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## Descriptions of spermatophores of *Oxyloma dunkeri* and *Oxyloma elegans* (Gastropoda, Pulmonata, Succineidae)

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**ABSTRACT.** Spermatophores of *Oxyloma dunkeri* (Zelebor in L. Pfeiffer, 1865) and *O. elegans* (Risso, 1826) are described for the first time.

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### Introduction

Spermatophores of Succineidae were discovered by A. A. Schileyko and I. M. Likharev [Schileyko, Likharev, 1986] – long slender structures with round cross-section in spermathecae of two specimens of *Oxyloma dunkeri* (Zelebor in L. Pfeiffer, 1865). However, the authors themselves doubted that these were really spermatophores. Description of spermatophores of *Oxyloma elegans* (Risso, 1826) and *O. dunkeri* facilitates understanding of physiological processes in representatives of this genus.

### Material and methods

Specimens were collected at the following locations:

1. *Oxyloma dunkeri*: Hungary, Zala, Balaton Lake near Batongyörök, 46°46'7,8"N 17°21'53,64" E, altitude 115 m above sea level. 25-28.05.2014. Leg. A. Reimann, 3 specimens.

2. *Oxyloma elegans*: Tver (Russia), silty shore of a slowly running stream, August 2014. Leg. E. V. Schikov, 15 specimens.

Dissections were conducted under the MBS-9 stereomicroscope. Reproductive system and spermatophores were photographed at different stages of the dissection. Drawings were made on the base of these photos.

Abbreviations used in the figures:

A – atrium, Dh – hermaphrodite duct, Ga – albumen gland, Gh – hermaphrodite gland, Ov – oviduct, P – penis, Pr – prostate, Rp – penial retractor, Spt – spermatophore, Sp – spermatheca, Spd – spermathecal duct, U – uterus, V – vagina, Vd – vas deferens.

### Results

Studied mollusks have typical shells for the species (Fig. 1). Spermatophores were found in 3 specimens of *O. dunkeri* and 2 specimens of *O. elegans*. Animals were in different physiological states; this was evidenced by great differences between uterus appearance. In some cases uterus was strongly inflated indicating the period of eggs laying, in other cases this condition was not observed (Fig. 2A, 4A, 5A, 6A).

After longitudinal dissection of the vagina walls, spermathecal duct and spermatheca, spermatophores could be easily removed.

In the first specimen of *O. dunkeri* two spermatophores were found (Figs. 2C, 2D, 2E, 2F, 2G). One of them was located in vagina and had an irregular shape (Fig. 2C, 2D). Sperm filled spermatophore almost entirely. Other spermatophore had the shape of curved dented cylinder (Fig. 2G). Its tail part was located in vagina, middle part was in spermathecal duct and the front part was found in spermatheca (Fig. 2F). Sperm filled the anterior and middle zones of the spermatophore. Small area in anterior part of spermatophore and its posterior part (formed by crumpled part of spermatophore – Fig. 2G) had no sperm. The walls of spermathecal duct were thickened as well as the walls of spermatheca lower area. On the inner surface of spermathecal duct curved pilasters were seen (Fig. 2E, 2F).

In the second specimen of *O. dunkeri* single spermatophore was observed. It was located in the vagina and distal part of spermathecal duct (Fig. 3A). Spermatophore had the form reminding the flask with quite regular folds (Fig. 3C, 3D). External sculpture of spermatophore was corresponding to the folds on the inner surfaces of vagina and spermathecal duct (Fig. 3B). The anterior region of spermatophore had no sperm. The walls of spermathecal duct were thickened in the middle and distal parts only (Fig. 3B).

In the third specimen of *O. dunkeri* spermatophore

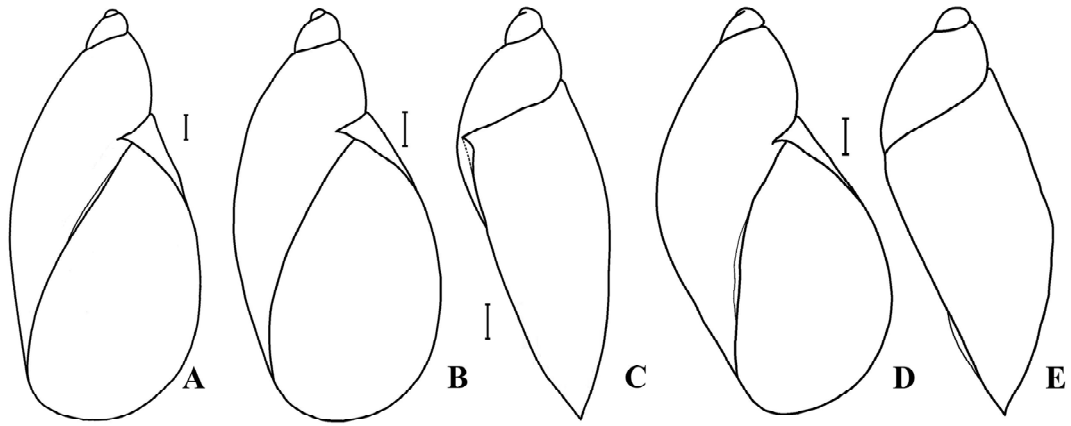
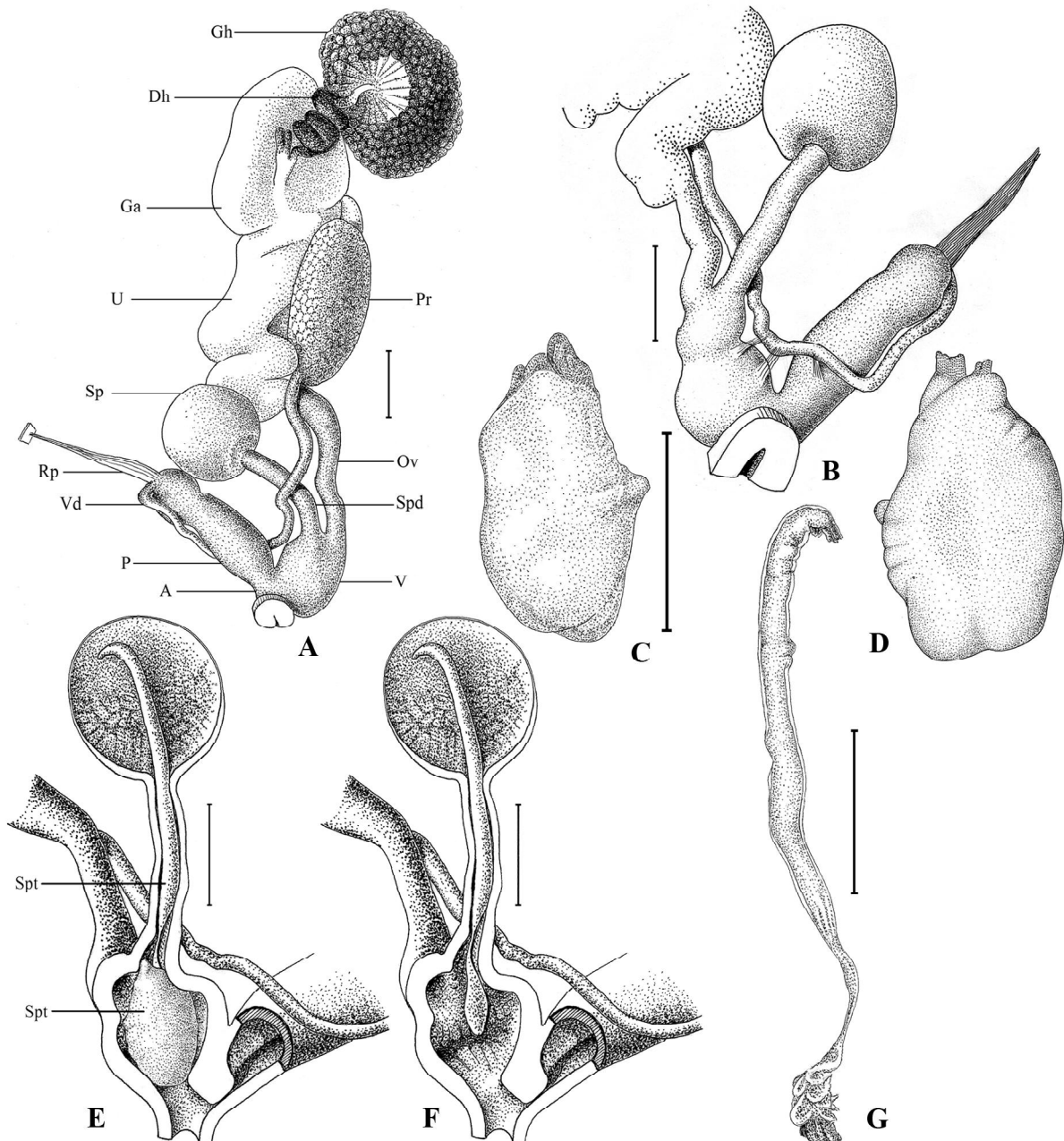


FIG. 1. The shells. A, B, C – *Oxyloma dunkeri*. D, E – *Oxyloma elegans*. Scale bar 1 mm.

РИС. 1. Раковины. А, В, С – *Oxyloma dunkeri*. D, E – *Oxyloma elegans*. Шкала 1 мм.



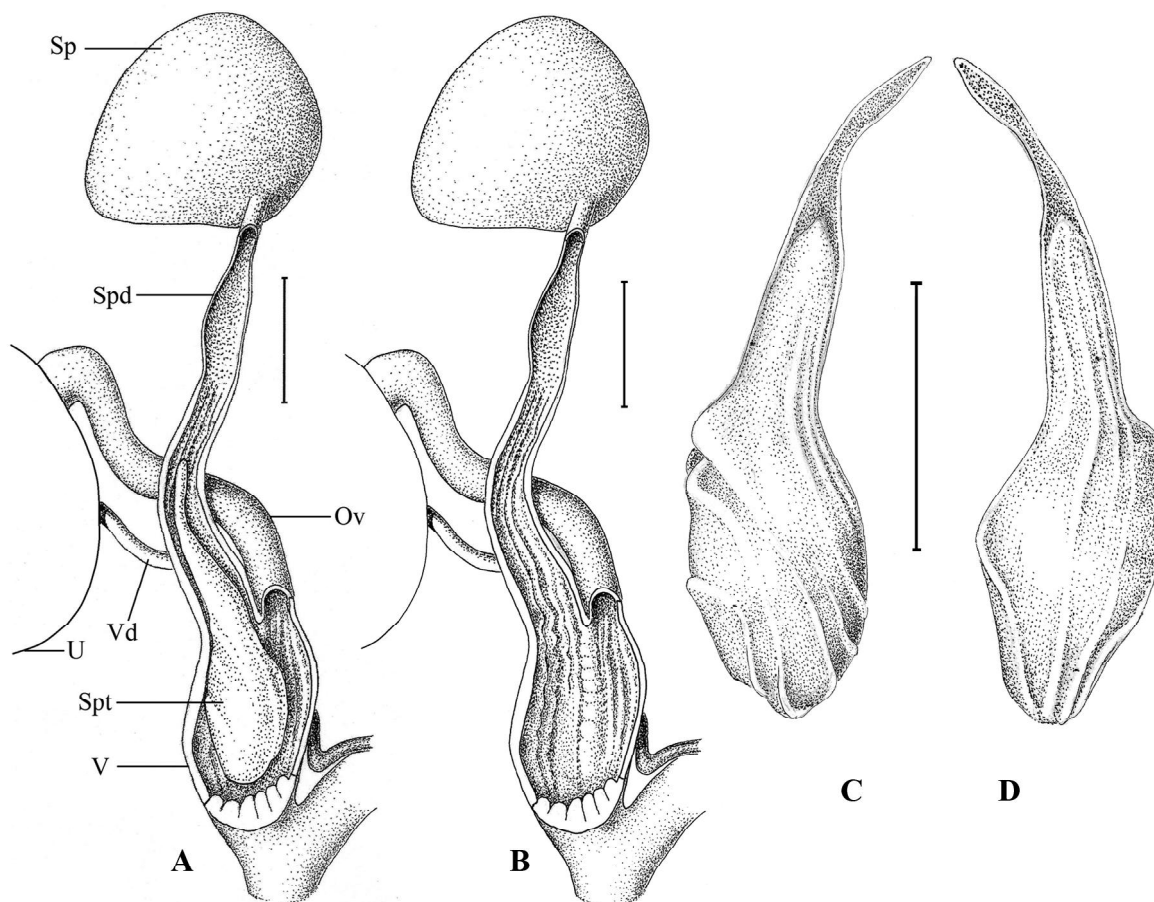


FIG. 3. *Oxyloma dunkeri*. A – longitudinal section of vagina and spermathecal duct with the spermatophore lying into them. B – the same view after removing the spermatophore. C, D – sides views of spermatophore. Scale bar 1 mm.

РИС. 3. *Oxyloma dunkeri*. А – Продольный разрез вагины и протока семяприёмника с лежащим внутри них сперматофором. В – То же после изъятия сперматофора. С, D – Сперматофор с двух сторон. Шкала 1 мм.

phore was placed in spermathecal duct. Only its most rear zone was still in vagina (Fig. 4B). Spermatophore had the form of a curved hose with a severely bloated middle part. Sperm appeared only in the middle part of spermatophore. Anterior and posterior areas of spermatophore were formed by spermatophore walls with the anterior zone folded in half (Fig. 4C, 4D).

The first specimen of *O. elegans* had the spermatophore located in vagina and distal part of spermathecal duct (Fig. 5A). The bulk of the sperm was in the back of the wide part of the spermatophore. Narrow posterior end of spermatophore was free

from sperm. In anterior part there were only two small lumps of sperm (Fig. 5B, 5C, 5D).

The second specimen of *O. elegans* had spermatophore occupying entire vagina and spermathecal duct (Fig. 6B). It had cylindrical form with strongly crushed rear area. Sperm filled anterior and middle zones of spermatophore. In the empty posterior part only small oblong mass of sperm was found (Fig. 6C).

## Discussion

The comparison of spermatophores and their localization in the genitalia of *O. dunkeri* shows the

FIG. 2 (previous page). *Oxyloma dunkeri*. A – general view of the genitalia. B – distal part of the genitalia. C, D – spermatophore from the two sides view. E – distal part of the genitalia. Vagina, spermatheca, spermathecal duct, atrium and penis are dissected. 2 spermatophores are seen. F – the same view. Spermatophore is removed from vagina. G – Spermatophore. Scale bar 1 mm.

РИС. 2 (на предыдущей странице). *Oxyloma dunkeri*. А – общий вид гениталий. В – дистальная часть гениталий. С, D – сперматофор с двух сторон. Е – дистальные части гениталий. Вскрыты: вагина, проток семяприёмника, семяприёмник, половая клоака, пенис. Видны 2 сперматофора. F – То же. Сперматофор из вагины удалён. G – Сперматофор. Шкала 1 мм.

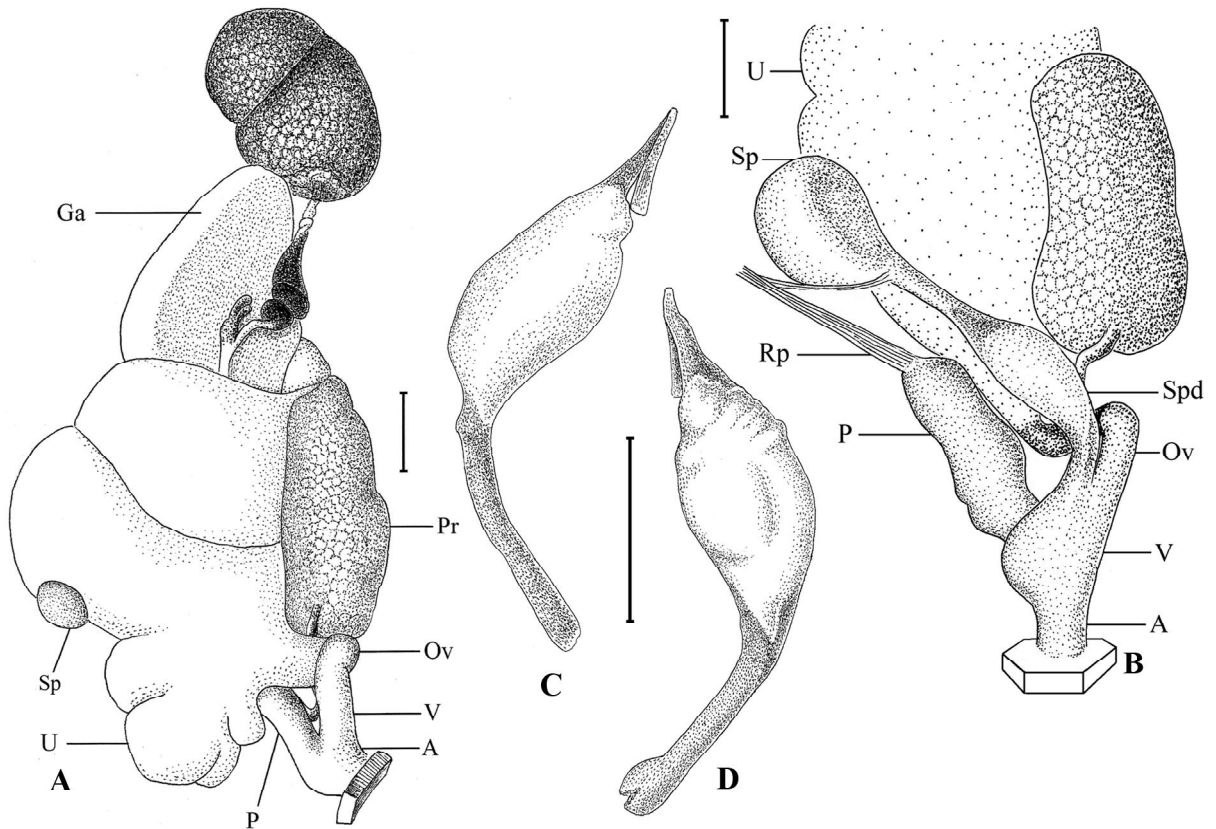


FIG. 4. *Oxyloma dunkeri*. A – general view of the genitalia. B – Distal part of the genitalia. In spermathecal duct spermatophore is visible. C, D – Side views of spermatophore. Scale bar 1 mm.

РИС. 4. *Oxyloma dunkeri*. А – общий вид гениталий. В – дистальные части гениталий. В протоке семяприёмника просвечивает сперматофор. С, D – сперматофор с двух сторон. Шкала 1 мм.

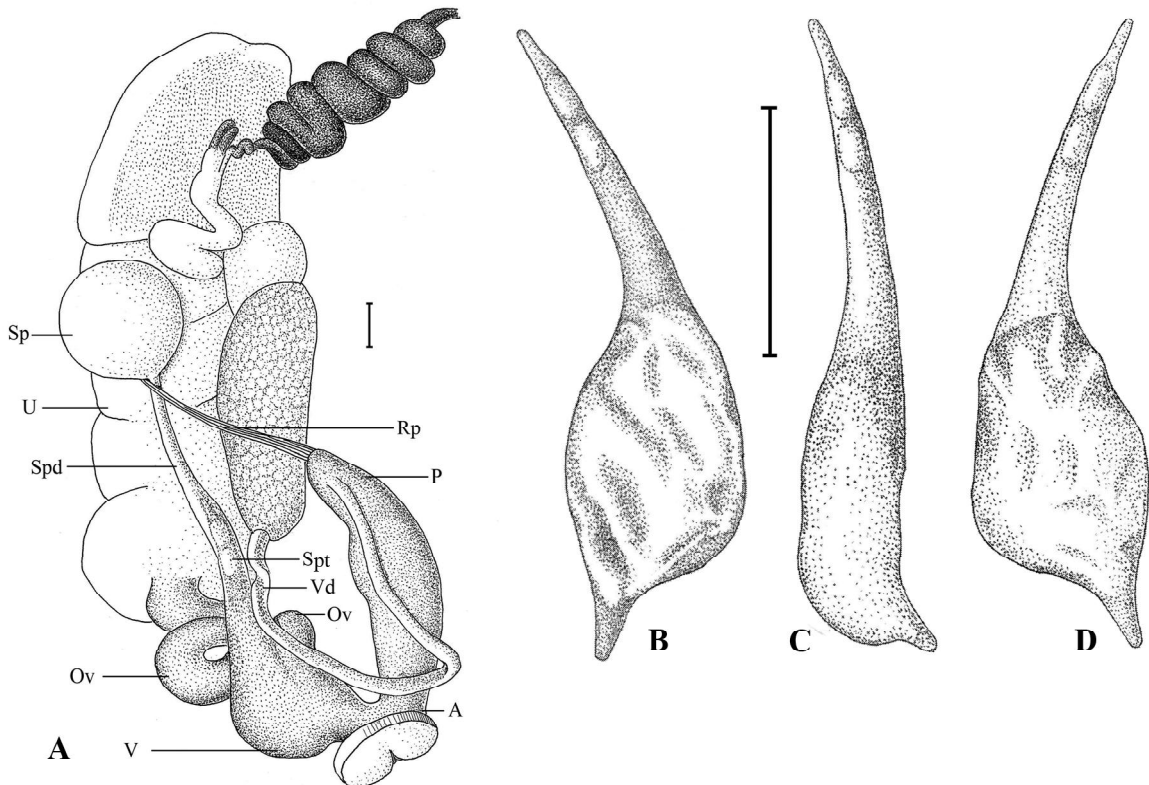


FIG. 5. *Oxyloma elegans*. A – general view of the genitalia. Spermatophore with small light masses of sperm is visible in spermathecal duct. B, C, D – spermatophore in different positions. Scale bar 1 mm.

РИС. 5. *Oxyloma elegans*. А – общий вид гениталий. В протоке семяприёмника просвечивает сперматофор с небольшими светлыми массами спермы. В, С, D – сперматофор в разных положениях. Шкала 1 мм.

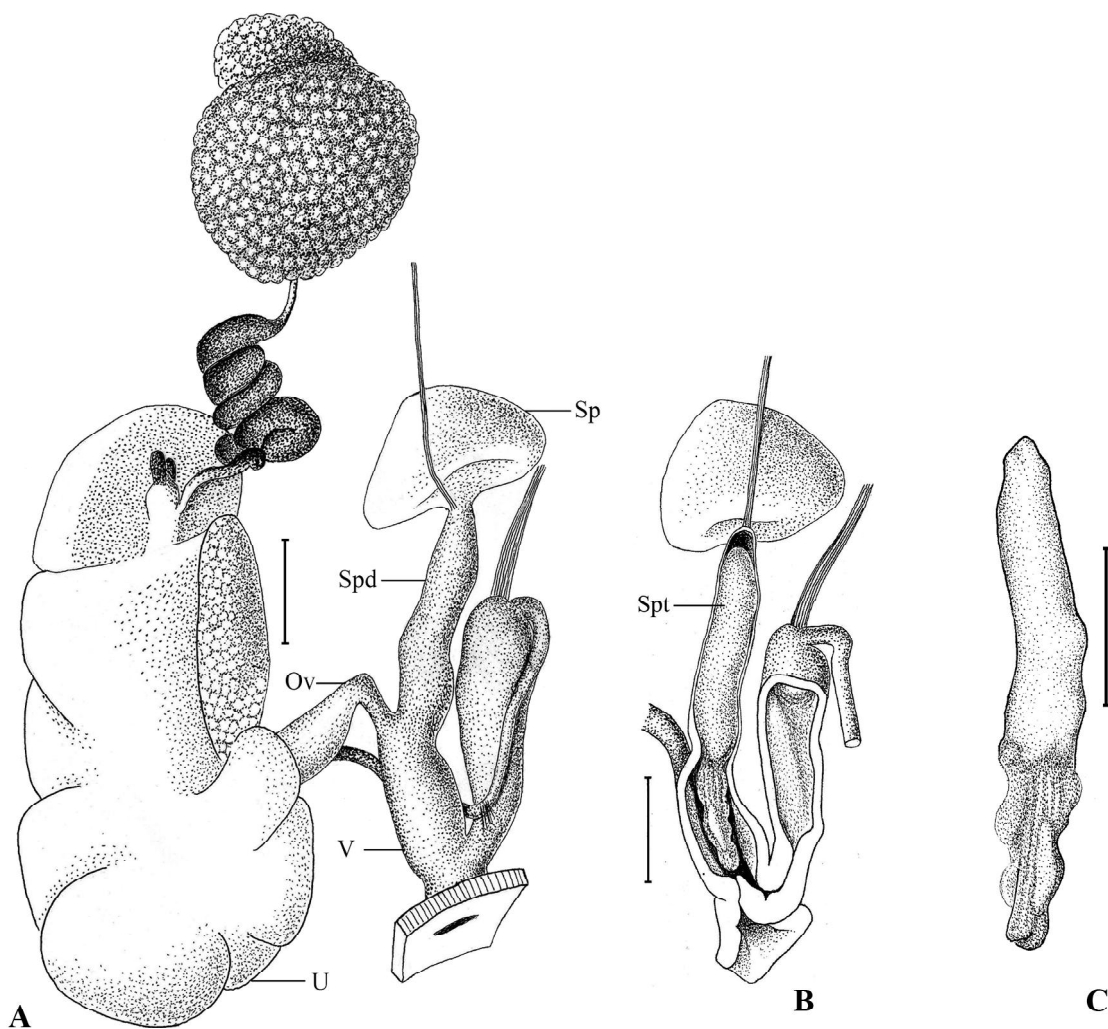


FIG. 6. *Oxytoma elegans*. A – general view of the genitalia. B – distal part of the genitalia. Vagina, spermathecal duct, atrium and penis are dissected. Spermatophore is seen inside vagina and spermathecal duct. C – spermatophore. Scale bar 1 mm.

РИС. 6. *Oxytoma elegans*. А – общий вид гениталий. В – дистальная часть гениталий. Вскрыты: влагалище, проток семяприёмника, клоака, пенис. Внутри влагалища и протока семяприёмника виден сперматофор. С – сперматофор. Шкала 1 мм.

patterns of changing of its form. After copulation spermatophore enters into the vagina and has the form of a lump. Then walls of vagina contracted and compress the spermatophore. Its anterior part becomes narrower and the spermatophore acquires the form reminding retort. Herewith mass of sperm doesn't fill the whole anterior area of spermatophore. Further compression of the spermatophore by the vaginal walls and spermathecal duct walls leads to the formation of a cylindrical shape. Mass of sperm is pushed from the rear part of spermatophore. During movement to spermatheca through spermathecal duct unfilled by sperm front end of spermatophore becomes crushed and bent.

In my opinion, similar processes with spermatophore occur in *O. elegans* as well. After the copulation clod of sperm emerge in vagina. Compressing of its walls gives spermatophore the flask-shaped form. Further compression of the vagina walls and sper-

mathecal duct walls pushes mass of sperm in the middle part of spermatophore. Thereat unfilled front zone of spermatophore rumples and folds in half.

Spermatophore movement in reproductive paths of the second specimens of *O. elegans* is a little different. Here one can see transforming of initial clod-like spermatophore in quite voluminous cylinder in which only rear part isn't filled by sperm.

Thus, spermatophores of *O. dunkeri* and *O. elegans* have elastic walls. During movement from vagina to spermatheca their form changes.

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Описание сперматозоидов *Oxytoma dunkeri* (Zelebor in L. Pfeiffer, 1865) and *Ox. elegans* (Risso, 1826) (Gastropoda, Pulmonata, Succineidae)

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**РЕЗЮМЕ.** Впервые описаны сперматозоиды *Oxytoma dunkeri* (Zelebor in L. Pfeiffer, 1865) и *O. elegans*

(Risso, 1826). Исследованные моллюски имели раковины, типичные для данных видов. Сперматозоиды обнаружены у 3 экземпляров *O. dunkeri* и 2 экземпляров *O. elegans*. Животные находились в разных физиологических состояниях. У всех особей семяприёмник был пустой. Сперматозоиды *O. dunkeri* и *O. elegans* имеют эластичные стенки. Сравнение сперматозоидов и их локализации в половых путях показывает закономерности изменения их форм. После копуляции сперматозоид попадает во влагалище и имеет форму комка. Затем стенки влагалища сокращаются и сжимают сперматозоид. Передняя часть сперматозоида сужается, и сперматозоид приобретает форму, напоминающую колбу. При этом масса спермы не заполняет до конца переднюю часть сперматозоида. Дальнейшее сжатие сперматозоида стенками влагалища и стенками протока семяприёмника приводит к образованию цилиндрической формы. Масса спермы выталкивается из задней части сперматозоида. При движении по протоку семяприёмника в резервуар, незаполненный спермой передний конец сперматозоида сминается и сгибается.

