

Andrzej WIKTOR

**New Slug Species (*Pulmonata: Milacidae and Limacidae*)
from the Balkan Peninsula**

[With 20 Text-figures]

The Balkan Peninsula is one of the most malacologically interesting areas of Europe, and it has played an important role in the history of the polyphyletic group of slugs as a centre from which they spread and where endemic forms arose. This area has not hitherto been studied sufficiently and it may be expected that more new species will be discovered there, especially species of a narrow distribution.

A considerable part of the materials on the basis of which the present paper has been written had been gathered by Hungarian malacologists and delivered to me for study and description by Mr. Laszlo PINTÉR in Budapest. I wish to thank Mr. PINTÉR for this favour and express my thanks also to the remainder of the gatherers. Also, I wish to extend my thanks to Dr. Oliver E. PAGET in Vienna for lending me the types necessary for the clarification of some taxonomic problems.

In the specification of the evidential material the abbreviations have been given of the museums in which the typical material is kept. These are:

TMB — Természettudományi Múzeum Allattara, Budapest,

MZW — Muzeum Zoologiczne Uniw. Wrocławskiego, Wrocław.

Milax (Tandonia) pinteri sp.n. (Figs. 1–6)

Material: Cudni Mostove (= Erkruprija), Rodopi — Bulgaria. A mixed forest with the spruce, pine, sycamore and beech, at a height of 1450 m; leg. A. WIKTOR, 10–11 June, 1969. A holotype and 12 paratypes (including 8 juv.), MZW; Erkruprija, near the bridges, leg. L. PINTÉR 8 July, 1973, 8 paratypes, TMB; Erkruprija, near a forest shelter-home, leg. L. PINTÉR, 8 July, 1973, 2 paratypes, TMB; Smolian-Ustovo, Rodopi — Bulgaria,

hornbeam and beech scrubs on a brook, leg. A. WIKTOR, 20 May, 1967, 4 paratypes, MZW; Deven, Rodopi – Bulgaria, hornbeam scrubs with single walnut-trees on a brook, leg. A. WIKTOR, 21 May, 1967, 9 paratypes, MZW.

The body length of the alcohol-preserved specimens comes up to 52 mm. Most of the specimens with full-developed reproductive organs are of a clearly smaller body size, namely, a body length of 30–35 mm, and a mantle length

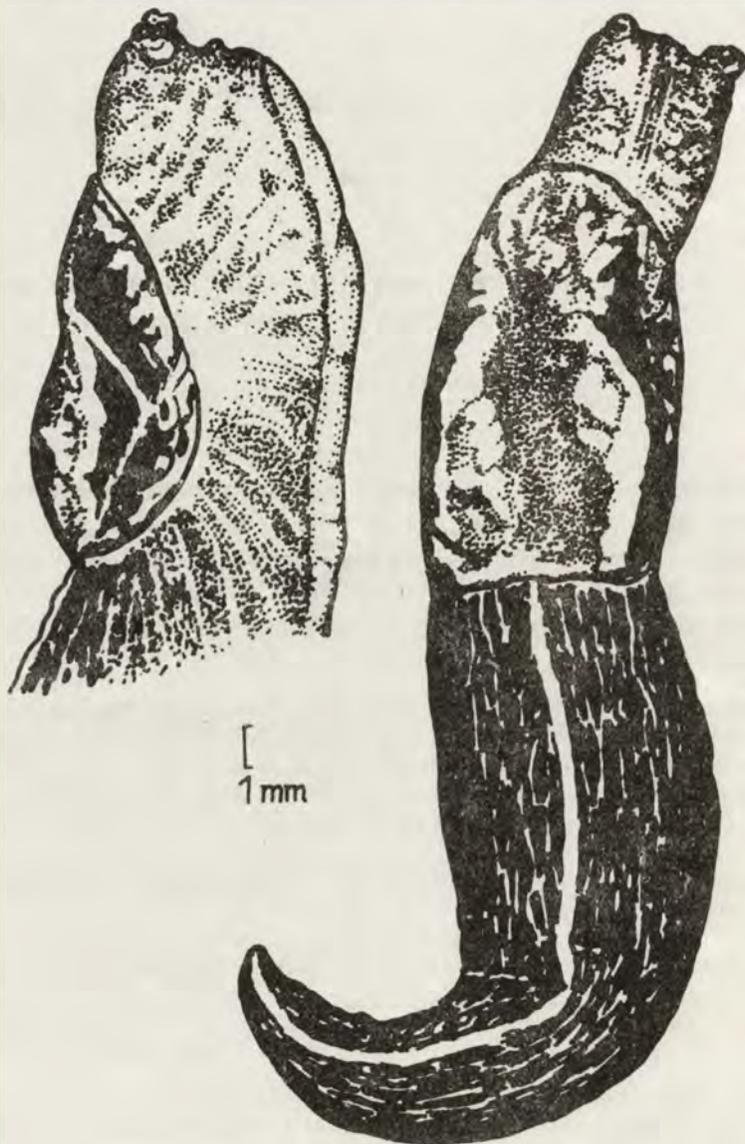


Fig. 1. *Milax (Tandonia) pinteri* sp. n. — a specimen seen from above and from one side (a paratype caught together with the holotype).

of 10–12 mm. The body is slender, its posterior end tapering gradually. The furrows in the mantle are poorly developed, and so are the skin ridges or “wrinkles” which are very fine and little-arched. There are 11 skin wrinkles between the dorsal medial line and the respiratory orifice.

Body colour. The back of the body is almost black. The sides become lighter and lighter in colour downwards. In addition, among the dark pigmented areas there are brownish cream-coloured spots (Fig. 1). On the sides of the body in many individuals, especially on the posterior end, where the overall pigmentation is dark-gray, or blackish, single, completely black round spots are found (similar to those in *Milax serbicus* WAGN.). Although it occurs in small amounts, the dark pigment reaches the lower part of the body, as far as to the edge of the foot. The mantle has a very characteristic pattern consisting of two irregular completely black lateral streaks. Their lower borders are ragged, and they finally pass into loosely scattered spots. The upper borders of these streaks, although they are in fact irregular, do not pass into a system of scattered spots. The upper borders of the lateral streaks are already within the area enclosed by a horseshoe-shaped groove. In the middle of the mantle there is a dark-gray, or blackish patch. It is fairly well-marked-off, because between this concentra-

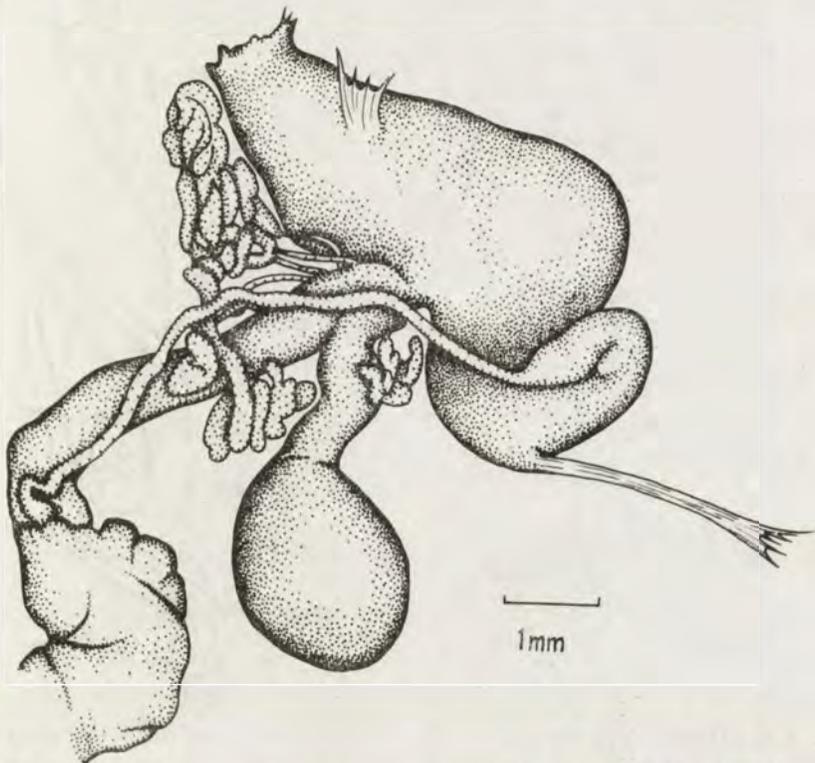
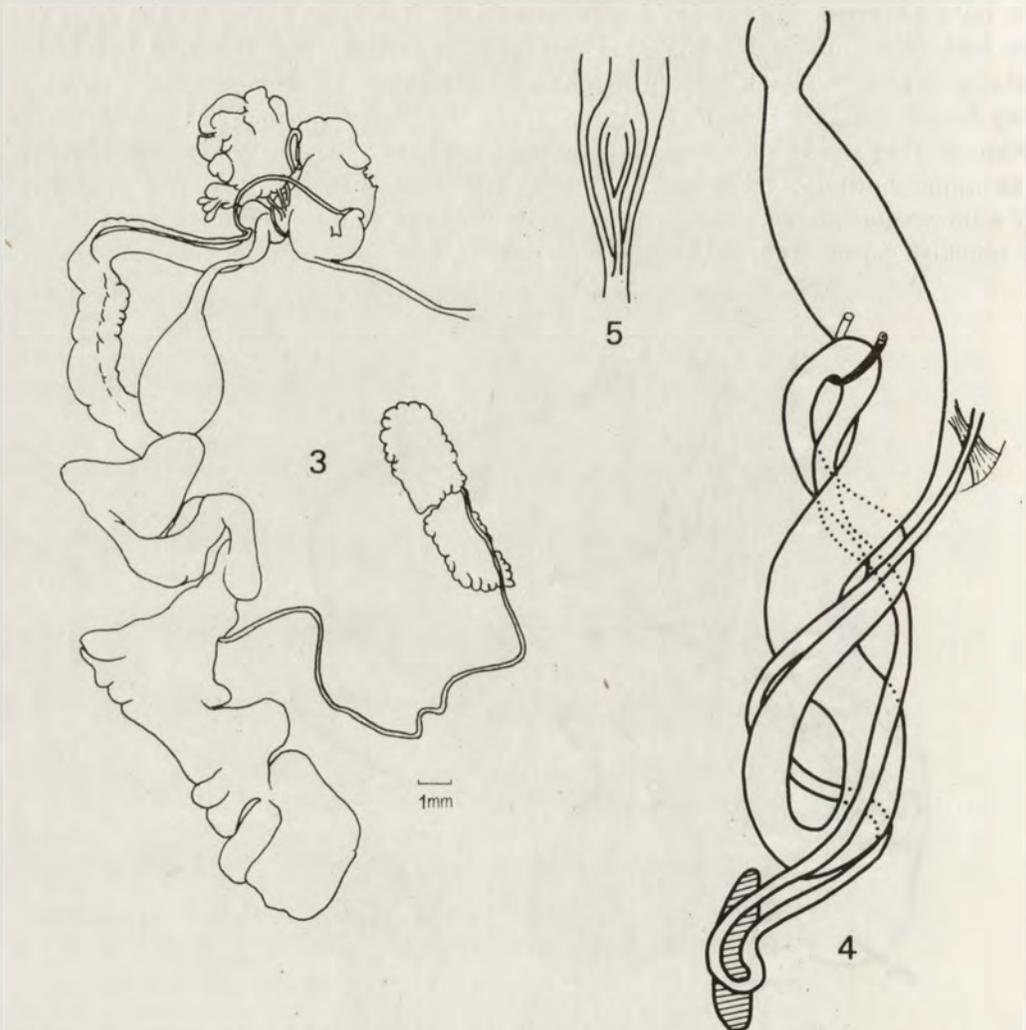


Fig. 2. *Milax (Tandonia) pinteri* sp. n. — the genital system (holotype).

tion of the black pigment and the completely dark lateral streaks there are two brownish cream-coloured streaks devoid of black pigment. The largest specimens collected at Deven are of a somewhat lighter colour. Their backs are dark-gray with a brown hue. Possibly, this is due to a slight maceration which the specimens may have undergone. In all the specimens the head and neck are blackish, whereas the sole is brownish cream-coloured.

The reproductive organs (Figs. 2, 3). The whitish ovotestis lies almost at the end of the visceral sac (Fig. 4). The hermaphrodite duct appears to be thin and markedly long. The albumen gland is far in the anterior area, as far as



Figs. 3-5. *Milax (Tandonia) pinteri* sp. n. 3 — a diagram showing the entire genital system (a paratype from Erkruprija, leg. PINTÉR, 8 July, 1973). 4 — the alimentary system; the shaded area represents the location of the ovotestis (holotype). 5 — the cephalic muscle.

in the mantle region. It is of an elongate shape. The vas deferens is thin and long. The very short epiphallus resembles a cone with its top directed towards the front of the body. Very short, too, is the penis which is of an irregular shape; in its outline it resembles a sphere. The spermatheca is large and oval in shape and its duct is relatively long, longer than the spermatheca itself. There is a wide, tube-shaped oviduct. The vagina, which is slightly wider than the oviduct, is very short. Very short, too, is the atrium whose anterior part tapers slightly. There is no stimulator in it. Both the spermatheca duct and vagina open into the atrium laterally. The cream-coloured vaginal glands are of the shape of elongate strongly pressed bands. From them several canals extend which lead into the female duct. The retractor muscle of the penis appears to be thin and attached laterally.

The radula (Fig. 6). A characteristic feature is the arrangement of the ectocones and endocones at wide intervals. The radula formula is 6.15.36/x 137.

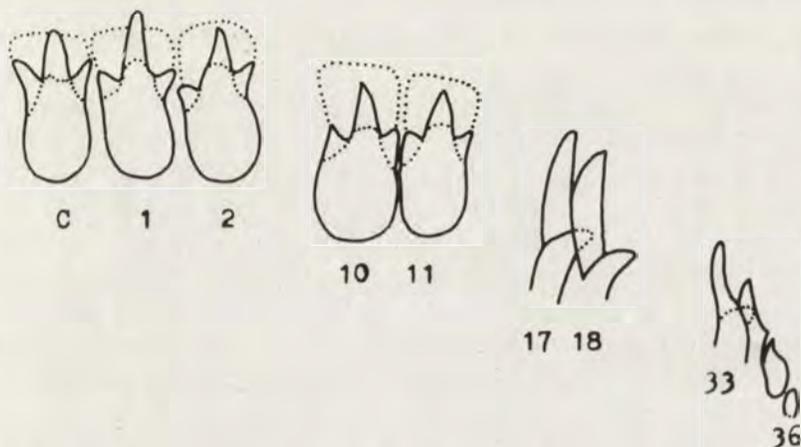


Fig. 6. *Milax (Tandonia) pinteri* sp. n. — radular teeth (a paratype caught at the same time as the holotype).

The alimentary system consists of a series of coils, as seen in Figure 4. The cephalic muscle can be seen in Figure 5.

The ecology. This species lives in areas which are well shaded and with a fairly high level of soil moisture. Specimens were found on limestone rocks and on sandstone substrata. All the habitats where the specimens were found were at small heights, that is, below 1500 m.

Notes. In its external features the species somewhat resembles *Milax (M.) caucasicus* SIMR., but it differs from all the species known so far by the structure of its reproductive organs.

The species has been named in honour of Mr. Laszlo PINTÉR, a Hungarian malacologist.

Milax (Subamalia) totevi sp.n. (Figs. 7-12)

Material: Deven, Bulgaria — Radopi: specimens found by a garden-wall within a town built-up area, leg. A. WIKTOR, 21 May, 1967. A holotype and 7 paratypes, MZW.

This species belongs to the largest representatives of the family *Milacidae*. The longest of the alcohol-preserved specimens is 75 mm in body-length, its reproductive organs being still not fully developed. The holotype, whose ovotestis is in the male phase of the reproductive activity, is 70 mm in body-length, and its mantle is 24 mm long. All the individuals smaller than the holotype are still entirely juvenile, with reproductive organs in the form of primordia. The posterior end of the mantle is broadly rounded and slightly indented in the middle. The horseshoe-shaped grooves in the mantle are little-developed, and shallow. The respiratory orifice is very small. The back is broad, gently arched, and the short keel is only 1 cm long. The ridges, or wrinkles on the skin are slightly arched and small; their number, from the medial line of the back to the respiratory orifice, is 21.

Body colour (Fig. 7). In its body colour and shape the species is very similar to *Limax flavus* L., The similarity is so great that specimens of the two species collected simultaneously could only be differentiated on close examination following preservation. The back, the mantle, and partly the sides of the body are of a blackish olive colour, with small olive, or brownish cream-coloured spots showing, as it were, through the skin all over the body surface. In the lower part of the body sides the blackish pigment becomes less intense and the light-coloured spots grow in number steadily. Finally, near the edge of the foot there is no dark pigment at all. Olive-coloured are also the keel and the streak, about 1.5 mm in width, that runs in continuation of the keel to the mantle. The entire sole of the foot is brownish cream-coloured.

The colour of the mucus was not recorded in the field. The alcohol, in which the slugs were preserved, stained yellow, as in the case of preserving slugs with a yellow mucus.

The reproductive organs (Fig. 8). Completely developed copulatory organs were only found in the holotype. In the paratypes, although they were still juvenile individuals, the reproductive organ primordia showed the specific features concordant with the holotype. The ovotestis lies at the very end of the viscera (Fig. 10). It is found to be relatively large in the holotype, while the albumen gland is comparatively small. This indicates that at the time of its collecting the slug was in the male phase of the reproductive activity. The hermaphrodite duct is thin and coiled. Thin, too, is the vas deferens. The epiphallus is of the shape of a tube bent forward. The penis, of a comparatively small size, is of the shape of a bobbin. In the anterior part of this organ there is a swelling of the wall in the form of a callosity. The penis retractor muscle, thread-like, as though of a vestigial nature, is attached laterally. The glans penis forms a ring of wrinkles inside the penis. The oviduct is tube-shaped, more

or less of the same diameter as the epiphallus. Of the same diameter is the short vagina. The vaginal glands which are small, strongly compact, adhere to the female duct. The spermatheca is alongate in shape, slightly narrowed

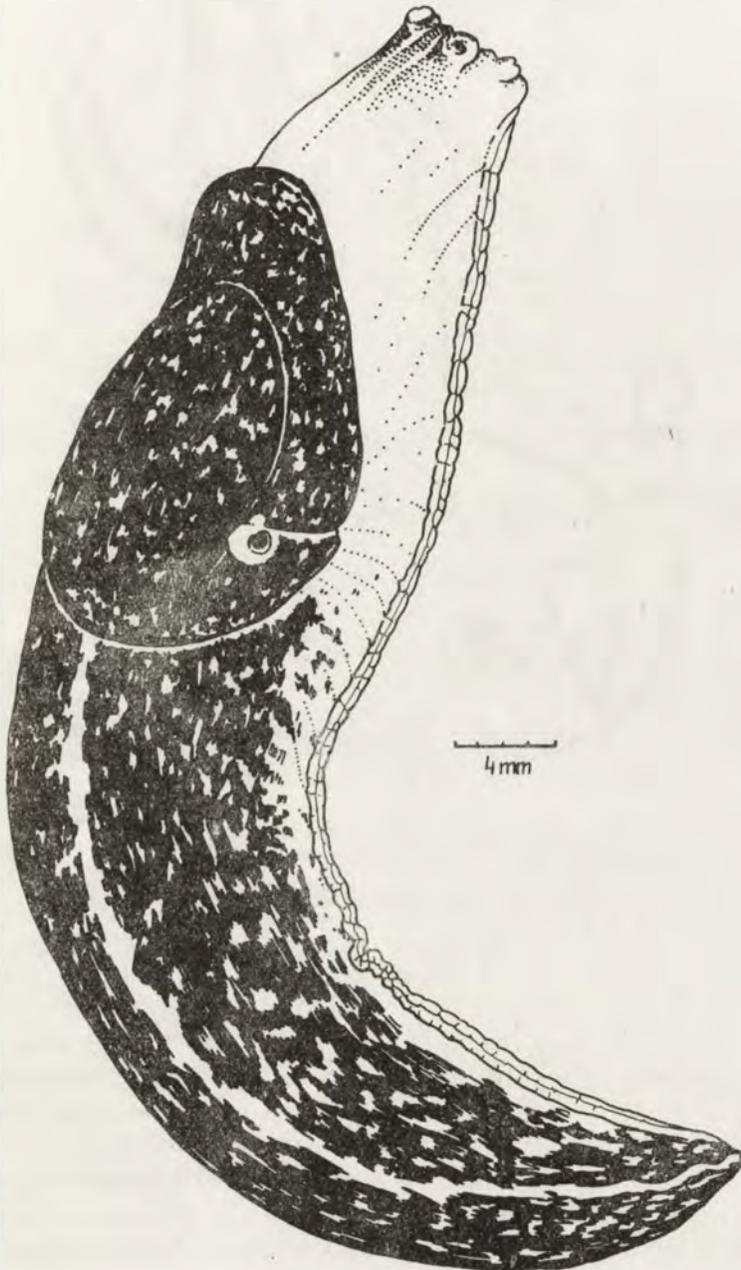


Fig. 7. *Milax (Subamalia) totevi* sp. n. — a paratype.

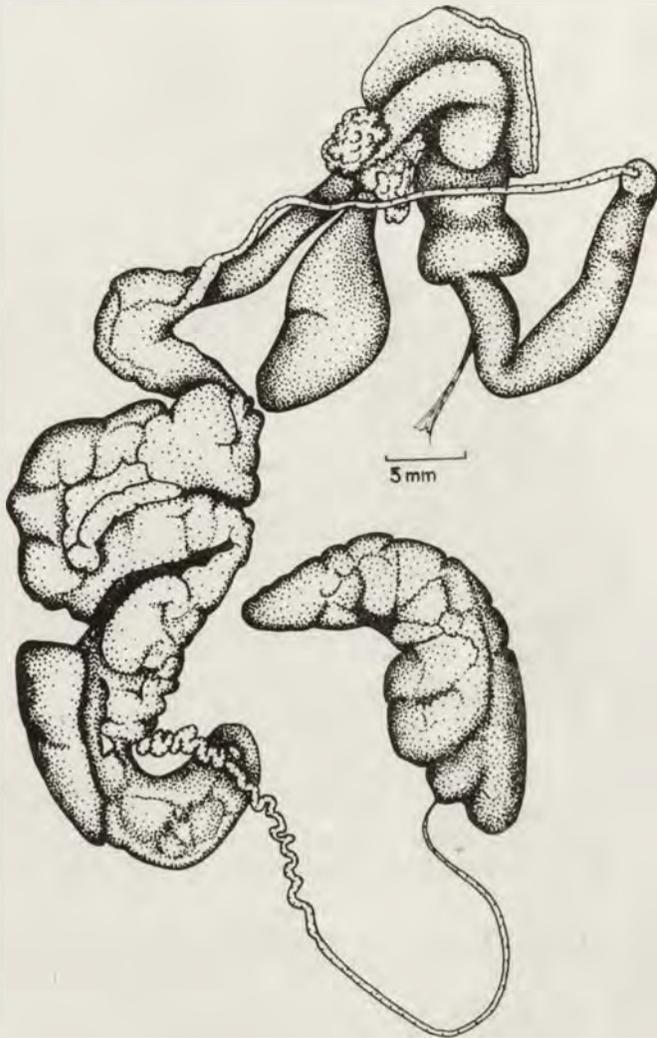


Fig. 8. *Milax (Subamalia) totevi* sp. n. — the genital system (holotype).

at the end. Its anterior part gradually passes into (without any clear boundary) a short spermatheca. The atrium appears to be almost completely reduced, so much so that one gets the impression that vagina and penis open only at the common orifice.

The radula (Fig. 9). The shape of the radular teeth is not very characteristic. In the transverse series they are arranged in a gentle arch so that it is difficult to discern the boundary between the lateral and the marginal teeth. The transition from tricuspid to bicuspid teeth is also continuous. The radula formula is as follows: C.17.49/x 156.

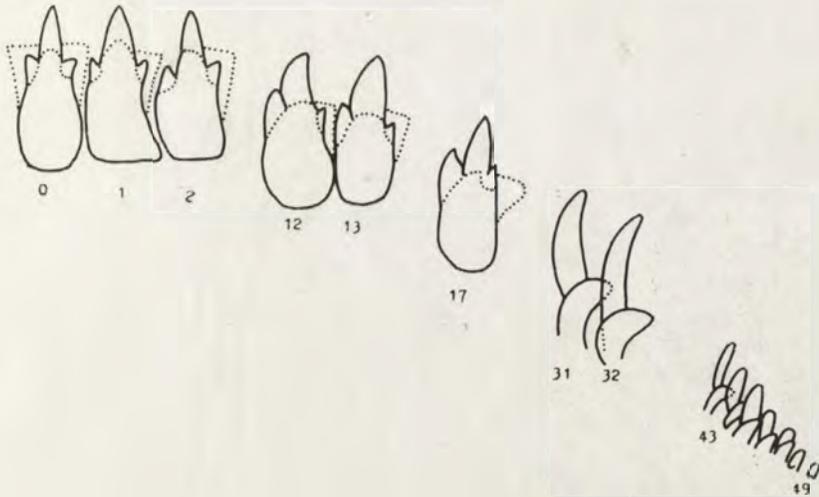
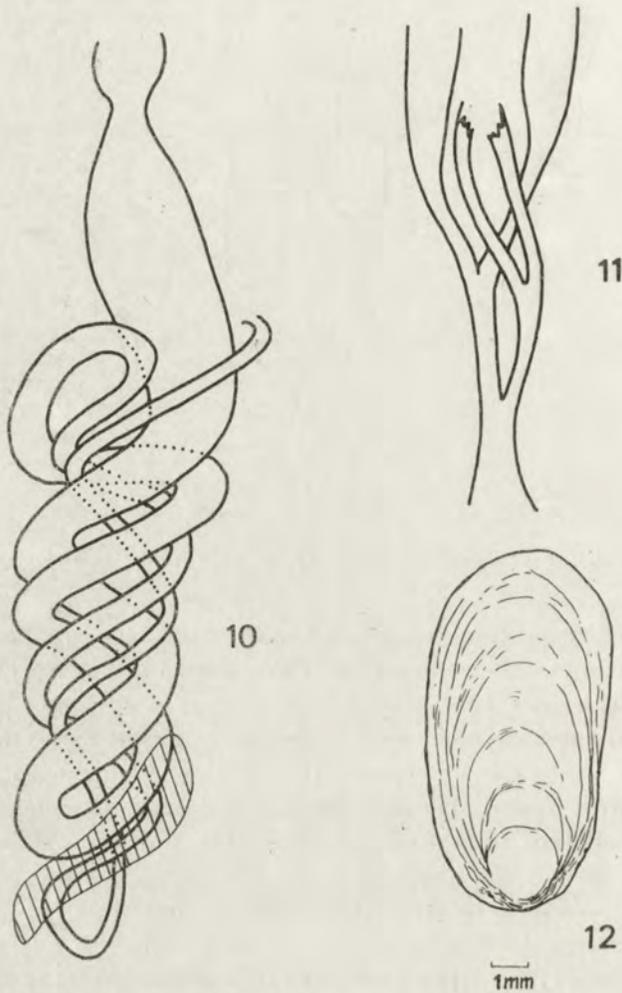


Fig. 9. *Milax (Subamalia) totevi* sp. n. — radular teeth (paratype)

The alimentary system consists of many coils, as can be seen in Figure 10. The ramification of the cephalic muscle is shown in Figure 11, and the shape of the shell — in Figure 12.

Ecology. All the specimens were collected at night, using an electric torch. It is impossible to establish whether the species is native to the area where the specimens were found, because the environment was clearly of a ruderal nature, and it bordered on a garden on one side, and on a street, on the other side.

Notes. As indicated by the above description, the new species may be included in the subgenus *Subamalia* POLLONERA, 1887. *M. totevi* sp. n. does not show any similarities in its appearance to any known species of the genus *Milax*. Individuals of this species attain the largest body-size in the family, considering the fact that the specimens known so far were not fully grown individuals. The most similar to it anatomically seems to be *Milax athenensis* H. WAGNER, 1931. The holotype of the last species is at the Naturhistorisches Museum in Vienna and I had the opportunity to examine it. It is a slug of a much smaller body size, only 48 mm (according to WAGNER — 49 mm). The specimen has already become strongly decolourized and the gray colour disappeared. *M. athenensis* differs from the new species, that is being described, by the shape of its body (the posterior end of the body tapers), and by the relief of its skin. There are only 18 ridges (wrinkles) between the dorsal medial line and the respiratory orifice. Of the holotype in the Vienna collection only the body covers, the reproductive organs and the shell have remained. In their structure the reproductive organs show a certain similarity, but at the same time some differences as well. The epiphallus and penis of the species compared are similar



Figs. 10–12. *Milax (Subamalia) totevi* sp. n. 10 — the alimentary system; the shaded area shows the location of the ovotestis (paratype). 11 — the cephalic muscle (paratype). 12 — a shell (paratype).

in shape, but in WAGNER's species the epiphallus is comparatively shorter and thicker, while the penis is more elongate. Spermatheca lacks the tapered posterior end, but instead it has a short spermatheca duct. Finally, the atrium is well-developed, cone-shaped (!), almost as long as the penis, whereas the vagina is very short. The particularly significant differences in the structure of the reproductive organs include primarily the differences in the size of atrium and vagina. Noteworthy, too, is the fact that some differences have also been found in the shape of the shell; in WAGNER's species the shell is broader, relative to its length.

On the basis of the description by WAGNER (1931) it may be assumed that

also *Milax taygeticus* WAGNER, 1931, shows certain similarities to the slug which is being described by me. Also in this case I had the opportunity to examine one specimen of the syntypical series, the same one as that represented in Figure 14 of WAGNER's paper (1931). As an item of the Vienna collection this specimen has the inventory number 36771. I select it as a lectotype for *Milax taygeticus* WAGN. The specimen in question is immature (and so are all the remaining syntypes — see WAGNER 1931), and apart from this, it is deprived of the pharynx. It is entirely faded and, therefore, its body colouration cannot be traced. The species described by WAGNER differs from *Milax totevi* in that its body is much slenderer, gradually tapering towards the end. Specimens of *M. totevi* of the same body-length as that of *M. taygeticus* specimens are at least twice as broad. In *M. totevi* much larger skin wrinkles are found, although their number between the dorsal medial line and the respiratory orifice is almost the same as in *M. taygeticus*, where there are 20 wrinkles.

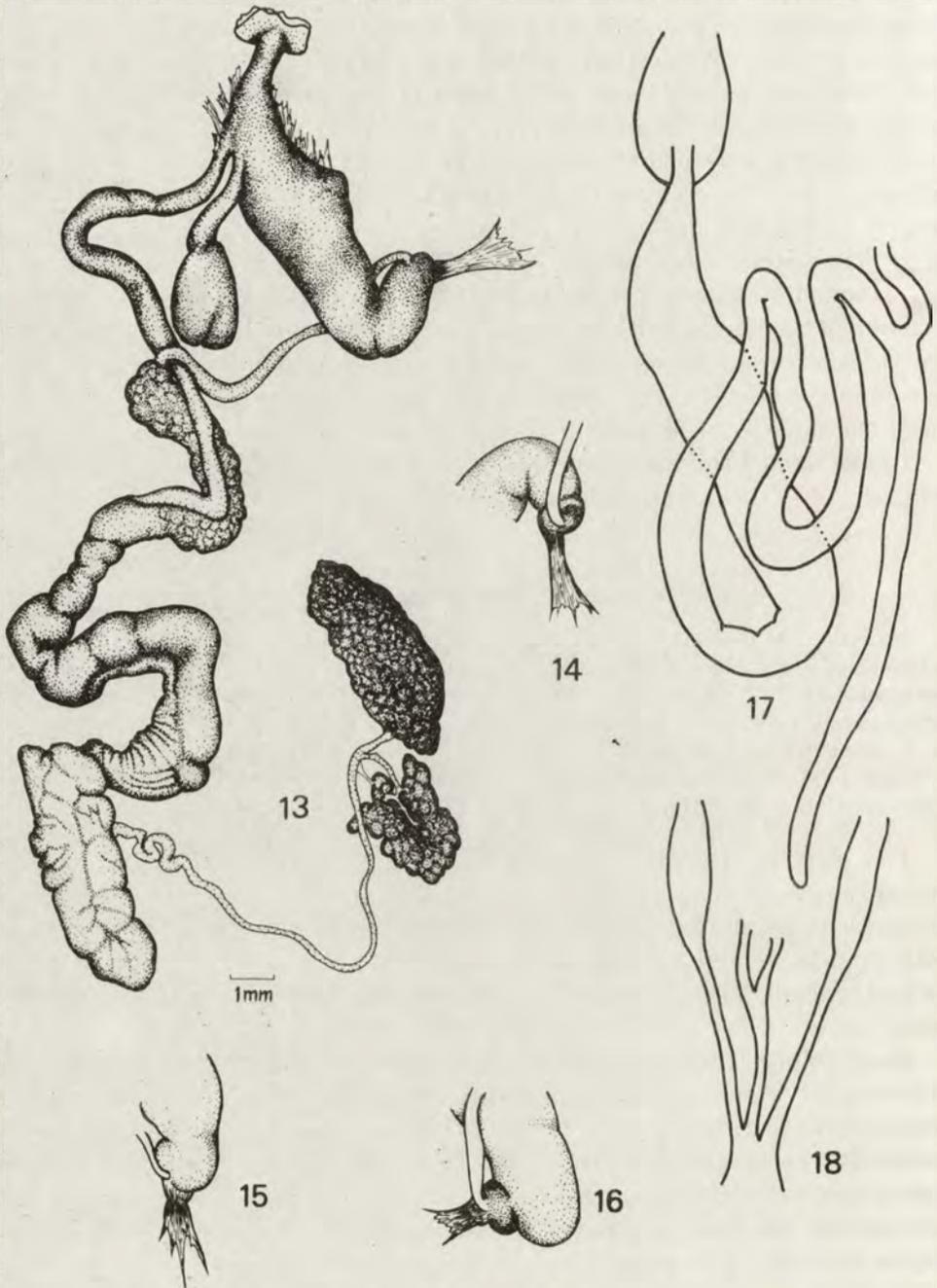
I have named this species in honour of Dymitr Totev PETKOV, a Bulgarian zoologist, my friend and field-work companion.

Lehmannia szigethyae sp.n. (Figs. 13–20)

Material: The Galačica mountains near the highway Carino–Sv. Naum, 10 km before the branching of the highway Macedonia–Yugoslavia, leg. L. PINTÉR, E. et P. SUBAI, A. SZIGETHY, 14 July, 1972. A holotype and 36 paratypes, TMB and 2 MZW; near the entrance to the monastery Sv. Jovan Bigorski, Macedonia — Yugoslavia, leg. L. PINTÉR, E. et P. SUBAI, A. SZIGETHY, 17 July, 1972, 6 + 24 juv. paratypes, TMB; on rocks near the monastery Sv. Naum on Lake Ochryola, Macedonia — Yugoslavia, leg. L. PINTÉR, E. et P. SUBAI, A. SZIGETHY, 14 July, 1972, 2 juv. paratypes, TMB.

The body is strongly elongated, but still with the appearance characteristic of the genus. Body-length of the longest specimen comes up to 45 mm, and the mantle is 15 mm long. The holotype body-length is 26 mm, and the length of the mantle — 11 mm. The posterior part of the mantle is gently rounded. The keel is small. There is a delicate skin relief, skin wrinkles between the dorsal medial line and the respiratory orifice ranging from 21 to 22 in number.

Body colour is variable. Some of the individuals, including the holotype, are brownish cream-coloured, with a variable complex blackish, or black colour. No distinctive features could be found in the pattern that would make it possible to identify the species concerned. The most frequent feature is the presence of three distinct streaks on the mantle. Likewise, in the posterior part of the body, outside the mantle, there may be streaks present, or a variable pattern of spots difficult to describe. The amount of dark pigment may vary. When there is much pigment, the spots fuse and the entire body of the slug becomes dark-gray, blackish, or even uniformly black. Most of the sexually immature individuals appear to be of such a uniformly black colour. In these dark-coloured specimens black is also the keel, whereas in the specimens with the colour-



Figs. 13–18. *Lehmannia szihethyae* sp. n. 13 – the genital system (holotype). 14 – the terminal part of penis viewed from the other side (holotype). 15 and 16 – the terminal part of penis (paratypes). 17 – the alimentary system (holotype). 18 – the cephalic muscle (holotype).

-pattern present the keel is of a light colour. The sole of the foot is in all individuals always uniformly black.

Reproductive organs (Figs. 13-16, 19). The ovotestis is of an elongate shape. The hermaphrodite duct appears to be relatively long, while the albumen gland is comparatively small. The spermoviduct is long and thin, with a well-developed segment of the prostate gland present in its anterior part. As in other species of this genus, the vas deferens is short and thick. It usually runs across the penis, and although it opens into the latter apically, it passes along it on the side of the outer body-wall. The penis is of a very characteristic shape — strongly elongated, almost cylindrical, or slightly broadened in its anterior part. In the posterior part of this organ a narrowing is often found which separates the narrowest portion (Figs. 13-15). This is where the opening of vas deferens and the attachment of the retractor muscle are found. This part is most often bent and gently turned forward. The vas deferens opens in the immediate vicinity of the retractor muscle at the end of penis, and only very rarely does it seem to open laterally, as can be seen in Figure 16, which probably is the result of some deformation due to the preservation. Near the opening of vas deferens there is always a dark spot consisting of black pigment. Flagellum is always absent (!). Inside the penis (Fig. 19) a tongue-shaped structure is



Fig. 19. *Lehmannia szigetthya* sp.n. — an open penis (paratype collected at the same time as the holotype).

found, with its free end directed forward. Besides, there are two longitudinal folds there which run along almost the entire organ. Spermatheca is oval in shape, the spermatheca duct being clearly marked off from the spermatheca, and the joint length of the two structures is only slightly larger than a half

of the penis. The oviduct is tube-shaped, thin and very long. The length of this organ equals that of penis. The atrium is short and tube-shaped.

The formula of the radula is C.13.34/x 142. The shape of the teeth is shown in Figure 20.

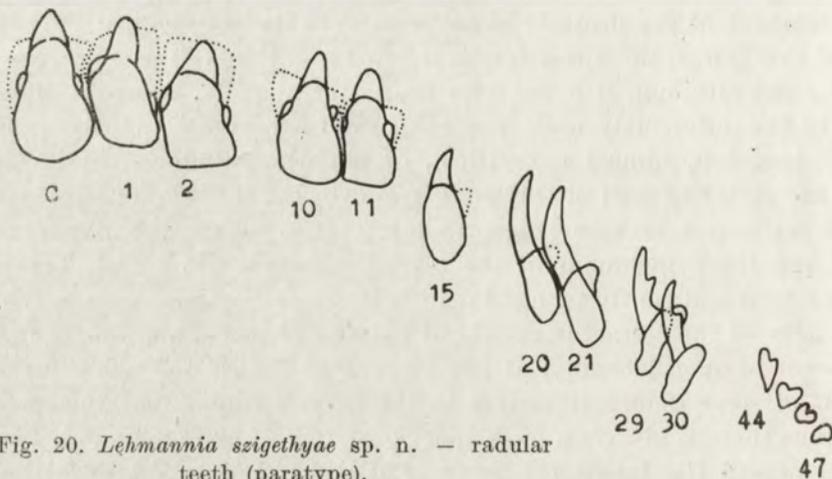


Fig. 20. *Lehmannia szigethyae* sp. n. — radular teeth (paratype).

The alimentary system is shown in Figure 17, and the cephalic muscle — in Figure 18.

Notes. The new species described clearly differs from all the known species belonging to the genus *Lehmannia* HEYNEM. by the shape of its penis, the more so as this organ is deprived of the flagellum, which is a very rare feature in this genus.

This slug has been given the species name in honour of Mrs. Anna SZIGETHY, the Hungarian zoologist who had collected it.

Muzeum Przyrodnicze
 Uniwersytetu Wrocławskiego
 50-335 Wrocław
 Sienkiewicza 21.

REFERENCES

- WAGNER H. 1931. Die in die Unterfamilie *Parmacellinae* gehörenden Formen des Naturhistorischen Museums in Wien. Ann. Naturhist. Mus. Wien, 46: 57-76.

STRESZCZENIE

[Титул: Nowe ślimaki nagie (*Pulmonata*: *Milacidae* i *Limacidae*) z Półwyspu Bałkańskiego]

Autor opisuje trzy nowe dla nauki ślimaki nagie z rodzin *Milacidae* i *Limacidae* znalezione na Półwyspie Bałkańskim.

Milax (Tandonia) pinteri sp.n. z Bułgarii charakteryzuje się czarniawym lub czarnym ciałem. Na płaszczu występują dwie czarne smugi o kształcie nieregularnym. Penis i epiphallus są bardzo krótkie.

Milax (Subamalia) totevi sp.n. z Bułgarii ma czarniawe ciało pokryte drobnymi oliwkowymi plamkami. Opiswany gatunek jest największym przedstawicielem rodziny *Milacidae*. Budowę genitaliów przypomina *Milax athenensis* WAGN., ale odróżnia się od niego małym, szczątkowym atrium i długą pochwą (vagina).

Lehmannia szigethyae sp.n. z Jugosłowiańskiej Macedonii ma ciało pokryte prawie czarnym rysunkiem. Gatunek ten wyróżnia się walcowatym penisem pozbawionym flagellum.

РЕЗЮМЕ

[Заглавие: Новые виды слизней (*Pulmonata*: *Milacidae* и *Limacidae*) с Балканского полуострова]

Автор описывает три новые для науки вида слизней из семейств *Milacidae* и *Limacidae*, найденные на Балканском полуострове.

Milax (Tandonia) pinteri sp. n. из Болгарии характеризуется черноватым или черным телом. На мантии имеются две черные полосы нерегулярной формы. Penis и epiphallus очень короткие.

Milax (Tandonia) totevi sp. n. из Болгарии имеет черноватое тело, покрытое мелкими пятнышками оливкового цвета. Описываемый вид является самым крупным представителем семейства. По строению genitaliев он напоминает *Milax athenensis* WAGN., но отличается от него маленьким, рудиментарным atrium и длинным влагалищем (vagina).

Lehmannia szigethyae sp. n. из Македонии в Югославии имеет тело покрытое почти черным рисунком. Этот вид отличается цилиндрическим penisом, лишенным flagellum.

Redaktor pracy — prof. dr J. Nast

Państwowe Wydawnictwo Naukowe — Warszawa 1975
Nakład 990 + 90 egz. Ark. wyd. 1 druk. 1 ●. Papier druk. sat. kl. III 80 g. B1. Cena zł 10, -
Nr zam. 2245-75 — Wrocławska Drukarnia Naukowa

<http://rcin.org.pl>