

## Additions to the Pulmonate Snails of Oklahoma (With Notes on Anatomical Techniques)

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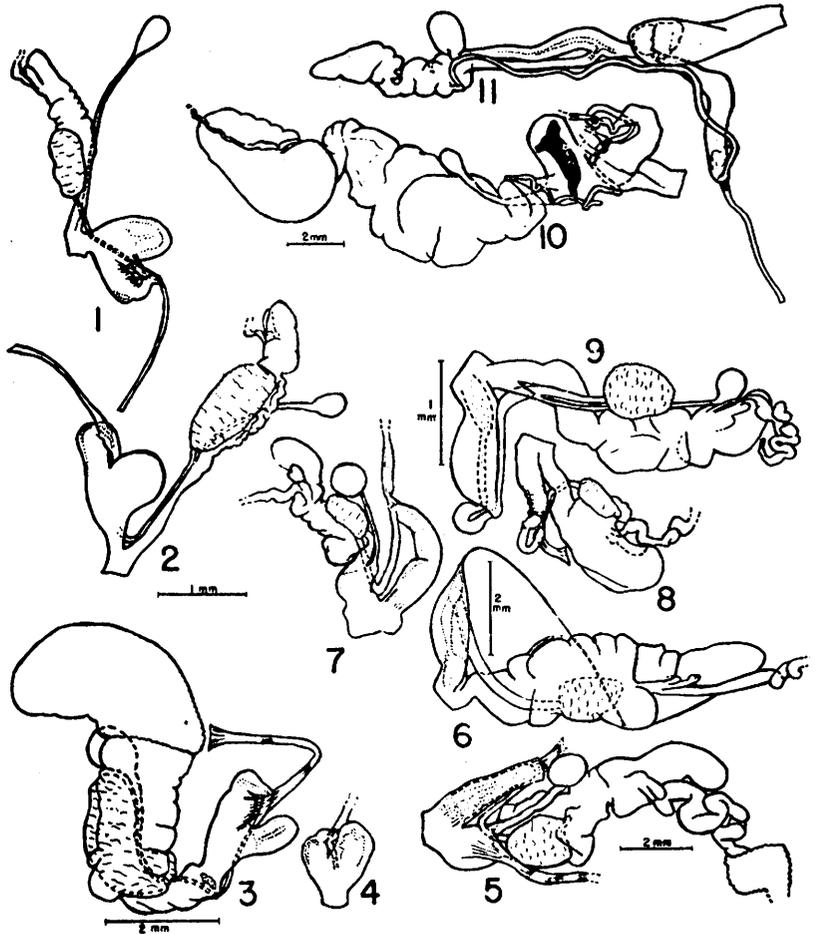
These additions in range or kind to the Philomycidae and Succineidae of Oklahoma can be identified most accurately by the examination of characteristics of the genitalia (copulatory organs especially) and jaws. These families are of much interest to the writer because they have been somewhat neglected, and are of uncertain phylogeny. The anatomical data needed for reliable identifications of these listed species are shown in Figures 1-11. However, allied taxa may be expected in Oklahoma and can be identified, or determined as new, by reference to the papers cited (1-8). The specimens mentioned here are in the University of Oklahoma Museum in a collection of the Oklahoma Biological Survey.

Any mollusk-collector can make the requisite dissections if the snails are dissected while immersed in water in a container with a wax-covered bottom. Using a common large pulmonate snail, a few trial experiments in dissection will soon permit one to devise a satisfactory method. If material is abundant, identifications should be based on the dissection of many specimens. Living snails to be dissected may be drowned or fixed for several minutes in boiling water, both methods being good for revealing particular details. The contracted and extended phases of the penis of *Succinea grosvenori* (Figs. 5, 8) were revealed by these methods.

The writer's dissection equipment consisted of a mechanically supported lens (ideally a dissecting microscope), two dozen fine rust-proof insect pins for pinning out and holding open the dissected parts, two pairs of sharp, fine-pointed forceps, and a petri-dish or shallow rectangular pan covered on the bottom by a layer of weighted, blackened paraffin one-fourth-inch deep.

With the operator holding a pair of forceps in each hand, tissues to be separated from parts of the genitalia are held with one pair of forceps and torn away by the other. Hardened, fluid-preserved, or dehydrated specimens often can be made dissectable by soaking in water with a few crystals of trisodium phosphate. All dissected material is an intrinsic part of a modern scientific collection of mollusca, and should be converted into standard microscope slides and photographed if feasible. Dissected material cannot be kept permanently in a condition suitable for critical re-examination when preserved in alcohol or an aqueous preservative.

Fortunately, crude slide-making processes can be used which are not satisfactory for conventional cytological research. Typically, the dissected-out intact parts of the genital system are pinned in a desired configuration, formalin-hardened, and lightly stained. They then are placed in a covered petri-dish (3-inch) where successive alcohols and xylol are added and removed. The xylol-cleared structure is then transferred to a slide and covered with a chip-supported cover-slip, and the mountant is pipetted onto the slide. No precise timing of the immersion in the various dehydrating series is needed. I use eight narrow-necked pint bottles holding 40, 70, 80, 85, 90, 95, and 100 per cent alcohol, and xylol. The fluids are poured from the petri-dish through a funnel and into a stock bottle. By placing the stock-bottle on the petri-dish just filled, the bottle provides a marker for the stage of dehydration attained. By placing dissimilar-appearing organs in the same petri-dish all can be dehydrated together. Commonly two to three days intervene between dissection and making the completed slide; once in alcohol of 70 or higher per cent, material can be left for a week or more, if need be, without further processing.



**FIGURES 1-11:** Figs. 1, 2, 4. *Quickella* (*Mediappendix*) *vagans*, Norman, Okla. Fig. 3. *Quickella* (*M.*) *oklahomarum*, Beavers Bend State Park, Okla. Figs. 5, 7, 8. *Succinea* (*Calcisuccinea* n. comb) *grosveneri*, Norman, Okla. Fig. 5, penis contracted; Fig. 7, penis-sheath removed; Fig. 8, penis not contracted, note apical loop. Fig. 6. *Succinea* (*D*) *concordialis*, near Wills, Okla. Note ensheathment of penis-loop homolog. Fig. 9. *Succinea* (*D*) *pseudavara*, Norman, Okla. Penis-retractor not shown. This is the loop-bearing anatomical form of the species and is not typical. Fig. 10. *Philomyces carolinianus*, Little River, Okla. Note thorn-shaped dart, wide, bulbous penis-base. Fig. 11. *Eumelus wetherbyi* *ragdalei*, Beavers Bend State Park, Okla. Note intra-atrial pilasters, elongate penis-base. Unless indicated otherwise, figs. are of like scale.

The completed slides should be labeled as soon as possible and cross-indexed to dissection notes, collecting data, and shells (if any). The anatomical characteristics are most clearly evident in the prepared slides.

Stains are useful but not essential; if later it is desired to make negative prints from the slides by using an enlarger, staining improves the image. My practice is to outline the organs with a minute quantity of stain (aceto-carmin) before immersing the tissues in the 40 per cent alcohol. The alcohol tends to remove the excess stain. Different thicknesses of glass (slides, cover-slips, window-glasses) yield chips which provide an array to choose from in properly spacing the cover-slip over the specimen. Thick genitalia are sometimes placed between two slides, with or without spacing chips, and partially compressed with rubber-bands until the xylol stage is reached. At this stage the bands should be removed, since they dissolve in and discolor the xylol.

Jaws and radulae are freed of tissue in a dilute aqueous solution of sodium or potassium hydroxide. They are mounted in a small drop of glycerin on a slide and four similar chips are added to support the corners of the cover-slip which should just compress the glycerin-drop to reveal the mounted structures, but should fill only a small part of the space under the cover-slip. Hot melted vaseline is then pipetted into the remaining space. Heating the slide, and adding the vaseline from opposite sides aids it to flow evenly and quickly about the compressed glycerin-drop. Radula, jaws, slides, and cover-slips may be salvaged from unsuccessful slide-making and the attempt repeated. If stored flat the mounts are permanent, and the method is especially valuable in that the material can be quickly unmounted for further manipulation by melting the vaseline and removing the cover-slip. To this technique may be added the useful one of A. Byron Leonard of the University of Kansas of staining jaws and radulae by concentrated eosin.

#### PHILOMYCIDAE

*Philomycus* has a dart, and ribless jaw, and in life is a more obtuse, less-elongate slug, and seldom has a smoky-colored lateral edge to the sole. *Eumelus* (all the known species) is dartless and unique in bearing a two-lobed pilaster in the upper atrium and lower vagina, and has a strongly ribbed jaw (like *Pallifera* which has no intra-atrial pilaster). *Eumelus* also invariably has the lateral edge of the sole smoky or dark-colored, and the foot-tip truncate or obtuse. Species of two genera have been confused in all earlier collections. The characteristics of the genitalia of *Eumelus* and *Philomycus* are contrasted in figures 10-11.

1. *Philomycus carolinianus* Bosc (1802). Coll. July 10, 1953, by Ed Bellis and Marvin L. Mays, floodplain of Little River 7 miles south of Broken Bow, McCurtain Co.

2. *Eumelus wetherbyi ragsdalei* Webb (1950). Coll. July 10, 1953, by Virgil E. Dowell, Beavers Bend State Park, McCurtain Co.; and Coll. August 2, 1953, by William C. Vinyard, entrance to Robber's Cave, Robber's Cave State Park, Latimer Co.

#### SUCCINEIDAE

Figures 1-9 characterize the five succineids reported here. *S. concordialis* (Fig. 6) in life is unique among the five in having the mantle reflected over the outer aperture-edge in normally turgid specimens. The penis-musculature of *S. grosvenori* causes two dissimilar types of anatomical configurations which at first sight might be considered specific differences. However, the strong muscles attaching on the muscular vagina (Fig. 5) are characteristic. In figure 7 the penis-sheath has been removed to show the stout, strong penis, which is unlike the homologous ductile part in species as exemplified by *S. (Calcsuccinea) luteola* (Figure 9). Clearly

the anatomy of *S. grosvenori* necessitates its transference to the section *Calcsuccinea* Pilsbry. It is possibly the most primitive member of this section. The recently discovered *Succinea* (*Heysuccinea*) *vaginacontorta* (2) has the ensheathed penis form of *S. luteola*, but bears a dense muscular vaginal lobation.

1. *S. (Heysuccinea) vaginacontorta* (Lee, 1951) Norman, Cleveland County.
2. *S. (Calcsuccinea) grosvenori* (Lea) 1864. Norman, Cleveland County.
3. *S. (Desmosuccinea) pseudavara* Webb, 1954. Norman, Cleveland County.
4. *S. (D.) concordialis* (Gould) 1848. Streamlet two and one-third miles west of University of Oklahoma Biological Station, Lake Texoma, Marshall County.
5. *Quickella (Mediappendix) vagans* (Pilsbry) 1900. This species may prove to be a synonym of *Succinea avara* Say. Near Hugo, Choctaw County; Norman, Cleveland County.
6. *Q. oklahomarum* Webb, 1953. (See type-locality) Beavers Bend State Park, McCurtain County.

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#### LITERATURE CITED

1. HUBBRIGHT, LESLIE. 1952. Rafinesque's slugs. *Nautilus* 66:46-47.
2. LEE, C. BRUCE. 1951. *Succinea vaginacontorta* (Section *Calcsuccinea*), a new amber snail from Kansas. *Occas. Papers Univ. Mich. Museum Zool.* No. 533:1-7.
3. LUTZ, LOUIS. 1951. A check list of the land snails of Oklahoma. *Proc. Oklahoma Acad. Sci.* 30, (1949):32-35.
4. PILSBRY, HENRY A. 1948. Land Mollusca of North America. Vol. 2 *Acad. Nat. Sci. Phila. Monogr.* 3. Philadelphia, Pa.
5. WALLEN, I. EUGENE. 1953. Additions to "A check list of the land snails of Oklahoma." *Proc. Oklahoma Acad. Sci.* 32(1951):27-30.
6. WEBB, GLENN R. 1950. New and neglected philomycids and the genus *Eumelus* Rafinesque (Mollusca, Gastropoda, Pulmonata). *Trans. Am. Microscop. Soc.* 69:54-63.
7. ————. 1951. Notes on the sexology of philomycid slugs of the genus *Eumelus* Rafinesque. *Tenn. Acad. Sci.* 26:73-78.
8. ————. 1953. Anatomical studies on some midwestern Succineidae and two new species. *Tenn. Acad. Sci.* 28:213-220.
9. ————. 1954. Pulmonata, Succineidae: *Succinea* (*Desmosuccinea*) *pseudavara*, new section and species. *Gast.* 1:18-19.