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SUCCINEA VAGINACONTORTA (SECTION CALCISUCCINEA),
A NEW AMBER SNAIL FROM KANSAS

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INTRODUCTION

THE amber snails, family Succineidae, are among the most widely distributed of the land pulmonates. Few regions are devoid of them; yet, in spite of their extensive range, the group remains relatively neglected by systematists. Since the time of Draparnaud (1801) most of the species have been described almost wholly on the basis of shell characters. In the nineteenth century, Lehmann (1873) and Fischer (1874) were the first to illustrate the anatomy of the genitalia of members of this family. Recently, Boettger (1939), Quick (1933), and Odhner (1950) have demonstrated the importance of the male genital structures of this family in classification. The schemes of classification proposed by these 3 workers are adequate in the majority of cases. In some instances of confusingly similar male genitalia, however, additional genital characters must be used. Accordingly, in describing this species the character of the female genitalia will be used as an adjunct to the male characteristics. The unique structure of the vagina has a decisive taxonomic value.

The specimens for this study were collected during the summer of 1950 by members of the University of Michigan Paleontological Expedition to Kansas. The presence of this species in the area was first noted by Claude W. Hibbard in June, 1942, but actual collections were not made until the summer of 1950. Collections were made on July 21, 1950, between 7 P.M. and 8 P.M., and on August 1, 1950, between 9 A.M. and 1 P.M.

The type locality (Pl. I, Fig. 1) was a sagebrush flat on which hairy gramma grass (*Bouteloua hirsuta* Lag.) was growing along a small

creek in the southwest corner of sec. 18, T. 33 S., R. 28 W., Meade County, Kansas. The stream is known locally as "Short's Creek." In the late Pleistocene the flat was probably a valley floor. It is not subject to flood. The nearest permanent water is Crooked Creek about one-half mile to the east. The hairy gramma grass occurred in thick stands with a few small patches between the stands. The snails lived on the spots of lichens, mosses, and occasional liverworts between these patches. Hibbard stated that the area is subject to intense droughts and periods of dryness alternating with spells of heavy rains. The snails were present in large numbers.

ACKNOWLEDGMENTS

The specimens used in this study were collected by Dwight W. Taylor, of Pomona College, while he was engaged in field work for the University of Michigan Museum of Paleontology. Claude W. Hibbard, of the Museum of Paleontology, University of Michigan, in charge of this expedition to Kansas in the summer of 1950, furnished ecological data as well as the photograph of the type area. William Brudon, staff artist in the University Museum of Zoology, provided drawing equipment. Photographs of the type specimen were supplied by the University of Michigan Photographic Services. The manuscript was read by Henry van der Schalie, of the Museum of Zoology, University of Michigan.

SYSTEMATIC DESCRIPTIONS

Class PULMONATA

Order STYLOMMATOPHORA

Family Succineidae

Succinea (Calcisuccinea) vaginacontorta, new species

(Pl. I, Figs. 2-3)

HOLOTYPE.—No. 162683; shell and slide of genitalia in University of Michigan Museum of Zoology.

TYPE LOCALITY.—Southwest corner of sec. 18, T. 33 S., R. 28 W., Meade County, Kansas.

DIAGNOSIS.—Shell is thin, light yellow, horn-colored, resembling *Succinea grosvenori* Lea in section Novisuccinea of Pilsbry (1948). Anatomically it is closely related to section Calcisuccinea of Pilsbry (1948). Shell differs from *Succinea grosvenori* Lea in having suture only moderately incised, aperture slightly flared to outer lip; whorls, 3. Internally, genital characters strikingly different. Genitalia resemble

those in *Calcisuccinea*, with the exception that this species has a well-developed vagina with a peculiar twist immediately next to the genital atrium.

DESCRIPTION OF HOLOTYPE.—Shell is dextral, fully developed. Whorls, 3, with suture only moderately impressed. Whorls which increase proportionately from the apex to the body whorl with no marked discontinuity in size. In life shell is a dull, translucent, light, horn yellow with greenish tones. Striae present and well raised (Pl. I, Fig. 3). Epidermis of upper whorl eroded away revealing dull white deeper layers of shell, parietal wall with well-developed callus, covering base of slightly curved columella (Pl. I, Fig. 2). Aperture obliquely ovate with a slight flare at base of outer lip. Interior of aperture with a thin shiny transparent sheen.

DESCRIPTION OF HOLOTYPE ANIMAL—EXTERNAL.—Macroscopically, the animal is a dull grayish white with the anterior part finely peppered with black pigment. The tentacles, fully developed for their entire length, taper slightly toward their extremities. Upper surface and basal part of the tentacles are more heavily pigmented. The inter-tentacular space is pigmented with small blotches of black (Pl. I, Fig. 3).

The surface of this hermaphroditic animal is sufficiently transparent in the region of the genital furrow to expose the outlines of both the vagina and penis. Retractor muscles of the upper tentacles are heavily pigmented with black and are easily seen through the epidermis. The skin appears to be smooth, but has weakly defined rugae. The peripodal groove is well developed and is especially evident anteriorly. The genital furrow is an oblique slit incised deeply on the right side of the animal, and slanting sharply anterolaterad, where it joins the beginning of the peripodal groove. The vagina and penis empty through separate atria into a common genital furrow.

The collar of the mantle is white, continuous around the edge, and broken only posteriorly by the common atrium for the anus and the pneumostome. The edge of the mantle may have a few to many concentrations of black pigment. Some appear gray. The rest of the mantle is finely reticulated. This netlike pattern also covers the dull yellow kidney. The digestive gland is dull white. The course of the intestine is easily followed through the digestive gland by the pigment concentrations on the surface of the mantle along its route. The extended animal measures 11.3 mm.

Dimensions of holotype: length, 9.8 mm.; width, 5.9 mm.; aperture length, 5.7 mm.; aperture width, 4.2 mm.

DESCRIPTION OF HOLOTYPE ANIMAL—INTERNAL GENITAL ANATOMY
(Pl. I, Fig. 1).—

Hermaphroditic gland. This is a creamy white structure composed of many individual follicles joined together in a bunch. The ends appear cauliflower-like on the surface. The hermaphroditic duct enters the center of the underside of the gland. The surface of the gland is covered by a thin black reticulated epithelium. Upon dissection the follicles easily separate, which makes removal of the gland in its entirety difficult.

Hermaphroditic duct. The coils composing this convoluted structure turn to the back and side of one another. The duct is of a uniform width and tapers slightly upon entering the hermaphroditic gland. It is creamy white although the heavy black pigmented epithelium that surrounds it makes this difficult to see. The duct originates at the base of the seminal vesicles.

Seminal vesicles. One of this bifid pair is larger than the other. The distal ends of both are rounded and slightly swollen. A pigmented epithelium covers these finger-like structures, but it is not of the same intensity as the covering of the hermaphroditic duct. The seminal vesicles are firmly imbedded in, though not joined to, the albumin gland. A fertilization sac (FS) is at the base of this structure.

Albumin gland. This finely folliculate white structure is loosely surrounded by a thin reticulated black epithelium.

Prostate gland. Compared to the eastern *Succinea ovalis* (Say), the almost white gland of this species is very small. It is loosely but evenly covered with a thin reticulated epithelium that covers the pustulous surface.

Uterus. Covered by a thin epithelium, this considerably swollen organ has loops that rest one on the other, giving it a stacked, obese appearance. The uterine coils of the type specimen are completely filled with albumin.

Vagina. The vagina is about two-thirds as large as the penis and has a white satin sheen. Distally, it becomes the uterus, whereas proximally one-third of the organ is in the form of a swollen twist giving a recognizable specific character for this species. The torsion (V') is at the base of the vagina, immediately next to the entrance to the common genital atrium, and has the same color as the rest of the vagina.

Seminal receptacle. The stalk of this organ originates at the base of the vagina immediately behind the twisted curve. As is usual in this structure the thin stalk bears a ball-like sperm receptacle at its

distal end. The entire structure is white. The receptacle of the type specimen is filled with sperm from a previous mating. The sperm agglutinates into a solid mass which should not be construed as a spermatophore. The stalk passes between the vas deferens and the oviduct before proceeding distally.

Penis. The thin, wandlike penis is enclosed in a large, thick, white, slightly curved sheath (PS) extending from its origin on the right side of the body across the body cavity to the left body wall. The sheath bears a few pigment granules on its surface. At its distal end the epiphallus emerges as a free loop (EP). Dissection reveals the penis to be enclosed in a sheath of tough, fibrous, fuzzy, connective tissue. This tissue is of such tough consistency that a sharp blade barely cuts through it. In transverse section the penis proper is only about one-third of the total diameter of the sheath. The epiphallus arises as a free loop from the top of the penis and proceeds attached to the sheath down the penis proper for one-third of its length. It then becomes free and passes on as the stout, short vas deferens (VD) that becomes buried in the prostate gland (P). The vas deferens is the same color as the seminal receptacle. Penial retractor muscles (PR) insert at the top of the penis immediately at the base of the free epiphallus loop and circle its distal end.

Radula and teeth. The radula pattern for this species is as follows: 17-9-1-9-17 x 82-83 (Fig. 1). The mesocone of the median is strongly developed, the entocone of the lateral is swollen and strongly evident, and the denticles of the marginals are progressively subequal.

DISCUSSION

The systematic position of this species is not definite. On the basis of shell characters it appears to belong in section *Novisuccinea* of Pilsbry (1948). Its genital anatomy indicates that its nearest American

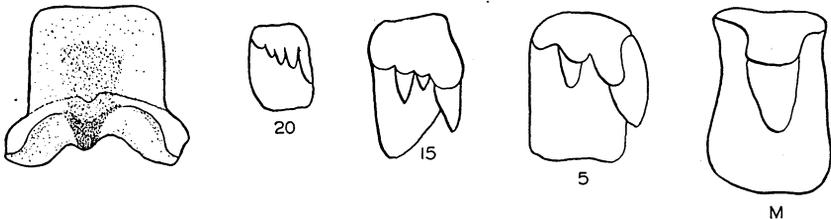


FIG. 1. Jaw of *Succinea vaginacontorta* in median projection. The 4 representative radular teeth are illustrated: the median, fifth lateral, fifteenth marginal, and twentieth marginal.

relatives are species of the section *Calcisuccinea* of Pilsbry (1948). Included in the *Calcisuccinea* are the following species: *Succinea campestris* Say, *Succinea luteola* Gould and its varieties, and possibly *Succinea concordialis* Gould and its variety. Based on dissections of specimens of the latter two species, available in alcoholic collections of the University of Michigan Museum of Zoology, as well as from statements by Pilsbry (1948), this group is characterized by having a very slender penis enclosed within an ample sheath from which the epiphallus emerges. The end of the vas deferens is enveloped in the penial retractor and the sheath. The vagina is extremely short. The jaw has a median projection (Fig. 1).

Although most of the above characters apply to *Succinea vaginacontorta*, there are several important differences. One in particular is diagnostic, that is, the unique character of the vagina with its striking twist at the genital atrium, which occurs in no other species of the section *Calcisuccinea*. The vagina itself is only two-thirds the size of the large penis. In addition, the vas deferens is barely enveloped by the penial retractor muscle and is extremely short; it has a broader diameter than that of any other species in the group. The penis lies across the entire body cavity from the right side to the left and is the most prominent structure when the cavity is opened.

Notwithstanding these differences there are characters which reveal the relationship of this species to the section *Calcisuccinea*. The jaw is simple and contains only a median projection. The penis is very plain and is enclosed in a sheath from which the epiphallus emerges as a loop. The color of the shell is not in keeping with that of the other members of the *Calcisuccinea* with the exception of *Succinea concordialis* Gould. In the living animal the shell is pale yellowish horn and not the whitish colorless character of the true *Calcisuccinea*. In spite of this apparent difference in shell color, *Succinea vaginacontorta* appears to be most closely related to the section *Calcisuccinea*.

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PLATES

PLATE I

FIG. 1. Type locality for *Succinea vaginacontorta* Lee.

FIG. 2. Front view showing columellar callus.

FIG. 3. Side view showing well-developed striae on surface of shell.

PLATE I



FIG. 1

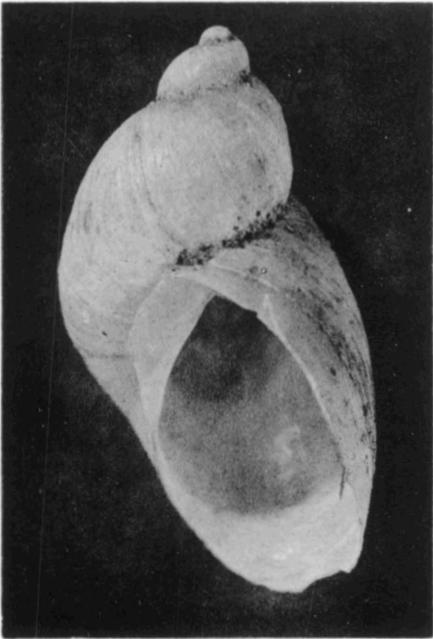


FIG. 2

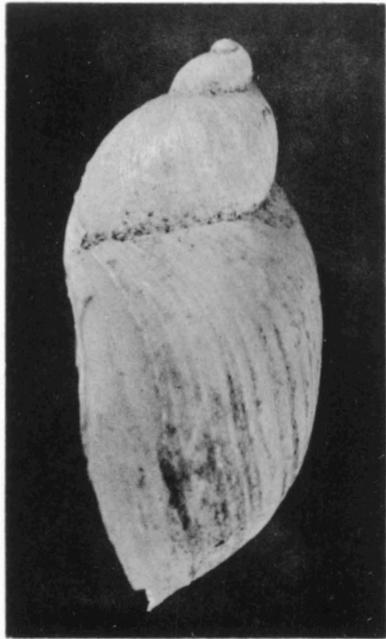


FIG. 3

PLATE II

FIG. 1. Genitalia of *Succinea vaginacontorta* Lee. AG, albumen gland; D.G., digestive gland; EP, epiphallus; F.S., fertilization sac; GF, genital furrow; H.D., hermaphroditic duct; HG, hermaphroditic gland; P, penis; PO, prostate gland; PR, penis retractor muscle; S.R., seminal receptacle; SV, seminal vesicles; U, uterus; V, vagina; V¹, vaginal torsion; V.D, vas deferens.

FIG. 2. Vagina showing the torsion (V¹) with the seminal receptacle immediately behind the vagina.

FIG. 3. Animal without the shell.

PLATE II

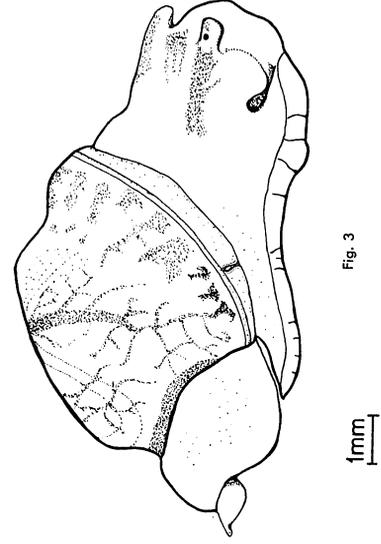


Fig. 3

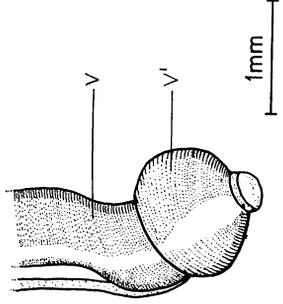


Fig. 2

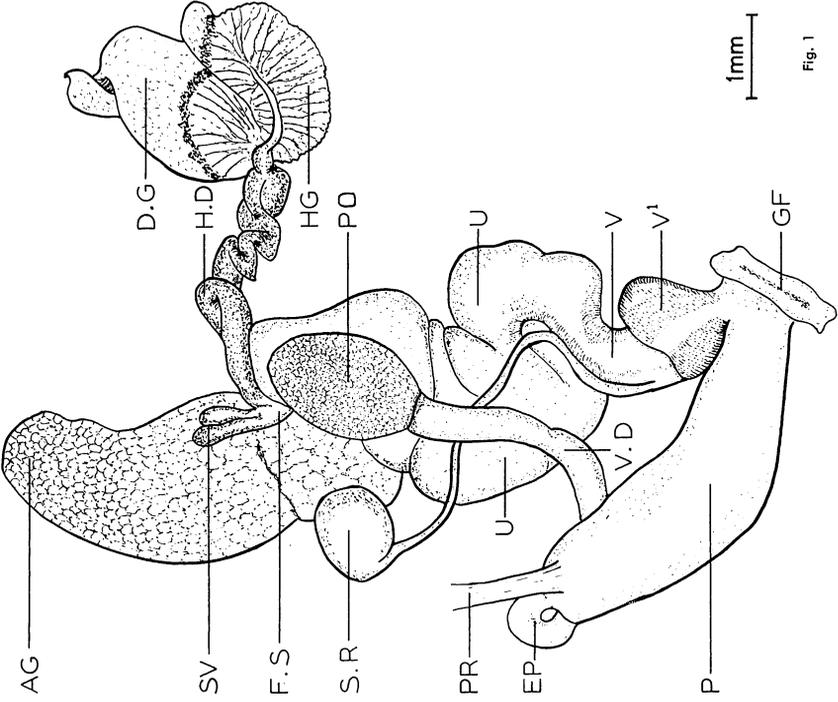


Fig. 1

