

Notes on Hawaiian Zonitidae and Succineidae

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INTRODUCTION

The material on which the present paper is based forms part of the malacological collection of the Bishop Museum. In 1920 I took to Philadelphia for comparative study the animals and shells of Hawaiian representatives of the families of Zonitidae, Endodontidae, and Succineidae and worked out there the anatomy of a number of the Zonitidae and Succineidae, but was unable to complete the analysis for lack of sufficient material. These notes deal with several genera of Succineidae and with three of the rarest genera of Zonitidae found in Hawaii. For comparison with the Hawaiian forms the very rich collection of wet material in the Academy of Natural Sciences was placed at my disposal in Philadelphia by Dr. Henry A. Pilsbry, to whom I am also indebted for advice and many courtesies. Thanks are due also to Miss Helen Winchester, who made the drawings for the two plates.

ZONITIDAE

GODWINIINAE

Sykes¹ proposed the generic title of *Godwinia* for Gould's *Vitrina caperata*, basing his conclusions on the anatomical studies of Godwin-Austen. From a further study of the anatomy it appears that a new subfamily title is necessary. The shells are rather small, 8-13 mm. in diameter, of few rapidly enlarging whorls, and a large aperture; the embryonic whorls are more or less distinctly and roughly, distantly and radiately costate; the umbilicus is small and circular.

Unfortunately the animals in all the specimens examined were much contracted. As shown by Godwin-Austen there are no shell-lobes. Both right and left dorsal lobes are strongly developed. The sexual orifice is situated rather high and is back of the pulmonary orifice (fig. 3, a). There is no tail pore or slit. The penis is entirely different from that of other zonitoid snails. It is rather large with a very short stout retractor. The distal end is slightly enlarged into a head and is very thick walled with a minute almost

¹ Sykes, E. R., *Mollusca: Fauna Hawaiiensis*, ii, p. 277, 1900.

median cavity. Near its base, the penis of most of the specimens examined bears a large saccate protuberance (fig. 1, *a*, *b*, and *f*); the vas deferens enters at the distal end of this protuberance and is imbedded within the wall of the penis (at *x*, fig. 1, *d*), and empties into the penial cavity just at or below the head of the penis (exactly where could not be determined from the specimens at hand). In specimens of *Godwinia haupuensis* (fig. 3, *d*) the penis is pyriform, widest near the base, and the vas deferens enters the wall just below the middle of its length.

The right tentacle does not pass between the male and female genital organs but between these organs and the buccal mass and under the main nerves leading to the genitalia.

The central and lateral teeth, as pointed out by Godwin-Austen, are unicuspid, but the cusp bears cutting points on both sides. In the centrals these cutting points are nearly opposite to each other, while in the laterals the inner and less distinct point is considerably higher than the outer. There are 4 perfect laterals, 2 to 4 transitionals, and from about 18 to 32 aculeate unicuspid marginals, the number depending on the age and species of the snail.

The members of this subfamily are known only from the island of Kauai. They are rarely found in abundance and are usually taken in thick, damp ferny jungle above the thousand-foot level, crawling on damp dead leaves. A very few specimens have been found on the under surface of fronds of low-growing ferns.

GODWINIA

Godwinia caperata (Gould). Pl. XXIV, 4; figs. 1 and 2.

Vitrina caperata Gould, Proc. Boston Soc. Nat. Hist., ii, p. 181, 1847; Moll., U. S. Expl. Exped., xii, p. 10, Pl. 1, 9, 9a, 1852.

Godwinia caperata Sykes, Fauna Haw., ii, Moll., p. 277, 1900.

This species has been collected on the highlands north and northwest of the Waimea Canyon. It is more abundant on the northern rim near the Waiakoali and Kawaikoi drainage basins than farther west. The specimen figured (Pl. XXIV, 4) is not quite typical as the periphery is slightly more rounded than that of Gould's figure. This specimen came from near Waiakoali Valley. Specimens from Kawaikoi Valley (Bishop Mus. No. 16743) agree very closely with Gould's description and figure.

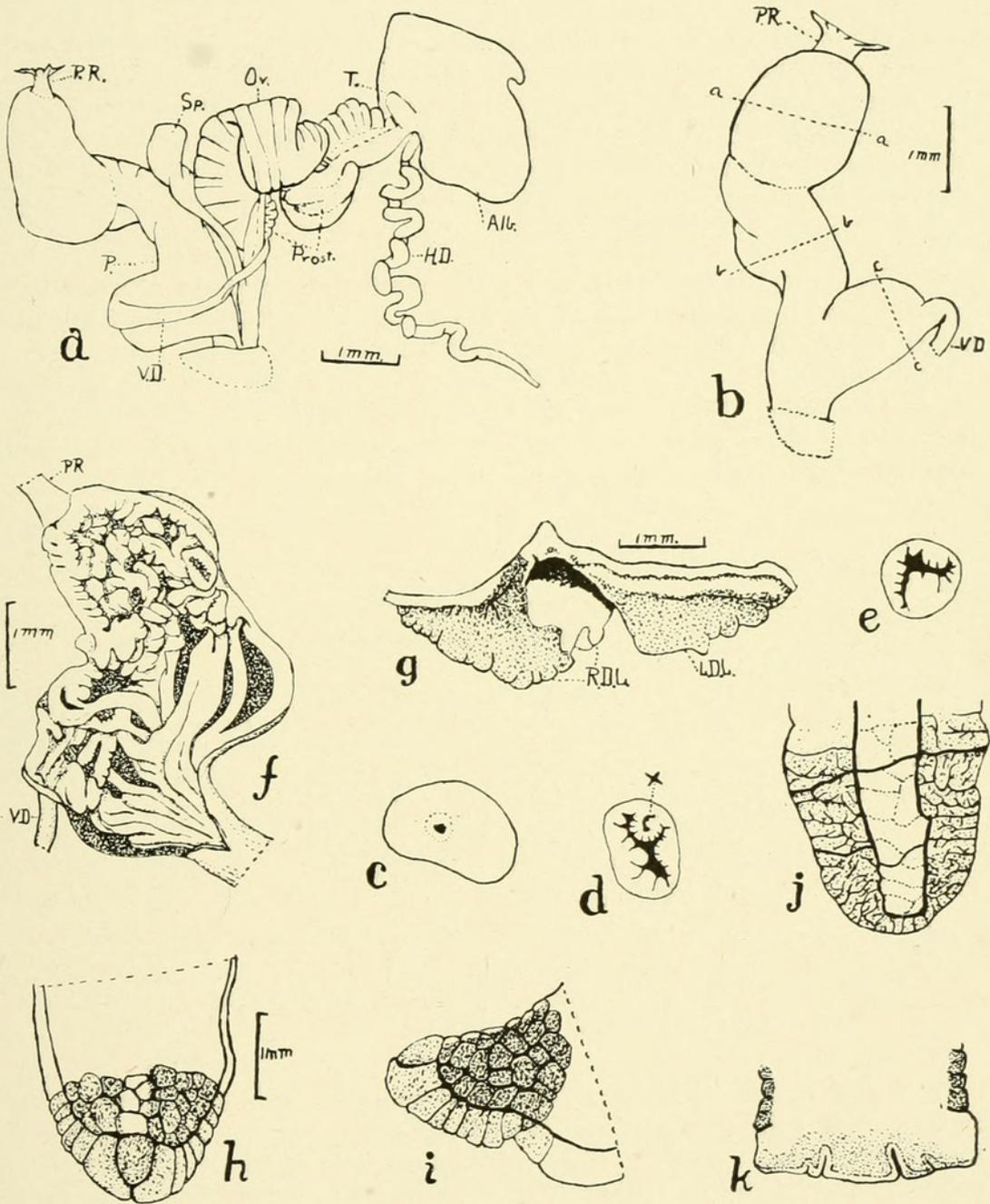


FIGURE 1. *Godwinia caperata* (Gould): a, genitalia; b, penis; c, cross section of penis at a-a; d, cross section of penis at b-b (x indicates position of seminal duct in the penis); e, cross section of penis at c-c; f, penis opened longitudinally to show arrangement of internal muscles; g, pulmonary orifice with right and left dorsal lobes; h, tail from above; i, tail from the side; j, under surface of foot; k, cross section of foot. (b, c, d, and e are drawn on the same scale; h, i, j, and k are drawn on the same scale.)

a, b, and f. *Alb*, albumen gland; *HD*, hermaphrodite duct; *Ov*, oviduct; *P*, penis; *PR*, penial retractor; *Prost*, prostate gland; *Sp*, spermatheca; *T*, talon; *VD*, vas deferens. g. *LDL*, left dorsal lobe; *RDL*, right dorsal lobe.

The color of fresh specimens is olive-lake, with a narrow indistinct reddish coloration accompanying and extending slightly below the suture; the outer and columellar margin of the aperture is edged with a narrow vinaceous line. There are $1\frac{1}{2}$ embryonic whorls which are sculptured with distant broad low radial costae, high at the suture and disappearing below, the costae and interstices covered with very minute regular close spiral striae. Alt. 8.0 mm., diam. 12.3 mm., $3\frac{1}{2}$ whorls (figured specimen).

The animal is uniformly very dark externally except for a broad light band accompanying the ridge of the tail (fig. 1, *h*). The sides of the foot below the pedal grooves are much lighter in color than the flanks of the animal (fig. 1, *i*). There is no distinct tail-pore or slit; but the tail ends above in a rather distinct button. The external portion of the dorsal lobes is a uniform slatey color (fig. 1, *g*). The mantle is densely and almost uniformly maculated with dark pigmentation.

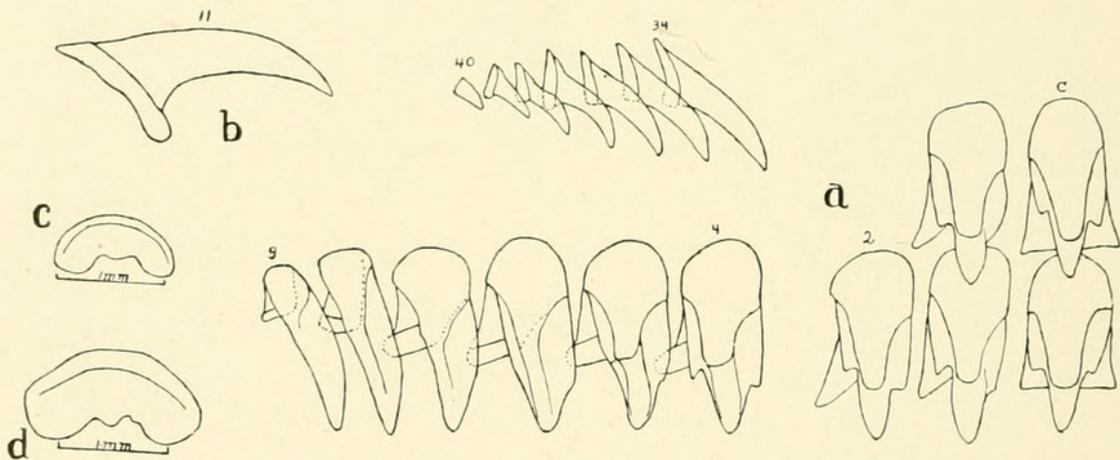


FIGURE 2. *Godwinia caperata* (Gould). **a**, teeth ($\times 250$); **b**, profile of eleventh lateral ($\times 250$); **c** and **d**, jaws.

The genitalia are simple. The albumen gland is large, trapezoidal in outline. The oviduct is strongly twisted on itself and can not be straightened out without breaking. The spermatheca is irregularly pyriform and united to the vagina by a short duct. The prostate gland is on the inner surface of the oviduct, which it nearly equals in length. The penis is large, more or less cylindrical in outline, its distal third somewhat swollen, bearing near its base a prominent swelling into which the vas deferens enters. It is made up of tough muscular tissue and is without any sheath. The vas deferens is simple, without any convolutions, and enters the distal end of the protuberance borne on the base of the penis. This protuberance has a large cavity (fig. 1, *e*) which narrows down to a much smaller diameter near the middle of the penis (fig. 1, *d*, at \times) and probably empties into the narrow duct in the distal third of the penis.

The tooth formula is 1-4 (4)-32. (1-40.)

Godwinia haupuensis new species. Pl. XXIV, 3; fig. 3.

The shell is thin, with a dull upper surface, narrowly umbilicate, dark olive-buff, much lighter below the periphery, with a low broad conical spire and bluntly angulate at the periphery. Whorls $3\frac{1}{2}$, slightly convex, separated by a deep suture. The first whorl and a half are roughly sculptured, the costae broad and slightly arcuate. On the next whorl the sculpture consists of closely packed, distinct, rather arcuate costae; on the upper surface of the last whorl the costae are more irregular in height and position than on the first and second, and on the lower surface the costae are more delicate and are very evenly spaced. The last whorl descends so slowly that the periphery of the penultimate slightly overhangs the suture. Aperture rather large, its outlines straighter above, more curved below, and its margins slightly approximating.

Height 5.1, maj. diam. 8.4, min. diam. 6.6; apert. height 4.1, diam. 5.5 mm.

Kauai: Northern slope of Mount Haupu in the southeastern portion of the island.

Type 58469 Bishop Museum; paratypes 17831 Bishop Museum and Academy of Natural Sciences, Philadelphia.

Godwinia haupuensis is quite distinct from *Godwinia caperata*. The shell is smaller with the same number of whorls, thicker with a much duller and more distinctly costate surface; the peripheral keel is also more pronounced. The "sinuous, branching furrows" mentioned by Gould and characteristic of *G. caperata* are entirely lacking in adults of this species. They are faintly developed in juvenile specimens where the shells are much thinner.

The upper and side surfaces of the foot (fig. 3, *a*) are dark colored except below the pedal grooves which are light; the sides of the head are also light colored. There is no distinct button near the end of the tail (fig. 3, *b*) as in *G. caperata*. The mantle is light except for two slightly dark patches of pigment, one over the heart and kidney and one over the intestine and ureter. The collar of the mantle is only slightly pigmented. The lung and the organs situated near and on it (fig. 3, *c*) are similar in both species.

Genitalia (fig. 3, *d*). The female organs are very much alike in both species. The penis of *G. haupuensis* is, however, somewhat different from that of *G. caperata*. No protuberance near the base was found in any of the specimens examined. The vas deferens enters directly into the penis near its lower third. A short distance above this a cross section showed two nearly equal cavities (fig.

3, *e*). The distal third of the penes of both species are somewhat similar.

The teeth of both species are similar in form but in *G. haupuensis* there are fewer in each row. The formula of this species is I-4(2)-23. (I-29.)

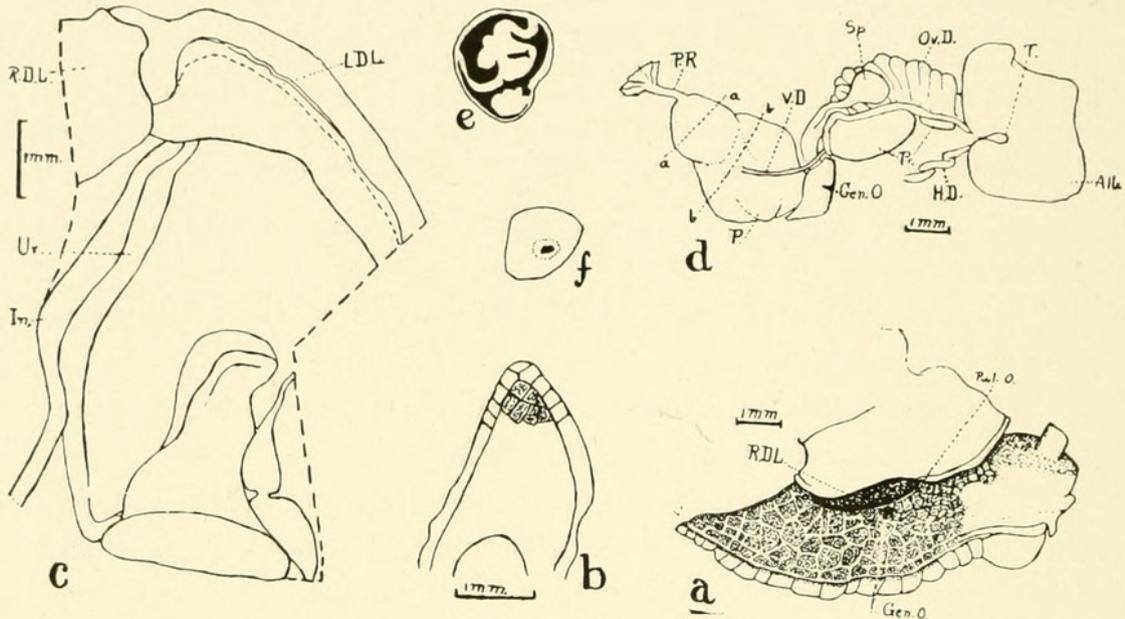


FIGURE 3. *Godwinia haupuensis*, new species: **a**, animal partly expanded showing the relative positions of the generative and pulmonary orifices; **b**, tail from above; **c**, lung; **d**, genitalia; **e**, cross section of penis at *b-b*; **f**, cross section of penis at *a-a*. (**d**, **e**, and **f** are drawn on the same scale.)

a. *Gen. O*, generative orifice; *Pul. O*, pulmonary orifice; *RDL*, right dorsal lobe. **c**. *In*, intestine; *LDL*, left dorsal lobe; *RDL*, right dorsal lobe; *Ur*, ureter. **d**. *Alb*, albumen gland; *Gen. O*, generative orifice; *HD*, hermaphrodite duct; *Ov. D*, oviduct; *P*, penis; *PR*, penial retractor; *Pr*, prostate gland; *Sp*, spermatheca; *T*, talon; *VD*, vas deferens.

VITRINA

Vitrina tenella Gould. Pl. XXIV, 2; fig. 4.

Vitrina tenella Gould. Proc. Boston Soc., ii, p. 181, 1847; Moll., U. S. Expl. Exp., p. 11, Pl. I, fig. 10, 1852.

Godwini (?) *tenella* Sykes, Fauna Haw., ii, Moll., p. 278, 1900.

Kauai (Gould); Maui, Haleakala 5000-9000 feet (Perkins, Cooke); Hawaii, Kukaiau (Thaanum), 1823 flow at 7000 feet (Forbes), Waikii (fossil).

Gould gives Kauai as the locality of this species, but I am sure that this must be a mistake. His description and figure agree

closely with specimens from Maui and Hawaii. As stated by Sykes, specimens have not been found on Kauai by any of the later collectors. Gould's diameter, $1/3$ in. (8.3 mm.) ($1/3 \times 1/11$ in.) is probably erroneous, as his figure (natural size) measures 4.8 mm. in diameter.

Owing to the small amount of available material from the island of Hawaii it seems best that the Hawaii form should be included at present with Gould's species from Maui. Some of the specimens are slightly larger than any that I have known to be found on Maui.

The size of the specimens from Hawaii as compared with those from Maui is shown in the following table:

Locality	Max. diam. mm.	Min. diam. mm.	Altitude mm.	Number of whorls	Bishop Mus. No.
Maui	5.2	3.7	3.0	3	58473
Maui	4.6	3.2	2.6	3	58473
Hawaii	6.1	3.9	3.7	$3\frac{1}{4}$	58472

The embryonic whorls of specimens from Maui and Hawaii are minutely punctate, as in the American and European species of this genus, the punctation being arranged in spiral rows. Fresh specimens are transparent chartreuse-yellow according to Ridgway's color nomenclature. The only material available for dissection was a very much contracted alcoholic specimen, an animal collected by Forbes on the island of Hawaii. Unfortunately the tip of the tail had been broken off and the presence of a pore could not be determined. The sides of the foot were dark slate-colored, the sole slightly lighter in color; the central area, about one-third the diameter of the foot, being much lighter. The dorsal and shell-lobes were very much contracted and intensely pigmented. The right shell-lobe is long and narrow and extends beyond the pulmonary orifice. The right dorsal lobe is short, almost triangular, and very thick. The left shell-lobe is short. The anterior left dorsal lobe is short and triangular in outline; the posterior left dorsal is broad in front, long and narrow behind. The mantle is light yellowish flesh-colored, indistinctly and minutely stippled for a short distance above the collar.

The right tentacle retractor does not pass between the oviduct and penis but between the genitalia and buccal mass and under the main nerve leading to the genitalia. This same arrangement was found in specimens of *V. alaskana* Dall (A. N. S. P. 107017).

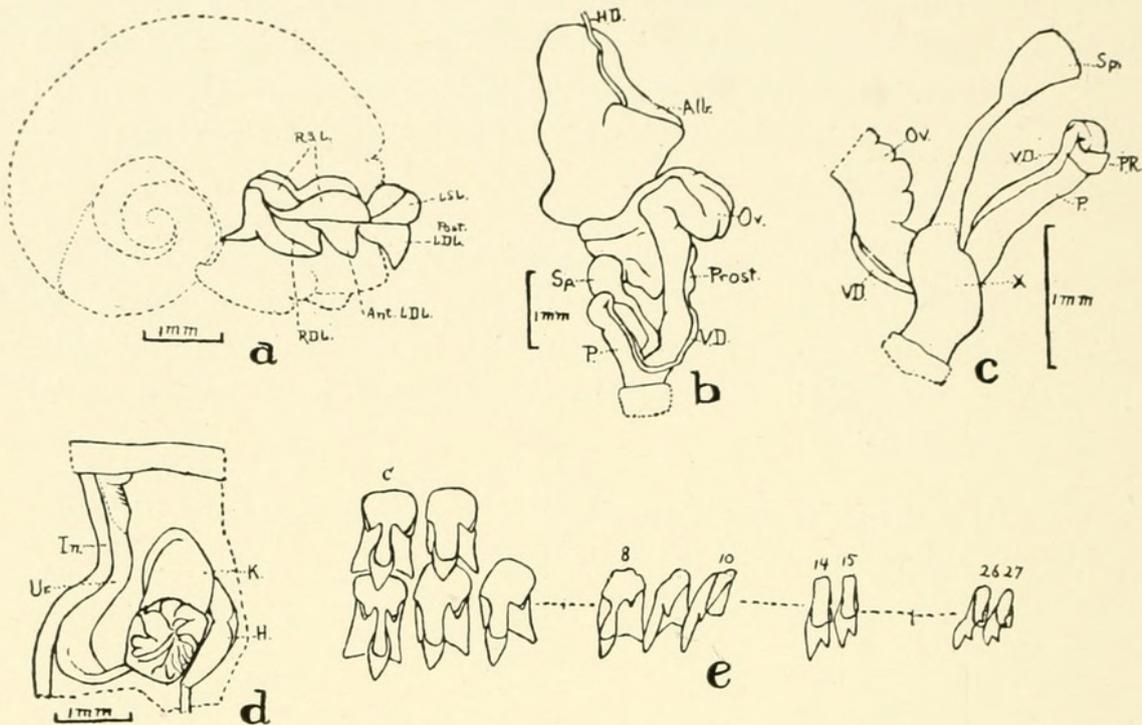


FIGURE 4. *Vitrina tenella* Gould: **a**, animal, much contracted, showing position of dorsal and shell-lobes; **b**, genitalia, ventral aspect; **c**, lower genitalia drawn to a larger scale, dorsal aspect (x, the enlargement at the base of the spermatheca); **d**, lung; **e**, teeth ($\times 380$).

a. *Ant. LDL*, anterior left dorsal lobe; *LSL*, left shell-lobe; *Post. LDL*, posterior left dorsal lobe; *RDL*, right dorsal lobe; *RSL*, right shell-lobe. **b.** *Alb.*, albumen gland; *HD*, hermaphrodite gland; *Ov.*, oviduct; *P.*, penis; *Prost.*, prostate gland; *Sp.*, spermatheca; *VD*, vas deferens. **c.** *Ov.*, oviduct; *P.*, penis; *PR*, penial retractor; *Sp.*, spermatheca; *VD*, vas deferens; *x*, enlargement at base of spermatheca. **d.** *H.*, heart; *In.*, intestine; *K.*, kidney; *Ur.*, ureter.

The pulmonary vein could not be made out in the specimen. The kidney is saccate in outline; the basal portion is shown opened (fig. 4, *d*). The ureter accompanies the right side of the kidney, passing over to the intestine near the base of the kidney; it enlarges rather abruptly just before reaching the intestine and continues forward as a broad duct.

The genitalia are extremely simple. The albumen gland is very large, roughly triangular in outline. The oviduct is tightly twisted. The spermatheca is rather large, its duct medium in length and broad, enlarging at its base and uniting with the oviduct close to the cloaca (fig. 4, *c* at *x*). The penis is simple cylindrical, about $1\frac{1}{2}$ mm. in length. The vas deferens is closely united to and accompanies the penis, entering close to the distal end of the latter organ. The penis retractor is very short and united to the penis and vas deferens just below their union.

The teeth are typical of the genus, the formula being 1-8-32; the central with a rather long cutting point and two minute ectocones; the laterals

with a long indistinct inside cutting edge and a short distinct ectocone. The inner marginals are distinctly bifid but without denticles on the outer margin. The very outermost marginals have about two minute denticles on their outer margin.

The finding of typical specimens of this holarctic genus in the Hawaiian shell fauna is hard to explain. There can be no doubt that they are endemic to the Territory of Hawaii and not of recent introduction, as all the specimens that have been collected were found at high altitudes (3000-8000 feet), and the possibility that specimens were accidentally introduced in places remote from human habitation is very slight. Furthermore the presence of this species in the Pleistocene fossil deposits of Waikii, Hawaii, is a strong argument against the theory of accidental introduction.

NESOVITREA new genus

Vitrea-like snails; whorls about four, the first whorl smooth, the rest minutely but distinctly striate. Aperture simple, outer margin thin, sharp. Umbilicus rather shallow, perspective showing all the whorls.

Contracted alcoholic specimens of the animals are without distinct shell-lobes, but have a strong right dorsal lobe, an anterior left dorsal lobe almost as well developed, and a long narrow posterior left dorsal lobe. Lateral pedal grooves are well developed, but there is no indication of a tail pore or slit in any of the much contracted animals examined. The spermatheca is attached to the base of the uterus very close to the latter's insertion on the cleaca.

Type *Vitrea pauxillus* Gld., from Maui.

The name Nesovitrea is proposed for a small group of very closely related species from the Territory of Hawaii.

Besides the type this genus is made up of the following species:

Vitrea (?) *lanaiensis* Sykes, Proc. Mal. Soc. London, ii, p. 298, 1897.
Fauna Hawaiiensis, ii, Pl. XI, figs. 43, 44, 1900.

² Hawaiiia Gude (Gude, G. K., Note on some preoccupied molluscan generic names and proposed new genera of the family Zonitidae: Proc. Mal. Soc. London ix, p. 272, 1911) was originally based upon *Helix kawaiensis* Pfr., and was said to equal *Hyalina* and *Pseudohyalina* in part. *H. kawaiensis* had been referred to *Pseudohyalina* by Sykes (Fauna Haw., ii, Moll., p. 279, 1900). Mr. Gude subsequently in an undated leaflet proposed to change the type of Hawaiiia to *Helix hawaiiensis* Ancey; but no *Helix hawaiiensis* was ever described by Ancey, nor was this specific name ever used by him in *Hyalina* or *Pseudohyalina*. We are therefore compelled to adhere to Mr. Gude's original designation of *Helix kawaiensis* Pfr. as the type of Hawaiiia.

Vitrea (?) *molokaiensis* Sykes, Proc. Mal. Soc. London, ii, p. 298, 1897.
Fauna Hawaiiensis, ii, Pl. XI, figs. 45, 46, 1900.

Vitrea (?) *hawaiiensis* Anc., Proc. Mal. Soc. London, vi, p. 120, Pl. VII,
figs. 8-8b, 1904.

Nesovitrea pauxillus (Gould). Pl. XXIV, 1; fig. 5.

Helix pusillus Gould, Proc. Bost. Soc., ii, p. 171, 1846.

Helix pauxillus Gould, Moll., U. S. Expl. Exped., p. 40, Pl. III,
fig. 46, 1852. *Vitrea pauxillus* Sykes, Fauna Haw., ii, Moll, p. 279, 1900.

Animals of all four species were examined and agreed very closely. The foot is light yellowish-white and has well-marked pedal grooves, but no tail pore or slit; the central section of the sole is extremely narrow, being slightly less than one-fourth the diameter of the foot.

All the animals examined were rather strongly contracted alcoholic specimens. There were no shell-lobes present. The right dorsal lobe in the contracted specimens is rather strong, as is also the anterior left dorsal lobe; the posterior left dorsal lobe is long and narrow. On the right side the collar is uniformly slate-colored, on the left side the collar is a lighter gray, and its upper portion is bounded by a dark-gray line. The right side of the mantle, from the right margin of the kidney to the intestine, is uniformly minutely and densely stippled with dark brown; the portion of the mantle covering the kidney is pale flesh-colored; the left side, below the kidney, is pale, indistinctly minutely stippled.

The pulmonary vein is indistinct. In a single specimen were seen minute branching veins extending downwards and to the left of the pulmonary orifice.

The generative organs are extremely simple. The albumen gland is proportionately large and long and is oblong in outline. The oviduct is not tightly twisted. Spermatheca rather small, with a long rather broad duct enlarging abruptly at its termination close to the base of the uterus. Penis very short and simple, cylindrical, about $\frac{2}{3}$ mm. in length, with a long slender penial retractor attached at its distal end; vas deferens short, not accompanying the penis to its base.

The right eye retractor does not pass between the oviduct and penis as in most snails but between the buccal mass and genitalia.

The tooth formula is 1-8-30.

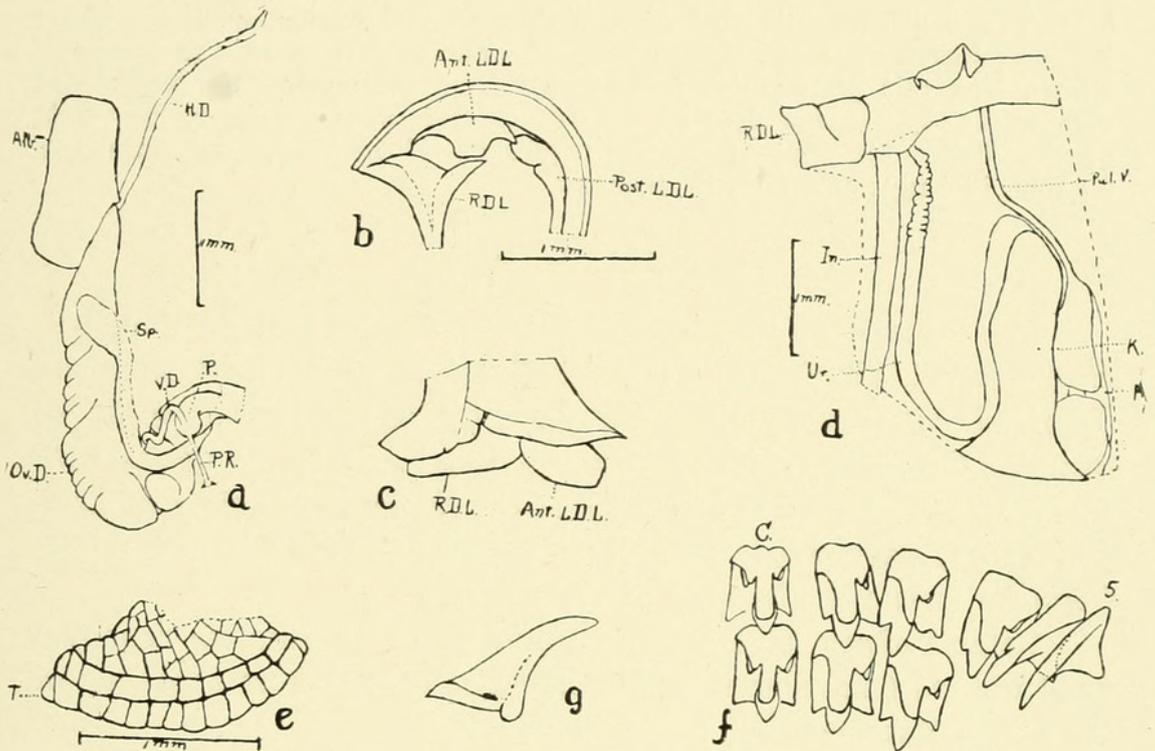


FIGURE 5. *Nesovitrea pauxillus* (Gould): **a**, genitalia; **b**, collar dissected from the rest of the animal, ventral aspect; **c**, collar, dextral aspect; **d**, lung; **e**, foot, somewhat contracted; **f**, teeth ($\times 410$); **g**, profile of a marginal tooth ($\times 410$).

a. *Alb.* albumen gland; *HD*, hermaphrodite duct; *Ov. D.*, oviduct; *P.*, penis; *PR*, penial retractor; *Sp*, spermatheca; *VD*, vas deferens. **b** and **c**. *Ant. LDL*, anterior left dorsal lobe; *Post. LDL*, posterior left dorsal lobe; *RDL*, right dorsal lobe. **d**. *H*, heart; *In*, intestine; *K*, kidney; *Pul. V*, pulmonary vein; *RDL*, right dorsal lobe; *Ur*, ureter. **e**. *T*, tip of tail.

SUCCINEIDAE

SUCCINEA

Succinea newcombiana Garrett. Pl. XXV, 4.

Succinea newcombianum Garrett, Proc. Cal. Acad. Sci., i, p. 103, 1857.

Succinea newcombiana Sykes, Fauna Haw., ii, p. 388, 1900.

Hawaii: Waimea (Garrett), Kohala (Perkins), Kaiwiki (Thaanum, no. 1143).

This species although almost as flat as *Catinella rubida* is, anatomically, a true Succinea. The shell is considerably flatter than that of *Catinella rotundata* Gld. This species was found in abundance by Thaanum at Kaiwiki.

The shells are pale chalcedony-yellow on the outside, whitish within; the growth-striae are very faintly marked. The parietal margin is furnished with a long thin plate which is separated from the upper outer margin of the aperture by a rather deep sinus. The aperture occupies nearly the whole of the shell. The figured specimen (Bishop Mus. No. 58474) measures 8.4 mm. in length, 6.8 mm. in diameter.

CATINELLA Pease

Pease proposed this generic title in the *Journal de Conchyliologie* (xviii, 1870), page 89, for *Succinea explanata* Gould and *Succinea putamen* Gould. On page 97 of the same work, he includes *Catinella rubida*, a new species, in the same genus with *C. explanata*. In the *Proceedings of the Zoölogical Society of London* (1871, page 459), he gives a generic description and selects *Catinella rubida* as the type of the genus.

Later authors have reduced *Catinella* as an absolute synonym or at the most have retained the name as a section or subgenus of the genus *Succinea*.

Anatomical studies of the animals of *Catinella rubida* and a number of other Hawaiian species formerly included in the genus *Succinea* lead me to believe that *Catinella* should be restored to generic rank. Unfortunately the number of species so far dissected has not been very large, but the additional material that will be available in 1922 will enable me to complete the work during that year. Most of the species formerly referred to *Succinea*, from Kauai, Oahu, and Molokai and some of those from Maui, in the form and arrangement of their genital organs resemble very closely *C. rubida*. Species referable to this genus differ considerably in the form and size of their shells. They also differ as to habits, as some are arboreal and others are terrestrial.

Catinella rubida Pease. Plate XXV, 1.

At an elevation of about 2000 feet, just below the swamp at Wahiawa, Kauai, I collected typical specimens of this species. Descriptions of the animals of this and other species from the Territory of Hawaii will be deferred until the anatomy of more of these species has been completed. The figured specimen measures 10.6 mm. in length and 7.8 mm. in diameter and is made up of nearly 1½ whorls; it is buckthorn-brown in color.

Catinella paropsis new species. Pl. XXV, 3.

The shell is rather flat, ellipsoidal in outline, slightly flattened at the sides, rather thick, nearly opaque, dull, and of a dark olive-buff color. Whorls about $1\frac{1}{2}$, the spire immersed. The last whorl is somewhat convex above, its dorsal surface minutely striate with concentric lines of growth and in addition marked with faint, broken, slightly radiating shallow sulci, which are also visible when viewed from within. The aperture occupies nearly the whole of the ventral side, its outer margin slightly undulating and edged by a narrow dark line. The parietal wall is furnished with a rather broad long plate which terminates within the outer wall of the aperture and is separated from its margin by a deep sinus.

Length 11.7, diameter 7.5 mm.

Oahu: Kaipapau, near the summit of the Koolau Range (Cooke).

Type No. 19307, paratypes No. 19410, Bishop Museum, and also in the Academy of Natural Sciences of Philadelphia.

So far as known this species is entirely terrestrial in its habits; all the specimens were found on very damp dead leaves. This species is extremely rare; the collection of the Bishop Museum has only four lots from different colonies numbering altogether 15 specimens, most of which are immature. These were found in dark and damp heads of ravines near the summit of the Koolau Range between Punaluu and Kaliuwaa.

Catinella paropsis is entirely distinct from any of the species already described from the Territory of Hawaii. Its closest relatives (except the following species *Catinella tuberculata*) appear to be the extremely flat *Catinella explanata* and *Catinella rubida* from the island of Kauai. From these it differs in the greater convexity of the last whorl, the thickness of the shell, and the peculiar radiating dorsal sulci.

Catinella tuberculata new species. Pl. XXV, 2.

This species is represented in the Bishop Museum by two specimens. One is of about the same color as *Catinella paropsis* (dark olive-buff), the other, the type, is of a slightly darker shade. *Catinella tuberculata* is easily distinguished from *Catinella paropsis* by its tuberculate surface, the tubercles being formed by wrinkled anastomosing sulci, which are so deeply impressed into the structure of the shell that the inner surface of the aperture is distinctly

malleate. The parietal plate is much narrower and less developed than in *Catinella paropsis*.

Length 11.2, diameter 7.6 mm.

Oahu: Mount Kaala (Thaanum). Type and paratype No. 36915, Bishop Museum; paratypes, Thaanum collection.

LAXISUCCINEA new genus

The shells are succineiform, the last whorl distinctly and bluntly angulate below its periphery, flattened ventrally, and forming a platform at and below the inner margin of the aperture. The margin of the aperture is entirely free and is not appressed to the last whorl as in other Succineidae.

Laxisuccinea is an interesting group of this rather conservative family. The separation of it from other Succineidae is based entirely on shell characters, but these characters appear to be of sufficient importance to necessitate the forming of a new genus. Unfortunately, the only two species which have been found are fossil. Both species are from the island of Kauai and were found in Pleistocene or Recent deposits near the sea, and each of the species was confined to a very limited locality. A search for living specimens was made in the vicinity, but none was found.

Type: *Laxisuccinea libera* new species.

Laxisuccinea libera new species. Pl. XXV, 6.

The shell is ovate, in its fossil state dull white with a slight yellowish tinge, irregularly marked with minute lines of growth. Whorls almost two; the first minute, very convex, and having a deep narrow suture; the last large, increasing very rapidly and occupying nearly the whole of the shell, bluntly but distinctly angled below the periphery and flattened ventrally just below this angle, its last fourth free, cornucopia-like. Aperture nearly ellipsoidal in outline, its margin free and erect, not attached either to the columellar or parietal wall. There is no indication of a parietal plate.

Length, 7.8, diameter 5.5 mm.

Kauai: in Pleistocene or Recent deposits in road cutting near the southern extremity of the Hanamaulu flat (C. S. Dole and Cooke).

Type No. 19539, Bishop Museum; paratype Academy of Natural Sciences of Philadelphia.

One whole specimen and five or six fragments are all the material I have been able to study, although to procure more material of this species two special trips were made to the identical spot

where the first fragments were found. It is entirely unlike any other species of the family to which I have been able to refer, the free aperture seen also in *Laxisuccinea haena* is its most distinctive characteristic.

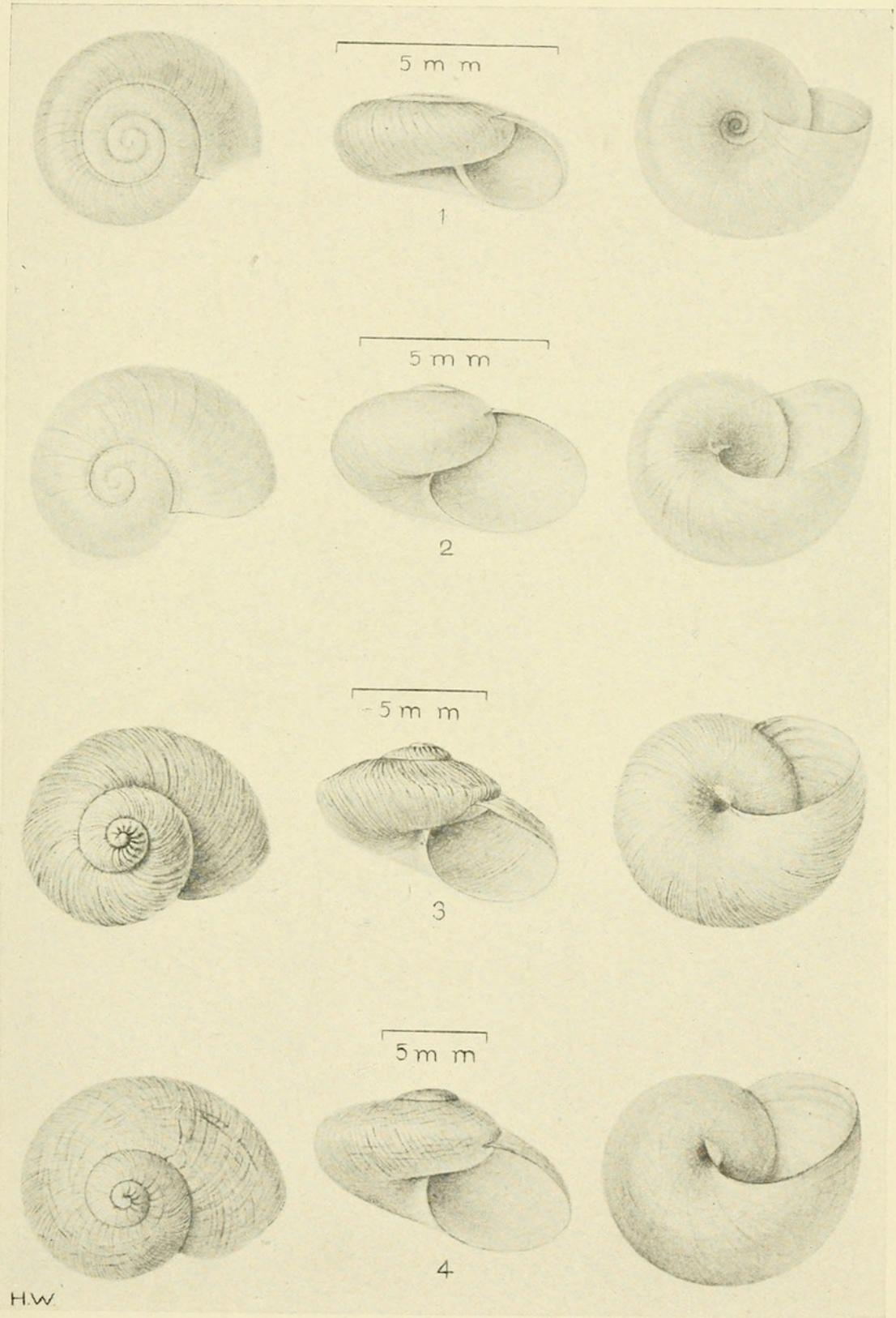
Laxisuccinea haena new species. Pl. XXV, 5.

The shell is broadly ovate, in its fossil state white, irregularly and unevenly minutely striate with lines of growth. Whorls $2\frac{1}{2}$, the upper $1\frac{1}{2}$ very convex with a deep suture, the last very large, occupying almost the whole shell, convex above, distinctly angled below the periphery and flattened ventrally just below the angle. Aperture oval, partly appressed to the parietal wall, but with its margin entirely free. There is no indication of a parietal plate.

Length 8.9, diameter 6.4 mm.

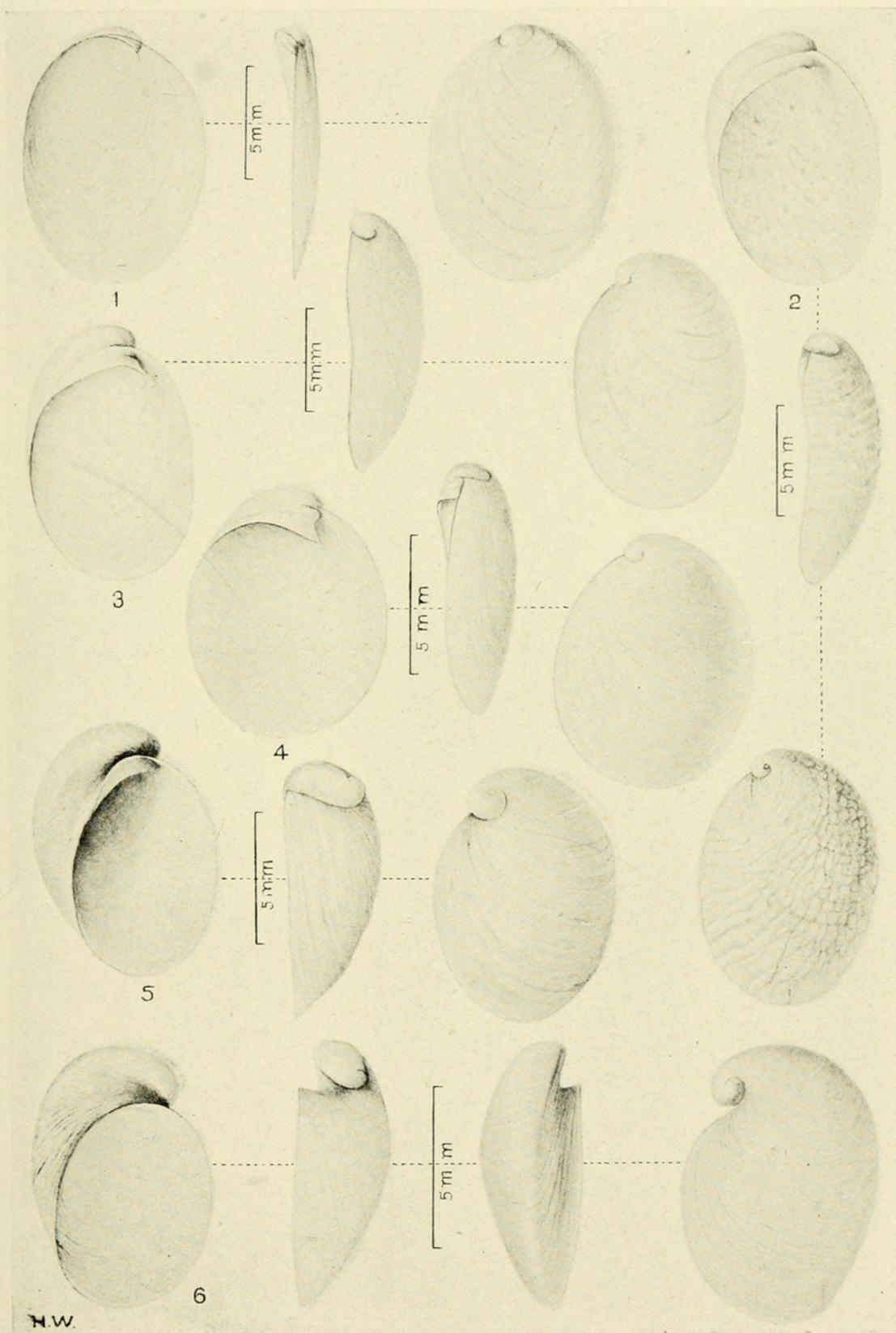
Kauai: in Pleistocene or Recent deposits in road cutting near the western extremity of the Haena Plain (Cooke). Type No. 58476 Bishop Museum, paratypes 37577 Bishop Museum, and also in Academy of Natural Sciences of Philadelphia.

Though less circular in outline, this species resembles, at first glance, *Catinella rotundata* Gould, from Oahu. It is, however, much more closely related to *Laxisuccinea libera* described above. Though the margin of the aperture is entirely free from the rest of the shell, its inner upper portion is partly appressed to the parietal wall. Evidently *L. haena* has not diverged so far from the parental Succinea-type as *L. libera* has done.



SHELLS OF ZONITIDAE: 1. NESOVITREA PAUXILLUS (GLD.); 2. VITRINA TENELLA GLD.; 3. GODWINIA HAUPUENSIS N. SP.; 4. GODWINIA CAPERATA (GLD.)

From drawings by Helen Winchester.



SHELLS OF SUCCINEIDAE: 1. CATINELLA RUBIDA PSE.; 2. CATINELLA TUBERCULATA C.; 3. CATINELLA PAROPSIS C.; 4. SUCCINEA NEWCOMBIANA GAR.; 5. LAXISUCCINEA HAENA C.; 6. LAXISUCCINEA LIBERA C.
 From drawings by Helen Winchester.



Cooke, C. Montague. 1921. "Notes on Hawaiian Zonitidae and Succineidae." *Occasional Papers of the Bernice Pauahi Bishop Museum of Polynesian Ethnology and Natural History* 7(12), 263–277.

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