis: Shell subcylindrical, medium sized, thickened. Whorls convex and regularly increasing, last whorl large, accounting for 1/2 shell height. Apex blunt, spire elevated. Suture wide. Callus thick. Umbilicus deep and wide.

Measurements: H 15.1-17.5 mm, D 6.0-6.5 mm, H/D 2.5-2.7, W 7.

Previous records: Lai Chau (Phong Tho) [3].

Remarks: This species clearly differs from *P. anceyi* and *P. excellens* by expanded last whorl. It differs from *P. excellens* in having a smooth shell surface and much smaller shell size. The species has been known only from Vietnam (Lai Chau) [3].

***Prosopeas muongbuensis* Do sp. n.**
(Fig. 2. A-C)

Examined material: *Holotype* (SORC 1415): Nang Phai village, Muong Bu commune, Muong La district, Son La province, Vietnam (21°25'26"N, 104°01'34"E, 711 m a.s.l.), limestone karst, 12.10.2013, coll. Do Duc Sang. *Paratypes* (SORC 1416): 20 shells, same data.

Diagnosis: Shell cylindrical, medium-sized, thin, yellowish-brown. Whorls convex and separated by an indented, relatively deep suture; callus thick and continued.

Description: Shell dextral, cylindrical, thin but rather strong, yellowish-corneous, slightly translucent, cylindrical-turritid, the apex obtuse. Whorls 6-6½, quite convex, the apex rounded, rather large, first two whorls smooth, the rest striatulate, the striae a trifle stronger and retracted near the suture. Suture wide and deep. Aperture small, ovate, slightly oblique, the outer lip thin, arched forward above. Columella concave above, then convex. Callus colour white, thick and continued. Umbilicus very narrow.

Measurements: Holotype: H 17.2 mm, D 6.9 mm, HA 6.3 mm, DA 4.8 mm, W 6. Paratypes (n=20): H: 16.5-19.0 mm, mean 17.9 mm; D: 6.3-7.1 mm, mean 6.7 mm; HA 6.6-7.0 mm; DA 4.6-5.0 mm; W 6-6½.

Etymology: Named after the type locality, Muong Bu commune.

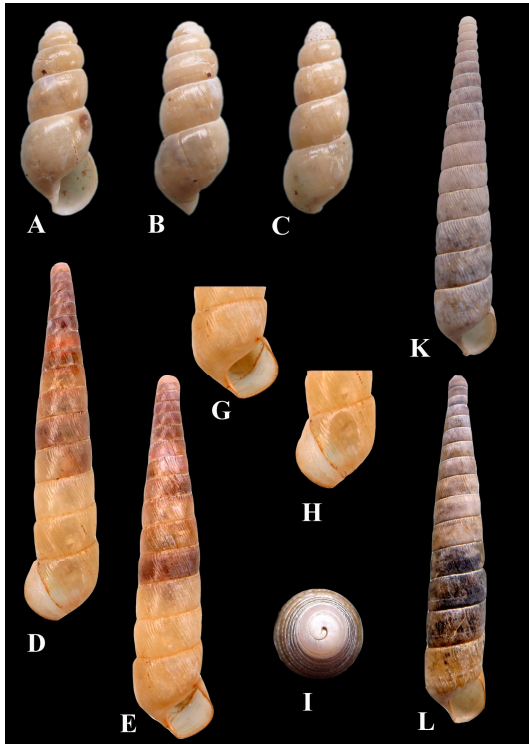


Figure 2. A-C, *Prosopeas muongbuensis* sp. n.: Holotype (SORC 1415): A, ventral view; B, lateral view; C, dorsal view; D-L, *Tortaxis comaensis* sp. n.: Holotype (SORC 1417): D, dorsal view; E, ventral view; G, H, last whorl; I, apex; K-L, Paratypes (SORC 1418).

Habitats: The new species has been found in limestone karst area of Son La Province: Na San plateau; Copia Natural Reserve; Muong Bu commune (type locality); Chieng Bang commune, Quynh Nhai district; Ta Khoa commune, Bac Yen district.

Remarks: A new species is fairly similar to *Prosopeas ventrosulum* Bavay & Dautzenberg, 1908 by having shell cylindrical with a blunt apex; teleoconch whorls convex and separated

by a deep suture; aperture ovate with the outer lip thin. However, it differs from *P. ventrosulum* from Lai Chau in the larger shell, yellowish-white color, less coarsely sculpture, 6-6½ (versus 7), the thinner callus, and narrower umbilicus. To date, no living specimens have been found.

Subfamily Rishetiinae Schileyko, 1999

Genus *Tortaxis* Pilsbry, 1906

Tortaxis Pilsbry, 1906 (1906-1907): 5.

Type species: *Achatina erecta* Benson, 1842.

Tortaxis elongatissimus Bavay et Dautzenberg, 1908 (Fig. 1E)

Tortaxis elongatissimus Bavay & Dautzenberg, 1908: 247; *Tortaxis elongatissimus* Bavay & Dautzenberg, 1909: 281, pl. 10, figs. 9, 10; *Tortaxis elongatissimus* Jaekel, 1950: 17; *Tortaxis elongatissimus* Schileyko, 2011: 10.

Type locality: Vietnam, Son La, Van Ho [3].

Material examined: 15 shells (SORC 1409): Pa Kha village, Long Luong commune, Van Ho district (21°47'7.1"N; 104°50'20"E; 1.107 m), natural forest, 04.7.2014, coll. Do Duc Sang & Sin Van Thuong; 10 shells (SORC 1410): Ban On cave, Moc Chau district (21°01'28.6"N; 103°58'52.2"E; 895 m), limestone karst, 27.6.2013, coll. Do Duc Sang & Nguyen Thanh Lap.

Diagnosis: Shell elongate conic, medium sized and pale yellow. Whorls flat and regularly increasing; last whorl large, accounting for 2/5 shell height. Apex acute. Aperture small and triangle; the outer lip thin. Callus thin. Umbilicus very narrow.

Measurements: H 26.2-28.5 mm, D 4.2-4.5 mm, H/D 6.0-6.3, W 13-14.

Previous records: Son La (Van Ho) [3].

Remarks: This species differs from *Tortaxis lubricus* and *T. mira* by having teleoconch whorls more coarsely ribbed; shell width more narrowly developed; suture shallower. It differs from *T. lubricus* by having a weakly shell and more whorls. The species has been known only from Vietnam [3].

Tortaxis lubricus Pilsbry, 1906 (Fig. 1G)

Tortaxis lubricus Pilsbry, 1906: 11, pl. 2, figs. 30, 31.

Tortaxis lubricus Schileyko, 2011: 10.

Type locality: Vietnam, Hai Phong [23].

Material examined: 20 shells (SORC 1411): Na Tre village, Chieng Ban commune, Mai Son district (21°14'20"N; 103°55'57.3"E; 651 m), limestone mountain, 12.9.2013, coll. Do Duc Sang; 20 shells (SORC 1412): Nha Nhung cave, Chieng On commune, Yen Chau district (20°58'42.4"N; 104°10'10.6"E; 802 m), limestone mountain, 26.9.2012, coll. Do Duc Sang & Bui Ngoc Cuong.

Diagnosis: Shell elongate cylindrical, medium sized and pale brown. Whorls convex and regularly increasing; last whorl large, accounting for 2/5 shell height. Suture deep and wide. Apex blunt. Umbilicus narrow.

Measurements: H 23.1-25.2 mm, D 5.3-6 mm, H/D 4.2-4.4, W 9.

Previous records: Hai Phong [23].

Remarks: This species is similar to the *Tortaxis pilsbryi* from Bac Kan, but can be distinguished by the smaller shell with light colour, more convex whorls and mostly regularly increasing.

Tortaxis papillosa Dautzenberg et Fischer, 1908 (Fig. 1H)

Tortaxis papillosa Dautzenberg & Fischer, 1908: 193, pl. 5, figs. 19, 20.

Tortaxis papillosa Schileyko, 2011: 11.

Type locality: Vietnam, Cao Bang, Thach An [8].

Material examined: 20 shells (SORC 1413): Cha May village, Co Ma commune, Thuan Chau district (21°20'46.7"N; 103°31'38.5"E; 1,391 m), natural forest, 13.06.2013, coll. Do Duc Sang & Nguyen Thi Huyen; 10 shells (SORC 1414): Pa Che village, Van Ho commune, Van Ho district (20°47'07.1"N; 104°45'20.8"E; 1,050 m), limestone mountain, 26.10.2013, coll. Do Duc Sang & Nguyen Thanh Lap.

Diagnosis: Shell cylindrically elongate,

large sized, glossy and pale yellow. Whorls convex and regularly increasing. Shell surface with fine growth lines to smooth. Suture deep and wide. Apex blunt. Aperture ovate. Umbilicus narrow.

Measurements: H 40.4-44.5 mm, D 9.5-11.1 mm, H/D 4.0-4.3, W 11½-12.

Previous records: Cao Bang (Thach An) [8].

Remarks: The species is similar to *Tortaxis pilsbryi*, but can be distinguished by the larger shell with light colour, more convex whorls. Our specimens differs from original description in having a coarsely rib-striated shell and much larger shell size.

Tortaxis comaensis Do sp. n.

(Fig. 2.D-L, 3.A-C)

Examined material: *Holotype* (SORC 1417): Co Ma Commune, Thuan Chau District, Son La Province, Vietnam (21°21'25"N, 103°31'18"E, 1,246 m a.s.l.), limestone mountain, 08.6.2013, coll. Do Duc Sang. *Paratype* (SORC 1418): 15 shells, same data.

Diagnosis: Shell cylindrical, very large-sized, thickened, yellowish-brown. Whorls flat and more coarsely ribbed; aperture subovate, oblique, with a thick peristome

Description: *Shell.* Shell very large, dextral, cylindrical, thickened; apex smooth, more or less rounded with inconspicuous growth lines; whorls 16-17 flat becoming increasing regular; shell surface with coarse growth lines which are more rib-like on the more narrowly sculptured, protoconch glossy; colour uniformly yellow, fairly glossy; suture shallow and impressed; aperture subovate, oblique with a simple lip; callus thin and uninterrupted; peristome single, contacting the body whorl and closing the umbilicus.

Genitalia. Oviduct with thin tube, connected between ovary and uterus; penis long, large, proximally cylindrical, and distally forming a swollen globular structure; flagellum long and slender; vas deferens long and thin, entering the epiphallus laterally; vagina long and wide, forming a long, uniform tube with the basally swollen pedunculus; gametolytic sac large, stomach-like; multifid gland with well-

developed 6 fibers; hermaphroditic duct slender and convoluted; hermaphroditic gland forming multiple clumped alveoli embedded in digestive gland (fig. 3A).

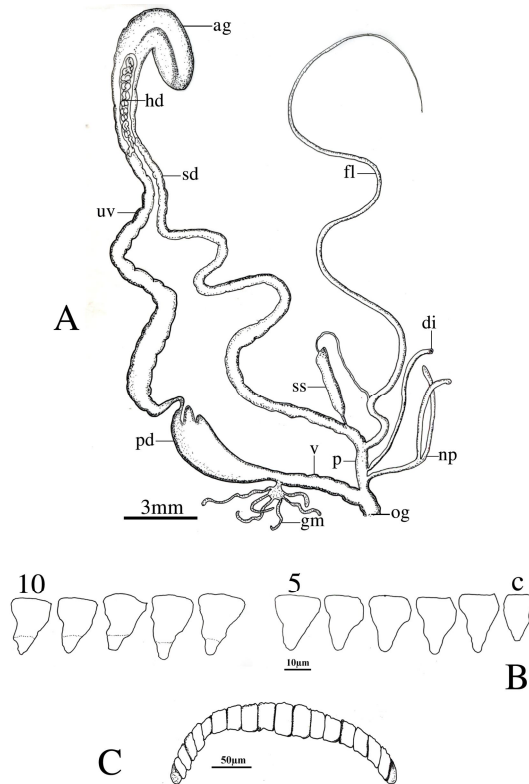


Figure 3. Reproductive system (A), radula (B) and jaw (C) of *Tortaxis comaensis* sp. n.

Radula. Teeth arranged in line-shaped rows, each row with about 43 teeth (11 : 10 : 1 : 10 : 11); A central tooth small, triangle with pointed cusp, latero-marginal teeth arranged in triangle shaped and undifferentiated; marginal teeth size decreasing from the inside out; the jaw significantly less curvature (fig. 4B, 4C).

Measurements. Holotype: H 64.0 mm, D 10.2 mm, HA 10.13 mm, DA 6.24 mm; W 17. Paratypes (n=15): H: 56.1-66.4 mm, mean 60.3 mm; D: 9.8-11.1 mm, mean 10.1 mm; HA 9.5-10.4 mm; DA 6.0-7.3 mm; W 16-17.

Etymology: Named after the type locality, Co Ma commune.

Habitats: New species has been found in limestone forests.

Remarks: This species is most similar to the *Tortaxis papillosa* Dautzenberg & Fischer, 1908. However, it is distinguished from *T. papillosa* by having larger shell with light colour, more whorls (17 versus 12). It also differs from the other *Tortaxis* species in Vietnam (*T. elongatissimus*, *T. erectus*, *T. lubricus*, *T. mira*, *T. permira*, *T. pilsbry* and *T. servaini*) by having larger shell, more whorls.

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**HỌ ỐC CẠN Subulinidae (Gastropoda: Pulmonata)
Ở SƠN LA VÀ MÔ TẢ HAI LOÀI MỚI**

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TÓM TẮT

Các loài ốc cạn họ Subulinidae phân bố rộng ở nhiều vùng nhiệt đới trên thế giới, chúng xuất hiện trong các môi trường có độ ẩm cao như rừng trên núi đá vôi, hang động, núi đá vôi, một số còn mở rộng ra khu dân cư, các sinh cảnh nông nghiệp và gây hại cho cây trồng. Tổng cộng đã có 9 loài thuộc 3 giống của Subulinidae được phát hiện ở tỉnh Sơn La. Trong số này, hai loài *Prosopeas muongbuensis* sp. n. và *Tortaxis comaensis* sp. n. được mô tả mới cho khoa học; 6 loài, *Allopeas gracile*, *Prosopeas anceyi*, *P. excellens*, *P. ventrosulum*, *Tortaxis lubricus* và *T. papillosa* được bổ sung cho khu hệ ốc cạn tỉnh Sơn La.

Từ khóa: Subulinidae, ốc cạn, loài mới, Sơn La, Việt Nam.

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