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Taxonomic Status of Bulimulus (Mollusca, Gastropoda) in Texas

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Careful study of an extended series of the Prairie Snail, *Bulimulus*, in the Southern Methodist University Collection[2], reveals so much intergradation between some of the subspecific forms that identification is nearly impossible. We have presented below some of our observations, and the conclusions derived from our study. We hope that they will aid in clarification of the taxonomic position of several questionable subspecies of *Bulimulus*.

In his *Manual of American Land Shells*, Binney[3] (pp. 396-402) lists the following species of *Bulimulus* as occurring in Texas: *B. patriarcha*, (Texas Subregion); *B. alternatus* Say, (Texas Subregion); *B. schiedeanus* Pfr. (Texas); *B. schiedeanus* var. *mooreanus* Pfr. (Washington and De Witt counties); and *B. dealbatus* Say (Texas). Singley[4], in 1892, lists the following species as either occurring in Texas or reported for Texas: *B. dealbatus* Say; *B. schiedeanus* Pfr.; *B. schiedeanus* var. *mooreanus* Pfr.; *B. alternatus* Say; *B. ragsdalei* Pils.; *B. patriarcha* W.G.B.; and *B. serperastrus* Say.

In his report Singley makes it clear that he did not actually believe that all the above were valid species or varieties. He wrote (p. 309): "I have no doubt but that *dealbatus, ragsdalei, patriarcha, alternatus, schiedeanus,* and var. *mooreanus* are simply varying forms of one species. The large number of examples from many localities, both in Texas and Mexico, that have passed through my hands in the past three months have established this fact beyond a doubt..."

Pilsbry and Ferriss[5] in 1906 confirmed Singley by revising the above list to two species, namely: *B. dealbatus* and *B.*

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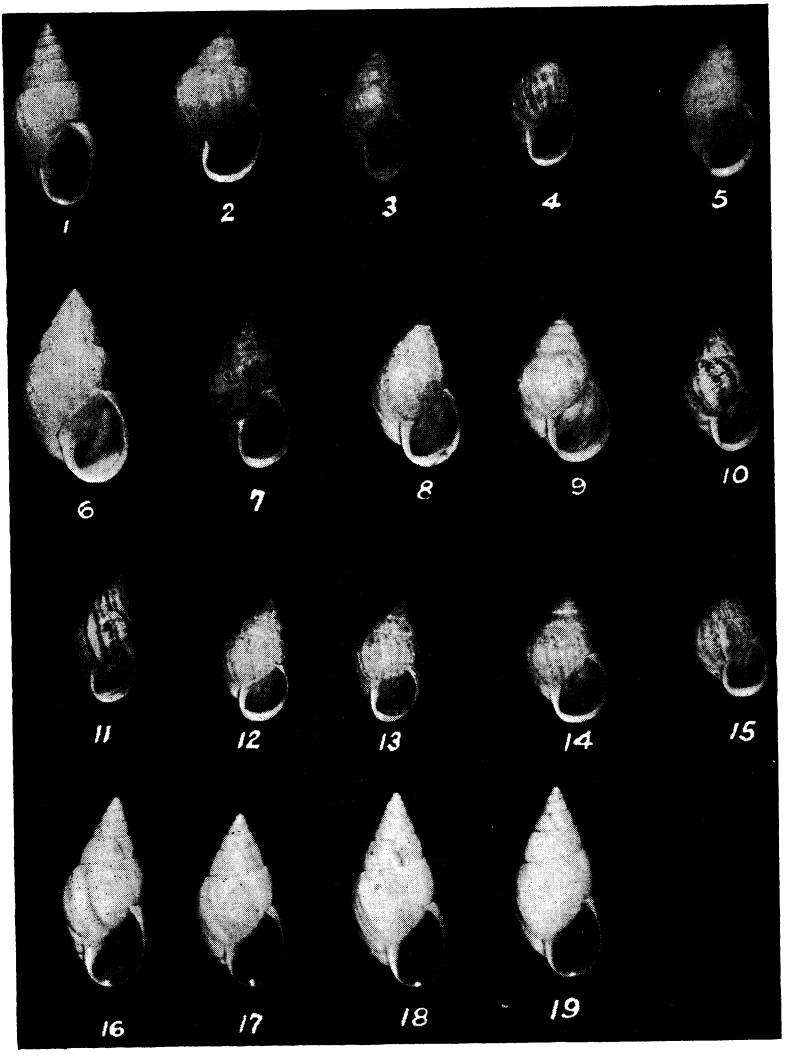
[2]Collected mostly by Dr. E. P. Cheatum during the last fifteen years.

[3]Binney, W. G., *A Manual of American Land Shells.* (Bulletin No. 28, U. S. National Museum, 1885.)

[4]Singley, J. A., "A Preliminary List of the Land, Fresh Water, and Marine Mollusca of Texas." (*Fourth Annual Report, Geological Survey of Texas*, Pt. II, 1892.)

[5]Pilsbry, H. A. and Ferriss, J. H., "Mollusca of the Southwestern States, Part II". *Proc. Acad. Nat. Sci., Phila.*, vol. 58, 1906, pp. 130-142.



ILLUSTRATIONS OF TEXAN *BULIMULUS* (x 0.75 natural size)

For identifications, refer to text-discussion.

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alternatus mariae (Albers). Under *B. dealbatus* the following subspecies were noted:

1. *B. dealbatus mooreanus* Pfr. Arid region of central and south Texas.
2. *B. d. liquabilis* Rve. Eastern and southeastern Texas.
3. *B. d. ragsdalei* Pils. Bluffs of Red River and southwestern Texas.
4. *B. d. pecosensis* Pils & Fer. El Paso, western Texas.

Our studies, based only on shell characteristics, have led us to doubt the validity of the first three of these forms (i.e., *B. d. mooreanus, B. d. liquabilis,* and *B. d. ragsdalei),* because intergradation appears to have removed distinctive characteristics that separated one form from another. The other three forms, *B. d. pasonis, B. d. pecosensis,* and *B. alternatus mariae,* seem to be of questionable standing, in the light of our findings. Some of the evidence for this conviction is shown in the plate. Fig. 1 is of true *B. alternatus* Pfr. from Mexico. The columellar tooth is well developed in this individual, but is poorly developed or missing entirely in other forms with the same measurements and markings. In Figs. 16 through 19, photographic evidence shows that the columellar tooth is not sufficient to warrant a subspecific differentiation (as was suggested in the *Journal de Conchyliologie* by Prof. T. D. A. Cockerell in 1891.) These specimens (Figs. 16-19) were all collected from the same spot, feeding upon the same shrub *(cenizo).* They were collected 63 miles south of Nuevo Laredo, Mexico. A gradual decrease in the columellar tooth development can be seen in these figures until it dies out completely in Fig. 19. This true *alternatus* appears not to occur outside of Mexico (this fact was suggested originally by Pilsbry and Ferriss) and here are shown only to afford contrast with the *B. alternatus mariae* of Fig. 2. *B. alternatus mariae* is a thinner-textured shell with distinctly less coloration on the inside. Characteristically it is more globose than the true *alternatus.* The one figured here is from Jim Wells County.

Fig. 3 is the typical *B. d. mooreanus* described by Pilsbry and Ferriss. As they noted "the shell is *thin,* ovate-conic, *opaque white above, coffee-with-cream colored below the periphery,* or sometimes either white or coffee-tinted throughout; sometimes varied with a few gray streaks, Umbilicus narrow. Interior cream white."[6] Intergradation

[6]Pilsbry, H. A. and Ferriss, J. H., "Mollusca of the Southwestern States, Part II." *Proc. Acad. Nat. Sci., Phila.,* vol. 58, 1906, p. 133.

of this form with *B. d. liquabilis* is shown in Figs. 8 to 11.

Pilsbry & Ferriss (p. 134) have defined *B. d. liquabilis* (Reeve) [Fig. 4] as follows: "The shell is thin, variable in shape but usually obese, aperture half the total length *or more.* Translucent-corneous or brownish-corneous more or less profusely marked with opaque whitish ragged streaks. Interior whitish or colored like the outside." This type of shell is very abundant in Mason County.

B. d. ragsdalei (Pils.) shows (Fig. 5) a great amount of variation in shape. Pilsbry & Ferriss (p. 137) state that it "varies from the ovate shape of typical *dealbatus* to a more lengthened and slender form, and is *conspicuously rib-striate,* the striae white on a tawny or white-blotched ground and weaker on the base of the shell. The lip-rib is strongly developed." Fig. 5 has the typical *B. d. ragsdalei* characteristics and measurements.

Although we have shells from the range occupied by *B. d. pecosensis,* none of our shells fits the diagnosis given by Pilsbry & Ferriss. They state that the shell is "conspicuously calcareous, whitish with some fleshy or sometimes corneous or ochraceous streaks; upper whorls striate, the last somewhat roughened by irregular growth-wrinkles. Spire long, composed of numerous short convex whorls, the suture nearly horizontal; apex white or pale; aperture small, usually ochre-tinted in the throat, lip strengthened by a rib within" (p. 138). Fig. 6 seems representative of this so-called subspecies, although the colors, if they were present, have faded.

The snails portrayed in Figs. 1-6 were chosen from among large numbers of intergrades. If they are similar to the original forms as revised by Pilsbry and Ferriss, then they are by far in the minority, the intergrades being dominant in numbers.

Figs. 7 to 11, inclusive, are all from near San Marcos in Hays County. Extreme variation is shown in length of spire, degree of globoseness, length of aperture, coloration, and the other factors considered significant by Pilsbry & Ferriss, yet they lack the typical globoseness of that form. Figs. 8-9 are more globose, as typical *liquabilis* should be, yet the shell colorations are those of *mooreanus.* Figs. 10-11 have the corneous-brown coloring of typical *liquabilis,* yet the overall appearance is one of slenderness like the typical *mooreanus.*

Thus, these forms are intergrades, since they do not show the typical characteristics of either subspecies.

Figs. 12-15 illustrate snails from the Bachman Lake area within the city limits of Dallas. The snails of Figs. 12 and 13 have identical dimensions and were collected within a few yards of each other. Fig. 12 has the "coffee-with-cream" color of *mooreanus* while Fig. 13 has the corneous brown coloration of *liquabilis*. The difference may be due to weathering of the shells. One of these (Fig. 12) was openly exposed while the other (Fig. 13) was protected by a soil covering. Both were lying within a few feet of each other. Thus, characters that were once considered by Pilsbry and Ferriss significant enough to aid in subspecific differentiation appear to be only changes brought about in the shell after death by physical and chemical forces.

The shells of Figs. 12 and 13 also have the characteristic rib striations of *B. d. ragsdalei,* but deviate from "the more lengthened and slender form" of *ragsdalei* as originally described. It would seem that *ragsdalei,* at least near Dallas, has almost completely intergraded with either *B. d. liquabilis* or *mooreanus* or both. Other shells found in this area bear out this observation more positively. Thus the shells of Figs. 14 and 15 show the extreme globoseness of the typical *liquabilis* but retain the characteristic rib-striations of *ragsdalei.*

In view of these findings we submit below a key to the species of *Bulimulus* occurring in Texas.

KEY TO BULIMULUS OF TEXAS

Shell relatively thin, ovate-conic or obese; color varies from white to coffee-tinted, or profusely marked with translucent or brownish-corneous streaks; rib striae varying from conspicuous to absent; aperture varying from one-third to two-thirds of the total length of the shell; interior either white or resembling exterior; columellar tooth absent . . . . . *Bulimulus dealbatus* Say.

Shell dense, solid, heavily calcareous; whitish with some fleshy, corneous, or ochraceous streaks; aperture approximately one-half total length of shell; interior whitish, pinkish, ochre-tinted, or purplish to dark brown; columellar tooth present or absent . . . . . *Bulimulus alternatus mariae* Albers.

Shell solid, ovate-conic; shiny white with gray or brown streaks; aperture less than half total length of shell; interior chocolate brown to purplish; columellar tooth present or absent (Not reported from Texas) . . . . *Bulimulus alternatus* Pfr.

Summary

In summary, on the basis of shell characteristics, the present taxonomic position of Bulimulus in Texas seems to be as follows:

1. *Bulimulus alternatus mariae* Albers. This appears to be the only *B. alternatus* found in Texas with clear-cut characteristics as defined by Pilsbry & Ferriss, the true *B. alternatus* having been reported only from Mexico.

2. *Bulimulus dealbatus* Say. The Texas shells are clearly of this form, originally described from Missouri and Alabama. On the basis of our findings it would seem that no differentiation can be made between *B. d. mooreanus, B. d. liquabilis,* and *B. d. ragsdalei* (as originally described by Pilsbry & Ferriss) because of almost complete intergradation between these three forms.

a. *Bulimulus dealbatus pasonis* Pilsbry & Ferriss. This form may exist in a restricted area near El Paso.

b. *Bulimulus dealbatus pecosensis* Pilsbry & Ferriss. In the light of our studies it seems that this form rightfully belongs with *Bulimulus alternatus mariae.* This partially conforms to the suggestion of Pilsbry & Ferriss that *B. dealbatus pecosensis* shows evidence of intergrading with *B. alternatus mariae.* Pilsbry and Ferriss found one colony of *B. d. pecosensis* in the midst of a large colony of B. alternatus mariae. Both colonies were living upon *Agave* (p. 138)

c. The other forms mentioned (i.e., *B. d. mooreanus, B. d. liquabilis,* and *B. d. ragsdalei*) are completely intergraded; *B. d. mooreanus* being more closely intergraded with *B. d. liquabilis* and *B. d. liquabilis* being in between *B. d. mooreanus* and *B. d. ragsdalei.*

3. Although we realize that subspecific names may be justified and very helpful, we contend that they should be eliminated in situations where characteristics are completely obliterated by intergrades.

It was a simple matter to select a shell from our collection of some 2500 shells which shows intergrading characteristics of these three subspecies. It was not an easy matter to select specimens to show characteristics of only one of these subspecies. We believe that a thorough investigation of environmental factors would shed much light on *Bulimulus,* and clear up the confusion which arises from dividing *B. dealbatus* into several subspecies.