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Report on the *Lymnaea (Stagnicola) palustris* (MÜLLER, 1774) complex in Belgium (Gastropoda: Pulmonata: Lymnaeidae)

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Abstract

A revision of the *Lymnaea palustris* (MÜLLER, 1774) complex in the collections of the RBINS, Brussels, is presented. Based on anatomical characters, two different species are distinguished: *Stagnicola palustris* (MÜLLER, 1774) and *Stagnicola fuscus* (C. PFEIFFER, 1821), a senior synonym of *Lymnaea vulnerata* KÜSTER, 1862. Anatomical details and distribution maps on both species in Belgium are provided.
Key-words: Gastropoda, Pulmonata, *Lymnaea*, *Stagnicola palustris*, *Stagnicola fuscus*, Belgium, anatomy, systematics.

Résumé

Le matériel de la collection belge de l'IRScNB identifié comme *Lymnaea palustris* (MÜLLER, 1774), a été réexaminé. Une étude détaillée des caractères anatomiques a permi de distinguer deux espèces: *Stagnicola palustris* (MÜLLER, 1774) et *Stagnicola fuscus* (C. PFEIFFER, 1821). Cet article présente des caractères anatomiques des deux espèces ainsi que des cartes de répartition en Belgique.
Mots-clefs: Gastropoda, Pulmonata, *Lymnaea*, *Stagnicola palustris*, *Stagnicola fuscus*, Belgique, anatomie, systématique.

Introduction

In order to find out whether any systematic differentiation occurred within the widely distributed species *Lymnaea palustris* (MÜLLER, 1774), JACKIEWICZ (1959) carried out detailed anatomical research on the reproductive organs of specimens from Poland.
As a result, the extremely variable species was split into three distinct species which were included in the genus *Galba* SCHRANK, 1803: *Galba corvus* (GMELIN, 1791), *Galba occulta* (JACKIEWICZ, 1959) and *Galba turricula* (HELD, 1836). JACKIEWICZ rejected the oldest name available: *Galba palustris* (MÜLLER, 1774) in favour of a younger synonym.
Research by HUDEC and BRABENEC (1966) on specimens from Czechoslovakia, until then determined as *Galba palustris* (MÜLLER, 1774), supported the same distinction in three species, although these authors did not entirely agree with the rejection of the name *palustris* by JACKIEWICZ (1959) which, according to them, was avoiding the existing nomenclatorial problem.
FALKNER (1984, 1985) in the course of two subsequent studies could not only clarify the identity of *Galba palustris* (MÜLLER, 1774) = *Buccinum palustre* MÜLLER, 1774 through topotypes, but also showed that *Galba turricula* sensu JACKIEWICZ (1959) is identical to *Stagnicola palustris* (MÜLLER, 1774) later acknowledged by JACKIEWICZ (1989), while *Galba turricula* sensu HUDEC and BRABENEC (1966) is a species distinct from *Stagnicola palustris* (MÜLLER, 1774). FALKNER (1984, 1985) included these species in the genus *Stagnicola* LEACH, 1830.
In her further anatomical research on the problematic *palustris* complex, JACKIEWICZ (1988a) found another distinct species which she called *Lymnaea vulnerata* KÜSTER, 1862 based on specimens from the locus typicus in Yugoslavia. According to FALKNER (1995) however, there are at least 16 probable earlier synonyms, of which the earliest, *Lymnaeus fuscus* C. PFEIFFER, 1821, turned out to be the correct and valid name. In a number of subsequent publications, this species proved to be quite common in Europe.
At present the *Lymnaea palustris* complex comprises five distinct species in Europe: *Stagnicola palustris* (MÜLLER, 1774), *Stagnicola turricula* (HELD, 1836), *Stagnicola occultus* (JACKIEWICZ, 1959), *Stagnicola fuscus* (C. PFEIFFER, 1821), and *Stagnicola corvus* (GMELIN, 1791) (JACKIEWICZ, 1993; FALKNER, 1995). Based on this knowledge we were expecting to find some of these species in Belgian *Lymnaea palustris* material. Whether or not these species should be placed into the genus *Lymnaea* sensu JACKIEWICZ (1993) or *Stagnicola* sensu GLÖER & MEIER-BROOK (1994) and FALKNER (1995) was of no immediate relevance in the context of this paper which presents preliminary results of a revision of material, formarly identified as *Lymnaea palustris*, in the collection of the RBINS. However to avoid confusion we have adopted the most recently used genus name: *Stagnicola* sensu FALKNER (1995).

Material and methods

The studied material is part of the collection of the Department of Invertebrates of the RBINS in Brussels. Snails used in this study were collected at several localities in Belgium over a period of more than 100 years (the oldest sample dates from 1882, JETTE, Reg. 3139, 1 specimen; the most recent one dates from 1989, DENDERMONDE Reg. 11302, 1 specimen). The older material was attributed to the species *Lymnaea palustris* (MÜLLER, 1774) by W. ADAM (1940, 1960), based on conchological characters. Half of this material consists of empty shells, which are not taken into consideration here because of their well known variability.

From 1960 onwards most of the material was preserved in 70% alcohol.

- 1323 specimens of the *Lymnaea palustris*- group were found in 161 samples collected during explorations by the Department of Invertebrates over a period of nearly 60 years (from 1930 onwards);
- 741 specimens were found at 49 sites from a swamp area in the vicinity of Ghent (Evergem) collected between 14-1-1967 and 16-1-1968 by DE COSTER & PERSOONE (1970) (half of them were infected by nematodes);
- 314 specimens were found in 70 samples collected at different localities, mostly polder ditches, in the Valley of the Yzer in 1981 (leg. B. VLAMINCK);
- 157 specimens were found in 33 samples collected between 1977 and 1981 in various parts of Belgium (leg. R. MARQUET).

Dissections were carried out under a WILD M10 stereomicroscope.

Abbreviations used in Figs 1-6

b.c. = bursa copulatrix
c.p. = corpus pyriformis
d.h. = ductus hermafroditicus
g.a. = glandula albuminalis
g.h. = glandula hermafroditica
g.n. = glandula nidamentalis
m.p. = male porus
n.p. = nervis penis
o. = oviductus
p. = penis
p.p. = praeputium
p.m. = protractor muscle
pr. = prostata
p.s. = penis sheath
r.p. 1 = retractor muscle on praeputium
r.p. 2 = retractor muscle on penis sheath
t. = truncus receptaculi
u. = uterus
v. = vagina + female porus
v.d. = vas deferens

Results and discussion

Over 500 dissections were carried out. In a number of cases, due to infection, poor relaxation or conservation, it was difficult to distinguish all diagnostic features of the reproductive system. However in most of these cases we could recognise at least praeputium, penis sheath and oviduct. The Belgian *Lymnaea palustris* material studied so far represents two distinct types in the structure of the reproductive organs corresponding to *Stagnicola palustris* (MÜLLER, 1774) and *Stagnicola fuscus* (C. PFEIFFER, 1821). The reproductive organs of the latter were only recently described (JACKIEWICZ, 1988a) and show a close relationship with those of *Stagnicola corvus* (GMELIN, 1791) from which it can only be separated with certainty by the inner structure of the prostata (JACKIEWICZ, 1990, 1993): the distal part of the prostata has many thick folds in *corvus*, and only two big folds, one along the other in *fuscus* (Fig. 3). Additional papers with anatomical evidence of *Stagnicola fuscus* from Germany (JACKIEWICZ & GERBER, 1990), Sweden (JACKIEWICZ & VON PROSCHWITZ, 1991) and France, the latter based on the work of de LARAMBERGUE (1928), whose anatomical figures (Planche II, Fig. 2; p. 498 Fig. H) and description of *Stagnicola palustris* seem to agree with the first anatomical description of *Lymnaea vulnerata* by JACKIEWICZ (1988a), appeared to be useful for separating *Stagnicola palustris* from *Stagnicola fuscus* in Belgian material.

THE *STAGNICOLA FUSCUS* TYPE IN BELGIAN MATERIAL (FIGS 1-3)

Shell conical, brown or horny with a low spire, 4 to 5 slightly convex whorls and shallow sutures. Body whorl usually a little swollen. Aperture oval, nearly half the shell height. "Hammering" sensu JACKIEWICZ (1993) may occur. Adult specimens between 12 mm and 24 mm high. Praeputium rather club-shaped, flattened (Fig. 3:b). The length ratio between praeputium and penis sheath is nearly 3:1, being the same as in *Stagnicola corvus* sensu JACKIEWICZ (1990) and *Lymnaea stagnalis*. Penis thick and short (Fig. 3:e) much like that of *Lymnaea stagnalis* and *Stagnicola corvus* sensu JACKIEWICZ (1988b, 1990). Wide in its initial part. Basal part with an annular swelling sometimes barely visible. The distinct final part of the penis is cuneate in shape (Fig. 3:e). Oviduct tube shaped and straight. The distal part opens into the vagina (Figs 2-3). Truncus receptaculi long and narrow, at least as long as the pyriform body (Fig. 2), only the terminal part is slightly funnel shaped were it opens in the vagina (Fig. 3:a). The spermatheca is brightly orange. Prostata big (Fig. 3:c), the initial part flattened and narrow, just a little wider at the utmost proximal part. There are two big folds one along the other inside the swollen distal part (Fig. 3:d).

Except for the annular swelling on the penis, the reproductive organs of Belgian *S. fuscus* material show little variability.

Figs 1-3. – *Stagnicola fuscus* (C. PFEIFFER, 1821) from TESTELT, UTM: FS35, leg. R. MARQUET, 23-10-1980.

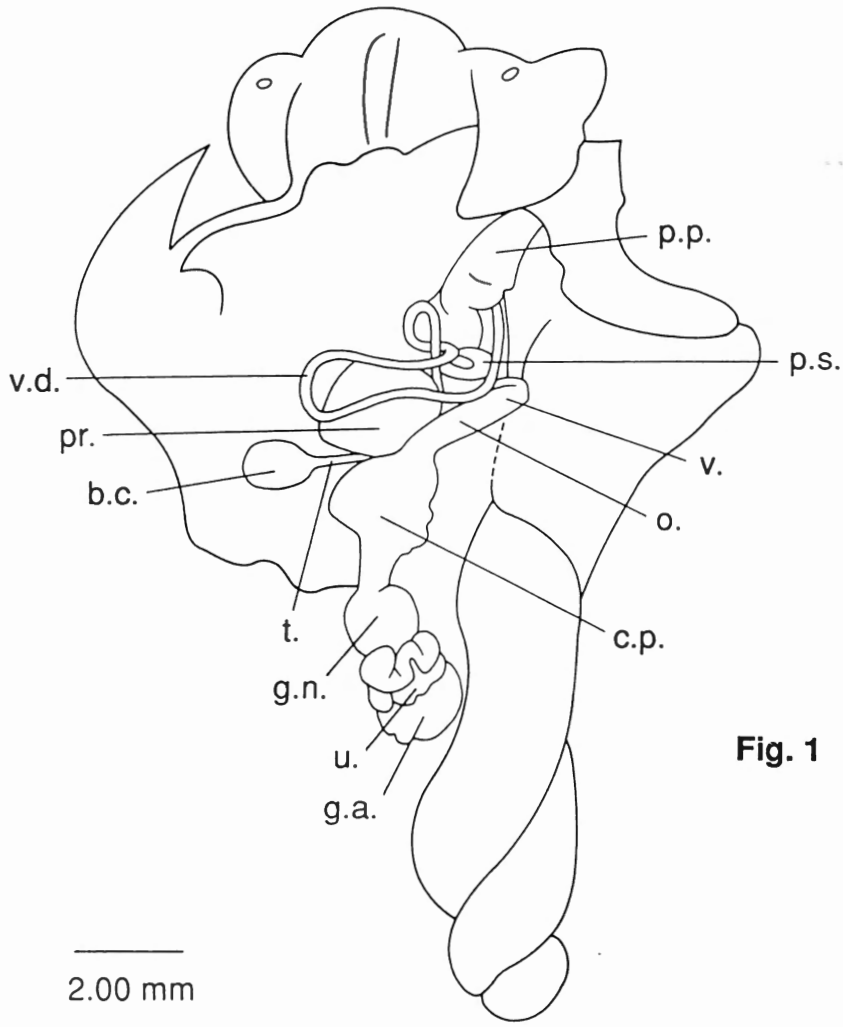

Fig. 1

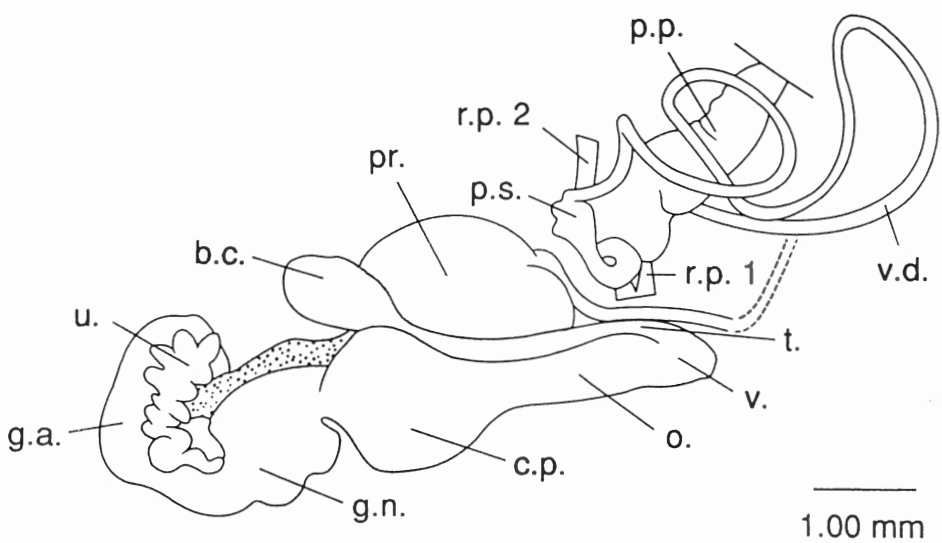

Fig. 2

Fig. 1. – General dissection of *Stagnicola fuscus*, showing the position of the reproductive organs (the vas deferens has been slightly moved to the left to show the position of the penis sheath underneath).

Fig. 2. – *Stagnicola fuscus*, anatomical features after cutting retractor muscles on praeputium and penis sheath and slightly separating the different parts.

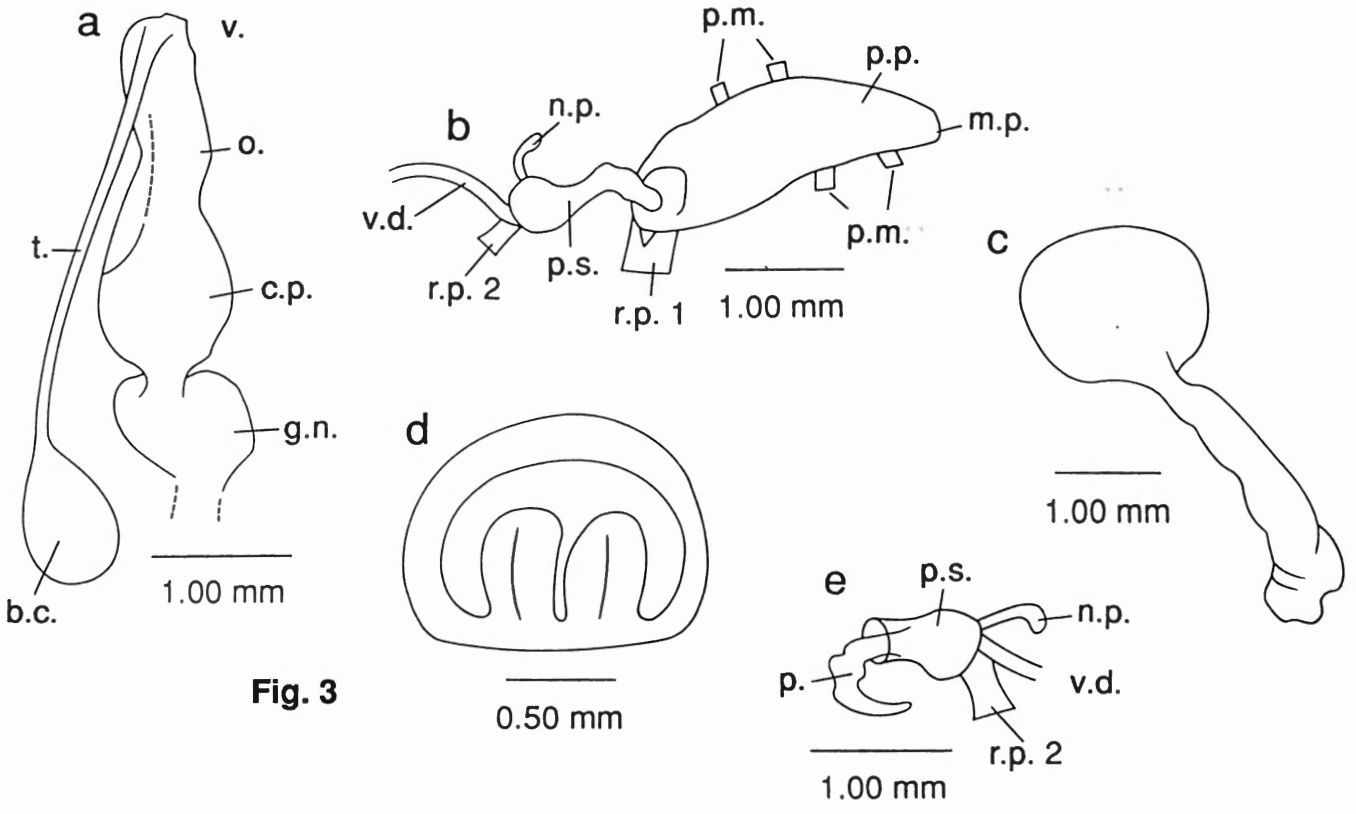

Fig. 3

Fig. 3. – *Stagnicola fuscus*: a. Female tract; b. Male tract; c. Prostata; d. Transversal section of the prostata; e. Penis with annular swelling.

THE *STAGNICOLA PALUSTRIS* TYPE IN BELGIAN MATERIAL (FIGS 4-6)

Shell turriform, dark brown, brown or horny, with a rather long spire, 5 to 6 whorls, usually convex with deep sutures. Body whorl usually little swollen. Aperture oval, less than half the shell height. "Hammering" sensu JACKIEWICZ (1993) may occur. Adult specimens up to 30 mm high. Praeputium rather club- shaped, flattened (Figs 5-6). Penis sheath long and cylindrical (Fig. 6:c). The length ratio between praeputium and penis sheath can be up to 1:2, but is at least 1:1. The penis is long and narrows gradually to a sharp tip (Fig. 6:e) sensu JACKIEWICZ (1988b). Oviduct long (Figs 4-6), cylindrical and having at least one bend before opening into the vagina (Fig. 4). Truncus receptaculi long and thin, always hidden behind the oviduct. The spermatheca is brightly orange. Prostata big, the initial part flattened and narrow, the distal part large and swollen (Fig. 6:d). Inside the prostata there is one big fold, filling nearly the entire lumen (Fig. 6:f). Proximal and distal part of the prostata are equally long.

The reproductive organs of the Belgian *S. palustris* material proved to show little variability with the exeption of the number of bends (1 to 3) in the long cylindrical oviduct.

A first separation was based on shell shape rather than shell size. Both turriform and conical specimens were found in Belgian material at our disposal. During dissection much attention was paid to the organisation of the reproductive organs after cutting the mantle sensu VAN DER VELDE & VAN KESSEL (1984). When a simple dissection of the mantle revealed following features: oviduct long, at least with one bend before opening into the vagina, truncus receptaculi hidden behind the oviduct and part of the penis sheath visible, further dissection showed without exception the above mentioned anatomical characters of *Stagnicola palustris* (MÜLLER, 1774).

On the other hand when a simple dissection of the mantle revealed a short cilindrical oviduct, a truncus receptaculi often partly running next to the oviduct and a penis sheath never visible, further dissection showed without exception the above mentioned anatomical characters of *Stagnicola fuscus* (C. PFEIFFER, 1821). Consequently a simple dissection of the mantle proved to be sufficient to single out *Stagnicola palustris* in the material studied so far.

However some caution has to be used with a simple dissection, bearing in mind the close relationship between *Stagnicola fuscus* and *Stagnicola corvus*. Although in the material at our disposal only the terminal part of the truncus is funel shaped and partly visible next to the

Figs 4-6. – *Stagnicola palustris* (MÜLLER, 1774) from OOSTDUINKERKE, UTM: DS76, leg. Malacology Section RBINS, 24-6-1938.

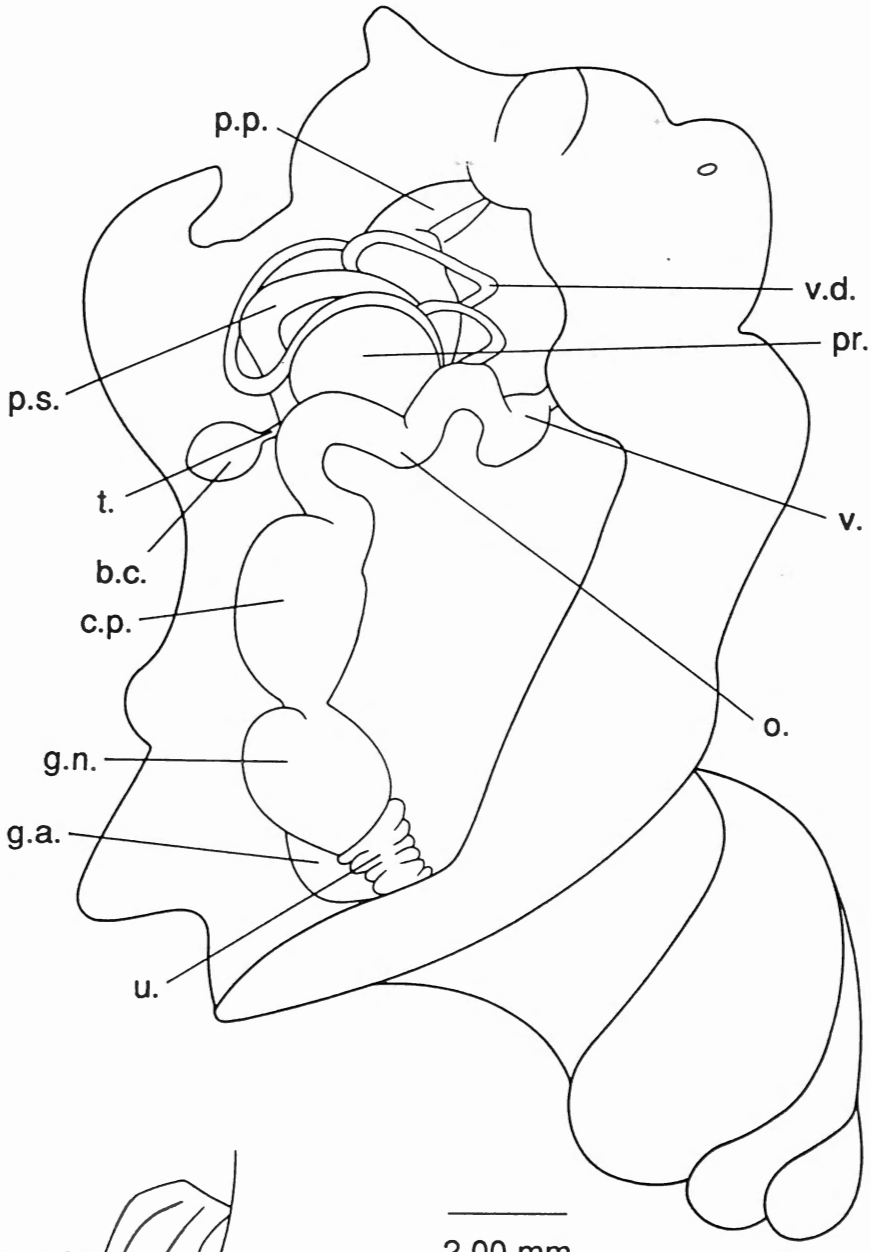

Fig. 4

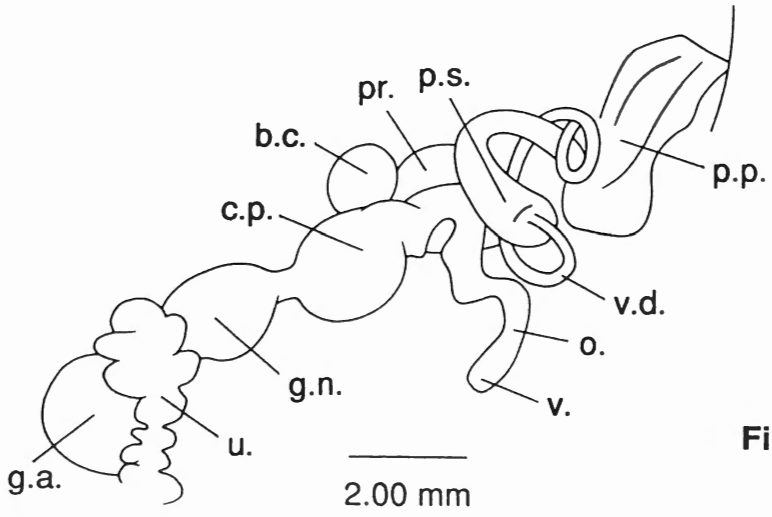

Fig. 5

Fig. 4. – *Stagnicola palustris*, general dissection, showing the position of the reproductive organs.

Fig. 5. – *Stagnicola palustris*, anatomical features after cutting retractor muscles on praeputium and penis sheath and slightly separating the different parts.

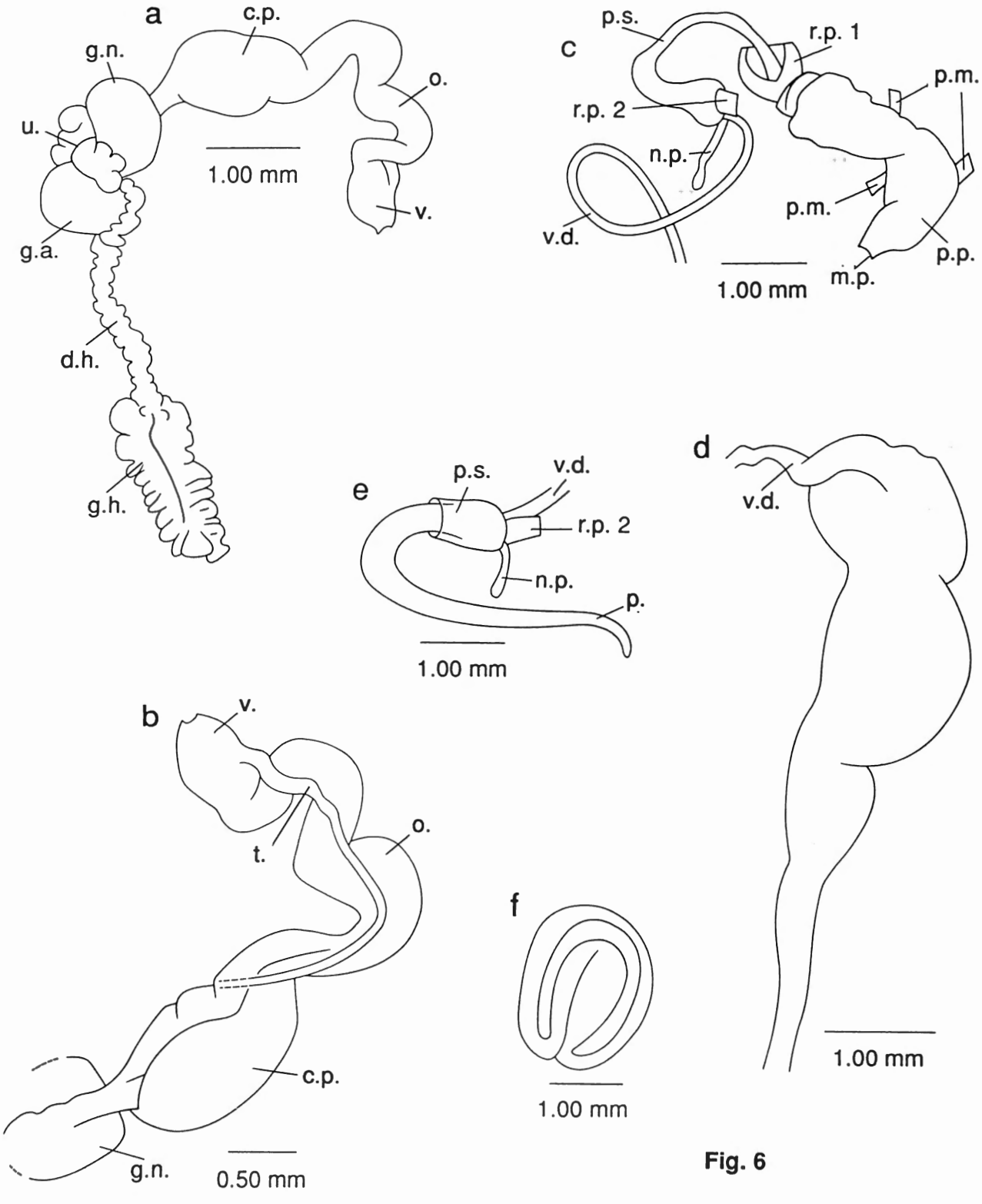

Fig. 6

Fig. 6. – *Stagnicola palustris*, a. Female and hermafrodite tract; b. Female tract (under); c. Male tract; d. Prostata; e. Long penis without annular swelling; f. Transversal section of the prostata.

oviduct (Fig.1), in some cases, the general dissection showed some remarkable resemblance with the general dissection of *Stagnicola corvus* as given by VAN DER VELDE & VAN KESSEL (1984, Fig. 2). Therefore a quick dissection can be useful when dealing with large samples providing the diagnostic features have been established first and doubtful cases are looked into separately.
Anatomical evidence for the occurrence of *Stagnicola corvus* (prostata with many thick folds) in Belgium still has to be confirmed. In conclusion we have to delete *Stagnicola corvus* (GMELIN, 1791) from the annotated namelist of the Belgian non-marine Mollusca (VAN GOETHEM, 1987, 1988). Its known distribution in Europe so far, including the fact that this species seems to be a typical lowland species (VAN DER VELDE, personal communication; GLOËR & MEIER-BROOK, 1994), could be in favour of its occurrence in Belgian polders as well.
With respect to *Stagnicola corvus* (GMELIN), we noticed different years were published with the author's name which might need some future attention, i.e. 1778 (VAN DER VELDE & VAN KESSEL, 1984), 1788 (JACKIEWICZ, 1993) and 1791 (GLÖER & MEIER-BROOK, 1994; FALKNER, 1995), while SHERBORN in Index Animalium 1758-1800 writes: *corvus Helix*, J.F. GMELIN in Linn. Syst. Nat., ed 13, I, 1790, 3665.

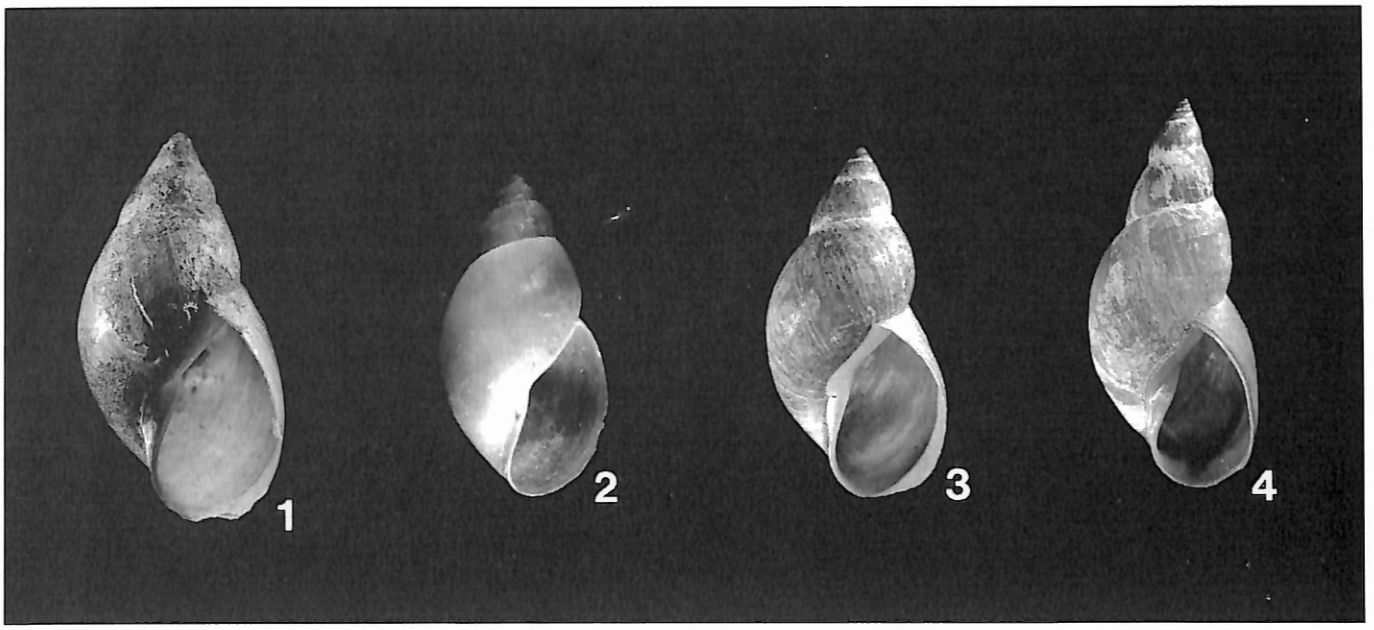

Fig. 7. – *Stagnicola fuscus* (C. PFEIFFER, 1821), 1. TESTELT (12 × 6 mm); 2. VIRELLES (12 × 6 mm); 3. NISMES (20 × 11 mm); 4. MERKEM (24 × 11 mm).

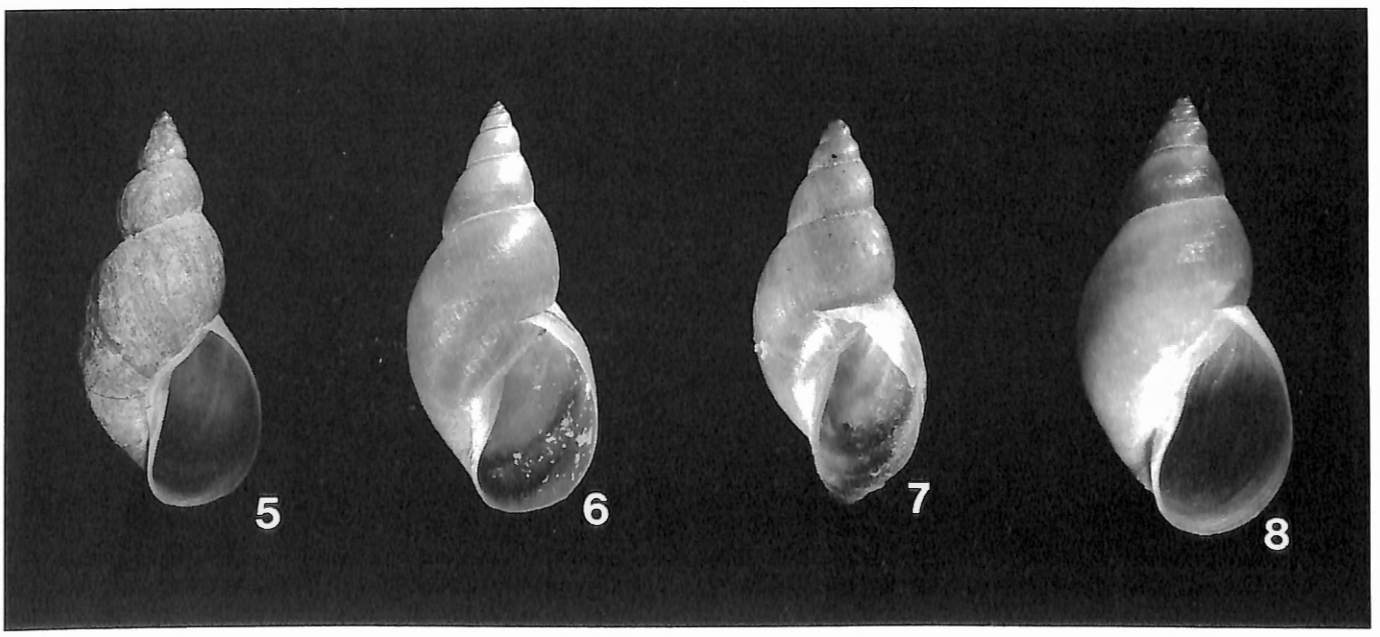

Fig. 8. – *Stagnicola palustris* (MÜLLER, 1774), 5. OOSTDUINKERKE (27 × 12 mm); 6. NOORDSCHOTE (20 × 10 mm); 7. NOORDSCHOTE (11 × 5 mm); 8. MERKEM (15 × 8 mm).

Distribution

According to FALKNER (1995) *Stagnicola fuscus* (C. PFEIFFER, 1821), seems to be the most widespread *Stagnicola* species of Europe, anatomically verified from localities in Germany, Sweden, Ireland, France, Switzerland, Austria, Hungary, Italy and Greece.
For Belgium, on a total of 317 locality data we investigated so far, 251 had *Stagnicola palustris* (MÜLLER, 1774) and 66 *Stagnicola fuscus* (C. PFEIFFER, 1821). More than half of these locations were canals, ditches, polder ditches or moats, rather common to the Belgian landscape. Both species are also present in brackish water bodies. They were present in ponds in towns and parks, in open country, woodland, dunes... From this variety of locations it seems that both species prefer rather slow moving, even stagnant water. Either species could be found in sampling sites which were connected or at least nearby, although only 5 samples contained both species. This is a strong indication that they usually don't live together, even if they share similar and close, related waterbodies.
Distributional data (Figs 9-10) are presented on standard maps with an UTM- grid (Universal Transverse Mercator), as used in the context of the European Invertebrate Survey project (EIS). The UTM- grid is composed of 10 × 10 km squares of which 376 partain to the Belgian territory (DE WILDE et al., 1986). The distribution maps show some gaps, partly because samples of empty shells were not taken into consideration in this paper, partly because some areas, such as the mountainous southern part of Belgium, haven't been sampled adequately yet.

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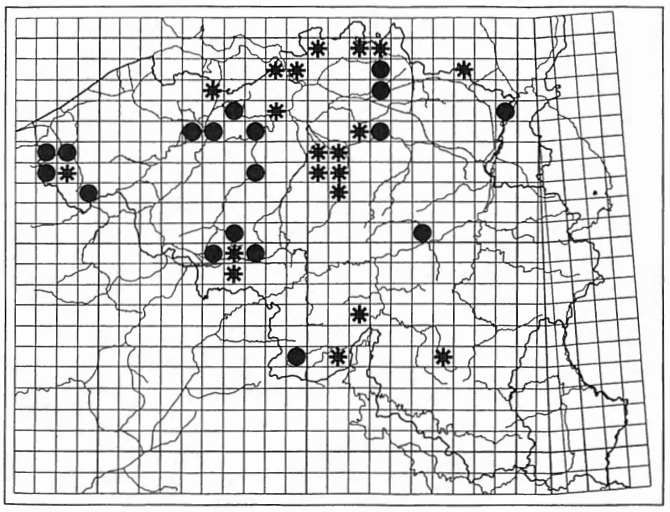

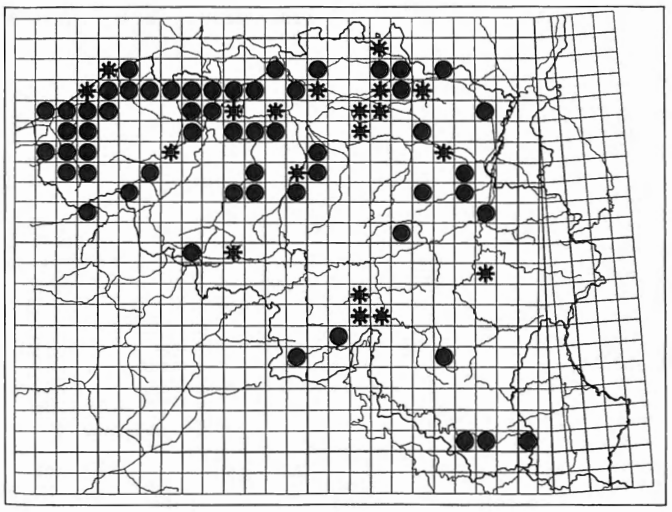

Fig. 9. – Preliminary distribution of *Stagnicola fuscus* (C. PFEIFFER, 1821) in Belgium: * pre 1950; • 1950 onwards.

Fig. 10. – Preliminary distribution of *Stagnicola palustris* (MÜLLER, 1774) in Belgium: * pre 1950; • 1950 onwards.

References

ADAM, W., 1947. Révision des mollusques de la Belgique. I. Mollusques terrestres et dulcicoles. *Mémoires du Musée royal d'Histoire naturelle de Belgique.*, 106: 1-298, figs 1-4, pls 1-6, cartes 1-162.

ADAM, W., 1960. Mollusques. I. Mollusques terrestres et dulcicoles. *Patrimoine de l'Institut royal des Sciences naturelles de Belgique, série Faune de Belgique*: 1-402, figs 1-163, pls 1-16, col. pls A-D.

DE COSTER, W. & PERSOONE, G., 1970. Ecological study of Gastropoda in a swamp in the neighbourhood of Ghent (Belgium). *Hydrobiologia*, 36(1): 65-80.

DE WILDE, J.J., MARQUET, R. & VAN GOETHEM, J.L., 1986. Voorlopige atlas van de landslakken van België / Atlas provisoire des gastéropodes terrestres de la Belgique. *Patrimoine de l'Institut royal des Sciences naturelles de Belgique*: 1-285, pls 1-133.

FALKNER, G., 1984. *Stagnicola palustris* (O.F. MÜLLER 1774) vom Originalfundort (Basommatophora: Lymnaeidae). *Heldia*, 1(1): 15-21.

FALKNER, G., 1985. *Stagnicola turricula* (HELD)- eine selbständige Art neben *Stagnicola palustris* (O.F. MÜLLER). *Heldia*, 1(2): 47-50.

FALKNER, G., 1995. Present-day knowledge on the systematics of the genus *Stagnicola* in Europe. In: A. GUERRA, F. ROLAN and F. ROCHA (eds), Abstracts of the 12th International Malacological Congres, Vigo, 1995: 378-379.

GLÖER, P. & MEIER-BROOK, C., 1994. Süsswassermollusken: Ein Bestimmungsschlüssel. *Deutscher Jugendbund für Naturbeobachtung*, 136 pp.

HUDEC, V. & BRABENEC, J., 1966. Neue Erkenntnisse über die Schnecken der Gesamtart *Galba palustris* (MÜLL., 1774) aus der Tschechoslowakei. *Folia parasitologica*, 13(2): 132-143.

JACKIEWICZ, M., 1959. Investigations on the variability and systematic position of *Galba palustris* O.F. MÜLLER. *The Poznan Society of Friends of Science. Department of Mathematical and Natural Sciences. Publications of the Section Biology*, 19(3): 89-174.

JACKIEWICZ, M., 1988a. Anatomy and taxonomic status of *Lymnaea vulnarata* KÜSTER, 1862 (Mollusca, Gastropoda). *Bulletin de la Societé des Amis des Sciences et des Lettres de Poznan. Série D, sciences biologiques*, 26: 125-128.

JACKIEWICZ, M., 1988b. The penis as a valuable diagnostic feature in lower taxonomic units of the family Lymnaeidae (Gastropoda, Pulmonata). *Malakologische Abhandlungen*, 13(2): 23-26.

JACKIEWICZ, M., 1989. *Galba turricula* HELD sensu JACKIEWICZ, 1959 als jüngeres Synonym von *Stagnicola palustris* (O.F. MÜLL.) (Gastropoda, Basommatophora: Lymnaeidae). *Malakologische Abhandlungen*, 14 (1): 1-5.

JACKIEWICZ, M., 1990. Systematic position of *Lymnaea corvus* (GMELIN, 1788) (Gastropoda: Pulmonata). *Folia Malacologica*, 2(4): 148-156.

JACKIEWICZ, M., 1993. Phylogeny and Relationships within the European Species of the Family Lymnaeidae (Gastropoda: Pulmonata: Basommatophora). *Folia Malacologica*, 5: 61-95.

JACKIEWICZ, M. & GERBER, J., 1990. Eine für die Bundesrepublik Deutschland neue Schlammschnecke: *Lymnaea vulnerata* KÜSTER, 1862 (Gastropoda: Pulmonata). *Mitteilungen der Deutschen Malakozoologischen Gesellschaft*, 47: 1-5.

JACKIEWICZ, M. & T. VON PROSCHWITZ, 1991. *Lymnaea (Stagnicola) occulta* (JACK.), *Lymnaea (Lymnaea) vulnerata* KÜST. und *Lymnaea (Lymnaea) corvus* (GMEL.) - drei für Schweden neue Schlammschneckenarten. (Gastropoda, Basommatophora: Lymnaeidae). *Malakologische Abhandlungen*, 15(14): 125-132.

LARAMBERGUE, E.M., de, 1928. Etude de l'appareil génital de quelques Limnées, ses rapports avec la systématique. *Bulletin de la Société Zoologique de la France*, 53: 491-509.

VAN DER VELDE, G. & VAN KESSEL, C.M., 1984. Anatomical evidence for the occurrence of *Lymnaea (Galba) palustris* (O.F. MÜLLER, 1774) and *L. (Galba) corvus* (GMELIN, 1778) (Gastropoda: Lymnaeidae) in the Netherlands. *Zoölogische Mededelingen*, 58(22): 341-352.

VAN GOETHEM, J.L., 1987. Nieuwe naamlijst met aantekeningen van de recente niet-mariene weekdieren van België. *Studiedocumenten van het K.B.I.N.*, 44: 1-65.

VAN GOETHEM, J.L., 1988. Nouvelle liste commentée des mollusques récents non-marins de Belgique. *Documents de Travail de l'I.R.Sc.N.B.*, 53: 1-69.

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