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Concerning Hungarian populations of „*Galba palustris*" studied by KILIAS (1992) (Gastropoda: Pulmonata: Lymnaeidae)

With 5 Plates and 5 Tables

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Abstract. The author has discovered that Hungarian populations of „*Galba palustris* (O.F. MÜLL.)" studied by KILIAS (1992) were, in fact, *Lymnaea* (*Lymnaea*) *corvus* (GMEL.) and *Lymnaea* (*Stagnicola*) *turricula* (HELD), and such has been documented by her personal collection. The anatomical structures of reproductive organs of the snails in each case were typical for the respective species (unpublished) and did not show hybrid characteristics as has been suggested by KILIAS (l.c.).

Kurzfassung. **Über die von KILIAS (1992) untersuchten ungarischen Populationen von „*Galba palustris*" (Gastropoda: Pulmonata: Lymnaeidae).** - Die Autorin hat festgestellt, daß die Exemplare der von KILIAS (1992) untersuchten ungarischen Populationen von „*Galba palustris* (O.F. MÜLL.)" tatsächlich zu *Lymnaea* (*Lymnaea*) *corvus* (GMEL.) und *Lymnaea* (*Stagnicola*) *turricula* (HELD) gehören, was auf der Basis eigenen Sammlungsmaterials bestätigt wurde. Die anatomischen Strukturen der Fortpflanzungsorgane der Schnecken (unpubliziert) waren in jedem Fall typisch für die jeweilige Art und wiesen keine Merkmale von Hybriden auf, wie von KILIAS (l.c.) behauptet wurde.

In 1959, after publication of my paper separating three independent species from the *Galba palustris* O.F. MÜLL. complex, namely *Galba corvus* GMEL., *Galba turricula* HELD [= *Lymnaea* (*Stagnicola*) *palustris* (O.F. MÜLL.)] and *Galba* spec. nov., Professor KILIAS, in his private conversation with Professor URBAŃSKI, questioned the independence of the separated species. According to his opinion they represented different developmental stages of one species only. - Over 30 years later, KILIAS in his paper of 1992 has asked again: „Was ist *Galba* (oder *Stagnicola*) *palustris*, muß man wohl heute fragen? Eine Art mit verschiedenen Ökoformen oder ein in mehrere Arten aufzuspaltender Komplex?". - The question has already been answered: these are independent species (FALKNER, 1984, 1985; JACKIEWICZ, 1959, 1988, 1992).

In 1992, KILIAS compared shells and reproductive organs of Hungarian population of „*Galba palustris*". He wrote that he wanted to publish results of these studies because the relations between the species were unclear. He also wanted to support his opinions that the species separated from the *Galba palustris* O.F. MÜLL. complex (JACKIEWICZ, 1959) as well as later redescribed *Stagnicola turricula* (HELD) (FALKNER, 1985; JACKIEWICZ, 1992) and *Lymnaea vulnerata* (KÜSTER) (JACKIEWICZ, 1988) were not the independent species. He took

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the following lymnaeid features into account: shell dimensions, praeputium length to penis sheath length ratio, number of internal prostate folds, shape of the outlet of spermatheca duct and spermatheca duct length to spermatheca diameter ratio (Tables 1-5). The author insisted that his studies were to verify the usefulness of the mentioned features for species separation.

KILIAS (1992), discussing results of his studies (Tables 1-5), stated that there was no snail with the characteristic features for one or another species only in each from the five studied population. On the other hand, the snails were always of mixed features for different species.

Regarding shell dimensions, the author found (Table 4) that as many as 8 from 10 shells were of *„corvus"* dimensions because their aperture height was higher than the half of the shell height. Dimensions of two remaining shells corresponded with *„turricula"* and *„occulta"* as their aperture height was lower than the half of the shell height. The author, however, did not take into account that small specimens of *„turricula"*, in contra-distinction to large ones, might be characterized by aperture height higher than 50 % of the shell height as a rule. It may be also seen among other lymnaeid species (JACKIEWICZ, 1959; JACKIEWICZ & GERBER, 1990). Almost all specimens from the KILIAS' populations (Table 4, 5) were small. That was why their aperture height to shell height ratio was the same as for *„corvus"*. The ratio of the aperture height to the shell height is an important diagnostic feature, however, it can not settle a taxonomic status. All other shell features should have been taken into consideration, e. g. a shell shape, whorl convexity, etc. The species could be identified more precisely on the basis of complex of the shell features.

The ratio of praeputium (Phallotheca I) length to penis sheath (Phallotheca II) length was the second feature analysed by KILIAS (l.c.). One ought to verify the identity of Phallotheca II and penis, referred by KILIAS (l.c.). Phallotheca II is not a penis but it is a penis sheath which shelters the penis localized inside. The sheath sometimes is longer than the penis.
In majority, praeputium (Phallotheca I) was much longer than penis sheath (Tables 1-3). It is an important feature for *Lymnaea* (*Lymnaea*) *corvus*. However, there were three cases when the praeputium was much shorter than the penis sheath (Tables 2, 3) and the ratio was 1 : 2. These three cases, untypical for *L.* (*L.*) *corvus*, are difficult to verify. Taking the whole responsibility for my opinion, I would like to stress that among hundreds reproductive organs I saw, among them also of Hungarian populations, I have never found any praeputium shorter than the penis sheath. Length ratio of these two organs was 3 : 1 as a rule. We can see (Tables 4, 5) that the praeputium is much shorter than the penis sheath in some Hungarian population that is a characteristic feature of *Lymnaea* (*Stagnicola*) *turricula*. In this species, the length ratio of the praeputium to the penis sheath may be between 1 : 2 and 1 : 5.

There is no problem with the third feature analysed by KILIAS (l.c.). The prostate of *L.* (*L.*) *corvus* has several folds (Tables 1-3) while that of *L.* (*S.*) *turricula* has one fold (Tables 4, 5).

The next analysed feature may be unreservedly accepted partially only. *L.* (*L.*) *corvus* really has a spermatheca duct end widened in funnel or almost funnel form (Tables 1-3), and the duct of *L.* (*S.*) *turricula* is without such a widening (Table 5). However, the endings of the spermatheca duct of *L.* (*S.*) *turricula* presented in Table 4, arouse my great doubts. Some of them are typical for *L.* (*S.*) *turricula*, the other for *L.* (*L.*) *corvus* and *L.* (*S.*) *occulta*. I want to stress that there was no specimen with the spermatheca duct widened in funnel form at the end among those plenty specimens of *L.* (*S.*) *turricula* (also from Hungary) dissectioned

Gehäusemaße Länge : Breite : Mündungshöhe	Phallotheca I : II	Prostata-lumen Falten	Spermotheca Stielansatz	Stiellänge zu ∅ Blase
1) Fundort : Tihanyrév				
40.2 : 17.0 : 20.2	3 : 1	mehrere	trichterförm.	2.5 : 1
37.8 : 16.0 : 19.2	3 : 1	mehrere	trichterförm.	3.0 : 1
35.0 : 16.5 : 18.5	3 : 1	mehrere	trichterförm.	3.0 : 1
32.0 : 15.0 : 18.5	3.5 : 1	mehrere	trichterförm.	3.5 : 1
29.5 : 13.0 : 16.7	3.5 : 1	mehrere	trichterförm.	4 : 1
29.5 : 13.0 : 16.5	4 : 1	mehrere	trichterförm.	3 : 1
26.3 : 12.3 : 15.7	3.5 : 1	mehrere	trichterförm.	3 : 1
26.0 : 13.0 : 16.0	3 : 1	mehrere	trichterförm.	2.5 : 1
25.0 : 12.0 : 14.3	3.5 : 1	mehrere	trichterförm.	3.5 : 1
20.5 : 9.3 : 11.2	3 : 1	mehrere	trichterförm.	2.5 : 1
entspr.: *corvus*	*corvus*	*corvus*	*corvus/occ.*	*turricula*
2) Fundort: Straßenkreuzung Tihanyrév-Balatonfüred				
35.0 : 15.4 : 19.0	3 : 1	mehrere	trichterförm.	2 : 1
32.5 : 16.0 : 19.0	2 : 1	mehrere	trichterförm.	2 : 1
26.8 : 13.0 : 15.5	3 : 1	mehrere	trichterförm.	3 : 1
25.0 : 13.5 : 16.0	2 : 1	mehrere	trichterförm.	2 : 1
24.2 : 12.3 : 16.0	3.3 : 1	mehrere	trichterförm.	3 : 1
23.0 : 11.0 : 14.4	2 : 1	mehrere	trichterförm.	3.5 : 1
23.0 : 10.5 : 14.3	1.7 : 1	mehrere	trichterförm.	2 : 1
20.2 : 10.4 : 14.7	2.5 : 1	mehrere	trichterförm.	3 : 1
18.5 : 8.0 : 10.0	1 : 2	mehrere	kaum trichterf.	2.5 : 1
15.7 : 7.0 : 8.5	1 : 2	mehrere	trichterförm.	2 : 1
entspr.: *corvus*	*8 × corvus* *2 × turric.*	*corvus*	*corvus* *5 × turric.*	*5 × corvus*
3) Fundort: Balaton östlich Balatonfüred				
37.0 : 18.0 : 20.0	2.5 : 1	mehrere	trichterförm.	3 : 1
37.5 : 18.0 : 20.0	2.5 : 1	mehrere	trichterförm.	3 : 1
28.0 : 13.2 : 16.5	3 : 1	mehrere	trichterförm.	4 : 1
27.0 : 13.5 : 16.0	3 : 1	mehrere	trichterförm.	3 : 1
26.2 : 12.0 : 15.8	4 : 1	mehrere	trichterförm.	4 : 1
26.0 : 12.0 : 15.0	3 : 1	mehrere	trichterförm.	3 : 1
25.5 : 12.0 : 15.0	2.5 : 1	mehrere	kaum trichterf.	3.5 : 1
25.2 : 12.5 : 16.2	3 : 1	mehrere	trichterförm.	2 : 1
11.0 : 5.6 : 7.0	1 : 1	mehrere	trichterförm.	4.5 : 1
6.8 : 3.6 : 4.0				1 : 1.5
entspr.: *corvus*	8 x *corvus* 1 x *occulta* 1 x *turric.*	*corvus*	*corvus/occ.*	1 x *corvus* 8 x *turric.*
4) Fundort: Malom sed				
18.5 : 7.0 : 8.8	1 : 2.5	1 Falte	ohne Erweiter.	3 : 1
14.5 : 6.0 : 7.6	1 : 2.75	1 Falte	ohne Erweiter.	3 : 1
14.2 : 6.7 : 7.6	1 : 2	1 Falte	trichterförm.	3.5 : 1
13.2 : 5.6 : 6.8	1 : 2.3	1 Falte	leichte Erweiter.	2.5 : 1
13.2 : 5.5 : 6.8	1 : 2.5	1 Falte	leichte Erweiter.	3 : 1
13.0 : 5.5 : 7.0	1 : 2	1 Falte	leichte Erweiter.	3.5 : 1
13.0 : 5.5 : 6.8	1 : 1.7	1 Falte	ohne Erweiter.	3.5 : 1
12.5 : 5.5 : 6.0	1 : 2	1 Falte	trichterförm.	3 : 1
12.0 : 5.2 : 6.8	1 : 2.2	1 Falte	leichte Erweiter.	3 : 1
11.5 : 5.8 : 6.4	1 : 3	1 Falte	trichterförm.	4 : 1
entspr.: 8 x *corvus* 2 x *turr./* *occ.*	*turric.*	*turric./* *occ.*	*3 x turric.* *7 x occ./* *corvus*	*turricula*
5) Fundort: Lauquellen bei Tata				
14.5 : 6.5 : 7.5	1 : 2	1 Falte	ohne Erweiter.	3.5 : 1
14.0 : 6.5 : 7.5	1 : 2.5	1 Falte	ohne Erweiter.	4.5 : 1
14.0 : 6.5 : 7.5	1 : 2	1 Falte	ohne Erweiter.	3.5 : 1
14.0 : 6.5 : 6.5	1 : 2.3	1 Falte	ohne Erweiter.	3 : 1
13.5 : 6.0 : 6.5	1 : 2	1 Falte	ohne Erweiter.	3 : 1
13.0 : 6.0 : 7.0	1 : 2.5	1 Falte	ohne Erweiter.	4.5 : 1
13.0 : 6.0 : 7.0	1 : 2.5	1 Falte	ohne Erweiter.	3 : 1
13.0 : 6.0 : 7.0	1 : 2.5	1 Falte	ohne Erweiter.	3 : 1
12.5 : 6.0 : 6.5	1 : 2.5	1 Falte	ohne Erweiter.	3 : 1
11.5 : 5.8 : 6.5	1 : 3	1 Falte	ohne Erweiter.	3 : 1
entspr.: 8 x *corvus* *2x turr./* *occ.*	*turric.*	*turric./* *occ.*	*turricula*	*turricula*

Tables 1-5: Shell dimensions and anatomical features of the reproductive organs for the Hungarian populations of „*Galba palustris*“ (published by KILIAS, 1992, pp. 26-27).

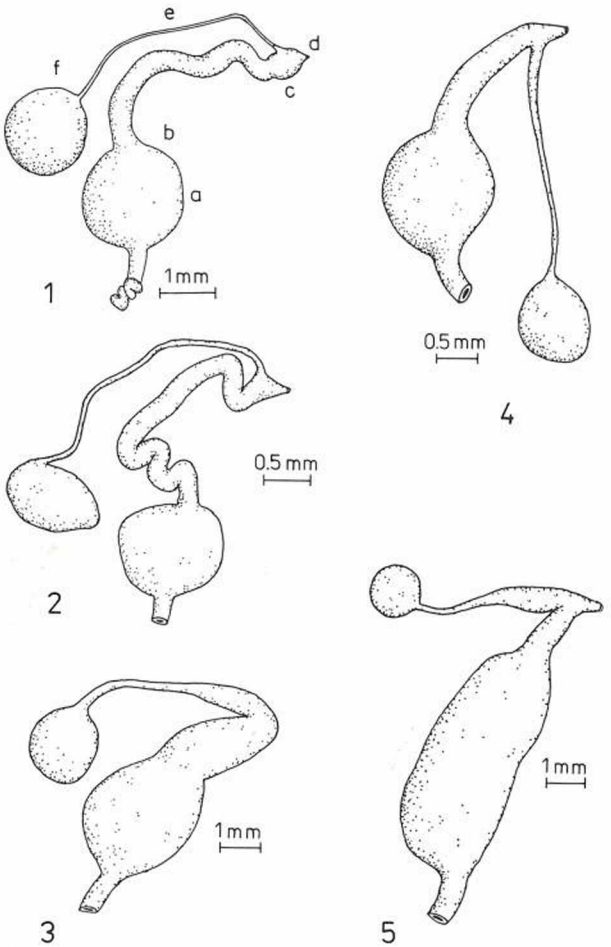

Plate I: Terminal part of female reproductive organs. - 1: *Lymnaea* (*Stagnicola*) *palustris*; 2: *L.* (*S.*) *turricula*; 3: *L.* (*Lymnaea*) *corvus*; 4: *L.* (*L.*) *vulnerata*; 5: *L.* (*S.*) *occulta*.
a - pyriform body, b - oviduct, c - vagina, d - opening of female reproductive organs, e - duct of spermatheca, f - spermatheca (after JACKIEWICZ).

by me. It is said that the author did not show any drawing of the spermatheca duct endings. It is therefore unclear if the widening was as large as that in *L.* (*L.*) *corvus* and how the widening described as a light one looked like. Moreover, the author should have taken the other important features of the spermatheca duct into consideration. The duct is short and big in *L.* (*L.*) *corvus* and *L.* (*S.*) *occulta* (Plate I, 3, 5). It is thin and long in *L.* (*S.*) *turricula* (Plate I, 2). These features should have been very useful.

The ratio of spermatheca duct length to spermatheca diameter was the last feature analysed by KILIAS (1992). This ratio is 2 : 1 for *L.* (*L.*) *corvus* and 3 : 1 for *L.* (*S.*) *turricula* as a rule. Among 30 specimens of *L.* (*L.*) *corvus*, studied by KILIAS (Tables 1-3), the former ratio was maintained for ten specimens only. Nineteen specimens had the duct slightly longer than the spermatheca diameter. One specimen had even the shorter duct. All but the last ratios are contained in the individual variability range. There are no significant deviations from the mean for *L.* (*S.*) *turricula* (Tables 4, 5).

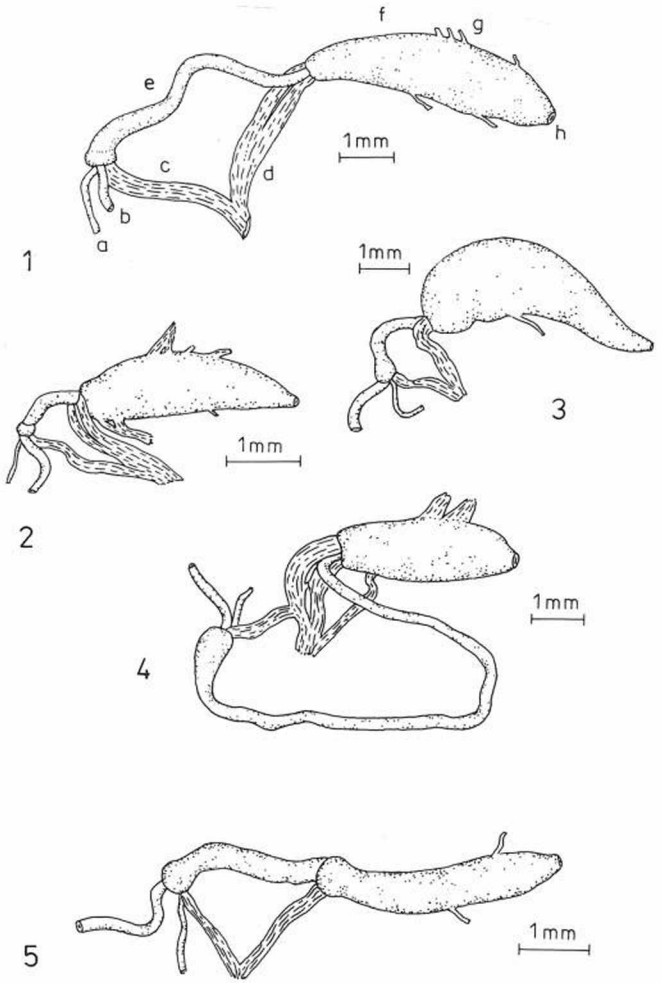

Plate II: Terminal part of male reproductive organs. - 1: *Lymnaea* (*Stagnicola*) *palustris*; 2: *L.* (*Lymnaea*) *vulnerata*; 3: *L.* (*L.*) *corvus*; 4: *L.* (*S.*) *turricula*; 5: *L.* (*S.*) *occulta*.
a - nerve of penis, b - vas deferens, c - retractor of penis sheath, d - retractor of praeputium, e - penis sheath, f - praeputium, g - protractor, h - opening of male reproductive organs (after JACKIEWICZ).

I postpone doing a general opinion of KILIAS' studies (1992). They were surely carried out on two species, those are *Lymnaea* (*Lymnaea*) *corvus* and *Lymnaea* (*Stagnicola*) *turricula*. I have also had Hungarian specimens of both species in my collection. I collected some specimens of *L.* (*L.*) *corvus* in Beech Mountains, 1983 (unpublished) and some of *L.* (*S.*) *turricula* at Balaton, namely 10 specimens from Balatonkenese, 1978 and 5 specimens from Balatonfired, 31.08.1983 (JACKIEWICZ, 1992). Both species were of their typical anatomical structure of reproductive organs. There were no mixed features.

KILIAS (1992) also states that *L.* (*L.*) *vulnerata* shows some mixed features. Its ratio of praeputium length to penis sheath length resembles *L.* (*L.*) *corvus*, while its ratio of spermatheca duct length to spermatheca diameter is similar to that of *L.* (*S.*) *turricula*. However, a

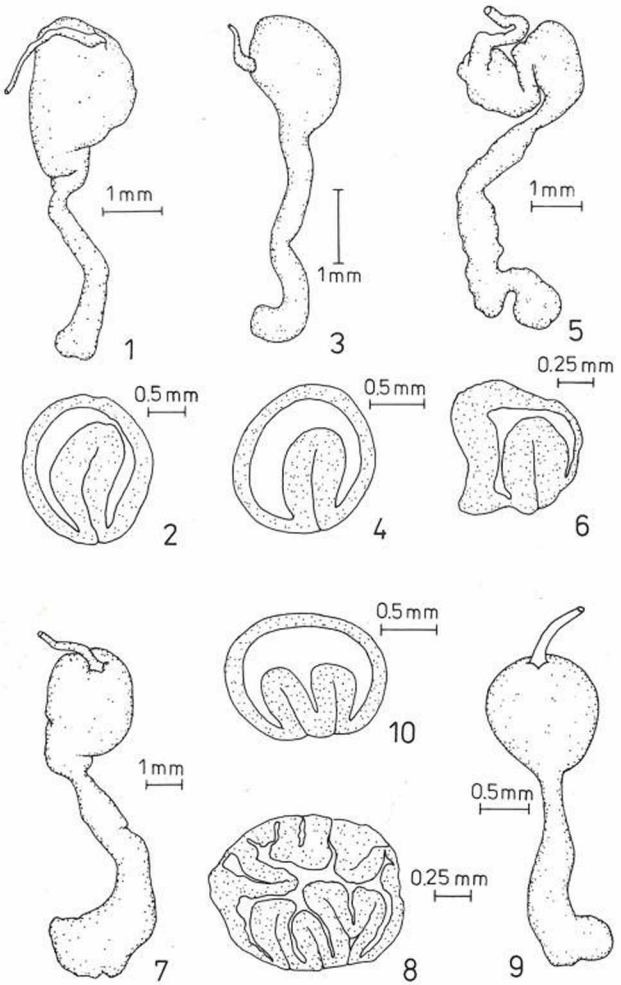

Plate III: Prostate and its transversal section. - 1, 2: *Lymnaea* (*Stagnicola*) *palustris*; 3, 4: *L.* (*S.*) *turricula*; 5, 6: *L.* (*S.*) *occulta*; 7, 8: *L.* (*Lymnaea*) *corvus*; 9, 10: *L.* (*L.*) *vulnerata* (after JACKIEWICZ).

very important fact has been overlooked by the author. The spermatheca duct of *L. (L.) vulnerata* is much shorter and much wider than that of *L.* (*S.*) *turricula*. Moreover, it is narrowly funnel-shaped at the end (Plate I, 4).

KILIAS (l.c.) should have also questioned the separateness of other lymnaeid species on the basis of „mixed" features. For example, *L.* (*L.*) *stagnalis* (L.) is characterized by the same ratio of praeputium length to penis sheath length as *L.* (*L.*) *corvus*, *L.* (*L.*) *vulnerata* or even *L.* (*Galba*) *truncatula* (O.F. MÜLL.). Regarding the same feature, *L.* (*Radix*) *peregra* (O.F. MÜLL.) resembles *L.* (*Radix*) *auricularia* (L.) and it is often difficult to distinguish these two species conchologically. The author also says that it is not possible to distinguish shells of *L.* (*L.*) *vulnerata* from the other lymnaeid shells. Although its shell really resembles the shell of *L.* (*L.*) *corvus*, it is more thickset and the whorls are more convex. The aperture height is

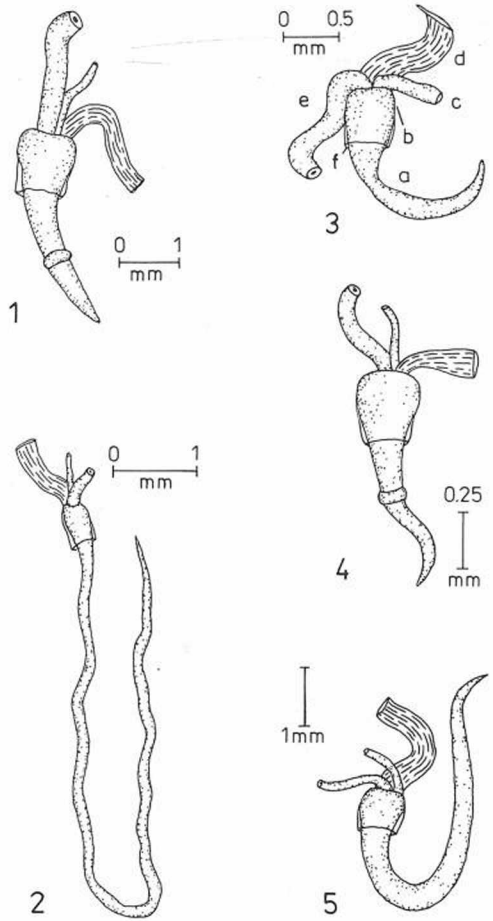

Plate IV: Penis. - 1: *Lymnaea* (*Lymnaea*) *corvus*; 2: *L.* (*Stagnicola*) *turricula*; 3: *L.* (*S.*) *occulta*; 4: *L.* (*L.*) *vulnerata*; 5: *L.* (*S.*) *palustris*.
a - penis, b - bulbous termination of penis sheath, c - nerve of penis, d - retractor of penis sheath, e - vas deferens, f - wall of the cut-off penis sheath (after JACKIEWICZ).

usually lower than the half of the shell height (JACKIEWICZ, 1988; JACKIEWICZ & GERBER, 1990).

Although KILIAS (1992) admits that there are two folds inside prostate of *L.* (*L.*) *vulnerata*, he adds that this feature was scarcely studied. It seems that 43 specimens of *L.* (*L.*) *vulnerata* from locus typicus: Cetina River near Omiš in Dalmatia (JACKIEWICZ, 1988), 25 specimens from Baden-Württemberg, Südbaden: „Karpfenhod“ = blinder Arm des Rheines bei Grazhaus, ca. 8 km südlich Breisach, Bundesrepublik Deutschland (JACKIEWICZ & GERBER, 1990), and 285 specimens from different parts of Sweden (published partially, JACKIEWICZ & PROSCHWITZ, 1991) give enough quantity of studied specimens.

Moreover, KILIAS (1992) states that two prostate folds are visible in majority of „*corvus*“ form and they are accompanied by additional small folds. I would like to stress that all prostate folds of *L.* (*L.*) *corvus* may be identically large but more frequently some of them

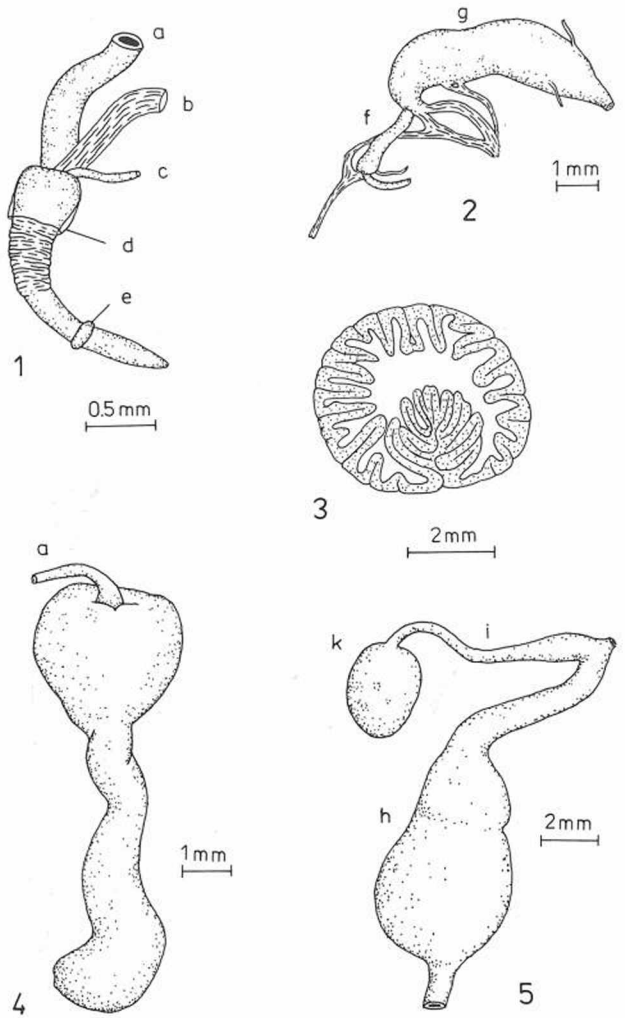

Plate V: Characteristic features of reproductive organs of *Lymnaea (Lymnaea) stagnalis*. - 1: penis; 2: praeputium and penis sheath; 3: transversal section of prostate; 4: prostate; 5: terminal part of the female reproductive organs.
a - vas deferens, b - retractor of penis sheath, c - nerve of penis, d - wall of the cut-off penis sheath, e - ring-like swelling, f - penis sheath, g - praeputium, h - pyriform body, i - duct of spermatheca, k - spermatheca (after JACKIEWICZ).

are larger. These larger ones are never shaped as they are in *L.* (*L.*) *vulnerata*. The folds fill the whole prostate inside so that only small slit is left between them (Plate III, 8). On the other hand, the prostate lumen is broad in *L.* (*L.*) *vulnerata* (Plate III, 10). Moreover, there are several small folds at the proximal part of *L.* (*L.*) *corvus* prostate. They never exist in *L.* (*L.*) *vulnerata*.

There are some other important features that differ all lymnaeid species I know. They differ especially in the pattern of their mantle surface which is similar only for *Lymnaea* (*S.*) *palustris* and *Lymnaea* (*S.*) *turricula* (JACKIEWICZ, 1993) and in the microsculpture of the

shell surface (JACKIEWICZ & KORALEWSKA-BATURA, 1995). They also differ in the structure as well as the shape of egg cocoons and in the arrangement of eggs in the cocoon (PIECHOCKI, 1979). The most distinguished cocoon among *Lymnaea* species (CZAPSKI, 1977) occurs in *L.* (*S.*) *occulta*.

Inspite of KILIAS' opinions (1992), I think that *Lymnaea (Stagnicola) palustris*, *Lymnaea (Stagnicola) turricula*, *Lymnaea (Stagnicola) occulta*, *Lymnaea (Lymnaea) vulnerata* and *Lymnaea (Lymnaea) corvus* are separate species. It is testified by the structure of their reproductive organs, so characteristic of each species. Even relatively small specimens have the reproductive organs developed typically for the species. The particular lymnaeid species show neither mixed nor transitional features, both inside the population and between various populations. It should be emphasized that differences in the reproductive organs between the above mentioned species (Plate I-IV) are not smaller than those between the other species of the family Lymnaeidae, for example between *L.* (*L.*) *stagnalis* (L.) (Plate V) and whichever species from these five questioned by KILIAS (l.c.).

KILIAS' paper (1992) has submitted nothing constructive to increase our knowledge on lymnaeid species. It has introduced unnecessary disorder.

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