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VIII
NOTES ON SOME UNDESCRIBED CALIFORNIAN
HELICES

BY
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Gradually accumulating material of the larger land snails of the Californian area enables the recognition, as so notorious in the case of the birds and mammals, of a considerable number of more or less strongly marked geographical races, descriptions of some of the more interesting of which are offered herewith. This paper is therefore to be taken as complementary to one published by the same writer in the University of California publications of a few years ago (Berry, :16). Unfortunately the earlier paper was not illustrated, as the figures prepared for it proved unsatisfactory for reproduction. The opportunity is now taken, at least in part, to make good the deficiency.

The writer's thanks are due to the various collectors hereafter mentioned who have so generously aided him by supplying specimens, as well as to Mr. John Howard Paine for the remarkable photomicrographs which constitute two of the plates.

August 11, 1920

***Epiphragmophora tudiculata allyniana*, new subspecies**

(Plate 4, figs. 1a-1c)

Diagnosis: Shell moderately thin, low-conic to depressed-globose, strongly umbilicate, the umbilicus narrow and steep-walled, but permeable to the apex and having a diameter of about one-eleventh the major diameter of the shell. Whorls about 6, convex, the last strongly inflated and somewhat descending in front. Aperture rounded, ample, and very oblique, its deflection about 40° . Edges of peristome converging and connected by a thin parietal callus. Periostracum quite glossy, but roughened over most of the later whorls by numerous fine incremental lines and a very fine, close malleation like small hammer dents, the latter becoming obsolete on the higher portions of the spire and in the immediate vicinity of the umbilicus.

Color a dull cinnamon or Prout's brown, becoming yellower and paler in the umbilical region, and with a dark liver brown band of a width of about 1.5 mm. on the shoulder, bordered above and below by a light yellowish-brown band of about equal width with the dark band and with its mate opposite, or the lower in some cases a little the wider.

Measurements:

| | Maximum diameter mm. | Minimum diameter mm. | Altitude mm. | Diameter umbilicus mm. | Number of whorls |
|----------------------|----------------------------|----------------------------|-----------------|------------------------------|---------------------|
| Type | 32.0 | 25.5 | 20.0 | 3.0 | 6 |
| Paratype in C. A. S. | | | | | |
| Coll. | 29.4 | 24.3 | 19.3 | 2.6 | 6 $\frac{1}{4}$ |
| " Smith Coll.. | 32.3 | 25.8 | 18.8 | 2.7 | 6 |
| " Berry Coll. | | | | | |
| " 4851 | 29.3 | 23.3 | 17.5 | 2.7 | 6 |
| " Smith Coll.. | 26.3 | 21.5 | 16.6+ | 2.7 | 6 |

Type: Cat. No. 4850, Berry Collection. Paratypes in the collection of the California Academy of Sciences and Cat. No. 1969, collection of A. G. Smith.

Type Locality: Jasper Point, Mariposa County, California; Allyn G. Smith, May, 1917; five living adults taken.

Remarks: This large and fine race cannot be confused with any of the described subspecies of *tudiculata*, unless it be the *E. t. umbilicata* Pilsbry from San Luis Obispo County. The latter is likewise a relatively depressed, finely malleate, umbilicate form, but is well distinguished from its Sierran relative by its smaller, less tumid, heavier, and much more solid shell, lighter color, more conspicuous banding, and more polished surface.

***Epiphragmophora traskii chrysoderma*, new subspecies**

(Plate 4, figs. 2a-2c)

Diagnosis: Shell as a whole depressed-conic in outline, moderately thin; whorls convex, the body whorl quite tumid. Umbilicus narrow, deep, little flaring, permeable; contained about eleven times, or a little less, in the diameter of the shell. Aperture only moderately oblique (30°). Peristome little thickened; only slightly reflected except over the umbilicus, the circular outline of which it barely indents; edges connected by a thin callus.

Nuclear whorls worn in type, but in other specimens very finely papillose and radially wrinkled, with obliquely slanting lines of larger, more regular, distant papillæ superimposed. Following whorls very finely wrinkly-papillose, usually more or less eroded. Growth lines as a rule comparatively weak, but stronger at sutures and becoming very strong on body of later whorls. Definite spiral sculpture hardly recognizable till latter part of fourth turn, but developing on fifth whorl into a somewhat wrinkly system of incised spiral lines visible to the naked eye, though more or less cut up by the intersecting growth lines; on the body whorl the whole complex strongly developed over its upper portion, becoming gradually weaker, but still very distinct, on the base.

Periostracum very thin, strongly dehiscent and almost impossible to preserve in dry specimens; very light golden brown (honey yellow of Ridgway) in color, sometimes showing streaks of a darker hue following the stronger lines of growth, but without any distinct spiral banding or other evident pattern. Shell beneath the periostracum pure white.

Measurements:

| | Maximum diameter mm. | Minimum diameter mm. | Altitude mm. | Diameter umbilicus mm. | Number of whorls |
|----------------|----------------------------|----------------------------|-----------------|------------------------------|-------------------------------|
| Type | 24.3 | 20.0 | 15.5 | 2.2 | 5 ³ / ₄ |
| Paratype | 26.0 | 21.3 | 16.4 | 2.4 | 5 ³ / ₄ |
| “ | 24.6 | 20.3 | 15.7 | 2.3 | 5 ³ / ₄ |
| “ | 22.7 | 18.7 | 14.2 | 2.1 | 5 ² / ₃ |
| Average | 24.4 | 20.7 | 15.45 | 2.25 | 5 ³ / ₄ |

Type: Cat. No. 4132, Berry Collection. Paratypes in the collection of the California Academy of Sciences and the private collection of George Willett.

Type Locality: Among loose talus on higher portion of southern end of South Coronado Island, Lower California; George Willett, December 13, 1918; 12 specimens.

Remarks: The Coronado Islands have for long been the reputed home of a snail belonging to the *traskii*-group of *Ephiphragmophora* which passed for many years as the *Helix carpenteri* of Newcomb, but Bartsch has lately reminded us that Newcomb's shell is almost certainly a mainland race of quite different affinities, and has therefore renamed the island subspecies *coronadoensis* (Bartsch, :16, p. 617), an action with which I am in accord. As there seemed to have been no collections of *coronadoensis* made within recent years, and the exact island of the group from which it came in the first place is still uncertain, Mr. George Willett took advantage of a brief visit to South Island in December, 1918, to undertake a special search for this snail. At first only the common *E. stearnsiana* (Gabb) was encountered, but finally in the southern part of the island, he found not only a thriving colony of what I take to be typical *coronadoensis*, but also a considerable number of specimens of the somewhat larger, pale-colored form here described. At the time, although found in a colony of its own, Mr. Willett took the latter to be merely an "albino" mutation of the other. This it may essentially be, but there are grounds, nevertheless, for believing that it represents considerably more than simply a sporadic variant.

Some readers will no doubt recall, as a previous attempt to give systematic recognition to an albinistic variation of one of

our Californian snails, the ill-fated *Helix anachoreta* of W. G. Binney. This is now considered by most authors, no doubt correctly, not to represent a fixed race, but to have been based on a chance light-colored variant such as is known to crop out ephemerally now and then in the race history of many diverse groups of organisms. Hence it has never been shown to inhabit any particular region or station, other than that regularly occupied by its "normal" prototype, *E. nickliniana* (Lea), or its occurrence to be any more than sporadic; in other words it does not seem to have become hereditarily persistent anywhere.

With *chrysoderma* it appears to be quite otherwise. In the first place, this light colored race, so far as the evidence goes, actually does constitute a definite colony in a definite locality and station on the island, as is indicated by "A" in the accompanying rough sketch received from Mr. Willett, namely among loose talus high on the slopes near the southern end of the island. Typical *coronadoensis*, I understand, was taken more or less sparingly with it, but proved more abundant on grassy slopes lower down and nearer the end of the island, where *chrysoderma* failed to recur. In the second place, the differences, though by no means great, appear to be fairly constant within the limits of the considerable series of both forms seen, and not confined to the dilution or lack of periostracal coloring alone. A comparison of the two series brings out the following special peculiarities of *chrysoderma*,—1) the *very thin*, strongly dehiscent periostracum (an exaggeration of a feature already present in some degree in *coronadoensis*), 2) the notably larger average size*, 3) the *light brownish-golden color* of the periostracum, 4) the *lack of spiral color bands* of any description, and 5) the more tumid outline of the body whorl. Possibly also the umbilicus averages slightly wider. The animal is light bluish gray in color.

Although I have recently described a curious little albinistic *Vertigo* (Berry, :19, p. 48), it was scarcely expected so soon to encounter another instance of an apparently hereditarily fixed albinism in a West American land snail. Very possibly both instances are more properly called albinoids than true

* The largest of 12 fully matured *coronadoensis* measures: Maximum diameter 24.1, minimum diameter 20.0, altitude 15.7, diameter of umbilicus 2.1 mm.; whorls $5\frac{2}{3}$. The average values of all the dimensions are: Maximum diameter 22.86, minimum diameter 18.95, altitude 14.78, diameter of umbilicus 1.87 mm.; whorls 5.60.

albinos. The true nature of such forms among the Mollusca is not yet well worked out, although in any event they are of considerable theoretical interest. Very few races of snails are distinguished by characters of such a nature as to strongly suggest their probable origin as sudden breaks or "mutations" of the DeVriesian type in the germ plasm of the ancestral form. But from the evidence at hand it appears quite reasonable to believe that the racial features of these two forms can be so regarded.

***Epiphragmophora traskii willetti*, new subspecies**

(Plate 4, figs. 3a-3c)

Diagnosis: Shell depressed-conic, conspicuously umbilicate, the umbilicus deep, permeable to the apex, and having a diameter about one-ninth to one-eighth the greater diameter of the shell. Whorls about $6\frac{1}{2}$ or a trifle less, convex, the last descending somewhat in front. Aperture ample and very oblique (45°). Edges of peristome converging and connected by a very thin, transparent parietal callus. Lip but little thickened, everted somewhat throughout, but especially at the pillar where it is sufficiently reflected to indent somewhat the otherwise circular outline of the umbilicus.

Color varying from near Prout's brown to tawny-olive, becoming a little paler and yellower in the umbilical region, and with a clear-cut, deep, liver brown band of a width of about 2.2 mm. on the shoulder, bordered below by a light yellowish band (near naphthalene yellow of Ridgway) of about equal width and above by a much narrower, slightly less clear-cut band of the same color.

Periostracum somewhat glossy and with a peculiar sheen. Lines of growth very numerous and quite regular. First half whorl delicately hyaline and nearly smooth except for a few weak incremental waves, with a fine weak papillation sometimes superimposed; next whorl and a half very finely and closely granose or wrinkly granose, with numerous, large, elongate, rather distantly spaced papillæ superimposed, the latter arranged fairly definitely in retractorily curved, very obliquely slanting series; papillæ on later whorls nearly, or quite, obsolete; spiral sculpture consisting of a weakly developed series of

incised lines, barely to be detected on the third whorl, then gradually increasing in strength to the penultimate whorl, but again becoming very weak on the upper portion of the body whorl, and nearly, though not quite, obsolete below.

Measurements:

| | Maximum diameter mm. | Minimum diameter mm. | Altitude mm. | Diameter umbilicus mm. | Number of whorls |
|-----------------------|----------------------------|----------------------------|-----------------|------------------------------|---------------------|
| Willett Coll. | 31.6 | 26.2 | 18.8 | 3.8 | 6 $\frac{1}{2}$ |
| “ “ | 31.4 | 26.6 | 19.0 | 3.7 | 6 $\frac{1}{2}$ |
| “ “ | 30.3 | 25.1 | 18.4 | 3.3 | 6 $\frac{1}{3}$ |
| “ “ | 30.1 | 25.2 | 18.5 | 3.8 | 6 $\frac{1}{2}$ |
| “ “ | 29.7 | 24.5 | 18.2 | 3.2 | 6 $\frac{1}{3}$ |
| “ “ | 29.3 | 24.2 | 17.3 | 3.7 | 6 $\frac{1}{3}$ |
| “ “ | 28.4 | 23.5 | 16.1 | 3.7 | 6 $\frac{1}{2}$ |
| Berry Coll. 4498. . . | 31.4 | 26.3 | 19.1 | 3.8 | 6 $\frac{1}{2}$ |
| Type | 21.1 | 24.8 | 18.4 | 3.8 | 6 $\frac{1}{2}$ |
| Berry Coll. 4498. . . | 29.4 | 24.6 | 18.0 | 3.2 | 6 $\frac{1}{3}$ |
| “ “ “ . . . | 29.+ | 24.3 | 18.3 | 3.2 | 6 $\frac{1}{3}$ |

Type: Cat. No. 4497, Berry Collection. Paratypes in private collection of George Willett.

Type Locality: Alt. 3500 ft., Pine Canyon, Sespe Creek, Ventura County, California; George Willett, March 24, 1919; dead but fresh shells of 10 adults, and 14 juvenals of various stages, both living and dead, found in rock slides. One living and three dead adults taken at same locality in 1916 or 1917.

Remarks: The shell of this beautiful snail is easily the largest, finest, and most richly colored of any of the *traskii*-group. In some respects it reminds one of the large mountain species, *petricola*, and like it has suffered a considerable reduction in the spiral sculpture usually so characteristic of the snails of this group. Nevertheless I believe its relationships are rather with the true *traskii*, an opinion which is fortified by the color and general texture of the shell and periostracum, quite different from the light, *Sonerella*-like gloss of *petricola*.

The majority of the specimens are in an excellent state of preservation and are remarkably constant in their characters. They appear to represent an unusually well marked race, not especially near to any of the previously described subspecies.

Its chief taxonomic features are the large size, depressed spire, wide umbilicus, weakly developed spiral sculpture (especially on the base), rich brown color, and prominent spiral banding.

Dead shells of what appears to be the same subspecies are before me from Sespe Canyon above the mouth of Tar Creek, collected by Harold Hannibal, and from Matilija Canyon, collected by H. N. Lowe, in May, 1919. Both localities are in Ventura County.

***Epiphragmophora petricola orotes*, new subspecies**

(Plate 4, figs. 5a-5d; plate 6)

Diagnosis: Shell thin, translucent, depressed-conic, conspicuously umbilicate, the umbilicus deep, permeable to the apex, and having a diameter about one-ninth the greater diameter of the shell. Whorls about $5\frac{1}{2}$, convex, the last descending somewhat in front. Aperture oval and very oblique (45°). Edges of peristome converging and connected by a thin, very delicate, parietal callus. Lip but little thickened and only very slightly reflected save at the pillar, where it tends to cover the edge of the umbilicus.

Periostracum more or less glossy, often showing quite a high polish. Lines of growth fine and numerous. First half turn weakly radially costate, with a few scattered papillæ; next three-fourths of a whorl finely, closely granulose, with fine, weak incremental costations, and, over all, traces of larger papillæ; granulation present to some extent on all remaining whorls, but of diminished importance as compared with the suddenly much increased incremental lines and the papillæ; latter now seen to be ranked, at least primarily, in the usual obliquely retractively slanting series, almost quincuncially arranged, but the appearance of regularity often lost; maximum development of these papillæ attained on the upper surface of the third whorl, still strong on the penultimate whorl, but practically absent from the body whorl except along the suture and within the umbilicus; spiral sculpture very poorly developed, only a few interrupted traces of incised threading being distinguishable on the upper third of the last two whorls, even these becoming entirely obsolete below.

Color a warm golden brown, running fairly near a tawny-olive, becoming a little paler and yellower on the base, and with a conspicuous dark (liver brown) band of a width of about 1.5 mm. on the shoulder, bordered above and below by a rather narrower band of a few tints lighter than the body of the shell.

Measurements:

| | Maximum diameter mm. | Minimum diameter mm. | Altitude mm. | Diameter umbilicus mm. | Number of whorls |
|--------------------------|----------------------------|----------------------------|-----------------|------------------------------|---------------------|
| Smith Coll. (3700 ft.) | 21.6 | 17.8 | 12.1 | 2.3 | $5\frac{2}{3}$ |
| Type | 20.4 | 17.0 | 11.4 | 2.3 | $5\frac{1}{2}$ |
| Chace Coll. | 24.5 | 20.5 | 14.0 | ... | ... |
| Berry Coll. 3988 | 22.1 | 18.3 | 12.5 | 2.4 | $5\frac{1}{2}$ |
| " " " | 21.2 | 17.5 | 12.+ | 2.3 | $5\frac{1}{2}$ |
| " " " | 21.0 | 17.2 | 11.8 | 2.4 | $5\frac{1}{2}$ |

Type: Cat. No. 3905, Berry Collection.

Type Locality: Altitude 2500 feet, near trail, south fork of Warm Spring Canyon, San Bernardino Mountains, California; under logs; Allyn G. Smith, December 26, 1917; one specimen.

Additional Localities: Alt. 3700 feet, near trail just south-east of summit, Warm Spring Canyon, San Bernardino Mountains, California; Allyn G. Smith, December 26, 1917; two specimens.

Alt. 6500 feet, west wall of Bridal Veil Falls Canyon near mouth, above Forest Home, San Bernardino Mountains, California, in talus; E. P. Chace, May 24, 1918; nine fully mature living specimens, several dead and young. (No. 3988 above are part of this lot.)

Remarks: This neat little helicoid is practically a miniature race of the large *E. petricola* Berry (:16, p. 107), with which alone it would seem to require any special comparison. From this it differs not only in its much smaller size, but also in its thinner shell, more polished periostracum, and still further reduction of the spiral sculpture. It occurs in the same general region of the San Bernardino Mountains as the typical form, but has only been discovered at localities farther into the mountains, at all of which it appears relatively constant and quite sharply separable from *petricola*.

For purposes of comparison figures of the shell and microscopic sculpturing of the type specimen of *petricola* are here appended (Plate 4, figs. 4a-4c; plate 5), especially as this species has recently been strangely misunderstood by Bartsch (:16, p. 612), who referred it without qualification to *E. traskii traskii* (Newcomb). As a matter of fact very few of the numerous races described by him in the same paper have nearly the claim to separate recognition that *petricola* has, although I believe with him that most of them will stand. *E. petricola* is in fact the earliest described prototype of a whole series of southern Californian mountain snails, the exact relation of which to true *traskii* still remains to be determined. *E. zechæ* Pilsbry (:16), on the other hand, seems quite close to *petricola*.

Both *petricola* and *orotes* are distinctly papillose over much of the upper surface. A very young *petricola* now at hand from the type locality (Cat. No. 3950, Berry Collection) shows that, when perfect, each papilla bears a minute, stubby, hair-like periostracal process.

***Epiphragmophora petricola sangabrielis*, new subspecies**

(Plate 4, figs. 6a-6c)

Diagnosis: Shell low-conic, thin, fragile, rather tumid, umbilicate; the umbilicus rather narrow, barely permeable to the apex, and with a diameter about one-twelfth the greater diameter of the shell. Whorls $5\frac{1}{2}$, convex, the last swollen and slightly descending in front. Aperture rounded, sometimes slightly flaring, oblique (40°). Edges of peristome slightly converging and connected by a very thin, transparent parietal callus. Lip only slightly thickened; everted near the pillar so as to indent the circular outline of the umbilicus.

Periostracum somewhat glossy, often with a strong satiny sheen or semi-iridescence. Lines of growth numerous and fairly strong, though somewhat irregular. First half whorl when unworn showing rather strong, more or less interrupted, incremental wrinkles, and traces of a strong, coarse, overlying papillation; succeeding turns very finely wrinkly-granulose beneath the retractively slanting lines of small and at first often nearly obsolete papillæ, the latter increasing in strength to the

penultimate whorl where they are always strongly evident as well as within the umbilicus and to a less degree over the region just behind the aperture on the body whorl; papillæ elsewhere on the last whorl more weakly developed. Spiral sculpture obsolete, a few weak traces persisting on the upper surface and peripheral region of the body whorl only.

Color light golden brown near buffy citrine, paler and with more of a yellow tone below, with a dark, liver brown band of a width of about 1.0-1.5 mm. on the shoulder, bordered above and below by a rather narrower band slightly lighter in tone than the body of the shell.

Measurements:

| | Maximum diameter mm. | Minimum diameter mm. | Altitude mm. | Diameter umbilicus mm. | Number of whorls |
|-------------------|----------------------------|----------------------------|-----------------|------------------------------|---------------------|
| Type | 26.3 | 21.0 | 15.7 | 2.2 | 5 $\frac{1}{2}$ |
| Paratype, Willett | | | | | |
| Coll. | 23.8 | 19.1 | 13.8 | 2.3 | 5 $\frac{1}{3}$ |

Type: Cat. No. 4848, Berry Collection. Paratypes in the collection of George Willett. (Neither specimen quite fully mature.)

Type Locality: Monrovia Canyon, San Gabriel Mountains, California; George Willett, March, 1919; 14 specimens, for the most part not quite mature.

Additional Localities: In addition to the lot from which the type was selected, the following specimens before me are possibly referable to the same subspecies. They are at any rate very close, although the material is still inadequate for entire certainty.

Millard's Canyon, north of Pasadena, San Gabriel Mountains, California; E. P. Chace, March 11 and June 3, 1917; one living adult, one living juvenal, seven dead of various ages.

Eaton's Canyon, north of Pasadena, San Gabriel Mountains, California; E. P. Chace, September 3, 1917; two living adults, six dead of various ages.

West fork San Gabriel River "just below the divide", San Gabriel Mountains, California; E. P. Chace, September 1, 1918; five dead shells.

Remarks: This mountain race appears to be somewhat similar to Bartsch's *avus* in shape, size, and the narrow umbilicus, but differs in the *weak* papillation of the upper surface, and the presence of a weak spiral sculpture. From *zechæ* Pilsbry, it is distinguishable by its thinner, more tumid shell, much narrower umbilicus, and the better developed papillation of the upper whorls. None of the other described races appears to require any special comparison.

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EXPLANATION OF PLATES

(Note: Figs. 4a-5d on Plate IV, and Plates V and VI, are from photographs by John Howard Paine. The remaining figures on Plate IV are from photographs by Berton W. Crandall.)

EXPLANATION, PLATE IV

(All figures natural size.)

Figs. 1a-1c. *Epiphragmophora tudiculata allyniana*, new subspecies. Anterior, apical, and basal views of type specimen, from Jasper Point, Mariposa County, California.

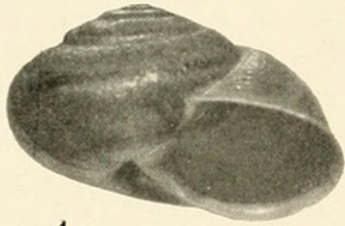
Figs. 2a-2c. *Epiphragmophora traskii chrysoderma*, new subspecies. Anterior, apical, and basal views of type specimen, from South Coronado Island, Lower California.

Figs. 3a-3c. *Epiphragmophora traskii willetti*, new subspecies. Anterior, apical, and basal views of type specimen, from Pine Canyon, Sespe Creek, Ventura County, California.

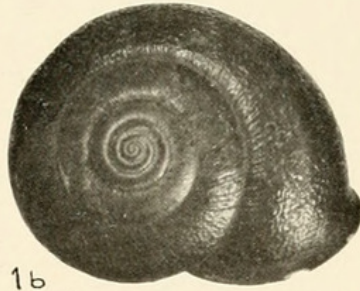
Figs. 4a-4c. *Epiphragmophora petricola* Berry. Anterior, apical, and basal views of type specimen, from Mill Creek Canyon, San Bernardino Mountains, California.

Figs. 5a-5d. *Epiphragmophora petricola orotes*, new subspecies. Anterior, apical, basal, and lateral views of type specimen, from Warm Spring Canyon, San Bernardino Mountains, California.

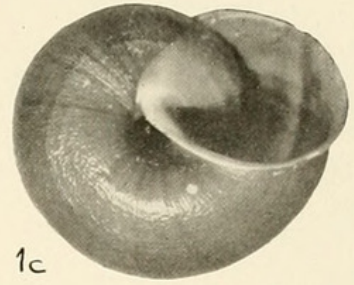
Figs. 6a-6c. *Epiphragmophora petricola sangabrielis*, new subspecies. Anterior, apical, and basal views of type specimen, from Monrovia Canyon, San Gabriel Mountains, California.



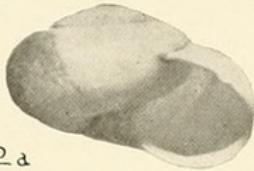
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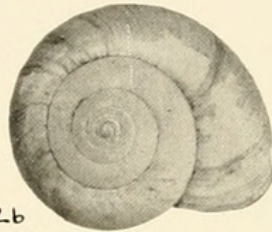
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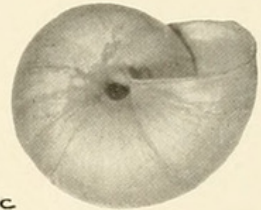
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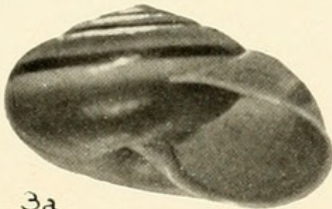
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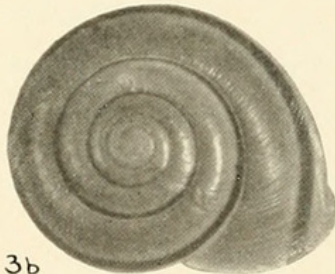
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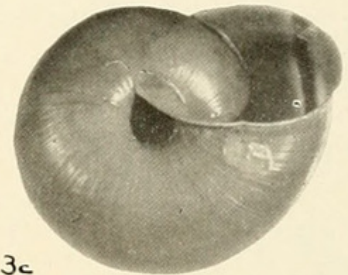
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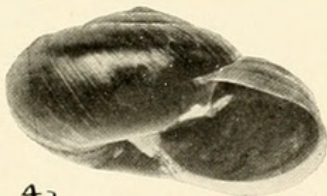
3a



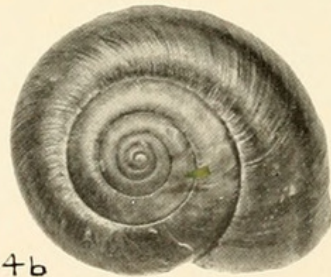
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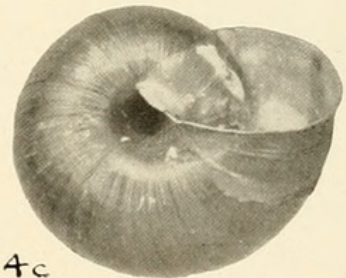
3c



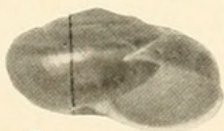
4a



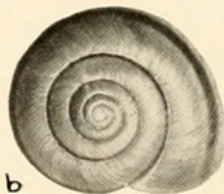
4b



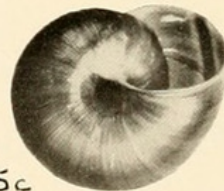
4c



5a



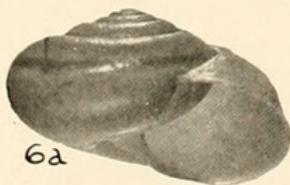
5b



5c



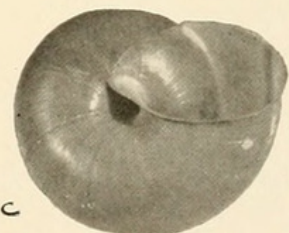
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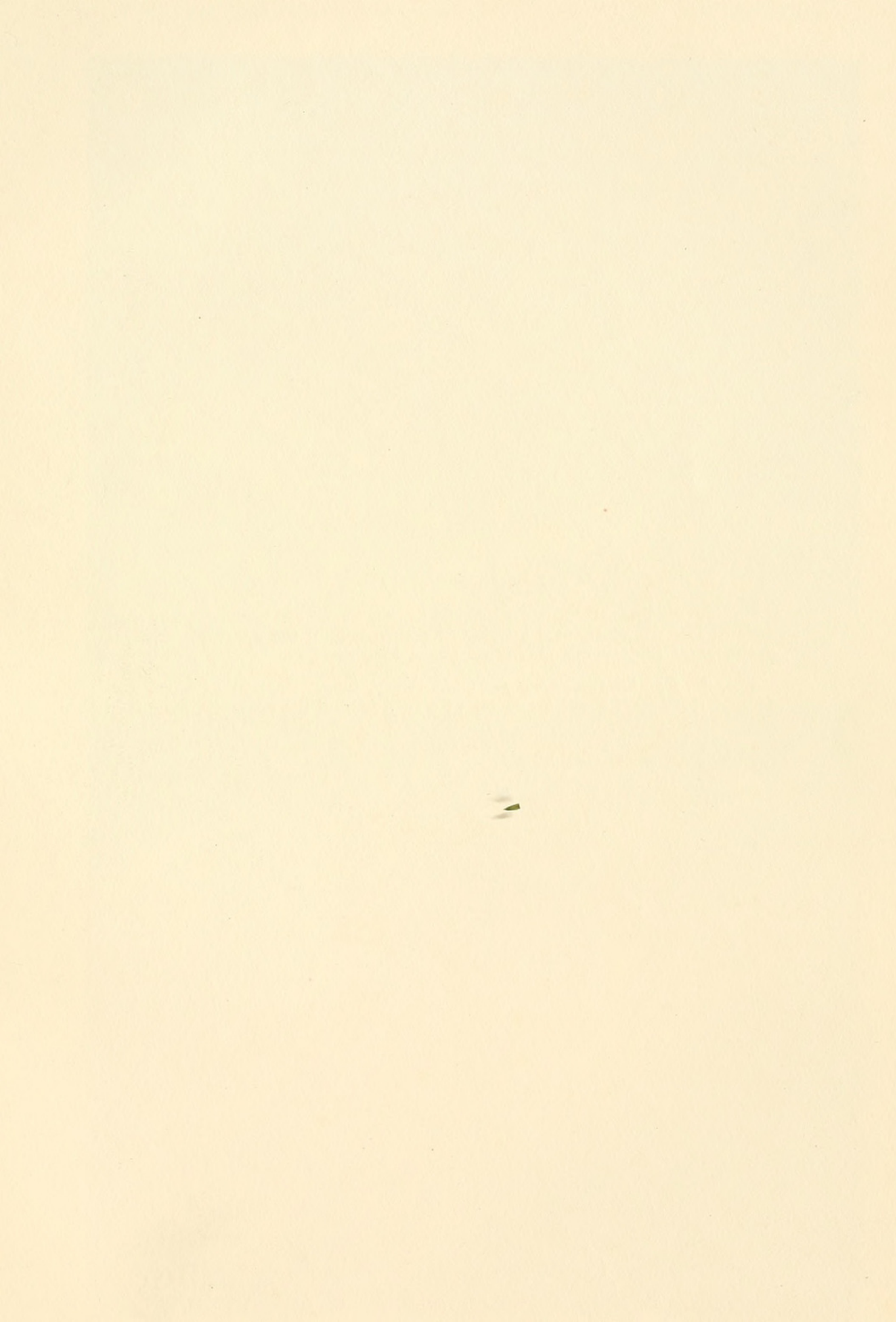
6a



6b



6c



EXPLANATION, PLATE V

Fig. 1. *Epiphragmophora petricola* Berry, type. Portion of upper surface of last whorl about a quarter of a turn behind the aperture, showing periostracal sculpturing magnified about 15 diameters.

Fig. 2. *Epiphragmophora petricola* Berry, type. Portion of basal surface of last whorl about a quarter of a turn behind the aperture, magnified about 15 diameters.



Berry, S. Stillman. 1920. "Notes on some undescribed Californian Helices."
Proceedings of the California Academy of Sciences, 4th series 10, 53–70.

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