









# THE NAUTILUS

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## A RECENT INTRODUCTION OF EXOTIC SPECIES OF MOLLUSCS INTO CALIFORNIA WATERS FROM JAPAN

BY PAUL BONNOT

During the last few years, interest in the culture of oysters in California waters has brought about the introduction of seed oysters (*Ostrea gigas*) from Japan. The California oyster business has been confined for many years to San Francisco and Tomales Bays which were used as holding grounds for the eastern oyster (*O. virginica*). Several pests were brought in and planted with them. None of the other bays in California were used, and as a result are free from undesirable species. The importing of Japanese "seed" therefore constitutes a new business, and as these seed are being planted in clean bays and inlets it was deemed advisable to inspect all incoming seed and to exclude if possible all the species of animals which might be harmful to the oysters as well as to the native fauna. The inspection has been carried on by H. C. McMillin and the writer and has already resulted in benefit to the growing oyster business. The first shipments were heavily infested with various species of molluscs but did not carry the dreaded Japanese drill (*Tritonalia japonica*). Finally on March 7, 1930, a shipment was received which was well stocked with drills and their egg cases. This shipment was condemned and piled up to dry on the beach. Since that time the Japanese producers have been much more particular with their seed, and it is unusual to find anything deleterious in the present shipments.

On March 26, 1930, a shipment of 150 boxes of Japanese seed was sampled at Elkhorn Slough, California. Twenty boxes of seed were washed and the resulting residue carefully examined. The specimens obtained were sent for identification to the United

States National Museum where the molluscs were identified by Dr. Paul Bartsch and the crustacea by Dr. H. A. Pilsbry. There were 22 species of molluscs and one crustacean. As far as we know no drills have been planted, but of course there is always the chance that they may have eluded us. However none have yet been found on the new beds.

Japanese species introduced with seed oysters. 3/26/30.

*Thais tumulosa clavigera* (Küst)  
*Alectrion lirata* (Dkr.) (?*A. festiva* Powis)  
*Turbo coronatus* (Gmel.)  
*Tegula undatella* (Gould) young  
*Potamides (Batillaria) multiformis* (Lischke)  
*Littorina (Littorivaga) sitchana* (Phil.)  
*Cellana amussitata* (Rve.) young  
*C. toreuma* (Rve.) young  
*Acmaea concinna* (Lischke)  
*A. heroldi* (Dkr.)  
*A. heroldi pygmaea* (Dkr.)  
*Siphonaria cochleariformis* (Rve.)  
*Odostomia (Evalea) species undet.*  
*Septifer rostratus* (Dkr.) young  
*Modiolus atratus* (Lischke)  
*Mytilus dunkeri* (Rve.) young  
*Anomia laqueata* (Rve.)  
*Pecten (Chlamys) irregularis* (Sby.) young  
*Cypricardia lyrata* (Rve.)  
*Paphia (Ruditapes) japonica* (Desh.) young  
*Sunetta excavata* (Hanley)  
*Macoma inquinata* (Desh.)  
*Balanus amphitrite albicostatus* (Pilsbry)

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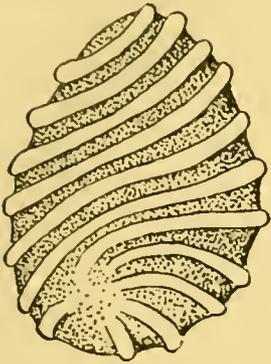
**SPIRALLY RIDGED EGGSHELL OF PLEURODONTE,  
 WITH NOTES ON THE RAPID GROWTH  
 OF A LAND SNAIL**

BY E. A. ANDREWS  
 Johns Hopkins University

While eggs of snails may be very small the egg capsule or eggshell may be very large as it encloses both the egg and much food material to feed the young before it comes out of the shell. Such eggshells may look like those of reptiles or of birds, and as far as we know they are smooth on the outside. Hence the occur-

rence of snail eggshells with ridges upon them seems worthy of notice.

In Jamaica, B. W. I., large white eggs suggesting those of lizards, but with marked spiral ridges, Figure 1, were found July 28, 1932, under leaves and trash on honeycombed limestone rock, in a small banana patch on the left side of the road coming from Stony Hill toward Kingston.



1 mm.

These eggs were in two separated clutches of twelve to twenty each, each egg being nine by seven millimeters. Such spiral eggs were known to a native boy there who stated the belief that they elongated and became directly the spiral "zebra shell," *Oxystyla undata*, some of which were found there together with several species of *Pleurodonte* and other land snails.

The ridges on the shell were most striking and about six in number, but passing once and nearly a half times about the egg it was possible to see at least ten parallel ridges on some sides of the egg. The ridges arose gradually from a central area near one end of the shell and faded away in a like area near the other end, but these two areas were on the side of the main axis of the shell so that only the one near the larger end of the shell is represented in the figure. These areas of origin and ending suggest a completion of the eggshell after muscular action of a secreting tube, and seem comparable to the big and lesser ends of the shell of the egg of the hen. These eggs floated in water and their shells were thick, not brittle, but pliable, like white kid leather. With the microscope it was evident that the organic matrix of the shell was filled with opaque, white, cuboidal crystals, which dissolved in acetic acid with effervescence and left in the matrix holes of the same shape as the crystals. Taken to Baltimore, Maryland, some of these eggs cracked open and young snails emerged August ninth. Each nearly filled the eggshell. One within the shell measured 7 by  $6\frac{1}{2}$  mm. but was only 3 thick as it was flattened somewhat like a planorbis in form, with the upper surface flat and the lower hollowed out by a deep umbilicus. The wide flaring mouth of the shell measured 3 mm.

These young were kept in a nine-liter glass jar together with a dozen or more young slugs, *Veronicella*, and all were fed lettuce, some plantain leaves and raw sweet potato and supplied with limestone and towel paper, but with no earth. On September 3rd there were but four to be found, two dead with diameters of 9 and 7 mm. and two living with diameters of 17 and 7 mm. These little snails then had a reddish tinge with eyes yellow on red stalks, in shells of two and a half whorls and with sharp peripheral edges.

The shells were very thin, horny, and so transparent as to allow the pigment of the mantle to show plainly. Even before hatching there were streaks of black pigment on the middle of the body parallel to the edge of the aperture. By October the 25th, the shells had increased to nearly four whorls and the pigment was scattered in small blotches, a dozen or so to each whorl, so that the animal had a mottled appearance since the pigment showed so readily through the thin shell. The shell was at first so very thin as it grew that when the larger shell had a diameter of 34 mm. a piece of 6 × 11 mm. broke off in handling, but this was rapidly restored. In the smaller snail growth was also by very thin shell and when it was 35 mm. wide, January 11, 6 mm. was broken off, but this was restored by a growth of 5 mm. of excessively thin shell within 20 days.

The rate of growth for both snails was about 10 mm. per month at first, but soon the smaller fell off to about one-third that rate and only in January had it grown to the size attained by the larger in October.

It is to be noted that the young from the same locality differed much in size at the time of hatching and two did not continue to grow at the same rate under conditions apparently alike. In November, the larger snail was already forming its maturity peristome and soon after that did not increase in dimensions. Thus under the above conditions of feeding and confinement this snail may attain to full growth in about four months from August through November. As mature shells they were identified by Dr. Henry A. Pilsbry as *Pleurodonte acuta semperfluens* Pilsbry and Brown, so that the possession of this peculiar spirally ridged eggshell is one of the characters of this species, which may be shared with other species as yet not traced to the egg.

The two survivors did not attain the complete size of adults taken in Jamaica, nor did they quite express all of the normal proportions of shell, for while having sufficient depth they lacked about one-tenth in maximum diameter since the edges of the shell were rounded and not characteristically sharp. It seems that under the abnormal conditions of confinement and restrictions in diet perfect form was not attained.

The following table gives measurements in millimeters and some weights in milligrams of the above two young, *a* and *b*, compared with those of normal adult, *x*, not reared in captivity. While the measurements are not exact, they show that the reared young may, after one season of growth from the egg, be nearly as large and nearly as heavy as some of the wild snails. The recorded losses in weight may have been due to losses in water as well as to errors in measurement.

Date	Maximum Diameter		Maximum Diameter		Thickness		Weight							
1932	m.	d.												
	8	9	7		6½		3							
	9	3	<i>a</i>	<i>b</i>	9	7	<i>a</i>	<i>b</i>						
	9	27	25	22	<i>a</i>	<i>b</i>	11	10						
	10	25	34	29	29	25½	17½	14						
	11	29	43½	31½	37	29	23	16						
	12	20	45	32	37	28	23	15						
							<i>a</i>	<i>b</i>						
1933	1	11	44	35	37	30	25	19	15000	7600				
	1	31	45	38	<i>x</i>	33	34	<i>x</i>	25	21	<i>x</i>	15500	9700	<i>x</i>
	2	25	45	43	50	37	35	47	22	22	21	16700	13700	22370
	3	24	45	43½	50	36½	35	45½	21	22	21½	16500	13250	22280
	6	3	45	43		38	36		23	22				
	8	2										15700	15400	

Dissection of a mature shell of this species shows that the anterior ten millimeters of the thick gonoduct, just before it divides externally into the short oviduct to pass to the exterior and the long deferent duct to pass to the penis sac, is marked by diagonal bands which are light in color and sharply outlined in the specimen preserved in Bouin's fluid. There are nearly a dozen of

these light bands that pass over the top and the sides of this terminal pouch, but there are none externally visible below, as that side is covered by the darker gland of the walls of the deferent duct. Internally oviduct and deferent duct are already separate. The deferent duct lies below and is covered above and on the sides by the white walls of the oviduct enveloping the top of the deferent duct with its thick glands. The diagonal bands are due to folds of the walls of the oviduct which are more than half a millimeter deep above and on the sides but much thinner below. Evidently the deep narrow clefts between the diagonal glandular folds account for the position of the ridges on the outside of the eggshell. The oviduct walls also have muscle fibers which doubtless play a part in forming the eggshell.

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## THE HABITATS OF IOWA SUCCINEAS

BY B. SHIMEK

The genus *Succinea* is often described as "amphibious." Of the species inhabiting Iowa this is strictly true only of *S. retusa*, though *S. concordialis* inhabits the muddy borders of lakes and streams (never, however, appearing in water), where it may be associated with *retusa*; while *S. avara*, though sometimes occurring with *S. retusa* on low, muddy flats, also extends well up into upland woods in contiguous territory, being our most adaptable species.

The remaining species, *ovalis* and *grosvenorii*, display certain peculiarities of habitat and distribution which are worthy of note.

*Succinea ovalis* Say is found in more or less scattered areas in all wooded parts of the state. In the eastern part the writer has almost invariably found it in low, alluvial woods, subject to overflow. During flood times the animals creep up on the trunks of trees and the stems of coarse plants which project above the water; but at other times during the open season they may be found creeping about on various plants, to which they may also remain attached during drier parts of the day or season after forming a thin, transparent epiphragm; or they may creep about on the moist ground or hide under logs. During the late fall or winter they hibernate under the fallen leaves of bottomland

trees, lying with the aperture uppermost, the latter covered with an opaque white epiphragm.

In 57 years of field experience in eastern Iowa, the writer has found but one exception to the rule that this species is found in low alluvial bottomlands. In April, 1901, a scattered colony was found at Iowa City on the rocky, wooded bluff below what is now the University President's house. They ranged from 25 to 75 feet above the river, thus being entirely above the highest flood level. After a prolonged search nearly 50 specimens were found, all living. They were all under sticks and leaves, and none had the winter epiphragm.

In the far western part of the state, however, this species is distinctly more xerophilous, being found most frequently in upland bur-oak groves, or in thickets bordering upon them, where it occurs scattered, or in small colonies. The writer has collected small sets in the border thickets on the high hills included in and adjoining Fairmount Park at Council Bluffs, and in upland, rather open, bur-oak groves in Mills, Harrison and Monona Counties, in all cases on loess ridges, and in some cases at heights fully 150 feet above the river-valley.

These western forms are usually somewhat smaller than the more typical eastern forms, with a somewhat longer spire and narrower aperture, but most of the bottomland specimens from eastern Iowa are of much the same type, though occasionally showing the larger form with broader aperture. The variation of the entire series is much the same as that which occurs in the loess fossils of this species in the same region, showing quite the same range in both form and distribution.

*Succinea grosvenorii* Lea is the most unique of our species of this genus, both in distribution and habitat. It has been found as far north as Ft. Simpson on the upper Mackenzie River, and it extends southward, east of the Rocky Mts., to Louisiana and Texas. Eastward, however, it seems to be limited to close proximity to the Missouri River, and to that of the Mississippi below the mouth of the former.

In all this range, unlike most of the other species of the genus, it is usually subject to xeric conditions, and this is true even of the lower Mississippi region, as will be shown.

In most of the published reports of this species no habitat is given,—a very common fault of local reports on molluscs,—and in several others the habitat, as given, is widely variant from that which the writer has observed along its eastern limit. Thus, Simpson (Conchologists' Exchange, vol. I, 1887, p. 65) reports it from the vicinity of Ogallala in western Nebraska, as abundant "in pools of alkali water near the South Platte River, in early spring." Walker (NAUTILUS, vol. 20, 1906, p. 81) states that it occurs in the Salt Basin at Lincoln, Nebraska, and at Hackberry Lake in Cherry County, of the same state. Hanna (*l.c.*, vol. 23, 1909, p. 96) says that in Douglas County, Nebraska, it was "found in colonies in wet places," while Over (*l.c.*, p. 92) notes it as common "on plains and prairies." More recently, Cheatum and Burt (Field and Laboratory, vol. II, no. 2, 1934, p. 50) report that in Dallas County, Texas, "it has been collected in swampy regions, as well as under thin blankets of humus in relatively dry areas." They refer it to localities (described in *l.c.*, vol. II, no. 1, 1933) which are mostly wooded and swampy.

With the exception of a small set collected in the Salt Basin at Lincoln, Nebraska, in 1889, the writer has never found the species living excepting on loess banks or bluffs along the Missouri River in Iowa (as far north as Sioux City), Nebraska and Missouri; on the west side of the Mississippi in Arkansas, and on the east side of the same stream in Kentucky, Tennessee, Mississippi and Louisiana.

The specimens were usually few and scattered, and this was true even in the two localities in which the species was obtained in greatest numbers, namely, at Hamburg, Iowa, and Natchez, Mississippi. In the former locality about 100 specimens were collected, most of them dead, while in the latter about 500 living specimens were secured after several days of incidental search.

Throughout this loess bluffs range the habits and habitat of this species were quite uniform. In drier weather the scattered individuals were found clinging to the bare faces of the loess bluffs, or on the equally bare upper parts of the talus at their base, and always on the more sheltered sides, either facing north, or protected by turns and crevices in the bluffs.

When thus found, they almost invariably cling with the aper-

ture (covered by a thin, transparent epiphragm) pressed against the face of the bluff. The epiphragm is quite readily dissolved on the return of moisture, but equally readily formed when necessary.

They creep about in moister weather, or during the early morning hours in drier periods, but close up promptly as soon as dry conditions return.

In the north a few specimens have been found late in the season, evidently tucked away for the winter, with thick, opaque, white epiphragms. These were found mostly in sheltered crevices.

The habitat of this species on loess bluffs has probably been overlooked by shell collectors because ordinarily no one would look for land snails in such barren, dry places. The writer's innumerable contacts with loess exposures throughout the Mississippi and Missouri valleys, however, brought them to light quite frequently.

It is evident that this species selects two quite different major habitats, namely, that noted above, and another on the plains which may be quite moist or wet, but more or less alkaline or saline. To the latter group belong those reported in the references quoted above (with the exception of the last), and also the sets which the writer has received from South Dakota, Kansas and Texas.

Both types, however, are distinctly xeric. The plains alkaline ponds and moist spots are very dry during much of the average summer, and even when wet, they are strongly xeric, as shown by the character of their scant vegetation. The loess bluffs are likewise subject to periodic xeric conditions, and this is true even in the southern mesic climate, for during drier seasons, and even during different hours of the day, they may be quite dry. It is evident, therefore, that this species is far removed in habit from the co-generic "amphibious" and mesophilous forms, and is a distinct xerophile.

As a loess fossil this species extends at least from Illinois to Nebraska, and formerly thus evidently reached far beyond its present eastern limits. It does not seem to be found in the far southern loess, though the range of the modern form extends at

least to its southern limit. The food and resting habits of this species are worthy of further study, and this should be undertaken by those who live in the region of its occurrence.

It is certain that both *S. grosvenorii* and the upland form of *S. ovalis*, are quite xerophilous, the former somewhat more so, and that both occur in closely contiguous places in the western part of the state, sometimes so close together that they appear to be mixed, just as they are in the loess. They, with other species with which they are associated, again suggest that the climate during the deposition of the loess of Iowa and vicinity was not moist and cold, but may have been quite as warm and dry as that of western Iowa is to-day.

The variation in habits and form of these species, quite as strikingly duplicated in some others, should also lead to caution in forming judgment concerning climatic conditions of past periods of time. Hasty conclusions based on individual species are always unwise; it is always safer to take entire faunas into account. If this were done we might have fewer "theories" and wildly fantastic explanations, but some of our scientific work would rest on a sounder foundation.

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## NEW SPECIES AND RACES OF LYMNÆIDAE FROM NEWFOUNDLAND

BY FRANK C. BAKER AND STANLEY T. BROOKS

In July, 1934, the junior author made a trip to the Island of Newfoundland for the purpose of collecting its molluscan fauna. This territory is, as far as the mollusks are concerned, almost a *terra incognita*, and it is not surprising that new forms should be found, since the region is completely isolated from the mainland and from adjacent islands. A complete report on the Mollusca collected will be published by the junior author.

### *Stagnicola palustris papyracea* nov. var.

Shell differing from *S. p. ungava* F. C. Baker in being more ovate with spire and aperture about equal in length, the whorls of the spire not as high as in those of *ungava*, the sutures less deeply indented; inner lip narrow, the columellar plait quite distinct and the umbilical chink small or absent; color light

horn, interior of aperture light or dark chocolate color; sculpture of finer lines than in *ungava*. All apices are decollate and but four whorls remain, but there are apparently six whorls in mature examples.

Length 18.6, diam. 10.5, apert. length 10.5, width 5.7 mm. Holotype  
 " 18.1 " 10.0 " 10.5 " 5.7 mm. Paratype  
 " 17.1 " 9.9 " 9.5 " 5.1 mm. Paratype

*Type locality*: Rocky pond near Whitbourne, Newfoundland.

*Types*: Carnegie Museum, Section of Recent Invertebrates, No. 62. 26761; *Paratypes*: Museum of Natural History, Univ. Ill., No. Z. 36336; Academy of Natural Sciences, Philadelphia, No. 164120.

This race of *palustris* at once suggests *S. p. ungava*, differing in its shorter spire, narrower inner lip and distinct columellar plait. It differs from *S. p. elodes* in its shorter less acute spire and obese body whorl. The shells are very thin which suggests the varietal name. The thinness of shell is probably due to lack of limestone rocks in the pond. The race is very constant in form and does not appear to vary to any extent toward typical *palustris* or its known varieties.

### *Stagnicola palustris perpalustris* nov. var.

Shell obese, with large ovate aperture and short, dome-shaped spire, the latter shorter than the aperture; sutures well impressed; outer lip thin with only a slight variceal thickening within the edge; inner lip rather broad, appressed tightly to the columella leaving only a slight umbilical chink; columellar plait heavy, parietal wall with distinct callus; color dark horn, interior of aperture dark chocolate colored; sculpture of heavy growth lines and impressed spiral lines; surface often malleated; only four whorls visible in mature shells, all spires decollated. Young shells indicate that there are probably six whorls in fully mature shells.

Length 19.1, diam. 11.3, apert. length 12.0, width 6.6 mm. Holotype  
 " 17.6 " 10.4 " 11.1 " 6.0 mm. Paratype  
 " 17.1 " 10.5 " 10.5 " 5.8 mm. Paratype

*Type locality*: Pools along Exploits River, Grand Falls, Newfoundland. *Types*: Carnegie Museum, Section of Recent Invertebrates, No. 62. 26762; *Paratypes*: Museum of Natural History, Univ. Ill., No. Z. 36337; Academy of Natural Sciences, Phila., No. 164119.

This race of *palustris* is at once recognized by its broad form, depressed spire and large aperture. It does not closely resemble any of the described forms of this protean species, approaching most closely to some short-spired forms of *S. p. nuttalliana* from the Rocky Mountain area.

### *Stagnicola newfoundlandensis* nov. sp.

Shell elongated with acute somewhat turreted spire as long as or longer than the aperture; spire whorls rounded with well impressed sutures; body whorl well rounded; aperture ovate, outer lip thin, inner lip flattened and reflected over the umbilical region leaving a small chink; the callus on the parietal wall is thin or absent; columellar plait absent or but slightly developed; color dark horn, aperture coffee colored within; sculpture of coarse growth lines and well developed spiral lines; there are six whorls.

Length	20.0	diam.	9.9	apert. length	10.0	width	5.3 mm.	Holotype
"	22.0	"	10.0	"	10.0	"	5.1 mm.	Paratype
"	18.8	"	9.2	"	9.0	"	4.7 mm.	Paratype
"	17.0	"	9.0	"	9.2	"	5.1 mm.	Paratype

*Type locality*: Camp 31, 8 miles from Lomond, Bonne Bay, Newfoundland. *Types*: Carnegie Museum, Section of Recent Invertebrates, No. 62. 26763; *Paratypes*: Museum of Natural History, Univ. Ill., No. Z. 36338; Academy of Natural Sciences, Philadelphia, No. 164118.

This lymnaeid resembles some of the elongate forms of the *Stagnicola emarginata* complex, especially *canadensis* and *ontariensis*. The color of the shell and aperture are different from *canadensis* and the inner lip is not turned back to form so flat a projection over the umbilical region. Compared with specimens of *ontariensis* from the St. Lawrence River below Quebec the shell is more elongated with longer, narrower, more acute spire, the inner lip is not flattened and the color is much darker. A few specimens of the new form resemble certain forms of *S. palustris elodes* but the typical forms have a different and heavier sculpture, a more rounded body whorl, a more acute spire, and the columellar lip is wider at the lower part and lacks the heavy, twisted plait of typical *elodes*.

There is great variation in height of spire and width of shell but the greatest number of specimens are uniform and it seems

best to recognize this form as a species distinct from either the *palustris* or *emarginata* complex.

**Fossaria obrussa brooksi** F. C. Baker

Shell differing from *Fossaria obrussa decampi* in having a longer, more acute and turreted spire, a shorter, more obese body whorl, a smaller, rounded aperture and a larger umbilicus; whorls shouldered; color light or dark horn, the aperture chocolate or coffee colored within; there are six whorls.

Length 11.5, diam. 6.0, apert. length 5.1, width 2.9 mm. Holotype  
 " 9.1 " 4.7 " 4.6 " 2.2 mm. Paratype  
 " 8.4 " 4.0 " 3.8 " 2.0 mm. Paratype

*Type locality*: Camp 31, 8 miles from Lomond, Bonne Bay, Newfoundland. *Types*: Carnegie Museum, Section of Recent Invertebrates, No. 62. 26764; Museum of Natural History, Univ. Ill., No. Z. 36339; Academy of Natural Sciences, Philadelphia, No. 164117.

This distinct little lymnaeid is related to *obrussa*, approaching most nearly to the race *decampi*. Its long scalariform spire, short, rounded body whorl, and small rounded aperture will at once distinguish it from *decampi*. It is named for Dr. Stanley T. Brooks who collected the Newfoundland material.

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**TWO NEW WEST AMERICAN SPECIES OF  
NUCULANIDAE**

BY IDA S. OLDROYD

**Leda austini**, n. sp. Fig. 2.

Shell of medium size, concentrically ridged, but the ridges are few and unevenly distributed; epidermis thin and in most of the specimens taken it was worn off leaving patches of chalky white. Posterior end attenuated, beaked; anterior end rounded and about  $\frac{1}{3}$  the length of the shell; umbones slightly elevated, rounded; ventral margin convex; dorsal margin concave. Length 12; height 5; diameter 3 mm.

Range: West Coast of Vancouver Island, Nootka Light. 2231-3-B; Porlier Pass 75 fms.; West of Gabriola Island 25 fms. Type in the Pacific Biological Station, Nanaimo, B. C. Type locality off Neck Point, in 100 fathoms. Specimens from type locality and from other stations in the Stanford Collection.

It is nearest to *Leda hamata* but differs in the shell not as ventricose. It is named for Mr. Austin Barker, my assistant of the summer of 1934.

Fig. 1.



Fig. 2.

*Yoldia gardneri*, n. sp. Fig. 1.

Shell thin; epidermis a brilliant olivaceous color; valves equal; lines of growth very faint or absent; base arcuate, anterior dorsal profile not rounded; beaks low, inconspicuous. It differs from *Yoldia ensifera* in the elongate form, and is much narrower; the blade-like processes are not prominent; posterior dorsal profile straight, while in *Yoldia ensifera* it is curved. Texture of the shell more delicate, and the shell more ventricose and elongate. Length 34; height 12; diameter about 8 mm.

Type in the Pacific Biological Station at Nanaimo, B. C. Type locality Gardner Bay, Pender Harbor, in 4 fms. Known only from type locality. Topotype in Stanford University collection.

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### THREE NEW MICRARIONTAS FROM THE CENTRAL COLORADO DESERT, CALIFORNIA

BY G. WILLETT

During the past winter the writer and his wife have made several trips to the chain of hills and mountains consisting of the Indio and Mecca hills and Orocopia, Chuckwalla and Chocolate mountains. These lie in the central Colorado Desert, east of Coachella Valley and Salton Sink.

The only land shell previously recorded from this region is *Micrarionta mille-palmarum* Berry, from Thousand Palms Canyon, Indio Hills. The three forms described below are of the same general group as the Thousand Palms species, the first of them, however, being much more closely related to it than the other two. They all, including *mille-palmarum*, have the arrangement of papillation on the nuclear whorls as in forms of *M. rowelli*, and may be races of that species, but complete intergradation with it is yet to be shown.

**Micrarionta brunnea**, new species.

Shell small and fragile, like *M. mille-palmarum*, but browner in coloration; light color above band on body whorl either absent or very inconspicuous. Measurements of type, in millimeters: Diam., 13.5; alt., 7.9; no. of whorls,  $4\frac{1}{3}$ .

Type No. 1042 Los Angeles Museum, and about fifty additional specimens, mostly dead, taken by G. and Ora A. Willett, near Chuckwalla Spring, Little Chuckwalla Mountains, Riverside County, California, February 21, 1935.

Specimens from Mecca Hills, near Shaver's Well, and from the northern Orocochia Mountains, are somewhat intermediate between *mille-palmarum* and *brunnea*, but nearer the latter.

**Micrarionta chuckwallana**, new species.

Easily distinguishable from *mille-palmarum* and *brunnea* by larger size, larger aperture, and heavier shell. Superficially very similar to *M. bakerensis* Pilsbry and Lowe, though there can hardly be very close genetic relationship between the two. From this form it differs somewhat in darker coloration, larger (higher) aperture and thinner lip. From *M. rixfordi*, of the Eagle Mountains, the closest known form on the north, *chuckwallana* is specifically distinct, as is shown in the different arrangement of the papillae on the nuclear whorls. Measurements of type in millimeters: Diam., 16.8; alt., 10.4; no. of whorls,  $4\frac{1}{2}$ .

Type No. 1040 Los Angeles Museum, taken by G. Willett about one mile south of Corn Springs, Chuckwalla Mountains, Riverside County, California, February 6, 1935. Twelve additional specimens secured at the same time and place, all dead, but several in a good state of preservation.

**Micrarionta chocolata**, new species.

Similar to *M. chuckwallana*, but differing in larger umbilicus, lighter coloration, and much narrower brown band on the body whorl. Measurements of type in millimeters: Diam., 16.7; alt., 10.3; no. of whorls,  $4\frac{1}{2}$ .

Type No. 1041 Los Angeles Museum, collected by Ora A. Willett, near Beal's Well, Chocolate Mountains, Imperial County,

California, February 19, 1935. Eight additional specimens taken at the same time and place. No living examples found.

LOS ANGELES MUSEUM, LOS ANGELES, CALIFORNIA

MARCH 2, 1935

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## NEW MOLLUSKS FROM THE PANAMIC PROVINCE

BY HENRY A. PILSBRY AND AXEL A. OLSSON

(Plate 1)

### Mytilidae

**Modiolus (Modiolus) nonuranus** n. sp. Plate 1, fig. 3.

Beach of Nonura Bay, near Punta Aguja, northern Peru (Olsson), type 164612 ANSP.; also at Punta Capullana between Talara and Lobitos attached to stones. Paratypes in Olsson collection.

A mussel having the general shape of *M. modiolus* (L.), covered with a black epidermis shading into olivaceous-brown at the beaks and a more dusky ray of the same extending to the ventral margin. Beaks quite tumid. Valves strongly convex from beaks to lower posterior outline, the ventral surfaces flattened, dorso-posterior surfaces moderately convex. Hinge line long, five-eighths as long as the shell. Surface with weak growth wrinkles, stronger on the ventral sides in the anterior half; posteriorly there is a faint appearance of radiating striae in the texture of the epidermis. Interior cream-white with a broad ray of vinaceous of varying intensity in the middle, a shorter stain of the same under the dorso-posterior angle.

Length 39.00 mm., greatest height 19.50 mm., diameter 16.50 mm.

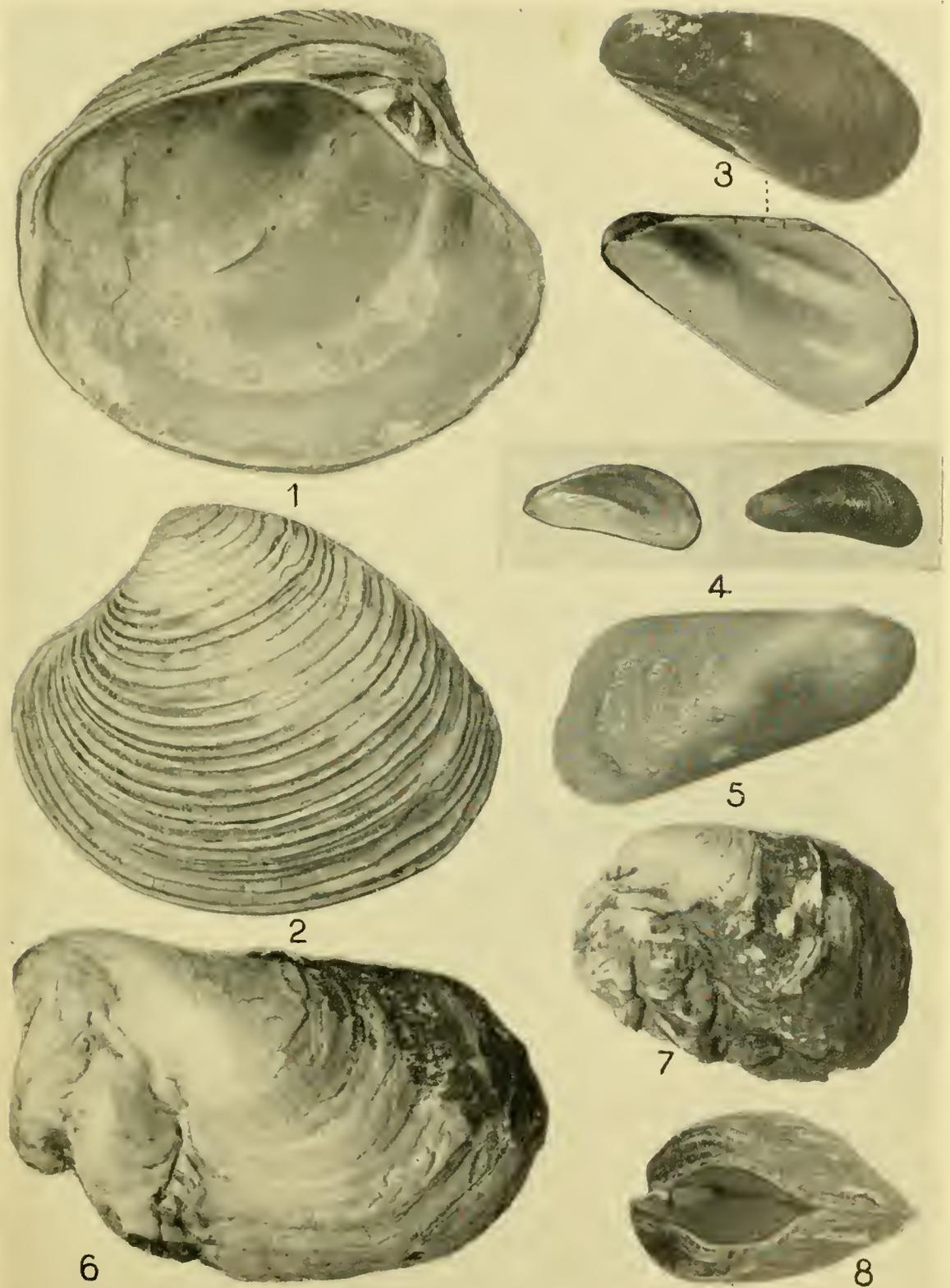
“ 37.50 mm., “ “ 23.00 mm. “ “ “

Though this mussel is abundant where found, we cannot find that it has been noticed hitherto. Rarely the interior is creamy white throughout except for a faint, vinaceous stain along the hinge. In the specimens from Punta Capullana, the whole interior is often clouded with vinaceous, generally darker than in the type lot, and the shells are smaller, up to 30 mm. long.

**Modiolus (Modiolus) tumbezensis** n. sp. Plate 1, fig. 5.

Beach at Puerto Pizarro, northern Peru (Olsson), type 164618 ANSP. Paratypes from tidal flats of Rio Tumbes, northern Peru. Also on beach specimen from Boca Pan.

Shell about 40–45 mm. in length, very thin, much compressed; beaks small, in a specimen 43 mm. long, the beak is about 6 mm.



1, 2. *Chione sechurana*. 3. *Modiolus nonuranus*. 4. *Modiolus playasensis*.  
5. *Modiolus tumbezensis*. 6-8. *Entodesma sechurana*.



from the anterior end; the dorsal margin is straight with a long, narrow, ligamental groove in the middle which does not extend under the beaks or to the posterior extremity; anterior end, obliquely rounded; the ventral margin is straight and if it be extended with the dorsal margin would meet together at an angle of about 18 degrees; posterior end somewhat expanded, its margin straight, rounding into the dorsal and ventral margins; valves but little convex to compressed, marked with regularly incised growth-lines on the ventral slope but with a smoothish growth-line only on the posterior-dorsal surface; color of shell brown or tan anterior of a line extending from the beaks along the anterior side of the umbonal slope, becoming greenish to olive-colored and minutely flecked with chocolate markings on the posterior side. Length 44.50 mm., height 21.50 mm., semidiameter 4.50 mm.  
 " 41.00 mm., " 18.50 mm., " 4.25 mm.

A small, thin species, inhabiting the tidal mud flats of the mouth of the Tumbes River. It is distinguished from the equally thin-shelled *M. speciosus* Dunker by its much smaller size and wider posterior portion.

**Modiolus (Brachydontes) playasensis** n. sp. Plate 1, fig. 4.

Playas, Santa Elena, Ecuador (Olsson), type 164617 ANSP.; paratypes in Olsson collection.

Shell about 20 mm. long, medium-elongate, of a brownish color, pale on the anterior portion and darker on the posterior; beaks nearly terminal and usually white; the ventral side, excavated or slightly contracted; a fairly pronounced, curved umbonal slope; posterior end rounded, evenly rounded above; dorsal margin arched to straight; sculpture extends over the whole surface as close-set riblets which are smallest on the anterior portion, coarsest on the umbonal slope; hinge structure variable, there being usually three or four small teeth, below and just in front of the beak, bordered on the posterior side by a small callused platform; the ligamental area is long and narrow, extending from the beak to the end of the dorsal margin; the posterior margin finely crenulated, most strongly so at its upper end; interior purplish.

Length 20.7 mm., width 9 mm., diameter 8.7 mm.

**Veneridae**

**Chione sechurana** n. sp. Plate 1, figs. 1, 2.

Pleistocene at Tric Trac Point near Bayovar, Bay of Sechura in northern Peru, (Olsson), type 164621 ANSP.; paratypes in Olsson collection.

Shell larger than most species of *Chione*, heavy, subcircular to subelliptical in form and ornamented with numerous, concentric, lamellar ribs; beaks small, situated near the anterior one-third, curved forward over the elliptical lunule; valves are moderately convex, the point of greatest inflation a little above the middle; the anterior side is a little produced and narrowly rounded at the end; the ventral margin is evenly rounded or slightly more so on the anterior half; lunule of median size, elliptical, flat, sculptured only with irregular lines of growth; escutcheon is elongate-elliptical, forming a deeply excavated area and smooth; hinge typical with three cardinal teeth in each valve, the middle tooth in each case being the largest; pallial sinus very small; interior of shell becoming irregularly thickened with age; ventral and lunular margins finely crenulated; sculpture consists of numerous, closely spaced, concentric lamellar ribs, separated by nearly equal intervals; the ventral face of each rib is rounded or pressed dorsally, forming a sharp, reflected edge which overhangs slightly the deep interspace on the dorsal side; no radial striae but on deep exfoliation of the surface layers, a minute radial structure is exposed within the substance of the shell; the concentric lamellar ribs extend with equal strength across the surface of the valve from the lunular edge to the margin of the escutcheon.

Length 66.50 mm., height 57.00 mm., semidiameter 19.00 mm.

“ 58.50 mm., “ 50.50 mm., diameter 35.50 mm.

“ 64.50 mm., “ 57.50 mm., “ 23.00 mm.

This species bears some resemblance to *Marcia kennerlyi* Reeve but is easily distinguished by its deep escutcheon and heavier, more convex valves. Unlike most species of *Lirophora*, the concentric ribs on our shell are not noticeably foliaceous on the posterior-dorsal area. The species occurs as a Pleistocene fossil in the Tablazo beds at Tric Trac Point near Bayovar, Bay of Sechura, along with abundant specimens of *Arca grandis* Broderip and Sowerby.

#### Lyonsiidae

*Entodesma (Agriodesma) sechurana* n. sp. Plate 1, figs. 6, 7, 8.

Bayovar, Bay of Sechura, northern Peru (Olsson). Type 164624 ANSP.; paratypes in Olsson collection. Also Bucaru, Panamá.

Shell rather large, irregular in form, pearly within and with a dark-colored periostracum; beaks small and terminal. The anterior end is sometimes slightly produced or convex but more

generally flattened or truncated; a deep, lunular excavation under the beaks in young, undeformed specimens; the posterior side broadly expanded; the ventral and dorsal margins subparallel; the anterior-ventral portion of the shell is broadly gaping, with a wide, elliptical orifice ventrally; the shell about the ventral gap becomes much deformed with growth, there being usually a wide furrow extending upwards across the valve to the beak and a second smaller furrow near the anterior end, the convex surface between the furrows very strongly wrinkled; interior pearly, with well-marked adductor scars.

Length 68 mm., height 41 mm., semidiameter 18 mm.  
 " 20 " " 8 " diameter 21 "

This species reaches about the size of the northern *E. saxicola* Bd. It differs obviously from *E. chilense* Phil. and *E. cuneata* Gray. It is probably a member of the cooler Peruvian fauna, but two small specimens were collected on the beach at Bucaru in southern Panamá.

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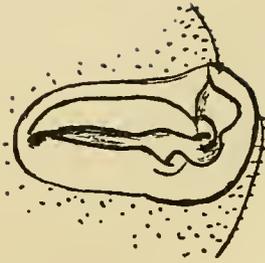
## A NEW SPECIES OF POLYGYRA FROM ARKANSAS

BY A. F. ARCHER

A new species of *Polygyra* was turned up in the Truman H. Aldrich collection in the Alabama Museum of Natural History, Tuscaloosa, Alabama, during an examination of material in preparation for work on a monograph of the Section *Stenotrema*. The specimens were collected by the Reverend H. E. Wheeler some years ago in Montgomery County, Arkansas. The species in question, a member of *Stenotrema*, is most closely related to those species inhabiting western Arkansas. The specific name is suggested by the type locality, and also is intended to commemorate the Caddo Indians.

### *Polygyra (Stenotrema) caddoensis* sp. nov.

*Description:* Shell imperforate, subglobose, rather thin. Color of shell very dull yellow; aperture ivory yellow. Whorls  $5\frac{1}{4}$ , very moderately increasing; nuclear whorl flattened; succeeding whorls moderately convex; body whorl convex with periphery set fairly high up towards the suture; base broad and rather flat. Aperture transverse. Edge of outer peristome raised and rounded. Basal peristome very moderately broad; its edge



raised and prominent in distal half, but proximal half more subdued. Anal sinus moderately rounded. Subanal denticle (outer tooth) strongly angular. Interdenticular sinus broadly rounded. Outer denticle (on outside of lip-notch) well developed. Basal notch (lip-notch) slightly twisted; rim bordering it raised. Inner denticle simple, of usual type.

Parietal lamella (tooth) not very prominent; its distal end very sinuous, and terminating in from downward-curving hook. Weakly developed butress connecting parietal lamella with outer peristome. Parietal callus strongly thickened. Nuclear whorl minutely pustulose. Succeeding whorls covered with a soft mat of short hairs.

Diam. 7.4 mm., height 4.9 mm.      Diam. 7.8 mm., height 5.1 mm.

Holotype.

Paratype.

Diam. 7.7 mm., height 5.0 mm.      Diam. 7.2 mm., height 4.9 mm.

Paratype.

Paratype.

Diam. 7.8 mm., height 4.9 mm.      Diam. 7.8 mm., height 4.8 mm.

Paratype.

Paratype.

Height-diameter index 64.7.

*Holotype*: 1. Alabama Museum of Natural History. Caddo Gap, Montgomery County, Arkansas. H. E. Wheeler, collector, July, 1913. Paratypes, No. 2, Alabama Museum of Natural History.

*Remarks*: This species is closest to *Polygyra uncifera* Pilsbry from Polk County, Arkansas. It may be readily distinguished from it in the following ways: the distal end of the parietal lamella is in the form of a sinuous downward-curving hook instead of being an upward-curving ridgelike hook as in *P. uncifera*; throughout its middle portion the parietal lamella gently curves instead of being strongly twisted as in the case of the latter species; the inner denticle is simple and not separated from the ridge around the basal notch by a depression; finally, the ridge around the basal notch is moderately raised, not sharply prominent as in *P. uncifera*.

I wish to acknowledge my indebtedness to Dr. Walter B. Jones and to Miss Winnie McGlamery for the use of the collection on which this paper is based.

## JAMAICAN LAND SNAILS, 5

BY H. BURRINGTON BAKER

(Plate 2)

The first paper of this series appeared in the last July number; the symbols used are explained on pages 7 to 9. The following key to the Jamaican groups of *Varicella* defines new subgenera; many species have been dissected, incl. *V. acuticostata* (Orb.) sent by Miguel L. Jaume.

**Anoma splendens medinae** new subspecies.

Basal keel longer and more continuous; columella usually strongly truncate. Alt. of type (fig. 1) 21.9 mm., maj. diam. 7.9 mm., min. diam. 6.8 mm. with  $8\frac{1}{4}$  whorls remaining.

Type locality (ANSP. 163925): NMM. This race somewhat approaches *A. alboanfractus* (Ch.), but is larger and more elongate.

**A. nigrescens levior** new subspecies.

Shell with spire smooth and polished; growth-threads not prominent until last  $\frac{1}{4}$  whorl, where (as in *quadricolor*) they are more widely spaced than in *nigrescens*. Typically greenish-white with white lip but also in *quadricolor* and *nigrescens* (fig. 4) patterns. Alt. of type (fig. 3) 19.3 mm., maj. diam. 8.0 mm., min. diam. 6.9 mm. with  $7\frac{1}{4}$  whorls remaining.

Type locality (ANSP. 163926): EJ3. This subspecies approaches *A. sinuata* (C.B.A.) in sculpture but has a much less sinuate peristome.

**Urocoptis ambigua medinae** new subspecies.

Shell as large as biggest *magna*, bright roseate; basal keel usually much stronger and sometimes appr. prominence in *U. cylindrus*. Alt. of type 34.2 mm., maj. diam. 11.9 mm., min. diam. 10.7 mm., alt. apert. 7.8 mm., diam. apert. 8.8 mm. with  $8\frac{1}{4}$  whorls remaining.

Type locality (ANSP. 163927): MMM. This might be regarded as a giant variety of *U. cylindrus* but occurs in the range of *U. ambigua* and certainly intergrades with var. *magna*.

*Key to Jamaican Subgenera and Sections of Varicella.*

A(B) atrial opening about halfway between visceral stalk and right ommatophore; retractor of last free from genitalia; anat-

omy otherwise similar to *Varicellaria*; richly colored shells with strongly sinuous palatal lip; type *V. leucozonias* Gmelin)

sg. *Varicella* Pfr.

B(A) atrial opening near base of right ommatophore; retractor of last in penioviducal angle; vagina and atrium short (long in *Melaniella*). (G) animal with dark bands radiating from visceral stalk; penial flagellum well developed; shell columella more or less truncate. (F) sg. *Varicellaria*; radular centrals unicuspid (tricuspid in *Melaniella*) but laterals bicuspid; shell varices usually conspicuous. (E) shell sculpture already distinct on 2nd embryonic whorl. (C) shell slender, with widely-spaced ribs (like *Melaniella* but columella more truncate); type *V. mandevillensis* Pils.

st. *Costavarix* new.

C(B) shell with closer, subequal growth-striae or riblets. (D) columella straightened and weakly truncate; type *V. blandiana* (C.B.A.)

st. *Varicellula* Pils.

D(C) shell usually stouter with strongly twisted, truncate columella; type *V. procera* = *V. necrodes* H.B.B.

st. *Varicellaria* Pils.

E(B) sculpture absent or vague on 2nd whorl (*Varicella* s.s., groups II, III, IV of Man. Conch.); type *V. similaris* Pils.

st. *Euvaricella* new.

F(B) radular teeth unicuspid; varices not distinctly colored; type *V. curvilabris* (Pfr.)

sg. *Varicellina* Pils.

G(B) animal usually whitish; penial flagellum vestigial; radular teeth unicuspid; shell columella spirally ascending, not truncate; varices often vague; type *V. laeviusculus* (C.B.A.)

sg. *Sigmataxis* Pils.

*Varicella* (*Varicellula*) *blandiana* subaequa new subspecies.

Ribs not puckered at suture. Alt. (of type) 12.15 mm., diam. 28 (3.36 mm.), alt. apert. 30 (3.66 mm.), diam. apert. 42 (1.54 mm.);  $8\frac{1}{4}$  whorls.

Type locality (ANSP. 163988): MM3b. This form has been confused with *V. proxima* (C.B.A.) from eastern Jamaica, but has heavier, more closely spaced, growth threads, like in typical *V. blandiana*.

*V. (Varicellaria) subdola* new species. Figs. 5 and 6.

Shell-form similar to that of *V. philippiana* but smaller and much smoother; corneous with numerous reddish chestnut varices (5 on last whorl). Embryonic whorls  $2\frac{3}{4}$  ( $3\frac{1}{4}$  sutural count); first  $\frac{3}{4}$  to one almost smooth, later with regular, impressed, growth lines (38 on last); neanic whorls similarly sculptured; 72 lines on last whorl (4 weakly convex interspaces per

mm.). Aperture elongate; peristome weakly arcuate, with palatal wall slightly concave. Alt. of type (fig. 5) 16.42 mm., diam. 42 (6.83 mm.), alt. last wh. 71 (11.62 mm.), alt. apert. 51 (8.38 mm.), diam. apert. 38 (3.16 mm.); 7 whorls.

Type locality (ANSP. 163989): WWF. On the basis of sculpture, *V. subdola* falls into the group of *V. jamaicensis* (Pfr.), but has a much shorter spire and a more twisted and truncate columella.

**V. (Euvaricella) castanea** new species. Fig. 7.

Shell elongate; chestnut corneous with bright reddish varices (3 on last wh.), followed by lighter bands. Embryonic whorls  $2\frac{3}{4}$ ; first  $1\frac{1}{4}$  almost smooth; next  $\frac{1}{2}$  whorl with impressed, growth lines appearing but often incomplete below; last with 30 quite distinct lines. Later whorls with interspaces between impressed, growth lines weakly convex; last with 58 much flattened, growth threads ( $4\frac{1}{2}$  per mm.) separated by evenly rounded sulci. Aperture elongate, with long axis about  $20^\circ$  to that of shell; peristome almost vertical but weakly arcuate; columella lightly concave, obliquely truncate. Alt. of type (f. 7) 15.37 mm., diam. 30 (4.57 mm.), alt. last wh. 58 (8.94 mm.), alt. apert. 36 (5.54 mm.), diam. apert. 44 (2.42 mm.);  $7\frac{1}{2}$  whorls.

Type locality (ANSP. 163990): EEJ. *V. castanea* has similar apical sculpture to, but stronger than *V. nemorensis* and *V. phillipsii*, both of which have some traces of growth-lines on the second embryonic whorl; it is more slender than either and lacks a palatal point or tooth. *V. costulosa* (C.B.A.) has a broader aperture with shorter columella and apparently lacks color-varices.

**V. (E.) arcuata paradisi** new subspecies. Fig. 10.

Shell paedogenetoid. Embryonic whorls  $2\frac{3}{4}$ , of which last has weak growth lines. Later whorls with irregularly spaced, major growth-furrows (weakest on last and obsolescent towards base) and almost flat, vaguely striate interspaces; color-varices more numerous (6 on last whorl). Alt. of type (f. 10) 7.66 mm., diam. 31 (2.40 mm.), alt. last wh. 57 (4.39 mm.), alt. apert. 34 (2.61 mm.), diam. apert. 48 (1.25 mm.); 7 whorls. Type locality (ANSP. 163991): VCMd.

**V. (Varicellina) vicina portlandensis** new subspecies. Figs. 8 and 9.

Shell larger with more whorls; bright corneous, slightly darker before and lighter after varices (3 on last wh.). Embryonic

whorls  $2\frac{3}{4}$ ;  $1\frac{3}{4}$  smoothish, last with 13 light growth furrows. Later whorls more closely striate; last with 46 major furrows and weakly striate, flat interspaces (3 to mm.). Palatal peristome arcuate, concave and thickened internally to form a low nodule; columella short, markedly sigmoid and strongly truncate. Alt. of type (fig. 8) 15.12 mm., diam. 35 (5.22 mm.), alt. last whorl 65 (9.84 mm.), alt. apert. 45 (6.86 mm.), diam. apert. 37 (2.54 mm.);  $7\frac{3}{4}$  whorls.

Type locality (ANSP. 163992): EJ3a. This quite constant subspecies is figured in *Man. Conch.*, vol. 19, pl. 9, fig. 39; the characters of its peristome distinguish it from *V. vicina* and it also has a less triangular aperture and wider plaits than *V. curvilabris* (Pfr.), which probably is west Jamaican (Gosse).

**Pleurodonte (Dentellaria) cara catadupae** new subspecies.

Figs. 11 to 13.

*Helix cara media* C.B.A. (1851, *Cont. Conch.* 9: 169) not *H. media* Gm. (1790, *Syst. Nat.*: 3640). Shell rimate to imperforate; spire more elevated; both sides of carina light-colored with very dark band above and below; slightly lighter towards suture and shading into much lighter on base. Outer two teeth large, united at base; innermost obsolescent. Lip brownish. Alt. of type (fig. 12) 14.1 mm., maj. diam. 220 (31.0 mm.), min. diam. 191 (26.9 mm.) with  $4\frac{3}{4}$  whorls; extremes of 4 shells: 13.0–14.8, 209–232 (30.2–32.0), 184–196 (25.4–27.9) with  $4\frac{1}{2}$  to  $4\frac{3}{4}$ . Type locality (ANSP. 163923): VW2, arboreal.

**Zaphysema olivaceum** new species. Figs. 14 to 16.

Animal with dark olive mantle-edge (orange to reddish in *Z. tunicatum*). Shell nearest *Z. tunicatum*, which also does not develop deciduous hairs on last whorl, but usually darker olive brown; growth wrinkles and microscopic criss-cross striae coarser; columella more sinuous, heavier and with more evenly rounded edge. Edge of peristome usually broken; abnormally thickened in type. Alt. of type (fig. 15) 22.2 mm., maj. diam. 121 (26.9 mm.), min. diam. 100 (22.2 mm.), alt. apert. 69 (15.2 mm.), diam. apert. 97 (14.7 mm.), with  $5\frac{1}{4}$  whorls; extremes of seven shells of same whorl-size: 22.0–23.5, 104–121 (24.5–26.9), 87–100 (20.4–22.4).

Type locality (ANSP. 163917): EEJa. This may be the true *Z. tenerrimum* (C.B.A.), but the unique type of that species looks more like *Z. tunicatum*, although it is an abnormally depressed shell with coarse, impressed spirals (probably due to injury).

*Guppya gundlachi* (Pfr.) + *Helix simulans* C.B.A. (type not seen), ground [EJF, KF, KHW, MM3, MN2,3, NM2; sexually mature when quite small; more angulate than usual (f. *orosiana* Mart.) when typical size (depressed) but attaining (MM3)  $2.53 \times 132$  (3.33 mm.), apert.  $42$  (1.07)  $\times 155$  (1.66 mm.), with  $5\frac{1}{4}$  whorls].

*Zonitoides arboreus* (Say), ground [MM3b, MN3c; small and depressed].

*Miradiscops opal* (Pils.), ground [MM3b; anatomy as in Mexican examples but shells with slightly larger umbilicus than types; *Helix apex* C.B.A. also looks like a *Miradiscops*].

*Opeas pumilum* (Pfr.), ground [EJF, EJ3, MM3].

*Lamellaxis* (*Leptopeas*) *micra* (Orb.), ground [EJ3, ENF, KC2, KF, KH, ML2, MM1-2, MN3, NM2, VC, VW2, WV, WSF, WW]. *L. striosus* (C.B.A.), ground [KF, KHS, ML2, MM1,3,4, MN2-3, NM2, VCM, WWF]. *L. robertsi* (Pils.) [KF, KHW; dead]. *L. (s.s.) monodon* (C.B.A.), ground [MN3]. *L. pallidus* (C.B.A.) [VCMd-dead]. *L. (Allopeas) gracilis* (Hutton), ground [MM3].

*Leptinaria lamellata* (Pot. & Mich.), ground [VW2-dead, WV, WWF].

*Subulina octona* (Brug.), ground near cultivation [EJ3, EJG, KC2, KF, KH, ML2, MM1,3, NM1-2, VCM, VW1, VWS, WC, WSF, WV, WWF].

*Spiraxis terebella* (C.B.A.), ground and on logs [KF, MN2-3, VW2, VWS]. *S. inusitatus* (C.B.A.), ground [MN3c]. *S. anomalus* (C.B.A.), ground, incl. typical [VW2] and race *hollandi* (Hend.) [VWS]. *S. mirabilis* (C.B.A.), ground [MN3c]. *S. problematicus* (Pils.), ground [MN3c]. All these species belong to different subdivisions of the genus, as will be discussed in a future paper.

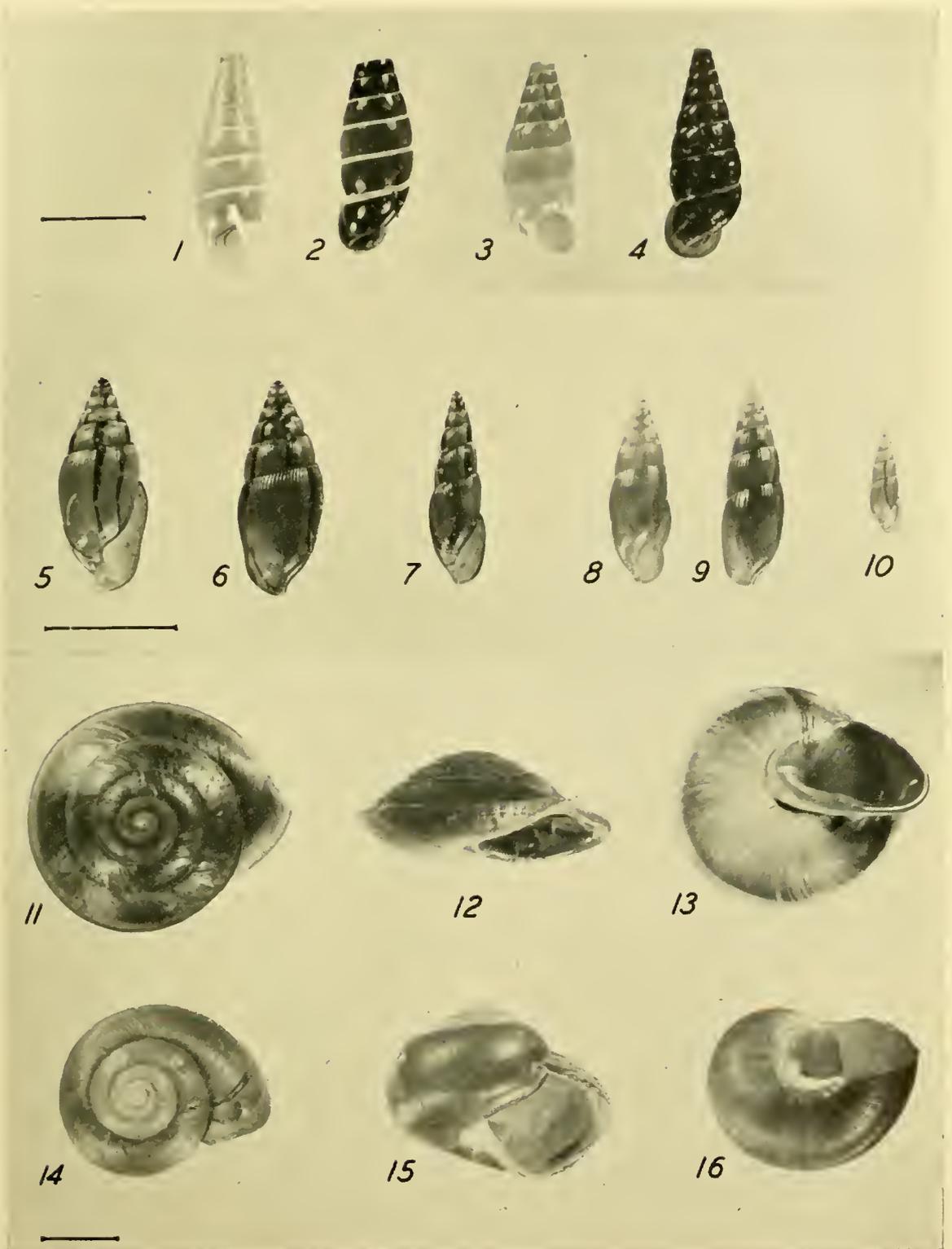
*Varicella* (*Costavarix*) *adamsiana* (Ch.), fair climber, at least occasionally [EJ3, EJF-fresh, ENF]. *V. costulata* (C.B.A.), ground [KHS]; subsp. *pallidula* Pils. [ML1-dead, ML2-fresh]. *V. gracilior* (C.B.A.) (= *gossei* Pfr.?), ground, incl. typical [VW2; like Man. Conch., pl. 12, f. 9, but larger], race with ribs obsolete on last whorls [VWS; like l.c., f. 8] and much stouter subsp. (divergence almost  $20^\circ$ ) [MN3a, NMM; 2 bleached shells]. *V. mandevillensis* Pils. (= *osculans* C.B.A.?), weak

climber [MN2,3, MN]. Living animals of all the smaller species of *Varicella* are apt to be clustered around egg-masses of *Pleurodonte* and other snails.

*V. (Varicellula) propinqua* (C.B.A.), ground, incl. typical [MM4, WC2] and paedogenetoid form [VCMb]. *V. puella* (C.B.A.), ground [WC2]. *V. proxima* (C.B.A.), ground [ENF.]. *V. blandiana* (C.B.A.), ground and on rocks (eating *Microceramus*), incl. typical [MM3, MN2-3] and f. *subaequa* H.B.B. [MM3]. *V. tenera* (?) *roperi* Pils. [ENF-dead, KF]. *V. rapax* Pils. & Br., ground [MN2, VWS].

*V. (Varicellaria) necrodes* H.B.B., weak rock-climber [MM4, MN2-3, NMM, NM2, NMV, fresh; NM2c found eating *Eutrochatella pulchella cavearum*]. *V. griffithii ischna* Pils. [KHWA-fresh]. *V. ligata* (C.B.A.), ground and rock-bases, incl. typical [NMV-fresh] and Mandeville race [MM3, MN3-fresh]. *V. philippiana* (Pfr.), mainly rock-bases, incl. typical [ML1, NMM-fresh, NMV-fresh, VW2] and race *elegans* (C.B.A.) [MM2-dead, 3, MN]. *V. subdola* H.B.B. [WWF-fresh].

*V. (Euvaricella) venusta* (Pfr.), ground, incl. typical [NMM-fresh, NM2a-dead, NMV-fresh] and smaller, thinner race with more widely spaced, weaker striae [ML1-dead, MM3, 4-fresh, MN1-fresh, 3]. *V. phillipsii* (C.B.A.), ground [EBL, EEJ, EJ2-3, EJF]. *V. nemorensis* (C.B.A.), ground [KC1-fresh, KF, KHS]. *V. castanea* H.B.B., ground [EEJ]. *V. biplacatula* Pils., ground [VW1-2]; subsp. *dissimilis* Pils. [KFKHW, ML-fresh, MM1-dead, 4-fresh, MN3, NMM, NM1-dead, NMV-fresh] and paedogenetoid stocks [WC, WWF]. *V. arcuata paradisi* H.B.B., ground [VCMd]. *V. similaris* Pils., ground and rock-bases, incl. typical [NM3, MN1, 3] and f. *sloaneana* Pils. [MM3]. *V. levis* (C.B.A.), ground [EJF]. *V. pellucens* (C.B.A.) [KHWA-fresh; amber color, with very light but distinct chestnut varices]. *V. clappi* Pils., ground [NM2a; slightly larger, one with more widely spaced striae on last whorl (appr. *pellucens* and all with similar coloration)]. *V. cochlidium* Pils., ground, large race [MN2-fresh, 3, NMM-fresh; as large as typical *clappi*; light horn colored with distinct, light chestnut varices]. *V. spina* Pils., ground [VWS; very light horn color without marked color-varices].



1, 2. *Anoma splendens medinae*. 3, 4. *A. nigrescens levior*. 5, 6. *Varicella subdola*. 7. *V. castanea*. 8, 9. *V. vicina portlandensis*. 10. *V. arcuata paradisi*. 11-13. *Pleurodonte cara catadupae*. 14-16. *Zaphysea olivaceum*.

PLATE 2. Scales represent 1 cm.; uppermost one for figs. 1-4, second for figs. 5-10 and lowest for figs. 11-16. Photographed by Alfred Zimmerman.



*V. (s.s.) leucozonias* (Gm.), *f. striatella* Pils., ground [EBL-dead, EEJ, EJ3, EJF-dead; caught eating young *Pleurodonte ingens* and *P. lucerna acuta*].

*V. (Varicellina) vicina* (C.B.A.), but larger and stouter [VW2-fresh]; subsp. *portlandensis* H.B.B., rock-bases [EEJ, EJ].

*V. (Sigmataxis) procera* (C.B.A.), ground in brush [EEJ-fresh, KF, KH, ML2-fresh, MM3, MN2-dead; very light but rarely with indistinct varices]. *V. paupercula* (C.B.A.), ground in brush and open, incl. typical [VC; light horn color, usually with bright chestnut varices], intermediate size [KH, WWF-fresh; varices bright] and race *tumens* H.B.B. [MM4, MN, NMM, NM2a; lighter, varices obsolescent]. *V. laeviusculus* (C.B.A.), ground in brush [VCM, WV-dead, KHWA-fresh; very light colored with light chestnut varices]. *V. cylindrica* H.B.B., ground [EEJ-living; EJ1,3, EJF-fresh]. *V. micans* (C.B.A.), ground, epidermis quite thick, rich horn colored, incl. large [VW2; some lack varices and have close striae full length (typical); others attain 12 mm. long with  $7\frac{3}{4}$  wh., develop more widely spaced striae on last whorl and have chestnut varices] and small races [VWS; 8.7 mm. long with  $6\frac{1}{4}$  wh. and bright varices]. *V. perstriata* Pils. [MN2-fresh; slightly smaller; bright amber color with vague varices]. *V. subaquila* H.B.B. [VWS-fresh].

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## NOTES ON THE PECTINIDAE OF HAWAII

BY LEO GEORGE HERTLEIN

Specimens of three species of *Pecten* from the Hawaiian Islands were recently presented to the California Academy of Sciences by Mr. Theodore T. Dranga. The species represented are *Pecten noduliferus* Sowerby, *Pecten cuneatus* Reeve, and *Pecten loxoides* Sowerby. These species appear not to have been reported heretofore from the Hawaiian Islands, and it therefore seems desirable to record such occurrences.

The specimens of *P. noduliferus* were collected at Paumalu, on the Island of Oahu. The valves are in most instances ornamented by about nine striated ribs, which are only faintly nodu-

lous on the right valve, but are decidedly nodulous on the left valve. The shells are commonly red or yellowish red in color. The altitude averages about 23 mm. They agree in most particulars with the figures given by Sowerby,<sup>1</sup> and with specimens of *P. noduliferus* from Mauritius in the conchological collection at Leland Stanford Jr. University. One specimen of this species in that collection attains an altitude of 33 mm.

The species belongs to the section *Lyropecten* in a broad sense, or to *Nodipecten*, if that be considered a distinct section. *P. noduliferus* has also been recorded from Mauritius, Réunion Island, Seychelles, Madagascar, Zanzibar, Amirantes, and the Maldiva and Laccadive archipelagos.

The specimens of *Pecten cuneatus* were collected at Kaneohe Bay, Oahu, at a depth of five to fifteen feet, in Porites coral. The valves are covered by many fine ribs, between which occur finer riblets. The shells agree with Reeve's<sup>2</sup> figures and description, and are similar to a specimen of *P. cuneatus* from the Moluccas in the collection at Stanford University, which has an altitude of about 38.5 mm. Those from Hawaii average about 33 mm. in altitude. The color of the exterior of the Hawaiian shells is orange and brownish purple, and the interior is a purplish red. Specimens from coral dredged in Honolulu harbor,<sup>3</sup> and stated by Mr. Dranga to be possibly subfossil, are much larger. The largest of those in the collection of the California Academy of Sciences measures 51 mm. in altitude. The ribs are relatively somewhat coarser, otherwise the shells are the same as those from Kaneohe Bay. *P. cuneatus* has also been recorded from the Moluccas, Torres Straits, Queensland, and Muscat on the Gulf of Oman.

This species in Hawaii appears to have been regarded by some workers as *P. albolineatus* Sowerby, but that is quite a different

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<sup>1</sup> *Pecten noduliferus* Sowerby, Thes. Conch., Vol. 1, 1847, p. 64, pl. 13, figs. 38, 39, pl. 14, fig. 94: "Mr. Morris's collection."—Kobelt, Syst. Conch.-Cab., Bd. 7, Abt. 2, Lief. 354, 1887, *Spondylus* und *Pecten*, p. 210, pl. 56, figs. 5, 6, 7, 8: "Mauritius und Zanzibar."

<sup>2</sup> *Pecten cuneatus* Reeve, Conch. Icon., Vol. 8, 1853, *Pecten*, sp. 94, pl. 24, figs. 94a and 95a: "Moluccas." [*Pecten sibyllæ* described by Sowerby (Proc. Zool. Soc. London, 1882, p. 120, pl. 5, fig. 12), without locality, bears a resemblance to *P. cuneatus*.]

<sup>3</sup> For a list of species dredged at Kewalo Harbor, Honolulu, see C. F. Mant, Nautilus, Vol. 36, No. 4, 1923, pp. 120-123.

species. Ostergaard<sup>4</sup> has recorded *P. albolineatus* from the Pleistocene of Oahu. No specimens of that species were included in the present collection.

The specimens of *Pecten loxoides* Sowerby from Waimea Beach, Oahu, are about 19 mm. in altitude. They correspond so exactly to Sowerby's<sup>5</sup> original description and figure that there seems little doubt as to the identity of the Hawaiian shells. The form is very oblique and the ears are small. The valves are ornamented by about 20 prominent, subrounded, smooth ribs. The right valve is white, the left is ornamented by brownish spots, roughly arranged in V-shaped patterns on the white background. Specimens of this species from Laysan Island, a northern unit of the Hawaiian group, are also present in the collections of the California Academy of Sciences. The largest specimen from that locality measures approximately 24.5 mm. in altitude.

Reeve has described *Pecten russatus*<sup>6</sup> from Hawaii, but no specimens referable to that species have been noticed in any of the collections examined by the author. Prof. Junius Henderson<sup>7</sup> pointed out that the specimens from Hawaii, referred by Bryan<sup>8</sup> to *Hinnites giganteus* Gray, should be placed in the genus *Spondylus*. Probably they can be referred to *Spondylus zonalis* Reeve. A specimen of this species was among those presented to the California Academy of Sciences by Mr. Dranga. An interesting occurrence is that of *Pecten radula* Linnaeus which was collected by Mr. Dranga at Tutuila, Samoa.

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<sup>4</sup> *Pecten (Chlamys) albolineatus* Sowerby, Ostergaard, Bernice P. Bishop Mus., Bull. 51, 1928, p. 8, Oahu, Hawaiian Islands: Pleistocene.

<sup>5</sup> *Pecten loxoides* Sowerby, Proc. Zool. Soc. London, 1882, p. 120, pl. 5, fig. 13: "Hab. Australia": Recent.—Kobelt, Syst. Conchyl.-Cab., Bd. 7, Abt. 2, Lief. 358, 1888, p. 266, pl. 70, figs. 3 and 4 (as *Pecten loxeoides*): Australia: Recent.—Dautzenberg & Bavay (Siboga Exped. Mon 53<sup>b</sup>, 1912, p. 150 [24]), placed *P. loxoides* in the synonymy of *P. inaequalvis* Sowerby. [*P. loxoides*, however, appears to possess diagnostic features which warrant its retention as a separate species.]

<sup>6</sup> *Pecten russatus* Reeve, Conch. Icon., Vol. 8, 1853, *Pecten*, sp. 126, pl. 29, fig. 126: "Hab. Sandwich Islands."—Kobelt, Syst. Conchyl.-Cab., Bd. 7, Abt. 2, Lief. 349, 1887, p. 167, pl. 46, fig. 6. Reeve's record cited.

<sup>7</sup> NAUTILUS, Vol. 40, No. 3, 1927, p. 81.

<sup>8</sup> Bryan, W. A., Nat. Hist. Hawaii, 1915, pp. 445, 457, pl. 104, fig. 13. Hawaii: Recent.

## PHYSA AMPULLACEA 'GOULD' BINNEY

BY W. J. CLENCH

The mid-western forms of this species have long been known under the name of *P. ampullacea* 'Gould' Binney. A study made of a large series of material from many sections of the north central and northwestern states indicate that two entirely separate species are involved. This confusion was brought about by the figures published by Binney (1865, p. 79). Two species were obviously used to figure, though the formal description refers to only one species. I propose the following to cover the unnamed species in the north central area of the United States and the south central area of Canada.

*Physa gouldi*, new species. Vol. 48, pl. 7, fig. 5.

*Description*.—Shell sinistral, medium to large, elliptical to ovate, imperforate, rather thin. Color ranging from light straw-yellow to reddish-brown. Whorls 5, rounded, sometimes slightly inflated. Nuclear whorl reddish-brown. Spire usually obtuse, not produced and continuing the line of the body whorl. Aperture large and ovate, flaring at the base. Palatal lip thin, usually marginate internally. Parietal lip very thin and only as a glaze on the body whorl. Columella slightly twisted, inclined to the left and generally terminating abruptly at the central portion of the body whorl. Suture only slightly impressed, producing a very small indentation in the otherwise smooth contour of the spire. Sculpture composed of fine cross striae, occasional specimens with growth lines in the form of slight ridges. Varicose bands of dark brown and visible both externally and internally. Surface of body whorl noticeably malleated in some specimens.

Length	15.5,	width	8.5,	aperture	12.0 × 5.0 mm.	Holotype
"	19.5	"	11.7	"	15.5 × 8.0 mm.	Paratype
"	15.7	"	9.0	"	12.0 × 5.5 mm.	Paratype

*Holotype*: M. C. Z. 103282, Mouse River, 6 mi. N. of Towner, McHenry Co., North Dakota, collected by Neal Weber, 1934.

*Paratypes*: M. C. Z., A. N. S. P.; and Univ. of Mich. from the same locality.

*Remarks*: This form was first described by Gould as *P. bullata*<sup>1</sup> but was not figured. As the name *bullata* was preoccupied,

<sup>1</sup> Gould, A. A. 1855, Proc. Boston Soc. Nat. Hist., 5: 128.

Binney at the suggestion of Gould, published it under the name of *P. ampullacea*,<sup>2</sup> and figured three specimens. His figures 134 and 135 are exactly like material that has been obtained from Montana and the Dakotas. His figure 133 is not at all like the other two and more nearly fits the original description as published by Gould.

An examination of the two specimens in the type series leads to the conclusion that the figures 134 and 135 were not drawn from the types, though Bartsch<sup>3</sup> believed that the artist might have drawn the broken areas of the shells. Both specimens of the type lot are badly broken, the type has a large portion of the aperture missing, and a large hole in the body whorl. The remaining specimen has the aperture side entirely missing, as though the specimen had been cut into halves with only the hinder portion remaining. In all probability the specimens were broken at the time Binney worked with the material, and as a consequence he selected others to figure but made no mention from what source he obtained the shells. The spire characters, both the general shape and the sutures, are quite different (figures 134 and 135), from the type specimens, and by his own statement fig. 133 was obtained from other material.

The exact locality is not known other than that of Oregon. At the time the specimens were discovered, 'Oregon' occupied a much greater area than its present boundaries now indicate, but the entire territory fell within the Pacific drainage area. None of the west coast forms so far examined quite approach the elliptical shape of the Montana-Dakota shells and again the *lack* of an impressed suture, which is very characteristic of the mid-western forms, does not agree at all with Gould's "sutura bene impressa" or Binney's translation "suture decidedly impressed." Gould further states "It accords most nearly with Haldeman's plate iii, f. 9, which was given him as *P. sayii* Tappan." It is evident that this comparison would not have been made if material similar to Binney's from which the figures 134 and 135 were obtained, had been used in the original diagnosis of the species. *P. ampullacea* of authors resolves itself into two species,

<sup>2</sup> Binney, W. G. 1865, Smithsonian Misc. Colln. No. 143, p. 79.

<sup>3</sup> Bartsch, P. 1919 (in Baker, F. C.), Bull. Amer. Mus. Nat. Hist., 41: 534.

*P. ampullacea* 'Gould' Binney for the Pacific drainage forms, and *P. gouldi* for the northern mid-western forms.

In relationship, *P. gouldi* appears to be closely allied to *P. warreniana* Lea. This latter species is more attenuated, has deeper incised sutures and a more amber coloration.

Henderson and Daniels<sup>4</sup> were of the opinion that *P. nuttallii* Lea was the same as *P. ampullacea*, basing their assumptions only upon the original description of *P. nuttallii*<sup>5</sup> overlooking Lea's figure of that species which had appeared later in his Observations.<sup>6</sup> If Lea's figures truly represents the species, it would be valid, and Hemphill's *P. ampullacea columbiana*<sup>7</sup> would become a synonym, as the description of the latter species agrees in all essential details with *P. nuttallii*.

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### BOSTON MALACOLOGICAL CLUB

The regular meetings of the Boston Malacological Club have been held during the past season, from October to May inclusive, on the first Tuesday evening of each month.

The October meeting was devoted to the summer experiences of members, and reports were forthcoming of collecting in such widely separated localities as Russia, the Belgian Congo, Cuba and California, as well as Maine, Tennessee and Florida. In November the Club was addressed by Dr. Bernard E. Proctor, of Massachusetts Institute of Technology, on "Molluscan Food Industries," and in December Dr. John H. Welsh spoke on "The Significance of the Mantle-flaps of Certain Fresh Water Mussels," and showed a series of lantern slides. At the January meeting Mr. William J. Clench spoke on "The Isolation of Species," citing various contributory factors, and stating that isolation is more pronounced among land forms than among marine species. Dr. Joseph C. Bequaert spoke in February on "Some Relations of Mollusks to Other Animals."

On the evening of March 5, the Club celebrated its twenty-fifth anniversary, with a banquet, at the Children's Museum of Bos-

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<sup>4</sup> Henderson J., and L. E. Daniels. 1917, Proc. Acad. Nat. Sci. Phila., p. 51.

<sup>5</sup> Lea, I. 1864, Acad. Nat. Sci. Phila., p. 116.

<sup>6</sup> Lea, I. 1866, Observations, 11: pl. 24, fig. 93.

<sup>7</sup> Hemphill, H. 1890, Naut., 4, No. 3, p. 27.

ton, in Olmstead Park, Jamaica Plains. The long tables, arranged in U-formation, were decorated to resemble a shell-strewn sea-beach—sand, blue water and white foam being achieved by the use of crêpe paper, while on the corners stood miniature light-houses, each with a small flashing light.

Following the dinner, at which forty-five members and guests were present, short speeches were made by the president, Dr. Charles H. Blake, and by Mr. William J. Clench, and a history of the Club was read by the Secretary. The guest of honor and principal speaker was Dr. Henry A. Pilsbry, honorary member of the Club, whose address, on his recent collecting-trip through Mexico, with accompanying lantern-slides, of unusual beauty, held the audience absorbed for an hour.

After a highly amusing sound-movie of undersea life had been shown, the evening closed with the distribution of boxes of labelled shells to all who were present.

A brief résumé of the history of the Club is as follows:

“The Boston Malacological Club dates its definite beginning to February 22, 1910, when five gentlemen met at the house of Professor Balch, in Jamaica Plain for supper and the discussion of a plan which had been in their minds for some time, the formation of a club for the study of mollusks. The result of the zeal awakened was the Organization Meeting, held by fourteen charter members on March 10, 1910, in the rooms of the Appalachian Mountain Club, in the Tremont Building, Boston. Within a year, the members numbered between twenty and thirty.

“For the first few years, the Club held but six meetings in a season, but these were later increased to eight, supplemented each year since 1914 by a Field Day, in May or June. Trips have been made to Scituate, Cohasset, Marion, Nahant, Marblehead and Gloucester, and two meetings were held at inland localities, for the collection of land and fresh-water forms.

“Although the Club owes so large a part of its favorable beginning to its first president, Professor Edward S. Morse, the gratitude of all the members is due in liberal measure to Mr. Charles W. Johnson, third to hold the office, for his whole-hearted and continuous interest during the entire time of his membership, from 1910 until his death in 1932. When in 1923

the Appalachian Mountain Club left the Tremont Building for other quarters, it was through Mr. Johnson's influence that our Club was privileged to hold its meetings in the library of the Boston Society of Natural History, a spot to which we have all become much attached, where we have continued to meet."

At the April meeting, the President, Mr. Charles H. Blake, gave an illustrated talk on a motor trip of 12,000 miles, to the west coast, by way of the southwestern states, up the California coast, and back to New England by a northerly route, and in May, Mr. J. Henry Blake, a charter member of the Club, described the Hassler Expedition, under Professor Louis Agassiz, which sailed from Boston in December, 1871, down the coast of South America, through the Straits of Magellan, and north to San Francisco, visiting San Juan Fernandez, and the Galápagos Islands *en route*. Observations were made during the voyage, and collecting was done wherever possible. Illustrated his talk with maps and sketches.

Officers were elected for the year. *President*: Charles H. Blake; *Vice-president*: Austin W. Cheever; *Secretary-treasurer*: Theodora Willard; *Conchological Recorder*: S. N. F. Sanford; *Executive Committee*: Mildred Seymour, William J. Clench.

Plans are under way for the annual Field Day.

THEODORA WILLARD,  
*Secretary*

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### NOTES AND NEWS.

We are pained to announce the death of the eminent malacologist M. PHILIPPE DAUTZENBERG, at his home in Paris, May 9th, in his 86th year.

DR. PILSBRY, DR. FRANCIS W. PENNELL and MR. CYRIL H. HARVEY will spend the summer collecting mollusks and plants in northwestern Mexico.

PANOMYA ARCTICA LAMARCK.—This species was recently collected by Mr. H. Stetson during a cruise of the ketch "Atlantis" of the Wood's Hole Oceanographic Institution. It was dredged dead from one of the newly charted canyons on the south side of George's Bank in 290 to 328 fathoms. (40° 21' N. 67° 50'

W.) The published record in Johnson's recent list gives 25–115 fathoms, so that the above record adds materially to the known depth at which this species occurs.

It is possible that this specimen was carried to this depth in a landslide of the substratum but Mr. Stetson thinks this to be improbable as the recent mud in which this specimen was found rests on a clay, possibly Tertiary in age, which occurred at a comparable depth in another canyon.—R. A. McLEAN.

MONADENIA FIDELIS (Gray).—Last April I was delighted to find this splendid snail alive, in a redwood grove near Prairie Creek, California. The animal varies in color, and is about 78 mm. long when crawling. The more brightly colored ones are reddish, a dull "old rose," finely tuberculate all over, the intervals between the tubercles grey, producing a mottled effect, especially on anterior part of animal. Mantle grey; tentacles red, blackish at end; foot-fringe narrowly bright red; sole very pale grey. Dark specimens are blackish, very dark, the caudal end dark brown, but the foot-fringe still red. There is no trace of a dark, dorsal stripe, such as is found in the Japanese *Euhadra*; instead of this, some show distinctly a broad pale reddish dorsal stripe, on three rows of tubercles, the areas on each side of this blackish. Keep refers to the beauty of the animal, and the "tinge of red in its complexion," but Binney describes it as "dull ocher, slaty towards the tail."

I have collected the large *Eulota* in eastern Siberia, species of *Euhadra* in Japan, and now *Monadenia* in California. These snails are surprisingly alike in general appearance, but the soft parts show that they belong to different genera.—T. D. A. COCKERELL.

AN UNUSUAL CASE OF COMMENSALISM between a snail (*Strophochilus oblongus* Müller) and a coprid beetle.—Mr. G. W. Hamlett, of the Department of Anatomy, Harvard Medical School, recently presented me with a number of small lamellicorn beetles which he observed at Tres Lagoas, in the State of Matto Grosso, Brazil, on living specimens of the large snail, *Strophochilus oblongus* (Müller). As this case of commensalism was new to me, I sent two of the beetles to Dr. Walther Horn. He had them identified by Mr. A. Boucomont as *Zonocopriss bucki*

Arrow, a species recently described from Porto Allegre (S. Brazil), and Paraguay (*Stylops*, London, vol. 1, 1932, p. 223, fig. 1). Arrow mentioned that "The habits of this insect appear to be highly peculiar. Mr. Buck discovered numerous examples concealed within the shells of a living specimen of a large terrestrial snail believed to be *Bulimus (Strophochilus) oblongus*, Müll. As many as 12 beetles were found within a single shell." Mr. Hamlett also brought back the snail, so that the identity of the host of the beetle is no longer in doubt. He tells me that the beetles keep within the mantle cavity beneath the lip of the shell, when the snail crawls about; but when it retracts within the shell, they are pushed outside. They probably feed either on the mucus or on the faeces of the snail and it may be supposed that the eggs are deposited and that the larvae develop in the faeces. The beetle is 4 to 5 mm. long.—J. BEQUAERT.

THE JOURNAL DE CONCHYLOGIE announces that a Réunion Amicale Internationale of conchologists, malacologists and paleontologists will be held at Paris July 4-7. The meetings will close with a banquet on July 5th, after which various interesting excursions are planned. Hon. Presidents: MM. E. L. Bouvier, Ph. Dautzenberg, and H. Douvillé. Malacologists of all countries are cordially invited to participate.

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#### PUBLICATIONS RECEIVED.

LAND SNAILS AS INDICATORS OF ECOLOGICAL CONDITIONS. By B. Shimek. *Ecology*, Oct., 1930, 673-686. Prof. Shimek concludes that the land-molluscan fauna of the Mississippi Valley is essentially a forest fauna, and its variations northward coincide with the various forest types. It is not, on the whole, a boreal fauna, though it contains some species of wide distribution which also extend into northern regions. The similarity, almost identity, of the local loess and modern faunas indicates that the conditions under which the loess was deposited were not essentially different from those which prevail in the Mississippi Valley today, and that there is no warrant for the belief that the formation of loess accompanied or closely followed glacial conditions. The terrestrial fauna of the loess emphasizes the correctness of the conclusion that the loess was of eolian origin.

# THE NAUTILUS

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## RATE OF MIGRATION OF CREPIDULA CONVEXA SAY

BY H. E. VOKES

University of California, Berkeley

Among the species inadvertently introduced into the fauna of San Francisco Bay together with the spat of *Ostrea virginica* Gmelin, was *Crepidula convexa* Say.<sup>1</sup> Collections made by the writer from the littoral zone at Moss Beach, San Mateo County, California, during the summer of 1933 were found to contain eight specimens of the latter form. This common, Eastern species thus seems to have become firmly established on the Pacific Coast and to have adapted itself to the waters of normal salinity in the Pacific Ocean proper, as well as to the waters of San Francisco Bay.

The introduction of this species was first reported (as *Crepidula convexa* Say var. *glauca* Say) in a note on NAUTILUS by R. E. C. Stearns in 1899.<sup>2</sup> He stated that H. Hemphill had collected a series of 30 or 40 specimens in the oyster beds at the southern end of San Francisco Bay. In 1918 E. L. Packard<sup>3</sup> reported that the *Albatross* collections made during the biological survey of 1912-1913 contained 115 individuals from the region where the first specimens had been obtained, and 18 from off the Alameda shore. This is approximately 12 miles from the original locality and indicates a rate of migration of about one mile per year.

The discovery of this species at Moss Beach represents the first report of its presence in the waters of the Pacific Ocean proper.

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<sup>1</sup> Say, T., Jour. Acad. Nat. Sci., Phila., vol. 2, p. 227; 1822.

<sup>2</sup> Stearns, R. E. C., Nautilus, vol. XIII, No. 1, p. 8. Communication dated March 10, 1899.

<sup>3</sup> Packard, E. L., Univ. Calif. Publ., Zoology, vol. 14, no. 2, p. 322, 1918.

Collections were made almost daily over a period of five weeks and the occurrence of but eight specimens suggests that this region marked the limit of its southern range. This would indicate a migration of approximately 46 miles from the area where it was first reported in 1899 and shows an average rate of approximately one and one-third miles per year.

The apparent discrepancy between the rates of migration to be noted in the stations reported by the *Albatross* and the occurrence here noted at Moss Beach admits of two possible explanations. It may be explained as due to an actual increase in the rate caused by the effect of current movements. However the only area in the region traversed where the currents are markedly strong is at the mouth of San Francisco Bay. Here, particularly during the period of the outgoing tides, a marked acceleration of the speed of migration may be expected. *Crepidula* is, however, a benthonic form and does not possess a free-swimming larval stage. Moreover, only some five or six miles of the entire 46 miles traversed is within the influence of this area, and the resulting rate of migration if correction is made for this zone is still in excess of that noted for the *Albatross* collections.

Another possible explanation is that a certain length of time passed during the years immediately after the species was introduced; in these years it was establishing a population of sufficient magnitude to make matings more than a chance occurrence, and was thus developing a sufficient degree of competition to require expansion of its range. When correction is made for this feature the actual migratory rate may be well in excess of one and one-half miles per year; although the rate of one and three-quarters miles indicated as between the *Albatross* and Moss Beach occurrences is probably excessive, due to the influence of the currents at the mouth of the bay.

It is of interest to compare this observed rate of migration of *Crepidula convexa* with that observed for *Littorina littorea* Linnaeus when introduced on the Atlantic Coast. Accounts differ, but all<sup>4</sup> agree that the species first appeared in the vicinity of

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<sup>4</sup> See:

Morse, E. S., Bulletin of the Essex Institute, vol. 12, pp. 173-176; 1880.  
Smith, S., Proc. Nat. Sci. Assoc. of Staten Island, vol. 1, p. 61, Jan. 14, 1888.

Halifax, Nova Scotia, about 1852-57, and was first reported at Portland and Kennebunk, Maine, in 1870. (Suggesting again the need of a certain period of time to permit the development of a population of sufficient size to permit and require dispersal.) Migrating with the Labrador current the species appeared at Salem and Provincetown, Mass., in 1872; averaging at least 60 miles per year between Kennebunk and Provincetown. Apparently experiencing difficulty passing around Cape Cod, it did not reach Wood's Hole until 1875. From here on its rate of migration speeded up again, though proceeding against the current, and it reached New Haven in 1880, averaging approximately 23 miles per year. It was first reported at the Narrows at Staten Island in 1888,<sup>5</sup> but the long sandy beaches, lacking intervening rocky shores or shingle beach, appear to have effectively prohibited much further movement as the latest report available indicates that the present southern range of the species is New Jersey.<sup>6</sup>

The marked contrast between the rate of migration observed for the two species does not readily admit of explanation. Fundamental differences in the habits of the two species are probably the most significant causes. It is also evident that although conditions are sufficiently favorable to permit the establishment and migration of *Crepidula convexa*, they are not as near the optimum as the environment of the Atlantic Coast proved to be for *Littorina littorea*.

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## CYPRAEA TIGRIS LINNÉ IN THE HAWAIIAN ISLANDS

BY WRAY HARRIS

For many years naturalists have believed it probable that the range of the tiger cowrie includes the Hawaiian Islands, although heretofore no definite proof of this has come to light. A few dead shells have been picked up at the beaches, and at least one specimen has been dredged in Honolulu harbor. *Cypraea tigris* is of widespread occurrence in the Pacific, and many specimens from

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<sup>5</sup> Jacot, A. P., Nautilus, vol. 33, p. 115, 1920.

<sup>6</sup> Johnson, Proc. Boston Soc. Nat. History, vol. 40, no. 1, pp. 1-204; 1934.

other localities are in private collections here. Dealers have imported large quantities of these shells for the curio trade. In the absence of living animals there can be no certainty that the shells found here are native. They may have been dropped accidentally by visitors at the beaches, to be picked up by others and subsequently reported as Hawaiian. Edmondson, in "Reef and Shore Fauna of Hawaii," 1933, says: "There is some evidence that *C. tigris* L. lives in offshore water about the islands, though no living specimens are known to have been taken."

In April, 1934, Mrs. Harris and myself were shown two *Cypraea tigris* by Mrs. Howard Hee, of Lanikai, Oahu. Both specimens contained decomposing animals. Mrs. Hee, in discussing the find, described accurately the living animal of *C. tigris*, which she had seen at the time the shells were discovered. They were taken in two fathoms of water at the outer side of Lanikai reef by Jiro Akamine, a Japanese fisherman. One of the shells was lost afterwards. Dimensions of the remaining specimen are: length, four and five-eighths inches, width three inches.

A large specimen of *C. tigris* is in the possession of Mr. Will J. Cooper, of Hauula, Oahu. This shell measures five and three-fourth inches in length, and three and five-eighths inches in width. It is the largest of which I have been able to find a record. Mr. Cooper's account of the shell is that it was taken about six years ago by Edward K. Nihipali at the edge of the reef at Hauula, in six feet of water. The living animal was seen by Mr. and Mrs. Cooper.

Five specimens of this species in the Bryan collection, Bishop Museum, Honolulu, are reported to be from the Hawaiian Islands. One from Waikiki, in good condition, measures five and one-fourth inches in length; an eroded specimen from Niihau Island is four and fifteen-sixteenths inches in length; another from Niihau or Kauai, beachworn, is five and one-eighth inches in length; a fragment measuring five and one-half inches in length was dredged from Honolulu harbor, and a fifth shell, labeled "Hoopuloa, Island of Hawaii," is two and seven-sixteenths inches long.

Dr. C. Montague Cooke, Jr., malacologist at the Bishop Museum, has noticed an interesting fact in connection with *Cypraea*

*tigris*. While small specimens are abundant south of the equator, shells taken near the northern limit of its occurrence are uniformly large. The average length of specimens in the Bishop Museum collection from Johnson Island, lat. 16° 45' N., long. 169° 39' W., is four and four-tenths inches. The average length of specimens which we have reason to believe are from the Hawaiian Islands is 5.19 inches.

Honolulu, Hawaii, July 28, 1935

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## FATAL CASE OF ATTACK BY CONE

BY TOM IREDALE

In June, 1935, a young man examining a cone, apparently *Conus textile*, at Hayman Island, Queensland, was bitten in the hand and died four and a half hours afterwards. This is the first fatal case in Australian history, though a few cases have been recorded from the islands to the north and east. One of the earliest notes was by A. Adams, in the Voyage of the Samarang, Vol. II, p. 356, 1848, who noted that the Commander, Captain Sir Edward Belcher, was bitten by a *Conus aulicus* on Meyo, a small island near Ternate in the Moluccas. Later Bennett (Gatherings of a Naturalist, 1860, p. 382, footnote) observed that *Conus textile* was poisonous among the islands of the New Hebrides Group. Since then *Conus tulipa* has been accused by Crosse and Marie (Journ. de Conch., Vol. XXI, 1874, p. 353) in New Caledonia, along with *Conus textile*. Montrouzier followed (Journ. de Conch., Vol. XXV, 1877, p. 99) with *C. marmoreus* at the I. of Maré, Loyalty Group, and *Conus geographus* (we have the actual shell in the Australian Museum) was found responsible for a case at Levuka, Fiji. These cover the cones that have proved poisonous and sometimes fatal, but it will be wise in the future to handle all species with great care. I have picked up many specimens of *C. textile*, a comparatively common species on the Great Barrier Reef of Queensland, and have collected all the others mentioned. One day at Low Isles, Queensland, a large number of *C. marmoreus* were found and handled without thought of danger, but this will not occur again.

## SOME SUPERFLUOUS NAMES IN WEST AMERICAN CHITONS

BY G. WILLETT

Probably no group of marine molluscs has suffered more from over-naming than have the chitons. The reason for this is obvious when we consider the great individual variation in many of the species and the difficulty in obtaining some of them in large series. At the time most of the earlier names were bestowed, collections were much fewer and smaller than they are today, in many instances only a specimen or two being available to the describers, resulting in very incomplete diagnosis of many species.

During more than twenty years collecting along the Pacific coast, the writer has made special efforts to accumulate specimens of chitons, and at the present time he has available satisfactory series of many forms that were formerly known only from few and widely scattered examples. He is also indebted to Mr. and Mrs. E. P. Chace and Mr. H. N. Lowe for use of their collections, and to the U. S. National Museum, through Dr. Alexander Wetmore, for photos of some of the types of Carpenter and Dall species.

As a result of study of the above, the following rearrangement of some forms seems necessary. In addition it is believed that further accumulation of pertinent material will result in the relegation to synonymy of several other names in this group.

LEPIDOPLEURUS NEXUS Carpenter, 1864.

Synonyms: *L. heathi* Berry, 1919; *L. ambustus* Dall, 1919.

Examination of more than forty specimens of this chiton from Catalina Island, San Pedro, and Los Coronados, Mexico, and comparison with photos and descriptions of types of the above three supposed species, seem to demonstrate that they all should be united under the oldest name. Neither is there evident a great deal of variation, excepting in age, color, and extent of wear.

LEPIDOCHITONA FLECTENS (Carpenter), 1864.

Synonym: *Dendrochiton semiliratus* Berry, 1927.

At the present time there are in the writer's collection thirty-three specimens of *L. flectens*, eighteen from southeastern Alaska

and fifteen from southern California. Six examples in each lot, examined under a glass, show, to a varying extent, the lustrations which were the principal character distinguishing *semiliratus*. Furthermore, the girdle characters show them all to be referable to *Lepidochitona*. *L. heathi* (Pilsbry) appears to be a shore form of *flectens*, the only constant difference between the two being the considerably larger size of the former. In most examples of *flectens*, particularly those from southern California, the pustules on the valves merge into slender riblets running lengthwise of the shell, while in *heathi* this is much less in evidence. Also, all specimens of *flectens* examined by the writer are at least partly red in color, while some examples of *heathi*, from Crescent City, California, in the Chace collection, are without a trace of red, closely approaching *L. raymondi* (Pilsbry) in coloration. That *heathi* and *raymondi* are distinct, however, is indicated by the greater degree of carination in the former, as well as by the somewhat coarser pustulation and more sharply defined lateral areas of *raymondi*.

ISCHNOCHITON DECIPIENS Carpenter, 1892.

Synonym: *Ischnochiton gallina* Berry, 1925.

After examination of a series of more than thirty specimens of this chiton in the Lowe and Willett collections, and comparing them with photos and descriptions, it seems to be clearly demonstrated that the two forms named above are color variations of one species. As to the red color referred to by Dr. Carpenter (MS.) as marking *decipiens*, a series of specimens in the Willett collection grades from red through brown and gray to cream. Until a recent examination of a series of specimens from La Jolla, California, in the Lowe collection, the writer had considered *gallina* to be a well marked species, and had not considered it necessary to compare his San Pedro taken specimens with other members of the group. Mr. Lowe's La Jolla series, however, contains one example typical of *gallina*, and another about midway between *gallina* and *decipiens* (light form), the rest of the lot being typical of the latter. Examination of the sculpture of valves and mantle of *gallina* and *decipiens* shows them to be identical in this regard and it appears conclusive that *gallina* must be considered only a color form of *decipiens*, probably with-

out any particular ecological significance. A conjecture that Carpenter's name *acutior* might also refer to this species is proved incorrect by examination of a photograph of the type kindly furnished by the U. S. National Museum. This shows the riblets on the lateral areas and anterior valve being formed of rather distant tubercles, which is not the case in *decipiens*.

LOS ANGELES MUSEUM, LOS ANGELES, CALIFORNIA,  
MARCH 14, 1935.

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## FERRISSIA IN THE LAKE REGION OF IOWA

BY B. SHIMEK

Three species of *Ferrissia* have thus far been recognized in the lake region centering in the Okoboji Lakes and Spirit Lake in northwestern Iowa, namely, *rivularis*, *fusca* and *parallela*.

Of these species *F. rivularis* (Say) has been found only in the Little Sioux and Des Moines Rivers, between which the lakes lie. Here it is found only in moderate numbers, on stones, mussel-shells and (more rarely) on sticks, in rather shallow water.

The remaining two species seem to have been confined to the lakes, though *F. fusca* rarely appeared in the larger kettleholes.

In more than 40 years of periodic field work in this region, the writer has found these two species in notable numbers in but one place, and under such peculiar circumstances that the case seems worthy of record.

All the larger lakes of this region drained into the Little Sioux River, a tributary of the Missouri, and the Okobojis and the Gar Lakes still form a connected system. Prairie Lake, a small lake to the east of the Gar Lakes, drains into the lower part of Lower Gar Lake by a small creek. The lake is rather shallow in the vicinity of the mouth of the creek, and formerly contained large beds of rushes (*Scirpus validus*) in the shallower parts, and also somewhat broken or scattered irregular beds of the yellow pond-lily (*Nymphaea advena*) where the water reached a depth of two or three feet. In some places these beds were somewhat intermingled, but in the main they were rather distinct. It may be of incidental interest to note that during August, in the deeper parts of the rush-beds, the muskrats, formerly very abundant in

this place, cut many of the rushes just above the water, or at the water-level, and built flat platforms of them on the "stumps" for their young.

The mollusks of this bed were first studied on the 25th of August, 1916, when about 450 specimens of *F. fusca* (C. B. Ad.) and only 7 specimens of *F. parallela* (Hald.) were collected. These specimens were all taken along the outer margin of the *Nymphaea* beds in slightly deeper water, and all were living. They occupied much the same position noted below, excepting that a very few of the *F. fusca* extended even to the lower surfaces of the leaf-blades.

Six days later, a day was spent in a more careful study of these beds, the petioles (and in a few cases the flower-stalks) being pulled at intervals all over the beds, but well within the margin. The result was that about 250 specimens of *F. fusca* and about 150 specimens of *F. parallela* were collected during the day, but much the greater part of the field remained undisturbed.

Both species occurred quite frequently in a constant relative position, *F. parallela* uniformly occupying the lowest part of the petiole within about four or five inches of the fine silt of the bottom, and *F. fusca* collecting on the next foot above, but chiefly on its lower six inches.

Both species were found chiefly on the petioles of older leaves, or (less commonly) on the few flower-stalks, and, in the great majority of those examined, both were found on the same petiole, though in unequal numbers. In no case, however, were they mingled, each keeping within its zone. In a few cases, only one (either one) of the species appeared on a petiole, and then in small numbers.

Many stems of the *Scirpus* were also pulled up, especially where they were somewhat mingled with, or at least near, the *Nymphaea*, but *not a single specimen of either species of Ferrissia was found upon them!*

This was the last visit possible during that season, but the writer expected to make a study of the causes of this peculiar distribution of the limpets during the following seasons, to determine if there was anything attractive or repellent in the plants involved; if they offered different food values; if the unequal mingling of the fresh water of the creek with the, even then, some-

what polluted water of the lake was responsible; or if some less obvious cause operated. The investigation of the winter condition was also contemplated, but a return to the lakes for a longer period was not possible until 1918, and by that time distinct changes had taken place. The pond-lily bed had been greatly reduced; only three living specimens of *F. parallela* were found just opposite the mouth of the creek; no living *F. fusca* remained; and the contemplated observations could not be carried on. Only a few dead shells were dredged from the mud of the bottom. It was evident that the lake had been greatly polluted, a condition which has since grown still worse, and the creek, moreover, had been polluted by stock.

Three efforts were made subsequently, one in 1928, another in 1932, and still another in 1934, but no more living Ferrissias were found, and, as noted in another article, all molluscan life had been destroyed in the lake by sewage-pollution.

During all the years of field experience in this region, the writer has found but few specimens of *F. fusca* at any other point, and only a single additional *F. parallela*, dead and bleached, was dredged in Millers Bay, some years ago, near a small bed of *Nymphaea*, now also extinct.

Elsewhere in Iowa *F. rivularis* seems to be confined to streams, often small creeks; *F. fusca* is usually found on aquatic plants, especially *Nymphaea advena* and *Castalia*, in ponds or shallow lakes; while *F. parallela* has not been observed in any other localities than those cited. None of these Ferrissias is really common.

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## THE GENERIC POSITION OF PLANORBIS UMBILICATELLUS WITH THE DESCRIPTION OF A NEW GROUP OF PLANORBIDAE

BY FRANK C. BAKER

The little fresh water shell known as *Planorbis umbilicatellus* Ckll. has been considered a *Gyraulus* by most conchologists. In a recent paper (Proc. Phil. Acad. Sci., 86: 48, 1934), Pilsbry suggests that this species, together with others, calls for generic verification. Specimens of *umbilicatellus* from Wainwright Park, Alberta, and North Star Lake, Minn., have been examined ana-

tomically. The species is not a Gyraulus and belongs to the Helisoma group of Planorbidae having a well developed penial gland. The form of the shell is not at all like that of Gyraulus but more like that of Menetus without a peripheral keel.

An anatomical examination of several species of Menetus indicates that this group is divisible into two subgroups, if not into two separate genera. In Menetus, of which *Palorbis opercularis* Gould is the type, the penial gland is greatly elongated, somewhat sausage-shaped when fully formed, and almost completely filling the preputial sac, which is regularly elongated. It has a cup-shaped termination opening at the proximal end from which a long, narrow duct extends through the body of the gland to the distal end. This duct enters the muscular collar or diaphragm between the preputial and penial saes.

In the group typified by *Planorbis exacuus* Say the penial gland is short and rounded, the cup or opening extends the whole length of the gland and there is no duct, its place being taken by an open canal or channel which is bordered by heavy, fleshy muscles connecting the gland with the muscular collar between the two saes. The preputial sac is also much swollen and the penial gland fits into a recess or "pocket" on the side to which the retractor muscle is attached. In Menetus the vas deferens enlarges as it enters the vergic sac, forming an "epiphallus" as in some land snails. This feature is absent in *Planorbis exacuus* and related species.

It should be noted that the penial gland is more or less variable in form in the same species. It may be small and subglobular and placed in the upper part of the preputial sac or it may be greatly lengthened and completely fill the preputial sac. Such a condition was observed in specimens of *opercularis*. Of *planulatus* 15 specimens were dissected and the penial sac varied 60 per cent in length. Probably the gland is enlarged to a greater degree during the breeding season. All specimens, however, were from the same lot collected at the same period.

Of the genus Menetus the following species and races have been dissected:

*M. opercularis* (Gould). Mountain Lake, California.

*M. planulatus* (Cooper). Crescent City, Cal., and Quatano, Vancouver Island.

*M. p. multilineatus* (Vanatta). Orcas Island, Puget Sound, Washington.

It is here proposed to call the group with the subglobular gland and absence of duct PROMENETUS with *Planorbis exacuouus* Say as type. About two dozen specimens of *exacuouus* and *e. megas* have been dissected. *Planorbis umbilicatellus* falls into this new group having the same form of penial gland and absence of duct, and also the same form of vas deferens. Promenetus is more nearly related to Planorbula than it is to Menetus, Planorbula having the same form of penial gland and preputium. Full details with figures of Menetus and Promenetus will be published in a work on the Planorbidae now in preparation.

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## A NEW VARIETY OF MONADENIA FIDELIS FROM CURRY COUNTY, OREGON

BY E. P. & E. M. CHACE

MONADENIA FIDELIS BERYLLICA, n. subsp.

Differs from other races of *fidelis* in the basal coloration, which is deep green, hellebore green of Ridgway being the predominating shade. Upper surfaces ranging from brown to straw in color but always with a tinge of green. All other characters varying as in the *fidelis* of Del Norte Co., Calif.

Type No. 122A in the collection of the writers, measures: maximum diameter 38.1 mm., minimum diameter 32.3 mm., altitude 29 mm.

Paratypes are in the collections of the ANSP., Dr. S. S. Berry, and Mr. Allyn G. Smith. These and eighty other specimens were collected in a patch of trees and brush near the mouth of Pistol River, Curry Co., Oregon. In this colony the mature shells were quite uniform in size (35 to 40 mm. in diameter) and light-colored tops predominated.

Mr. Smith found a colony of very similar shells beside the highway three miles north of Wedderburn. We visited this colony later, finding conditions and shells very similar to those at Pistol River.

In a colony near the mouth of Hunter's Creek (three miles south of Gold Beach) the shells are more variable in top coloration and the green is a little less prominent.

The colony at Port Orford looks very much like *fidelis* var.

*pronotus* Berry, except that they have a distinctly green base. Like *pronotis*, they are living under grass and weeds on the ocean bluff.

A set of nine shells was picked up while making a hurried trip from Bosley Butte to the Chetco River. This locality is about fifteen miles from the coast and a little more than that from the mouth of the Pistol River. These shells are the greenest we have ever seen. In some specimens the green of the base extends up over the periphery almost to the suture, making the usual dark peripheral band with light borders very inconspicuous.

In addition to these five strong colonies we have taken scattering shells belonging to this form in six other localities all in Curry Co., and the absence of any shells of the usual coloration points to this green form as a good geographic race.

The Stanford University collection contains two specimens collected by Harold Hannibal, labeled *E. fidelis* green var., Oregon and California, that certainly belong to this subspecies.

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## A NEW SPECIES OF CERION FROM LONG ISLAND, BAHAMAS, AND A NOTE ON CERION MILLERI (PFEIFFER)

BY W. J. CLENCH

CERION (STROPHIOPS) JOSEPHINAE, sp. nov. Plate 3, figures 1 and 4.

*Description.*—Shell cylindrical, solid, ribbed and perforate. Color a flat white, with the ribs a little shining. Interior of aperture a dark brown. Whorls  $9\frac{1}{2}$  to  $10\frac{3}{4}$ , first 6 whorls rounded conic, later whorls nearly parallel sided. Nuclear whorls nearly smooth, opaque and glass-like, remaining whorls porcelanous. Umbilical pit fairly deep, abruptly margined by a slight ridge. Parietal tooth well developed in the mid-area of the parietal wall. Axial lamella entirely absent or only faintly developed well within the aperture. This follows back when present along the base of the columella for about a full whorl. Aperture subquadrate. Lip entire, distinctly collared, the back-fold strongly developed and generally much thickened. Sculpture of strong axial ribs numbering about 32–35 on the body whorl.

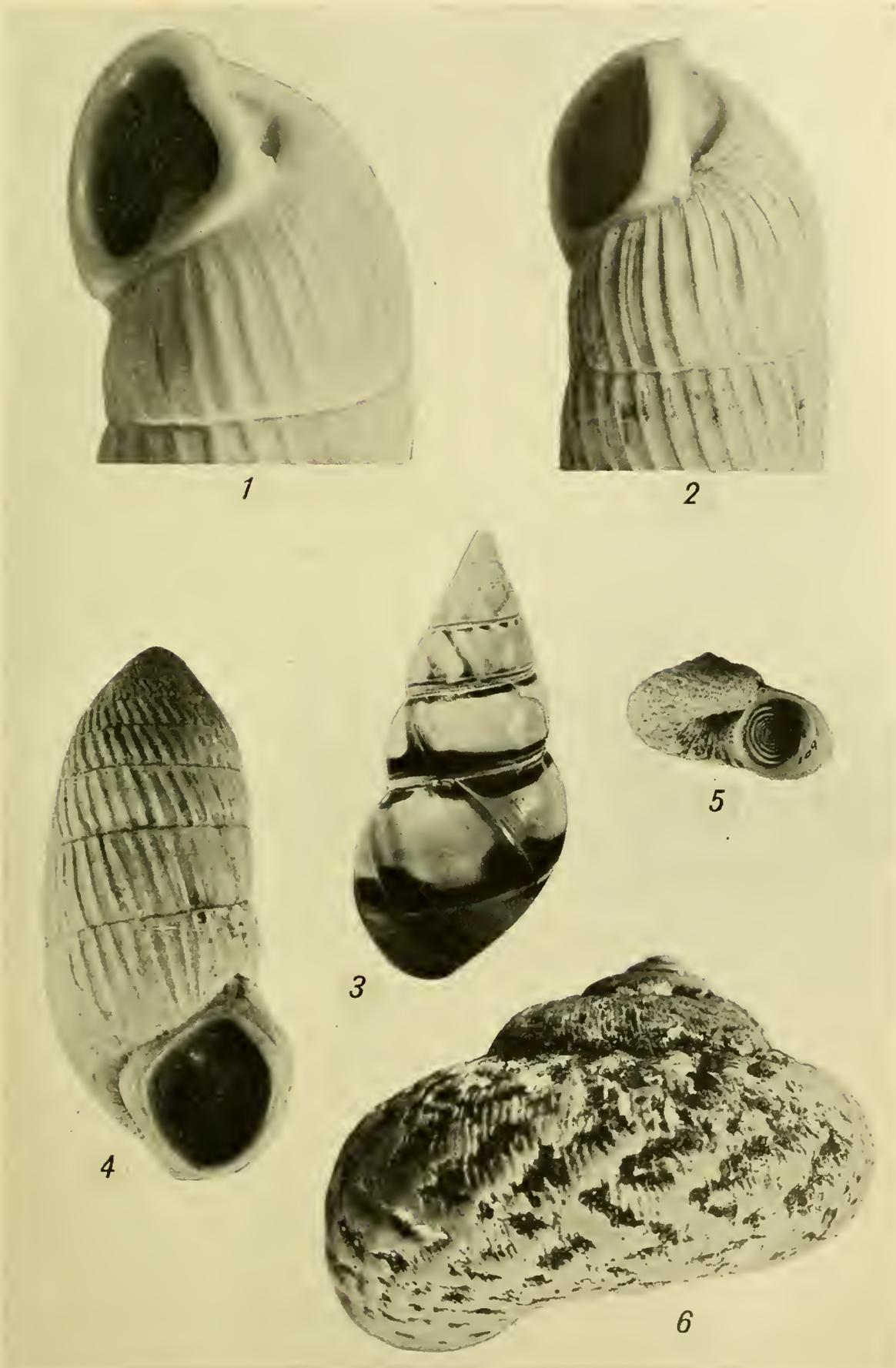
The holotype measured,  $34 \times 14.8$ , the aperture  $9 \times 7$  mm. The average measurements of ten paratypes were  $33.3 \times 14.1$ , the aperture  $8.8 \times 7.2$  mm., the largest measured 36.5 mm. in length.

*Holotype*.—Mus. Comp. Zoöl. no. 76474, Tate's Bay, S. E. Long Island, Bahama Islands. Edith Johnson collector, Nov. 19, 1923 (C. J. Maynard collection). Paratypes from the above locality in the M. C. Z., U. S. N. M., A. N. S. P., and the Univ. of Mich.

*Remarks*.—A fairly large series of this species was contained in the Maynard collection. It is quite a distinctive form though closely related to *C. melanostomum* Clench (Proc. Bost. Soc. Nat. Hist., 40, p. 212, pl. 2, fig. A and C. 1934), from the same island. It differs from this later species by being larger, not being colored at all, having the axial lamella absent or nearly so and not having the umbilical ridge defined on its outer side by an incised line (see Plate 3, figure 2). In this new form, the umbilical ridge is not in evidence on the inner parietal wall as it is in *C. melanostomum*.

Very little is known about the molluscan fauna of Long Island. It is a fairly large island (about 65 miles in length) but so far has only had four species of *Cerion* recorded from it (*C. nudum*, *caerulescens*, *melanostomum* and *josephinae*). The first two from the vicinity of Clarendon, the last two from the southern end. Nothing is known at all from the northern half of the island.

*Cerion milleri* (Pfeiffer) was first described in the Malak. Blätt. 14, p. 129, 1867, and assigned to Duck Key, Exuma Group, Bahama Islands. A series of Pfeiffer cotypes are contained in the collection of the Mus. Comp. Zoöl., originally in the T. Bland collection with the above locality data. This species is exceedingly close to both *C. oweni* Dall and *C. bendalli* Pils. from Great Abaco. A study of modern maps and charts of the Bahama archipelago fails to bring to light any "Duck Key" in the Exuma Group. Such a key, of course, may exist in this group, but it is questioned. There is, however, a Duck Key in Cherokee Sound, Great Abaco. *C. bendalli* was described from the main island opposite this little key. Though *C. milleri* is exceedingly close to this form, specific differences do exist. It would appear from both the relationships and the name of the key that *C. milleri* is a member of the Abaco assemblage of *Cerion* and not those of Exuma Island.



1, *Cerion josephinae*. 2, *C. melanostomum*. 3, *Lignus caribaeus*. 5, 6, *Poteria caribaea*. Figs. 1, 2, 6  $\times 3$ ; fig. 4  $\times 2$ . 1 and 6 paratypes, 3, 4, 5, holotypes.



## A NEW JAMAICAN POTERIA

BY W. J. CLENCH AND C. G. AGUAYO

POTERIA CARIBAEA, new species. Plate 3, figs. 5 and 6.

Shell depressed, turbinate, solid, rough and widely umbilicate. Color dull white to pale pink in specimens denuded of periostracum, the last a dull, dark, brown when present. Whorls 5-5½, strongly convex, with the body whorl slightly flattened on top. Spire depressed. Aperture nearly circular, slightly and evenly flaring, nearly holostomatous and pinched or angled at its superior portion where it is joined to the whorl above. No true columella as the shell is produced as a coiled, cylindrical tube with a wide umbilicus. Sculpture: nuclear whorl smooth; second and the third and a half whorls axially costate; remaining whorls rather finely then coarsely rugose with irregularly, fine wrinkles (the original costae) passing over the rugose areas. The rugose sculptural characters are set in a spiral pattern, though occasionally somewhat oblique. Operculum circular, evenly and spirally laminated, the lamina in a single coil with a central nucleus, the central portion somewhat depressed.

The holotype measured 25 × 20 in width, the height 15.8 mm. The aperture 11 × 12 mm. The average of five paratypes measured, width 24.8 × 20.5, height 16.7 mm.

*Holotype*.—Mus. Comp. Zoöl., no. 109264, Spring Mount, St. James, Jamaica. B. W. Arnold collector, (April, 1932). Additional paratypes from the above locality in the A. N. S. P., the Univ. of Mich. and the collection of C. G. Aguayo.

*Remarks*.—This species is somewhat close to *P. varians* Adams in its relationships, though differing from this later species by being far more heavily sculptured, being nearly or entirely white or dull grey, and not having the wide umbilicus margined by a definite ridge. *P. caribaea* usually possesses a slight angle at this point but not nearly so sharply marked. In addition, the sculpture of *P. varians* is much reduced to nearly wanting on the base of the body whorl, especially in young specimens, whereas *P. caribaea* has coarse sculpture over the entire base.

The large series of the present new form exhibits some hybridization with *P. varians* which also occurred in this area at Spring Mount.

## JAMAICAN LAND SNAILS, 6

BY H. BURRINGTON BAKER

The first paper of this series appeared in the first number of vol. 48, in which the symbols used for localities are explained on pages 7 to 9.

*Volvidens (Trifaux) triodon* H.B.B., ground [WWF].

*Hyalosagda (Lacteoluna) immunda* (C.B.A.), ground [EEJ—adult,  $8.7 \times 171$  (14.9 mm.),  $4\frac{1}{2}$  wh.; EJ1, 3 juvenile on rocks]. *H. rufula* (Pfr.), ground [KHWa, MM3b, MN3ac, NMM; smaller than *immunda*]. *H. ptychodes* (Pfr.), ground, incl. typical [EEJ—fresh, EJ3, EJF, MM3b, MN2–3, NM2, NMM—fresh, NMV—fresh, VW2—fresh, WWF] and less angulate Mandeville race (*immunda* auct.) [MM3bc, MN2–3; more rapid whorl-increase than other two].

*H. (Aerotrochus) subpyramidalis* (C.B.A.), trunk-arboreal [EBL—dead, EEC, EJ2–3, KH, ML2, MM, MN2–3, NM2, WC1, WWC—dead; aestivating shells look like asterisks because of adherent dirt]. *H. perdepressa* (C.B.A.), ground [ENF, KC1—fresh, NM2]; subsp. *brevior* (C.B.A.), ground [KCC, MM1, MM2—fresh, VCMa—fresh]. *H. omissa* (Pils.) [MN3b—fresh].

*H. (Microsagda) epistyliulum* (C.B.A.), under rocks [MM2–4, VW1, VWS—dead]. *H. angustispira* (C.B.A.), under rocks [EEJ; pl. 8, fig. 8;  $2.0 \times 147$  (3.0 mm.), umb. 5.2 times,  $4\frac{1}{2}$  wh.]. *H. spreata* (C.B.A.), ground and under rocks [EE, EJ, ENF; fig. 7;  $4.7 \times 146$  (6.9 mm.), umb. 5.6 times,  $5\frac{1}{2}$  wh.]. *H. inconspicua* (C.B.A.), ground [KHWa].

*H. (Strialuna) haplotrema* H.B.B., ground [MN3c]. *H. sincera* (C.B.A.), ground and under rocks, incl. typical [EEC, EJ3, ENF, VCN, VW2—fresh, VWS—fresh; major riblets vague to absent on last whorl] and race *diminuta* (C.B.A.) [EEC, ENF, KC1—fresh, KF—fresh, KH—fresh, MM3, MN3, NMV—fresh, VC, VW2—fresh, VWS; ribs distinct].

*H. (Stauroglypta) anthoniana* (C.B.A.), ground to deep-in-rocks, incl. typical [NM2, NMV] and paedogenetoid form *invasa* (Pfr.) + *boothiana* auct. [KHWa, ML2, MM, MN, NM, VCmd, VW, WSF, WC1, WWF]. *H. peraffinis* (C.B.A.), mainly ground, also under rocks, incl. typical [ENF, KCC, KF, KH,

ML2, MM3-4, MN3b, VCM, VF, VW1, WSF, WC, WW] and more elevated form (*spretta* auct.) [KCC, KHS, MM3a, VC, WC2, WWF].

*H. (s.s.) similis* (C.B.A.) [EBL, EJF, EJG, ENF]; subsp. *ambigua* (C.B.A.) [EE]. *H. hollandi* (C.B.A.) [ML1, MM1-3]. *H. arboreoides* (C.B.A.), incl. typical [EBL-dead, EJ1-3] and smaller form [KF, KHS-dead]. *H. simplex* (Pils. & Br.) [MM3a-dead, MM4, MN2-3; often rimate]. *H. osculans* (C.B.A.) [NM2; the only lamellate species]. All species on ground and under rocks, most frequently in disturbed places.

*Proserpinula infortunata* (Bland), ground [KH, ML2, MM2-4, MN3, NM2, VCMb, VF, VW2, VWS, WV]; subsp. *proserpinula* (Pfr.), ground [NM2b (one shell), WSF, WC1; without lamina but with deeper suture and more cylindrical whorls than *discoidea*]. *P. discoidea* (C.B.A.), ground [EJF, MN1-dead, VW2-dead, VWS]. *P. margaritella* Pils. & Br., ground [MN1, 3ac].

*Sagda (Parahelix) epistylioides* (Fér.), deep-in-rocks [WSF; shape extremes  $18.4 \times 111$  (20.4 mm.),  $9\frac{1}{4}$  wh.,  $16.7 \times 141$  (23.6 mm.), 9 wh.]. *S. connectans* (C.B.A.), deep-in-rocks, incl. typical [NMV, NM2a;  $18.1 \times 141$  (25.5 mm.),  $9\frac{1}{4}$  wh.] and paedogenetoid race [MN2-3;  $11.5 \times 154$  (17.7 mm.),  $7\frac{3}{4}$  wh.]; subsp. *catadupae* H.B.B., deep-in-rocks [VW2]. *S. occidentalis* H.B.B., deep-in-rocks [WC2-dead, WWC-dead, WWF]. *S. jayana* (C.B.A.), deep-in-rocks [KF most depressed,  $18.3 \times 138$  (25.3 mm.),  $8\frac{1}{4}$  wh.; KH incl. highest,  $18.8 \times 106$  (20 mm.),  $9\frac{1}{4}$  wh.]. *S. adamsiana* Pils. & Br., deep-in-rocks, incl. typical [MM, MN; shape extremes MM3)  $25 \times 100$  (25 mm.), 10 wh.,  $24.5 \times 106$  (26 mm.), 10 wh., and  $18.5 \times 135$  (25 mm.),  $8\frac{1}{2}$  wh.; paedogenetoid and most depressed at edges of woods and along fences] and race with double columellar lamella (like in *jayana*) [MM3 (rare), ML]. *S. montegoensis* Pils. & Br., ground and under rocks [VCMb; VF usually larger,  $20.5 \times 114$  (23.8 mm.), 9 wh.]. *S. spei* Pils. & Br., under rocks on hillsides [WC1, WC2-dead]; subsp. *portlandensis* H.B.B., under rocks [EEJ, EJ1, 3b]. *S. anodon* Pils. & Br., bases of and under rocks, flood-plain at base of hills [KC2, KCC-dead]. *S. grandis* Pils. & Br., deep-in-rocks [NMM, NM2, NMV; shape extremes  $27.8 \times 113$  (31.5 mm.),

9½ wh., 32.4 × 89 (28.7 mm.), 11¼ wh.]. *S. maxima* Simps., deep-in-rocks [WV; 26.6 × 113 (30.1 mm.), 9 wh.]; subsp. *jacobensis* H.B.B., deep-in-rocks, incl. typical [VF] and paedogenetoid race [VW1; 22.4 × 120 (26.8 mm.), 7½ wh.]. Most of the species of *Sagda* vary greatly in relative height and may attain sexual maturity when only half grown.

*Sagda* (s.s.) *kingswoodi* H.B.B., ground [WC2–dead]. *S. pila* (C.B.A.) [VW2–dead]. *S. triptycha* (Pfr.), rock-bases, edges of woods, incl. typical [NMV–dead; 13.2 × 115 (15.1 mm.), 5¼ wh.] and dwarf race [NM2, NMT–dead; 10.0 × 108 (10.8 mm.), 5½ wh.]. *S. foremaniana* (C.B.A.), rock-fences [MN3]. *S. cookiana* (Gm.), bases of and under rocks, open rock-slides [KHW].

*Zaphysema* (*Meiophysema*) *lamelliferum* (C.B.A.), fair climber [EBL–fresh, EEJ, EJ; shell hirsute, lamina inconstant].

*Z.* (s.s.) *macmurrayi* (C.B.A.), deep-in-rocks, [MM4, MN3–fresh, VW2–dead]. *Z. tunicatum* (C.B.A.), fair climber, incl. typical [MN3, NM; hairs not developed on last shell whorl; mantle-edge orange red], small dark race [KHW] and small yellowish race [VW2; mantle-edge orange]. *Z. olivaceum* H.B.B., good rapid climber [EEJ, EJ1, EJ2–3–dead]. *Z. bud-dianum* (C.B.A.), aestivates on ground [VF, VW1, WV, WWF; shell hirsute; mantle-edge spotted with orange]. *Z. mundum* (C.B.A.) (+ *tenerrima* auct.), good climber [M; shell hirsute, usually even on last whorl; mantle-edge reddish].

*Thysanophora* (*Lyroconus*) *plagiptycha* (Sh.), leaf-arboreal [EEC, MM3]. Apparently the only group of Thysanophorinae in Jamaica.

*Pleurodonte* (*Lucerna*) *lucerna* (Müll.), mainly ground, incl. typical race [WWC, small coastal subfossils], *fuscolabris* (C.B.A.) appr. *lucerna* [WC2], *fuscolabris* [WWF, WC1, VC–dead], *fuscolabris* slightly appr. *goniasmos* [WSF] and *fuscolabris* appr. *nobilis* [VF]. Subsp. *patina* (C.B.A.), mainly rock-bases, incl. *nobilis* (C.B.A.) appr. *fuscolabris* [WV, VW1], *nobilis* appr. *goniasmos* [VW2] and race near *nobilis* [NMV; typical color and tan-and-white shells, mainly with obsolescent carinae]. Subsp. *goniasmos* (Pils.), ground and rock-bases, incl.

Balaclava race [NM excl. NMV; superficially like Fér. (Hist.: pl. 57, f. 1) but with reduced teeth], more typical stocks [MN, ML1] and *goniasmos* appr. *sublucerna* [MM2-4; MM4 with many high turbinate shells]. Subsp. *semperfluens* Pils. & Br. (= *abnormis* Pfr.?), rock-bases, incl. large race [KH] and topotypes [KF]. Subsp. *sublucerna* (Pils.), ground, incl. large race [KC1, size of *semperfluens*] and typical [KCC]. Subsp. *acuta* (Lam.) + *lamarckii* (Fér.), weak climber, incl. typical *acuta* [ENF, EJ3], *acuta* but often smaller, weakly carinate, with large percentage of broadly rimate shells (as in next two from same region) [EEJ] and race *heteroclites* (Lam.) + *lamarckii*, var. a, the smaller coastal and hilltop race [EJ2-dead; EEC-dead, rimate]. *P. chemnitziana* (Pfr.), weak climber on rocks, incl. typical and rimate forms [EJF], small form [EJ1], a very variable series [EEJ] and Blue Mts. race [EBL; epidermis largely eroded and peristome widely adnate below]. *P. ingens* (C.B.A.), fair rock-climber, incl. mixed *ingens* and *imperfurata* (C.B.A.) [EJ2-dead, EJ1, 3], and lot also containing *indigna* (C.B.A.) [EEJ]. *P. bainbridgei* (Pfr.), deep-in-rocks, incl. typical stock [NMV] and Mandeville race [MM, MN; smallest (diam. 43 mm.) from MM2 and albinos from MN3].

*P. (Dentellaria) peracutissima* (C.B.A.), fair climber, incl. typical race [ML1-fresh, MM3-4 (light periphery), MN2-3, NMM-fresh, NMT], grading into f. *martiniana* (Pfr.) [MN1] and broadly rimate race of *cara* size [NMV-fresh]. *P. cara* (C.B.A.), incl. 4-toothed, almost imperforate, more granulate stock [NM2a-fresh] and 4-toothed, rimate shell [NMM]; subsp. *catadupae* H.B.B., arboreal [VW2]. *P. soror* (Fér.) appr. *peracuta* Vendyes but with 2 outer teeth scarcely joined [WSF-fresh; like Chemn. II: pl. 78, f. 3, 4]. *P. tridentina* (Fér.) with f. *browneana* (Pfr.), subarboreal [WC]; same with white radial zigzags [WC2, WWC]; appr. subsp. *chittyana* (C.B.A.), subarboreal [WWF]; subsp. *schroeteriana* (Pfr.), under rock [WV]. *P. pallescens* (C.B.A.) [NMT-fresh, NMV-fresh]. *P. anomala* (Pfr.), weak climber, incl. typical [MM2-3, MN3, NMM, NM2ab] and race "convexa" (C.B.A., preoc.) [NMM, NM1, 2c, NMV-dead]. *P. invalida* (C.B.A.), under rocks [KF and subfossil from KC2, KCC]; subsp. *simson* (Pfr.) [KHWa, KC1-

dead]; subsp. *consanguinea* (C.B.A.) + *sinuosa* (Fér. not Gmelin), fair climber [EJ2-3, EJF, KHS-subfossil, KHwB-dead]. *P. sinuata* (Müll.), weak climber, incl. big [MN3, NM excl. NMT; diam. 31.4 mm.] and smaller shells [MM3, MN1, NMT, VW2 and dead from VCM, WSF, WWF]. *P. okeniana* (Pfr.), rock-bases, incl. f. *fortis* (C.B.A.) [VW1-fresh; dark-colored, superficially like *sloaneana*] and typical lighter shells [WV; more like *atavus*]. *P. atavus* (Pfr.), rock-bases [WW]. *P. sloaneana* (Pfr.) with f. *vendryesi* (Ckll.), good climber [VCM, VF, VW]. *P. valida* (C.B.A.), good climber, incl. smallish stock [ENF], typical [EJ, EBL], intergrading with small dark globose shells [EEJ, 19 × 140 (27mm.)] and small depressed form [EEC, 15.5 × 190 (29 mm.)]. *P. strangulata* (C.B.A.), rock-bases near hilltops [EEJ, EJ3-dead].

*Polydontes (Thelidomus) asper* (Fér.), arboreal, incl. typical [KHw, M, NM, VF-dead, VW2-dead], paedogenetoid race [WC1, 25 × 39 mm., 3¼ wh.] and appr. *cognatus* [WV, WWF]; subsp. *cognatus* (Fér.), subarboreal [WWC].

*P. (Eurycratera) jamaicensis* (Gm.), deep-in-rocks (KHw-fresh, ML1, MM3-4, NM1-2-dead, VW2, WV-dead, WSF-fresh).

*Cepolis (Dialeuca) nemoraloides* (C.B.A.), arboreal [ML1, MM2-4, MN2]. *C. conspersula* (Pfr.), arboreal [MN1, 3, NMV]; subsp. *fuscocincta* (C.B.A.), subarboreal [NM2]; subsp. *negrilensis* H.B.B., arboreal [WC1, WWC]. *C. subconica* (C.B.A.), arboreal [EE, EJ2-3, ENF, KF, KHS-dead, KHw, ML1 (juvenile?); many color forms incl. *pulchrior* (C.B.A.)].

*C. (Hemitrochus) graminicola* (C.B.A.), arboreal [KC1-fresh, MM2-3].

*Bulimulus guadalupensis* (Brug.), weak climber, near cultivation [MM1, 3, NM2a; said to have been introduced into Mandeville a few years before; now becoming a garden pest]. *Drymaeus immaculatus* (C.B.A.), arboreal [KC1-dead, KCC-dead, MM3, MN-dead]. *Oxystyla undata* (Brug.) [MM3c-dead] and var. *jamaicensis* Pils., arboreal, especially on cacti [KC, KF].

*Microceramus gossei* (Pfr.), rock-faces with slight shade [MM, WWF].

*Spirostemma dunkeri* (Pfr.), ground at rock-bases [MN3a]. *S. ipswichense* Pils., very weak rock-climber [VWS]. *S. inusi-*

*tatum* (Vend.), rock-bases [ENF]. *S. cognatum* (Vend.), rock-bases [EEJb, EBL (?)]. *S. tenellum* (C.B.A.), rock-bases [VC]; subsp. *tenerum* (C.B.A.), near rock-bases [MM3a, VW2-dead]. *S. mandevillense* Pils. & Br. [MN3bc-dead].

*Anoma gracilis* (C.B.A.), arboreal [ML]. *A. tessellata cinerea* (C.B.A.) [VW2-dead]. *A. levis concinna* (C.B.A.) [ML1-dead]. *A. splendens* (Pfr.), arboreal [MM3-4, MN3, typical and f. *citrina* (C.B.A.); MN1, f. *rosealabris* (Ch.) and *albida* (C.B.A.)]; var. *medinae* H.B.B. [NMM, *splendens*, *citrina* and *albida* colors]. *A. striata* (C.B.A.), fair climber but aestivating on ground [NM2]; subsp. *corpulenta* (C.B.A.) [NMV-dead]. *A. nigrescens* (C.B.A.), arboreal [EEJ, typical, f. *rufilabris* (C.B.A.) and f. *leucostoma* Pils. (on same tree!); EJ1, *nigrescens*, *leucostoma* and *quadricolor* patterns]; subsp. *quadricolor* (Ch.), arboreal [EJ2, typical coloration only]; subsp. *levior* H.B.B., arboreal, [EJ3, *quadricolor*, *leucostoma* and *nigrescens* patterns; EJF, ENF-dead, all *leucostoma*].

*Urocoptis (Spirocoptis) lata* (C.B.A.), under rocks, incl. typical [EJ2-3, EJF] and f. *antonionis* Pils. [EEJ, EJF, ENF]; subsp. *manchionealensis* Pils. [EEC]. *U. sanguinea* (Pfr.), under rocks, incl. typical (KF, KHS) and race *cerina* (C.B.A.) [KHW]. *U. megacheila* (Ch.) and appr. *amethystina* (Ch.), under rocks [WWF].

*U. (s.s.) brevis* (Pfr.), fair climber even on trees, incl. typical and f. *obesa* (C.B.A.) [KC2], mainly f. *columna* (C.B.A.) [KC1] and race *abbreviata* (Desh.) [KCC]. *U. gravesii* (C.B.A.), rock-bases [VC]. *U. procera* (C.B.A.), rock-bases [ML1]. *U. dubia* (Ch.), under rocks [VF, VW1]. *U. ambigua* (C.B.A.), under rocks and rarely rock-bases, incl. typical [MM, MN1, 3], appr. *procera* [MN2], appr. *fortis* [MN1], appr. *elizabethensis* Pils. & Jarv. [NM2a, NMV] and appr. *medinae* [NM2b]; subsp. *magna* (C.B.A.), under rocks, incl. typical [NM2, NMV; and f. *fortis* (C.B.A.) [NM2b]; subsp. *medinae* H.B.B. [NMM]. *U. cylindrus* (Dillw.), under rocks, incl. small [WSF] and large [VW2] races. *U. zonata* (C.B.A.), under rocks [WV]. *U. nobilior* (C.B.A.), cliff-bases [KHW].

*U. (Bactrocoptis) rosea* (Pfr.), rock-bases and very weak climber [MM3, NM1-2, NMV]; subsp. *striata* (Ch.), rock-bases

[WSF]. *U. hollandi* (C.B.A.) [NM2, VW2, dead]. *U. pupaeformis* (C.B.A.) [NMMV-dead].

*Brachypodella* (*Geoscala*) *seminuda* (C.B.A.), rock-bases and weak climber [KC2, KF, KH, ML2]. *B. costulata* (C.B.A.), rock-bases, [ML2, MN3, NMM, VW1-2]; subsp. *savlamari* H.B.B., rock-bases and under [WC1, WWF-dead]. *B. robertsi* (C.B.A.), rock-bases [VC].

*B. (Simplicervix) inornata* (C.B.A.) [MM3, NMM, VCMb; dead].

*B. (Mychostoma) pearmanaeana* (Ch.), damp shady rock-races [WWF]. *B. alba* (C.B.A.), damp shady rock-faces, incl. quite typical [VWS], race *striata* Pils. [VCMb], race *minima* Pils. [ENF], race *eos* Pils. [EEJ, EJ3, EJF], race near *occidentalis* Pils. [NMMV] and race *striatula* (C.B.A.) [EEJ, EJ1].

*B. (Apoma) chemnitziana* (Fér.), fair climber even on trees [KH]. *B. gracilis* (Wood), rock-races with slight shade [ML1, MM2-3, MN1, 3, NMM, NM2, VW2].

## YOUNG STAGES OF DISCUS ALTERNATUS

CHARLES H. BLAKE

The young of our land snails are rarely described, and in the case of *Discus* (*Anguispira*) *alternatus*, I was desirous of being able to distinguish it from *D. cronkhitei* var. *catskillensis* with which it is often associated. A long series of each collected at Randolph, N. H., in late August, 1933 gave the information. The four figures given were drawn with a camera lucida to the same scale. The spirals at the left represent the embryonic whorls from above. While, at a glance, the specimens are similar, they



Fig. A. *Discus* (*Anguispira*) *alternatus* of 3 whorls. Fig. B. *D. cronkhitei* var. *catskillensis* of 3½ whorls.

differ in almost every detail, but especially in the aperture. The radial ribs of *alternatus* are somewhat irregular. The colored bands each cover the space of about two ribs and begin about one and a half whorls from the origin (extreme apex of nucleus), the ribs beginning at about the same point. The nucleus itself is covered with fine, close-set, decussating wrinkles. The umbilicus is narrower in *D. alternatus*. A specimen of 8½ mm. diam. is flatter, especially on the lower face, and in one of 17 mm. the angulation of the outer whorl has largely disappeared.

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### SOME NUDIBRANCHS OF BERMUDA, WITH A DESCRIPTION OF A NEW SPECIES<sup>1</sup>

BY HENRY D. RUSSELL

While collecting at low tide along the shore of Ferry Reach in front of the Bermuda Biological Station on March 10, 1934, I found an undescribed species of *Glossodoris* (Ehrenberg), which I have named *clenchi*, after Mr. W. J. Clench, Curator of Mollusks in the Museum of Comparative Zoölogy, Harvard University. I take this opportunity to thank Dr. Wheeler, director of the Bermuda Biological Station, for his kind assistance during my work at the Laboratory.

GLOSSODORIS CLENCHI, n. sp. Pl. 4, figs. A-E.

The description of the new species is as follows: Body, depressed (9 mm. long, 3 mm. wide, and 1.5 mm. thick), mantle, elongated, thickened at the edges and bluntly rounded at both ends, the posterior end slightly narrower than the anterior end; surface smooth, edges approximately parallel, except for a slight narrowing in the region of the rhinophores, behind which its outline is somewhat sinuous. The margin bears a colored band, the outer edge of which is a thin red line, the inner portion being a much broader opaque-white line. This band extends entirely around the mantle. The dorsal surface of the mantle is brick red in color and is ornamented with four opaque-white areas and fifteen light-blue spots. Of the four areas, the two anterior constitute a pair, each having a much elongated elliptic outline, which at its anterior end surrounds the base of a rhinophore; but the two remaining areas occupy a median position in the space

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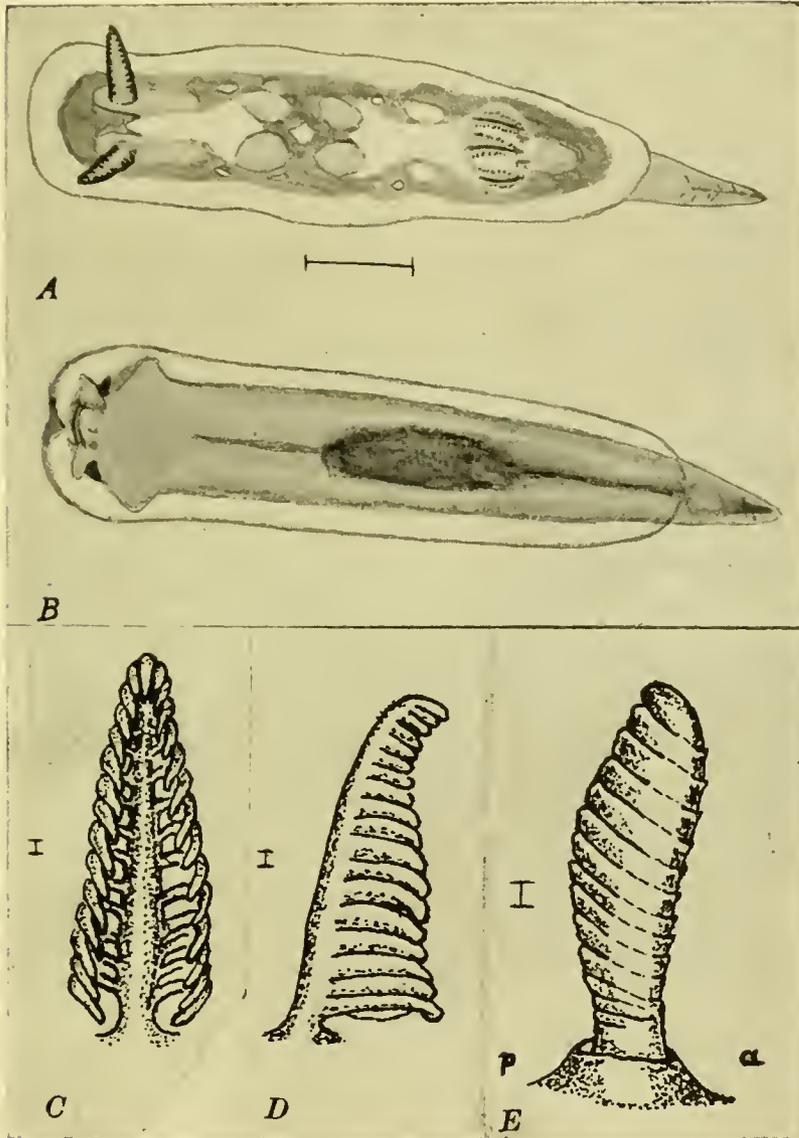
<sup>1</sup> Contributions from the Bermuda Biological Station for Research, Inc.

between the rhinophores and the branchae. The anterior one, which bears some resemblance to a clove, is located in the forward third of this space while the posterior one, suggesting a longitudinal section of a metatarsal bone of man, occupies the hinder third of this space. Of the light-blue spots, three pairs are relatively large, two pairs (largest of all) occupying the most of the middle third of the space between rhinophores and branchiae, the third pair lying on the outer side of the "metatarsal" area. Of the nine remaining spots, one is equidistant from each of the four largest blue spots; the other eight are arranged in pairs in more lateral positions. Rhinophores, deep purple, conical, sharply pointed and retractile within sheaths, each bearing 14 lamellae. Branchiae, seven in number, simply pinnate, opaque-white, with a deep purple line running down the center of each. The anterior and lateral five are larger than the posterior two which are very small. They may be retracted within a cavity. The anus occupies a projection arising from their center. Head, small, about one half the width of the mantle, faintly pink and bearing two short, slightly flattened, conical, bluntly pointed tentacles. The mouth is slit-like. Foot, which is narrower than the mantle and projects beyond it only with its sharply pointed tip, is about five times as long as wide and straight edged, anterior end well rounded, with short, blunt, projecting anterior angles. It is nearly opaque white, though the blackish-brown visceral mass shows through it. The dorsal surface of the posterior end of the foot is tinged with purple, deepest at the tip and fading rapidly laterally and anteriorly till it merges into opaque white as it passes beneath the edge of the mantle.

Since there is only one specimen which is very small it was thought better to forego the examination of the radula, rather than dissect the mollusk.

Remarks.—This nudibranch was found under a coral rock about a foot beneath low-tide mark and was accompanied by *Eupolytnia magnifica*, *Hermodice carunculata*, planarians, and brittle stars. It was quiet, apparently neither feeding nor laying eggs, in water the temperature of which was 62° F.

The animal is hardy; it lived for three weeks in tanks both in the laboratory of the Biological Station and in the Harvard Biological Institute; and it survived, with no apparent ill effects, the trip from Bermuda to Cambridge in a bottle of sea water. In the Biological Institute it was kept in aerated sea water at room temperature, but finally died, probably from lack of food.



*Glossodoris clenchi* Russell

A, B, dorsal and ventral views of body. C, D, anal gill in posterior and lateral views. E, lateral view of rhinophore, right side.



This species is entirely distinct from any known *Glossodoris* both in size and color pattern, which is so striking that it should not be confused with any species hitherto described. It is, however, very definitely a *Glossodoris*, as shown by the elongated, thick, smooth mantle, narrowing in the region of the laminated and sheathed rhinophores, by the projection of the posterior portion of the foot beyond the mantle, by the small head, and the simply pinnate branchiae, which are few in number and retractile, like the rhinophores, into cavities. *Glossodoris roseopicta* Verrill is closely allied to this new species, but differs from it chiefly by much greater size, tuberculated mantle, more numerous branchiae and the bluish ground-color of its mantle. *Glossodoris zebra* Heilprin is another allied species, but differs from *Glossodoris clenchi* in that it is much larger, with more numerous branchiae, and a dark purple-blue ground color. The type specimen is at the Museum of Comparative Zoölogy, Harvard, No. 109085.

*FACELINA AGARI* (Smallwood).—On March 10, 1934, a specimen of *Facelina agari* was taken with *Glossodoris clenchi* under a coral rock in front of the Laboratory of the Bermuda Biological Station. At that time, it was laying eggs. It ceased laying when captured and did not lay in captivity.

The egg mass had the form of a whitish cord about 1.6 mm. in diameter, coiled in a flat spiral of approximately three turns, which was attached by one face to the under side of the rock. The cord consisted of a clear gelatinous material of uniform diameter, in which the whitish eggs were imbedded; these were grouped, at fairly regular intervals, in regions containing a large number of eggs alternating with narrower regions containing fewer eggs.

*Facelina agari* is a hardy species, for it survived equally well with *Glossodoris clenchi*, identical vicissitudes both in Bermuda and Cambridge, Mass.

A peculiarity of the progression of this animal in life is interesting to note. Unlike the steady motion of most nudibranchs, this species moves forward in little jerks, causing the cerata to wave abruptly first to one side and then the other, as it zigzags its way over the bottom.

## THE FIFTH ANNUAL MEETING OF THE AMERICAN MALACOLOGICAL UNION

The American Malacological Union held its Fifth Annual Meeting in the Buffalo Museum of Science, Buffalo, New York, on Thursday, Friday and Saturday, June 27, 28 and 29, 1935. Calvin Goodrich, vice-president of the Union, presided at all sessions in the absence of the president, William J. Clench, who was on an expedition to the Bahamas. Addresses of welcome were given by Chauncey J. Hamlin, president of the Buffalo Society of Natural Sciences, and John E. Andrews, president of the Conchological Section of the Society, responded to by Mrs. Ida S. Oldroyd, honorary president of the Union.

The following papers were read: Thursday afternoon, "Pteropoda" by Joshua L. Baily, Jr.; "Collecting in Guatemala" by Henry Vander Schalie. Thursday evening, "Methods of Dispersal of Mollusks" by Junius Henderson. Friday morning, "Conchology in Buffalo" by Carlos E. Cummings, Director of the Museum; "The Development of Spines in *Melania setosa*" by Calvin Goodrich; "Some of the Difficulties Encountered by Commercial Oyster Growers of the Pacific Coast" by C. Austin Barker; "Collecting Snails in Utah" by Elmer G. Berry; "Fossil Non-Marine Mollusks of North America" by Junius Henderson. Friday afternoon, "Eight Weeks on the Dredge Boat and Its Results" by Ida S. Oldroyd; "A Mollusk New to the Great Basin" by Calvin Goodrich; "Some Land Shell Localities in Illinois" by Frank Collins Baker; "The Beginnings of the American Malacological Union" by Norman W. Lermond. The Annual Dinner was held at Hotel Statler on Friday evening, speakers being John E. Andrews, Junius Henderson and Frank Collins Baker.

Saturday was given over to field trips. East Aurora was visited in the morning, where an hour was spent in collecting in Cazenovia Creek, following a tour of the Roycroft Shops. After luncheon at the Roycroft Inn the party proceeded to Niagara Falls where mollusks were gathered from the rocks at the foot of the American Falls. Crossing the river at Lewiston to the Canadian side, Niagara Glen was visited for collecting before the return to Buffalo.

The Council for the ensuing year consists of the following: Mrs. Ida S. Oldroyd, honorary president; Calvin Goodrich, president; Joshua L. Baily, Jr., vice-president; Norman W. Lermond, corresponding secretary; Imogene C. Robertson, financial secretary; Henry A. Pilsbry, Paul Bartsch, William J. Clench, Junius Henderson.

At the business meeting held on Thursday evening a resolution was passed that the Union petition the New York State Museum to hasten if possible the publication of the work by Dr. Henry A. Pilsbry on the New York State Mollusca, the manuscript of which was completed some years ago. It is much needed.

Capt. W. A. Read's invitation to hold the meeting for 1936 in St. Petersburg, Florida, was accepted with pleasant anticipations. Invitations to Ann Arbor for 1937 and San Diego for 1938 have been received with thanks and tentatively accepted.

A more detailed account of the meeting with list of members has been printed separately and may be obtained free of charge from the financial secretary, Mrs. Imogene C. Robertson, Buffalo Museum of Science, Buffalo, New York.

IMOGENE C. ROBERTSON,  
*Financial Secretary.*

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### WARREN H. ESHNAUR

The Conchological Club of Southern California, sustained a severe loss in the passing on January 10, 1935, of Mr. Warren H. Eshnaur at his home in Bellflower, California.

Mr. Eshnaur was in his 75th year, having been born in June, 1860, at Hannibal, Mo. He brought his family to Terminal Island near San Pedro in 1903, and he and his wife were active members of the group of collectors who lived in this vicinity and brought so many species to light before harbor improvements interfered with the collecting. Mr. Eshnaur was a railroad engineer for a great many years but retired about 15 years before his death. After his retirement he made his home in Bellflower, but made eight trips to Florida, and one to Canada which added many species to an already large collection.

As the Conchological Club of Southern California was originally composed of ladies only, Mr. Eshnaur did not become a

member until February, 1923, although he had long been known for his kindly assistance to younger collectors. He is survived by his widow, equally well known as a conchologist, by one son and three grandchildren.

C. M. GAY, *Secretary*.

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## NOTES AND NEWS

EXACT DATES OF THE NAUTILUS.—Volume 48 (1): pp. 1–36, pl. 1, was mailed July 10, 1934; (2): 37–72, pl. 2, Oct. 15, 1934; (3): 73–108, pls. 3, 4, Jan. 19, 1935; (4): 109–144 (+ 8), pls. 5–9, April 24, 1935.—H. B. B.

STAGNICOLA ELRODIANA, NEW NAME FOR *Limnaea montana* ELROD.—In the course of looking up names of European Planorbidae the name *Limnaea montana* Bouguignat (in Servain, Bull. Soc. Malac. Fr., V, 1888, p. 296) was observed. As this name antedates *Limnaea (Stagnicola) montana* Elrod (NAUTILUS, XV, p. 111, 1901) the American species may be called *Stagnicola elrodiana*.—FRANK C. BAKER.

ARCA BARBATA Linn.—On a recent collecting trip to Poponessett Beach, 4 miles southwest of Cotuit, Massachusetts, I found a living specimen of *Arca barbata* L. among a large number of *Modiolus demissus plicatulus* Lam. that were attached to a big chunk of peat which was lying slightly above the low tide level. Johnson, in his recent list, gives North Carolina as the northern limit for this species. This same limit is given by P. G. Sheldon in his "Atlantic Slope Areas." It is hardly conceivable that a piece of peat could have floated from the region of the Carolinas as far as Cape Cod. This record, then, extends the range of the species several hundred miles northward.—R. FOSTER.

MOLLUSKS AND THE MISSOURI RIVER.—So far as I know, a curious and misleading mistake of W. G. Binney's has never been rectified. In his Bibliography of North American Conchology, 1863, pp. 406–407, he cites Cooper's list of mollusks collected by Schoolcraft, published as an appendix to Schoolcraft's report, and repeats the list, with localities. Unfortunately he makes the

title of Schoolcraft's book read "Narrative of an expedition through the Upper Missouri to Itasca Lake," etc., instead of "through the Upper Mississippi," and gives "Upper Missouri" as the locality of all species reported by Cooper from the "Upper Mississippi."

Most of the species so listed are Unionidae. Though many species of this family have been reported from tributaries of the Missouri, especially the Big Sioux and streams of eastern Nebraska, I do not know of any from the Missouri itself, except two or three species above Great Falls, Montana, where conditions are different from those below. Many years ago Bartsch (THE NAUTILUS, XXX, 92, 1916, citing a previous paper in Science) stated that the Missouri formed an effectual barrier to Unionidae, because of the great amount of sediment carried by the water. Over, in his report on the Mollusca of South Dakota (THE NAUTILUS, XXIX, 80, 1915), said that "owing to the velocity of the current and the rapid deposition of sediment, no shell-life exists in the Missouri River."—JUNIUS HENDERSON.

CORYPHELLA PELLUCIDA Alder & Hancock.—While collecting recently at Nahant, Mass., March 16, 1935, five specimens of the above species were taken. They ranged in size from  $\frac{1}{4}$  to  $\frac{7}{8}$  inches, the last given as the adult size by the above authors. This is an addition to our North American nudibranch fauna as it has not been reported before from our shores. This is probably due to the confusion of its external characters with those of *Coryphella rufibranchialis* Johnston, to which it is closely allied. It can be distinguished from *C. rufibranchialis*, however, by its smaller size,  $\frac{7}{8}$  inch, as opposed to  $1\frac{1}{8}$  inches for *C. rufibranchialis*; the much more pellucid body as opposed to the opaque white of this latter species; the longer recurved anterior angles of the foot; the definite cerise color of the cerata in contrast to the orange-red color of *C. rufibranchialis*; the definite white tip of the cerata, while those of *C. rufibranchialis* bear an equally definite opaque white annulation at their tip. The proportionate length of the adult cerata to the body length in *C. pellucida* is not more than 4:1, and in *C. rufibranchialis* it is approximately 3:1. Finally, the width of the foot in proportion to its length is greater in *C. pellucida* than in *C. rufibranchialis* which is far more attenu-

ated and possesses a long sharply pointed tail extending well beyond the last posterior cerata.—H. D. RUSSELL.

A SPECIES OF GONIOBASIS NEW TO THE GREAT BASIN.—Dr. Carl L. Hubbs of the University of Michigan, while engaged in 1934 in a study of the fishes of interior drainages, collected *Goniobasis* in two springs of Long Valley, Washoe County, Nevada. The quaternary lake that occupied this valley appears to have been independent of Lake Lahontan, and there is at present no clear geological indications of former connection with any other body of water. Faunistically, however, the *Goniobasis* points to links either with the Columbia River at the north or with Pitt River to the west. The shells have been compared with the types of *G. newberryi* Lea in the United States National Museum. There is no difference between the two forms except in the unimportant matter of color bands, *newberryi* being banded and the Nevada shells lacking that character. *G. newberryi* came from the Des Chutes River of the Columbia. As Pilsbry directed attention in 1899, *newberryi*, *bulbosa* Gould and *nigrina* Lea are the same to all intents and purposes, *nigrina* being “characteristic of the Sacramento,” of which Pitt River is a tributary. The radulae of the Long Valley specimens are peculiar in that the inner marginals have only three denticles while those of the outer marginals are reduced to seven or eight. This seems to be an effect of the depauperization to which the shell has also been subjected.—CALVIN GOODRICH.

LIOPLAX PILSBRYI CHOCTAWHATCHENSIS, n. subsp.—Shell smaller than typical *L. pilsbryi* Wkr., imperforate, ovate, sculptured with sigmoid growth lines and coarse, close, undulating spirals. Light green with sigmoid black growth-rest lines. Apex truncated by erosion, about 3 whorls of the high, conic spire remaining; suture deep; periphery rounded. Aperture rounded, bluish within; lip sharp, black-edged, sigmoid; parietal callus strong and black-edged. Alt. 16 mm., diam. 10.5 mm.; aperture 8.5 × 7 mm. Type 162240 A.N.S.P., from Horseshoe Lake, Choctawhatchee River, Washington Co, Florida, coll. by D. B. Gillis, Oct., 1933, presented by T. Van Hyning.

This variety is distinguished from the typical form by being smaller, but with similar sculpture. It is about the size of *L.*

*subcarinata* Say, but is without the two spiral angles on the last whorl. It is smaller than *L. s. occidentalis* Pils. *L. cyclostomati-formis* Lea is narrower and smoother.—E. G. VANATTA.

THE STATUS OF *Geotrochus* VAN HASSELT.—This genus was proposed for Javan shells defined by having the shell resembling *Trochus* in shape, while the animal resembles the “Colimaçons” (land snails). Four species were mentioned but none described. The first to be recognized was *Geotrochus zonatus* v. Hasselt, which Professor von Martens (1867, Preuss. Exped. nach Ost-Asien, Zool. Teil, ii, p. 253) placed in the synonymy of “*Trochomorpha*” *conus* (Philippi), having seen an unpublished plate of van Hasselt’s, and received one of his specimens from the Leyden Museum. *Geotrochus* has therefore the status of a genus established without species, later a species included by another author (Opinion 46, Int. Commission on Nomencl.) Von Martens’ action validated *Geotrochus* for the species *conus* Phil.

In 1832 Swainson proposed the same name, *Geotrochus*, for *Helix pileus* Müller (Zool. Illustr. second ser., ii, pl. 91), evidently in ignorance of van Hasselt’s use of that term 9 years earlier. Beck accepted Swainson’s genus, but erroneously added van Hasselt as one of the authorities for it. The name was discussed by von Martens in the work mentioned above, and the references were given by me in Manual Conch. vol. 7, p. 3, under the genus *Papuina*. The synonymy will stand thus:

#### GEOTROCHUS Van Hasselt.

*Geotrochus* Van Hasselt, 1823, Allgem. Konst-en-letterbode, p. 233. Von Martens, Preuss. Exped. nach Ost-Asien, Die Landsehn., p. 253, for *G. zonatus* v. Hasselt = *Helix conus* Phil., here accepted as type.

*Chiroktisma* Gude, Proc. Malac. Soc. Lond. vol. 10, p. 390, type *Helix conus* Phil.

#### PAPUINA v. Martens.

*Papuina* v. Martens, 1860, Die Heliceen, p. 166, type *Helix lituus* Lesson.

*Geotrochus* Swainson, 1832, Zool. Ill. (2) ii, pl. 91, mt. *Helix pileus* Chemn. Not of Van Hasselt.—H. A. PILSBRY.

ASHMUNELLA METAMORPHOSA Pilsbry, Proc. A. N. S. Phila. 1905, p. 252, from Barfoot Park, Chiricahua Mountains, is a shell

very similar to *A. esuritor*, but described as distinct on account of supposed differences in the genitalia. A new examination of the original preparation (88885 alc. coll. A.N.S.) shows that these were due to a stupid mistake; the part described as vagina (*vag.* in my pl. 21, f. 27) is really the penis and lower part of epiphallus, on which the penial retractor is inserted at the lower bend in said figure. This correction does away with the differences from *Ashmunella esuritor* Pils. As the small differences in the shells are doubtless merely individual, *A. metamorphosa* will become a synonym of *A. esuritor*.—PILSBRY.

LIGUUS FASCIATUS CARIBAEUS, new species. Plate 3, fig. 3.—Shell large, rather solid and somewhat dull, whorls  $7\frac{1}{2}$ –8, rather convex. Color: ground color of early whorls pinkish, followed by pinkish gray, changing to yellowish and finally to a deep burnt orange on the body whorl. Early whorls axially flamed with irregular bluish grey bars. Peripheral band (1–1½ mm.) brown-orange, usually margined above and below by narrow bands of white. Above the white band there is a blackish brown band, usually *very irregular* in width. Bands of similar color are to be found immediately above and below the suture. Below the peripheral band a much narrower band occurs, sometimes wanting or only appearing irregularly. Columella white, usually margined by a 3–4 mm. band of brown, then a much narrower whitish band. Parietal wall glazed white, margined with either pink or brown. Periostracal green lines absent in the present type series. Columella generally irregular and uneven, not smooth as is usually found in this genus.

*Holotype*.—(56 × 25.4 mm.) Mus. Comp. Zoöl., no. 109050, Monte Dios, Santa Lucia, north coast of Pinar del Rio, Cuba. (Received from C. G. Aguayo and M. L. Jaume).

This is a very distinctive color race, differing sharply by reason of its color and irregular supra- and infra-peripheral bands. Generally, the spiral bands on *Liguus* are constant, increasing gradually in width with the growth of the shell. The present form exhibits much irregularity in this respect, with this band (as well as the sutural bands) suddenly becoming wider or narrower, generally at or near the seasonal rest lines.—W. J. CLENCH.

LYMNAEA AURICULARIA L. and FERRISSIA CAURINA (Cooper) IN COLORADO.—*L. auricularia* has hitherto been reported from two Colorado localities, Colorado Springs and south of the Arkansas

River. It has recently appeared in a small lily pond at D. M. N. Andrews' Rockmont Nursery, near Boulder. It is almost certain that the mollusks were introduced with pond lilies obtained from the Woodlake Water Gardens, at Woodlake, California. The lilies are not of a native species, but named horticultural varieties. The *Lymnaea* has been found at several localities in California. As it is likely to spread in Colorado and become a permanent member of the fauna, a record of its appearance at Boulder is made for the benefit of future investigators. On the lily pads there are many specimens of *Ferrissia* that appear to be *F. caurina* (Cooper), a common species in lakes of the Pacific States, occurring, so far as I have observed in collecting it from many lakes and ponds, only on lily pads and stems.—JUNIUS HENDERSON, Boulder, Colorado.

#### PUBLICATIONS RECEIVED

NOTES ON THE ANATOMY OF OREOHELIX, III, WITH DESCRIPTIONS OF NEW SPECIES AND SUBSPECIES. By Henry A. Pilsbry (1934, Proc. Acad. Nat. Sci. Philadelphia 85: 383-410). In this paper, Dr. Pilsbry celebrates the thirtieth birthday of his next-to-youngest genus of the U. S. Helicidae, by clarifying still more of its perplexing shadows. *O. strigosa goniogyra*, *O. s. delicata*, *O. amariradix* and *O. junii* are new, while *O. yavapai cumingsi* and *O. y. clutei* "Ferriss" are vested. The true *Helix cooperi* W.G.B. is shown to be a subspecies of *O. strigosa*, and the name *O. subrudis* (Pfr.) is chosen, as the least of several evils, for the distinct species formerly known as *O. cooperi*. Besides much additional material on the morphology of the many races of these two wide-ranging species, the animals of *O. idahoensis baileyi*, *O. junii*, *O. carinifera* and *O. houghi* are described. A list of the recent and Pleistocene species and subspecies brings all the data up to date.—H. B. B.

ABNORMALITIES IN THE UTERINE YOUNG OF CAMPELOMA RUFUM, A FRESH WATER SNAIL. By Norman T. Mattox. Amer. Midland Nat. 16: 144-152. 1935. 2.7 percent of the uterine young studied were in a twinned or polyvitteline condition. Two dextral young were found within the same membrane on 23 occasions, 1 dextral and 1 sinistral in three, and 3 individuals in one membrane once. Double monsters are described and figured; con-

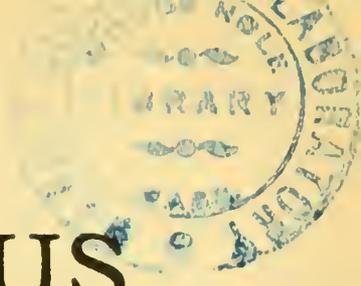
joining of oral surfaces, two-headed individuals and those with foot tissues fused formed 0.67 percent. 2.3 percent possessed abnormal shells; elongate, asymmetrically coiled, flattened, or compressed without coiling were encountered. Mechanical disturbance of the developing embryo has been suggested as the cause of malformation.

NEW MOLLUSKS FROM WEST MEXICO, together with a list of shells collected at Punta Penasco, Sonora, Mexico. By Herbert N. Lowe. Trans. San Diego Soc. N. H. 8: 15-32, 4 plates. Twenty-seven new species and two subspecies described are part of the results of Mr. Lowe's very productive explorations in the Gulf of California and southward, of which he has given some account in NAUTILUS vols. 43 to 48. The figures, by E. H. Quale, are among the best pen drawings of shells we have seen.—P.

FURTHER NOTES ON THE DESERT SNAILS OF RIVERSIDE COUNTY, CALIFORNIA. By George Willitt. Bull. S. Cal. Acad. Sci. 34: 1, 2. *Micrarionta granitensis* and *M. mccoiana* are new species.

NOTES ON A WARTY GROWTH ON THE HEAD OF SOME LAND SNAILS. By Iwao Taki. Journ. of Sci., Hiroshima Univ., vol. 3, pp. 159-183, 5 plates. A growth hitherto unnoticed is found on the heads of snails of the genera *Helicostyla*, *Euhadra*, *Ganesella* and some other east Asiatic genera of the same families. It consists of modified dermal tubercles, and reaches its full growth at sexual maturity. It has no special innervation. Should be looked for in related West Coast genera.—H. A. P.

CATALOGUE OF THE SHELL-BEARING MOLLUSCA collected from the Kesen and Motoyosi Districts, northeastern Honsyu, Japan, immediately after the Sanriku Tunami, March 3, 1933, with descriptions of five new species. By S. Nomura and K. Hatai (Saito Ho-on Kai Museum Research Bulletin No. 5). From a study of the shells cast up by this destructive tidal wave (*tunami*), the authors conclude that the digging and shearing power of the great wave was restricted to the littoral zone down to a depth of 10 meters, more or less. Many living mollusks were thrown up, 240 species being recorded. Two plates illustrate new or interesting forms.—H. A. P.



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## COMPARATIVE STUDIES OF LOESS AND RECENT MOLLUSKS

BY B. SHIMEK

Attempts have been revived in recent years to show that the climate during loess deposition was much colder than at present in the same region. As this contention is based largely upon the land molluscan fauna of this deposit it is important that comparative studies of the fossil and modern forms be made, though it must be remembered that in the final estimate no single species is a criterion, but that the final conclusion must be based on the fauna as a whole.

The notes on the species of this fauna, of which this is the first installment, are based on the writer's very large collections of both fossil and modern forms, the former almost wholly and the latter largely collected by himself during more than half a century, chiefly within our loess region from Indiana to Nebraska and from Minnesota to Louisiana. Throughout, the "fossils" are those from loess.

### POLYGYRA PROFUNDA (Say)

This species now ranges from western New York to Minnesota and Nebraska, and southward to Virginia and Kansas.

The fossils have been found from the southwestern part of Indiana to the eastern counties of Nebraska south of Douglas County, and from the southern third of Iowa to Louisiana. They are locally common in Mississippi, Arkansas, Tennessee, Kentucky and southern Illinois, but are less frequent northwestward.

The species now lives in deep, chiefly upland woods, especially on bluffs, but in northern and western Iowa and eastern Nebraska it extends into smaller prairie groves which suffer from summer drouth, where it is usually much smaller than the type (usually given at about 28 mm. in diameter).

Both fossil and recent forms are very variable in size, as the following table shows.

<i>Locality</i>	<i>No. of spec.</i>	<i>Gr. diam.</i>	<i>Height</i>	<i>No. of whorls</i>
<i>Recent</i>				
St. Louis, Mo. ....	1	32.5 mm.	17.0 mm.	5.5
Cincinnati, O. ....	16	29.5-25.5	17.0-15.0	5.5-5
N. Illinois (2 loc.) ....	19	30.5-25.5	16.5-14.0	5.3-5
N. E. Iowa (3 loc.) ....	26	29.5-21.5	16.0-13.0	5.2-5
Iowa City, Ia. ....	108	28.0-22.5	17.0-13.0	5.5-5
Mason City, Ia. ....	252	25.0-20.0	16.0-11.5	5.1-4.8
Floyd Co., Ia. ....	20	25.5-21.0	14.5-12.5	5.1-5
E. Nebraska (3 loc.) ...	5	25.0-23.0	15.0-14.0	5.2-5
<i>Fossil</i>				
Tunica, La. ....	2	27.0-25.0	14.5-13.0	5.2
Mississippi (3 loc.) ....	313	30.0-23.5	16.5-12.0	5.4-5
Helena, Ark. ....	227	30.0-22.0	16.0-12.5	5.3-5
W. Tennessee, (3 loc.) ...	43	30.0-23.5	17.0-12.5	5.5-4.8
Hickman, Ky. ....	130	33.5-24.0	17.5-13.5	5.5-5.2
New Harmony, Ind. ...	7	27.0-23.0	16.0-13.5	5.5-5.2
Alton, Ill. ....	63	28.0-19.5	14.5-12.0	5.4-5.1
Ill. (4 other loc.) ....	44	30.0-21.5	16.5-12.0	5.5-5.1
Iowa City, Ia. ....	49	25.0-21.0	14.0-12.5	5.3-5.1
W. Iowa ....	3	26.0-24.0	14.5-12.5	5.
E. Nebraska ....	2	25.0-23.0	15.1-15.0	5. -5.2

The larger sets, both recent and fossil, form perfect series to the half of a millimeter between the extremes given in the table.

F. C. Baker described a fossil *var. pleistocenica* from Alton, Illinois, as follows: "Shell uniformly smaller than typical *profunda*, more solid, with slightly higher spire and proportionately smaller aperture and umbilicus; the color bands developed in but two specimens of the 16 examined . . ."

The dimensions of the three types, as given, range as follows:

Gr. diam. 26-22 mm.                      Height 14.7-14.0 mm.

The table shows that this range is about the same as that of the fossils from Iowa and Nebraska, and that *the recent forms from the prairie groves of N. Iowa and E. Nebraska are even slightly smaller.*

It should also be noted that the present writer's series of 63 shells from one exposure at the type locality, Alton, Ill., shows a much wider range in both diameter and height than given in Baker's description. It very much resembles the recent set from a single colony at Iowa City.

As for the remaining characters, it may be said that the chalky shells of the larger loess species always give the impression of greater solidity, and that the height of the spire and size of the aperture vary equally in both fossil and recent forms. The color bands may also be absent in recent forms and constitute no distinctive character. Thus a set of 114 recent shells from Iowa City shows 81 with bands, 6 with very faint bands and 27 unicolorated.

The table also shows that there is so much overlapping in the several series that no lines can be drawn between different phases. It is, moreover, absurd to apply the name *pleistocenica* to a form which is still living in Iowa and Nebraska, or to infer from it that the climate was much colder during loess deposition.

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## NOTES ON PHILIPPINE FRESHWATER MOLLUSKS

BY CALVIN GOODRICH

Mr. Pedro de Mesa, of Lubang, made a collection of freshwater shells in three rivers of the Philippine Islands in January of last year. Specimens were taken in such quantities that a satisfactory study of shell variation could be made and a conception be obtained of species distribution. The first lot received was from Agkawayan River of Lubang Island. Mr. de Mesa took the trouble to collect at three different stations of the stream. Unfortunately, the material became mixed during shipment and has had to be considered as a whole. That from the Lilimbon River of Luzon, on the other hand, came through undisturbed, making it clear that while the stream is a short one and everywhere close to the sea, the molluscan fauna at the mouth, midway and near the source is, in each place, fairly distinctive. The Antipode River, a tributary of Pasig River of Luzon, was touched at one spot. The findings on the melanians are here set forth.

*Melania setosa* Swainson. This species was plentiful near the mouth of Lilimbon River. Three specimens were taken at the

midway station and none at the source. A single shell was in the lot from Agawayan River. The most interesting feature of this mollusk is that the spines at the shoulder develop out of the epidermis and not, as in most spinose freshwater shells, by an extension of the crystalline shell substance. It is true that the bases of these bristles are "bony," but they consist of only blunt projections. They are formed as in spinose *Neritina*, *Murex* and *Io* by an extension of the outer lip which at first is open, then closed on the posterior side and finally strengthened with the aragonite "substratum." This, it may be said in passing, is the manner in which *Elliptio spinosa* (Lea) forms its curious processes. *M. setosa* differs from this simple method in detail. The base has a sloping canal, facing forward. Through this, the periostracum makes its extension. A septum in the shell base forces the follicle upward into a stiff, sharp bristle. The largest of these bristles is 6 mm. from base to tip. The spines when dry are very brittle. Wet, they stand a good deal of rough treatment. Reeve illustrates the species as having irregularly curved or drooping bristles. All I have seen are stiffly upright. *Setosa* is obscurely plicate. Revolving folds or striae cover the shell from shoulder to base. Color is reddish-brown in the young, black in the old. Juveniles have flammules which are confined mostly to the upper parts of the striae.

*Brotia asperata* (Lamarck). The early post-embryonic whorls are smooth, ornamentation beginning as widely-spaced longitudinal plicae. In 26 of the 109 specimens from the Antipode River, the plicae are set off from the prevailing ground color by a dark pigmentation. Following the axial ribs in growth are incised striae, two to five in number and close to the suture. Later, the spacing between the incised striae becomes the more prominent sculpture, standing out as folds or ridges that on the body whorl cover the whole surface. In six shells, the crossings of plicae and striae are elevated into nodes, being particularly strong at the periphery. Body color ranges from reddish brown to purple or nearly black. The largest shell measures, altitude 65 mm., diameter 24.25 mm. The indicated number of whorls for a full-grown individual is fifteen. Besides the Antipode River, the Lilimbon River contains this species near the source. *Asperata* would appear to be a small-stream form similar to some

species of *Pachychilus*. Another resemblance, that of radula, will be mentioned later.

*Melanoides crenulata* (Deshayes). Only very young shells show the longitudinal plicae. The distinctive sculpture is striate. The striae of typical specimens that are from near the mouth of Lilimbon River are strong and coarse. They cover the entire body whorl, breaking into one to four rows of beads and rectangles just below the suture. In the largest specimens, this nodulous sculpture is not carried to the body whorl. It is, apparently, a phenomenon of middle-age. Shells taken at the midway station of Lilimbon River are much smoother than those near the stream mouth. Striae are so reduced that they are microscopic in some instances. This species, like most of the Philippine melanians, is marked by delicate flammules, usually irregular in shape. They disappear with age. The largest shell taken by Mr. de Mesa has been reduced to three whorls by erosion. It measures 46.25 mm. altitude, 16.25 mm. diameter. Two small, finely striate specimens occurred in the sending from Agawayan River.

*Melanoides aculeus* (Lea). This is one of the heavy, elongate, flat-whorled species. It shows small variation, size perhaps excepted, as between colonies. The young are distinctly plicate, a few shells showing incised striae. Longitudinal flammules appear at the top of the early whorls. They disappear as the mollusk, with age, becomes dark-brown or black in color. Specimens run to an altitude of 60 mm. even after considerable loss by erosion. An undamaged specimen would probably have twelve whorls.

*Melanoides hastula* (Lea). By matching shells of different ages, it is possible to conclude that a full-grown shell of this species has attained to eighteen whorls and that, if uneroded, it would have a length of 120 mm. The young are very attenuate, fragile, angled bluntly at the periphery and ornamented with low plicae between which flammules are deposited. Plicae are not always present, but incised striae appear on the upper whorls and the base is always more or less striate. Ridges, shoulders and nodes occur occasionally at the upper suture. The aperture is elongate-ovate, not much produced. The outer lip is a little sinuate. A characteristic of the species is an increase of the convexity of the whorls with age, an effect of loose-coiling. The largest specimens

seen occur near the mouth of Lilimbon River. There is a reduction in size in the direction of up-stream and some slight accompanying modification of sculpture. About 600 specimens were taken in the Agawayan River, all of them much smaller than those of the Lilimbon. *Melania subula* Lea is probably a synonym.

*Melanoides lateritia* (Lea.) Dr. Vander Schalie, while preparing radulae of this species, found it to be viviparous. Four shells yielded 147 young. They were of different ages, ranging from  $1\frac{1}{2}$  whorls, seemingly the full development of the embryo, to five or six whorls. The shells are deeply sutured with a corresponding convexity of whorls. Ornamentation begins at about the third whorl. This, in most cases, is a keeling of the periphery that develops into striae. Plicae are strong only on the oldest of the juveniles. Half grown shells of *lateritia* display flammules. In addition, certain individuals have one to three bluish or purple bands, and through excess of pigment one shell is bluish over the entire disk. Plicae of adults are broken into regularly spaced squares or rectangles. In instances, these granules are joined into irregular nodes that are a little raised in their centers. The species runs to ten or twelve whorls. Many specimens were taken in the Agawayan River, 28 near the mouth of Lilimbon River, two at the midway station and one near the source. *Melania scropulus* Reeve and *M. obliquegranosa* Smith appear to be synonyms.

*Melanoides riquetii* Grateloup. Taken only in the Agawayan River. Like *lateritia*, this species is viviparous. Thirty-four young were recovered from three shells. The greatest number were of only three whorls. One specimen had five whorls, two of which were smooth if sharply defined growth lines be excepted. The fourth whorl was plicate over the whole surface, with two striations amounting to keels. Both plicae and striae increased in strength on the fifth whorl. The lip of this specimen was sinuous as in the case of adults. *Riquetii's* outstanding character is the plication which is regularly spaced and follows the sinuous line of the outer lip. Occasional flammules are present.

*Melanoides pugilis* (Hinds). Taken in numbers near the mouth of Lilimbon River. One specimen appeared in the collection taken midway of the river. The sculpture is stoutly plicate-striate, the plicae developing into "bony" spines at the shoulders.

The reddish color of the shell, broken by flammules of irregular outline, is most conspicuous in the young.

*Faunus nitidus* von der Busch. Found only in the Agawayan River, but there in numbers. The shells run as large as 50 mm. altitude by 18 mm. diameter, with twelve whorls intact. None had reached the possibly gerontic state in which the fissure at the suture is pronounced and the basal sinus has become conspicuous. Faint traces of plicae appear on some early whorls and are maybe only vestiges of a primitive plication. There is an occasional striation on the neanic whorls near the suture. Color is brownish black in all specimens except a few that are of a mahogany shade. The spires of some of the lighter colored shells show flammules that are more or less prominent.

The operculum of *M. setosa* is thick, black, elongate. The nucleus of all opercula that were seen was worn away as in *Eurycaelon* of the southern United States. *B. asperata*, alone of these melanians, has a paleomelanian operculum. The spirals run to about five whorls. In *M. crenulata*, *aculeus* and *hastula*, the opercula are light reddish-brown in the young, large and black in the old. The surface is crinkled, a marked characteristic of the American *Gyrotoma*. The nucleus is crowded into the left margin near the base, sometimes even resting on the basal margin. The operculum is the form known as subspiral, no doubt a development out of the paucispiral phase. *M. lateritia*, *riquetii* and *pugilis* have small, thin, clavate opercula, the spirals being tightly coiled and reduced to a position near the base. This type of operculum, similar to that of *Pleurocera*, suggests degeneration. For a shell so large, the operculum of *F. nitidus* is rather small. It is ovate, thin, reddish brown. The spiral lines are distinct and of about four whorls. In development, this form of operculum appears to be midway of the paleomelaniid operculum of *asperata* and the neomelaniid form in *aculeus* and *hastula*.

The shape of the plate which bears the cusps of the central teeth is so varied that, on this character alone, almost any of the species may be distinguished from any of the other species. The lateral teeth of *M. setosa*, *M. lateritia*, *riquetii*, *aculeus* and *pugilis* are bent or twisted so that the basal lines of the pedestals lie parallel with the posterior margins of the centrals instead of being, as is usual, oblique or at right angles to them. In shell

characters, *aculeus* and *hastula* have a superficial resemblance, but in this one matter of lateral teeth they are far apart. The marginals, with the exception of those of *asperata*, are very much alike. The inner and outer marginals are difficult to distinguish, their differences consisting in numbers of cusps rather than in their configuration. The radula of *M. setosa* is virtually a duplicate of one taken from a specimen of *M. amarula* L. of Mauritius. The central tooth of *Faunus nitidus* resembles that of *Potamides*, serving as an additional warrant for the erection of the genus. The surprise of this study was the radula of *B. asperata*. It is long, narrow, the teeth strong and well defined. In almost all characters it is identical with the radula of *Doryssa* as illustrated by Dr. H. B. Baker in Occasional Papers, Museum of Zoology, University of Michigan, No. 210, 1930. It appears also to be like the radula of *Potadoma ponthiervillensis* Dupuis and Putzeys, figured by Pilsbry and Bequaert, Bulletin American Museum Natural History, 53, 1927, p. 272.

In an examination of this work, I find that viviparity is known of the melanians *Melanoides tuberculata* (Müller) and *Sulcospira sulcospira* (Mousson) besides the Tanganyika genera *Tiphobia* and *Lavigeria*. It seems likely that the phenomenon is more extensive in the Melaniidae than has generally been thought and that it is a specific as well as a generic adaptation. As for the generic names employed in this paper, the writer has misgivings. *Melanoides* as defined by Pilsbry (1927), "shell never very large or heavy," would rule the Philippine *aculeus* and *hastula* from this genus. *Semisulcospira* as used by Kuroda (Venus, I, 1929) might be available for one form of *crenulata*, but not for the typical mollusk. Characters in the family are extremely plastic. Extensive parallel development has taken place. Bringing the genera into biological unity is a difficulty still to be surmounted.

Following is a list of all the species taken by Mr. de Mesa :

Agkawayan River, Lubang Island

<i>Melania setosa</i> Swainson	“ <i>riquetii</i>
<i>Melanoides aculeus</i> (Lea)	(Grateloup)
“ <i>crenulata</i>	<i>Faunus nitidus</i> von der Busch
(Deshayes)	<i>Potamides fluviatilis</i> (Potiez
“ <i>hastula</i> (Lea)	and Michaud)
“ <i>lateritia</i> (Lea)	



of variations, but have also contributed an excellent bibliography of the literature bearing on this subject. Since their work is so largely concerned with variations in both recent and fossil *marine* forms, rather than freshwater forms, I felt that it would be well to mention some of the variations observed in our freshwater mussels.

One of the earliest published observations regarding a transposed hinge is that of Louis Agassiz who in 1859 exhibited a specimen of *Unio ligamentinus* (*Actinonaias carinata*) at a meeting of the Boston Society of Natural History. Agassiz mentioned that he thought it was rare and not easily observed. Mr. Isaac Lea, when he noticed Agassiz's communication to the society, published a list in 1860 of the specimens he had observed to indicate such abnormalities. I have revised Mr. Lea's list according to our present system of nomenclature and have listed the North American forms he mentions there:

TRANSPOSED HINGE TEETH OF NORTH AMERICAN NAIADES  
Reported by Isaac Lea in 1860, Proc. Acad. Nat. Sci., p. 51

*Single lateral in each valve:*

*Elliptio complanatus* (Dillwyn)

2 *Lampsilis ventricosa* (Barnes)

*Proptera purpurata* (Lamarck)

*Single lateral in left; double in right:*

*Elliptio hopetonensis* (Lea)

2 *Elliptio complanatus* (Dillwyn)

*Proptera alata* (Say)

*Ligumia nasuta* (Say)

*Lampsilis radiata* (Gmelin)

*Double lateral in both valves:*

3 *Elliptio complanatus* (Dillwyn)

*Treble lateral in left valve; partly treble in right:*

*Elliptio dilatatus* (Raf.)

Three Uniones have been omitted from the above list, since they are not North American, two being from India and one from Bengal.

In this connection I have prepared the following tables to indicate the series of specimens and their variations which I have observed:

RECORDS OF TRANSPOSED HINGE TEETH OF NORTH  
AMERICAN NAIADES

*Single lateral in each valve:*

- Amblema costata* (Raf.) Mich.  
*Fusconaia flava* (Raf.) Mich.  
*Elliptio strigosus* (Lea) Georgia  
 2 *Elliptio obnubilus* (Lea) “ (2 lots)  
*Plectomerus dombeyana* (Val.) Miss.  
 11 *Micromya iris* (Lea) Mich. (8 lots)  
 2 *Micromya vibex* (Conrad) Florida  
 5 *Ligumia nasuta* (Say) Mich. (3 lots)  
 2 *Lampsilis fasciola* (Raf.) Mich. (2 lots)  
 5 *Lampsilis siliquoidea* (Barnes) Mich. (4 lots)  
 2 *Lampsilis anodontoides* (Lea) Ky.

*Single lateral in left valve; double in right:*

- 3 *Elliptio strigosus* (Lea) Georgia (2 lots)  
*Elliptio obnubilus* (Lea) “  
*Micromya iris* (Lea) Mich.  
*Micromya vibex* (Conrad) Georgia  
 2 *Micromya lienosa* (Conrad) Florida  
*Ligumia nasuta* (Say) Mich.  
*Lampsilis fasciola* (Raf.) Mich.  
 2 *Lampsilis siliquoidea* (Barnes) Mich. (2 lots)  
*Lampsilis claibornensis* (Lea) Miss.

*Double lateral in both valves:*

- Fusconaia flava* (Raf.) Mich.  
*Amblema boykiniana* (Lea) Georgia  
 4 *Elliptio dilatatus* (Raf.) Mich.  
 3 *Elliptio obnubilus* (Lea) Georgia (3 lots)  
*Elliptio folliculatus* (Lea) Georgia  
 3 *Ptychobranchus fasciolare* (Raf.) Mich. (3 lots)  
*Medionidus kingii* B. H. Wright, Florida  
*Carunculina paula* (Lea) Georgia  
 2 *Micromya iris* (Lea) Mich. (2 lots)  
*Micromya ogeecheensis* (Conrad) Georgia  
*Ligumia recta* (Lamarck) Mich.  
 6 *Lampsilis siliquoidea* (Barnes) Mich. (5 lots)

*Triple lateral in right valve; double in left:*

- Micromya iris* (Lea) Mich.

In general, the normal dentition in species belonging to the sub-families *Unioninae* and *Lampsilinae* is such that the lateral tooth of the left valve is double, while that of the right valve is single; with the cardinals bearing the same relationship, though

often there is a tendency for the cardinal in the right valve to double. However, as Lea (1860, p. 52) has shown, and as my tables indicate, there are many aberrant forms. Again, it is of interest in this connection to note that these have for the most part been ignored by workers in the field, and many of the descriptions of species in a manual such as Simpson's (1914): "Catalogue of the Naiades" fail to take them into account.

It is not my intention to attempt to explain just why these forms vary as they do. I merely wish to call attention to them, and to suggest that it would be of interest if we could accumulate a mass of such information which might give some clues as to whether such variations have any evolutionary significance. At present, we have based our evolutionary concepts of the North American naiades entirely on their gill structure and its modifications for the carrying of glochidia. We do not have any adequate system based on any other organ or group of organs which will substantiate what has been postulated on the basis of gill-structure. It would, therefore, be of interest if we could substantiate our present system by information such as may be furnished from hinge-structure.

That hinge-structure has been used by former workers, such as Neumayr, Bittner, von Wöhrmann, and von Vest, to trace the evolution of freshwater forms from certain marine ancestors is well known. Nevertheless, there is still a good deal of uncertainty regarding this matter. It would perhaps be well to review briefly the most important of these theories.

Neumayr, in 1889, was the first to postulate the origin of the Unionidae from the marine *Trigonia*. He pointed out that the structure of the hinge in both groups is of the schizodont type, and he also suggested that there is an affinity in the structure of the gills, the separation of the two lobes of the mantle, and in the absence of siphons. It is also indicated that there is some similarity in the development of a nacreous shell, the presence of a strong epidermis and the arrangement of the muscle scars of both groups.

S. von Wöhrmann, in 1893, agreed that there are relationships between *Unio* and *Trigonia*. He, however, believes that the naiades have descended from the marine genus *Trigonodus*. His theory, too, seems very plausible since he reports that *Trigonodus*

only occurs in sand, rubble and marls of the Raibler deposit of the Alps, the lithologic composition indicating deposition near a coast. This is also the case in *Trigonodus cristonensis* in North America. It is suggested that this proximity to the coast has permitted colonization in the mouths of rivers where the transformation into the *Unio*-like form was carried out.

W. von Vest, in 1899, postulated the origin of the Unionidae from *Avicula*. He believes this more plausible than from either of the two other groups. He mentions that *Avicula* had already appeared in Silurian time and that it has been a vigorous group from that time to the present. He believes that this genus might well have colonized rivers. He argues that the hinge-structure of *Unio* is already present in the embryonic forms of *Avicula* where it is shown by two small but prominent teeth, which could thicken in the descendants of *Avicula* living in rivers and thus form the powerful hinge elements of a *Unio*. On the other hand, the weakly developed teeth of the *Avicula*-hinge could disappear completely during the transformation into the freshwater forms, and in this way the toothless forms, such as *Anodonta*, *Leila*, *Spatha*, etc., might be developed. Again, such forms with wings, as *Hyria avicularis*, *Hyriopsis*, *Proptera purpurata*, etc., may be considered a reversion to the original *Avicula* type. Thus, in brief, is von Vest's theory. He does not ignore the previous two theories, but suggests a number of reasons why they are not tenable. In fact, he is not ready to discredit the work of Neumayr, nor that of Wöhrmann, but finds a place for their work within his own theory by stating: "It does not therefore exclude the possibility that *Trigonodus* itself with all its descendants, nor even *Trigonia* with its descendants, and likewise all *Uniones* in part *directly*, in part *indirectly*, might have originated from *Avicula*."

Not only have attempts been made to trace the evolution of bivalves on the basis of their hinge-structure, but much of our classification of this group is also based on it. Consequently, one must assume that hinge-structure is a reliable criterion because of its *constancy*. However, such an assumption is not justified unless repeated observations show that such a set of characters is constant. It is with this in mind that it would be well for us to attempt to note such variations as occur.

There is another aspect to this problem which makes a knowledge of such variations of great importance. Those working with living material are able to obtain a knowledge of variation which enables a proper evaluation of diagnostic specific characters. The paleontologist, however, is often not able to fully appreciate the significance of certain variations within groups, because of fragmentary and insufficient amount of material. Consequently, any information which can be contributed regarding the variation of certain diagnostic characters within a group ought to be of help in enabling the paleontologist to arrive at a more correct evaluation of his material.

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PHYSA AMPULLACEA GOULD, PHYSA NUTTALLII  
LEA AND PHYSA COLUMBIANA HEMPHILL

BY JUNIUS HENDERSON

Dr. Clench (THE NAUTILUS, Vol. 49, p. 31) says that the exact locality of *P. ampullacea* "is not known other than that of Oregon," which at the time of the discovery of the species included a great deal of territory not within the present boundaries of the state. The species was first named *P. bullata* Gould. That name being preoccupied, it was changed by Gould himself to *P. ampullacea*. The types were credited to Dr. J. G. Cooper. Two statements by Cooper himself, overlooked by everyone up to the present time, definitely fix the type locality in the Okanogan drainage, at Lat. 49° N., and almost beyond question at Lake Osoyoos. Binney added to the reprint of the description: "Found also in Lake Oyosa, Washington Territory, by Dr. Cooper, one of whose specimens is figured above (Fig. 133)." This is the figure that Clench correctly mentions as of the real *ampullacea*, Figs. 134, 135 being clearly something else, which Clench described as new, *P. gouldi* Clench. In using the word "also" Binney clearly thought that Lake Oyosa, the locality from which his figured Cooper specimen came, was not the original locality, which is incorrect. In his "Report upon the Mollusca collected on the Survey," Pacific R. R. Survey, XII-2, p. 378, Cooper gives Lake Oyosa as the only locality of *P. bullata* Gould (*P. ampullacea* Gould), and on the same page, under *Planorbis corpulentus*, he says, "Lake Oyosa, Okanagan River." I have found no such lake name on any map or elsewhere, but Lake Osoyoos is in the Okanogan drainage, and the 49th parallel of latitude, mentioned later by Cooper, crosses this lake. Cooper (Proc. Calif. Acad. Sci., IV, 98, 173, 1869-1871) noticed the discrepancy in Binney's figures in reporting *ampullacea* from California, saying: "They [the California specimens] are of the large form figured by Binney in L. and F. W. Shells, p. 79, Fig. 185 [133], and are interesting as showing a permanency of form so far south of latitude 49°, where I discovered them in 1853. Binney's figures [referring to Figs. 134, 135] may be of a Klamath Lake specimen, and differ from my types (f. 133), more resembling var. *propinqua* Tryon." These statements of Cooper defi-

nately fix the type locality of *ampullacea* at the Okanagan drainage on the 49th parallel, and at Lake Osoyoos, unless there is a Lake Oyosa in that region.

As to *Physa nuttallii* Lea, Dr. Clench says: "If Lea's figures truly represent the species, it would be valid, and Hemphill's *P. ampullacea columbiana* would be a synonym, as the description of the latter species agrees in all essential details with *P. nuttallii*." Just what are "essential details?" Hemphill's description of *columbiana*, based upon 200 specimens from Astoria, Oregon, says "shell globose or moderately elongated, shining, solid, of a dark horn or chestnut color." Lea's description of *nuttallii*, based upon two specimens from Lewis River, obtained by Thomas Nuttall, says "shell inflated, rather thin, semi-transparent, somewhat bright, whitish." These descriptions do not suggest the same species to me, and the locality for *nuttallii* is very much in doubt. Is the Lewis River the one in southwestern Washington, or the Snake River, which was called the Lewis by many early writers and repeatedly by Nuttall in the account of his travels? (See THE NAUTILUS, XLVII, 87, 1934). As to shape, it is difficult or impossible to accurately describe the outlines of a *Physa* without figures. Lea figured his species, Hemphill did not. However, there are specimens of *columbiana*, undoubtedly from the type lot, in the Hemphill collection at the University of Colorado Museum (four of this lot figured on Plate 7, fig. 3); probably also in the Hemphill collection at the California Academy of Sciences, and a large lot in the Hemphill collection at Stanford University, probably most of the original 200. A careful examination of this material, in comparison with Lea's description and figures of *nuttallii*, convinced me that the two have nothing in common, and that *columbiana* certainly has nothing to do with *ampullacea*, as Hemphill believed. His ideas of relationship of species were often peculiar. In addition to the differences between Lea's and Hemphill's species as indicated by the descriptions, Lea's figures indicate a species very much less globose than Hemphill's specimens of *columbiana*. Most of the latter are of a rich chestnut color, the surface very finely rippled with minute, rather regular, somewhat rounded striae, instead of fine, sharp growth lines. With a large series of *Physas* from many western localities at hand, I spent much time

trying to decide just what *nuttallii* is, from the figures and description, and concluded that it would be better not to apply that name to any specimens unless the types are available for comparison, or specimens agreeing with the types from some western Lewis River.

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## A NEW DEEP-WATER LUCINA FROM OFF MARYLAND

BY R. A. McLEAN

LUCINA (LUCINOMA) ATLANTIS, new species. Pl. 5, figs. 1-2.

*Description.*—Shell of moderate size, elongate. Color of shell chalky white, covered with a conspicuous, greenish-yellow periostracum. Sculpture consists of small, sharp, concentric ridges, closely set on the umbos, more and more widely spaced toward the lower margins. Fine, indistinct, concentric lines are found between these ridges. Margin of shell entire, sinuate both anteriorly and posteriorly. Lunule clearly marked, long and lanceolate. Area plainly indicated. Ligament relatively conspicuous. Umbos white, slightly anterior, prominent and with the beaks curved forward. Interior white, slightly lustrous, with numerous small radiating striae most clearly defined near the margin; scars clearly defined. Two cardinal teeth in each valve, the anterior left and the posterior right are large and bifid, the remaining two are smaller. Anterior laterals are present but are nearly obsolete.

Length 69, height 48, width 26 mm.

*Holotype.*—M. C. Z. no. 73345, North Atlantic, 38° 10' N., 73° 51' W. (off Maryland).

*Remarks.*—Our specimen was obtained alive by Messrs. Stetson and Schevill in the course of geological studies from the ketch "Atlantis" of the Wood's Hole Oceanographic Institution. It was taken in a haul from 300 up to 118 fathoms on Aug. 5, 1935.

It is very close to *L. blakeana* Bush but differs in outline and proportions. The ratio of length to height to width for our species is 1.0 : .69 : .37 as against 1.0 : .88 : .43 for *L. blakeana*, thus our species is longer and more compressed for its length and is also more sinuate in outline.

## A NEW SPECIES OF PAPUINA WITH NOTES ON *P. TAYLORIANA*

BY W. J. CLENCH AND A. F. ARCHER

The new species and notes presented here are based upon a large and fine series of *Papuina* recently received from the D'Entrecasteaux and Trobriand Islands off the eastern end of New Guinea.

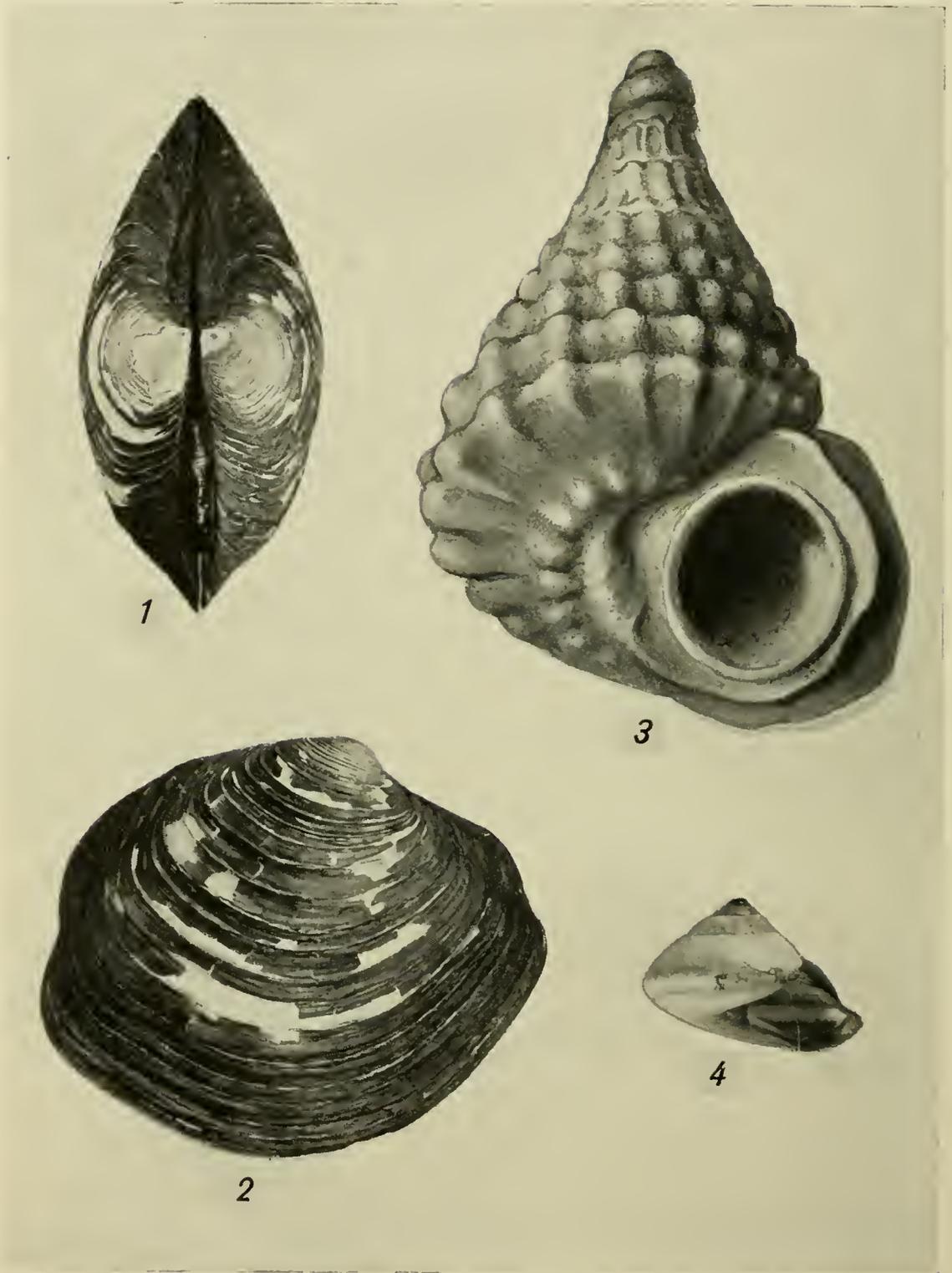
*PAPUINA WILLIAMSI*, new species. Plate 5, fig. 4.

*Description.*—Shell medium in size, imperforate, thin but strong, translucent and somewhat shining. Whorls 5, slightly depressed and moderately convex, the last definitely angulated. Color: first whorl blackish brown, shading into brown on the first half of the second whorl, this color completely disappearing in the second half of the second whorl, being replaced by the pale ivory ground color of the shell, the last half of the body whorl changing evenly into dull orange or brownish orange. Lip deep pink, the pink coloration carried back for 1 to 2 mm. on the body whorl below the lip. There are a series of faint and rather narrow bands of darker shades of the ivory ground color occurring above and below the periphery. These are best observed in transmitted light. Columella short and straight forming an angle of  $113^\circ$  with the basal area of the lip. Spire forming an angle of about  $90^\circ$ . Aperture oblique and cast at an angle of  $41^\circ$  from the base. Palatal lip slightly flattened, with a pronounced sigmoid curve on the upper portion, the extreme or outer portion forming a slightly flattened point (this is the termination of the whorl angulation). Parietal area faintly glazed, hardly enough to obscure the fine sculpture of the whorl below. Suture indented slightly. Sculpture of fine, oblique, irregular thread-like incised lines, cut at right angles by the fine growth lines. Great diameter, 25.2; lesser diameter, 20.4; height, 15.3 mm.

*Holotype.*—Mus. Comp. Zoöl. no. 110396, Omarakana, central Kiriwina, Trobriand Islands. Rev. H. Williams collector, June, 1935.

*Remarks.*—Only a single specimen of the new form was obtained by Rev. Williams. It is closely related to *P. albocarinata* (Smith) and *P. a. trobriandensis* (Hedley), but differing decidedly in its type of coloration. Both of the above forms are defined by the spiral bands over a pale ivory ground color. The first by only slight shades of difference in the ivory color of these





1, 2, *Lucina (Lucinoma) atlantis* McLean, p. 87.  
3, *Mecoliotia bermudezi* C. & A., p. 92.  
4, *Papuina williamsi* C. & A., p. 88.

bars, the second replaced by blackish brown color bars. *P. williamsi* is further differentiated by brownish orange wash of color and the pink lip, this being white in *albocarinata* and black in *trobriandensis*.

The presence or absence of the black tip (nuclear whorl coloration) is a character very difficult to understand. Its occurrence in many land snails, that are members of several different families, would point to a rather fundamental element in the color physiology of these animals. Many races or forms of *Liguus* have been established on the presence or absence of spire-tip coloration and certainly in the case of this genus, warrants such taxonomic differentiation. Even in *Papuina* it appears to be capable of segregation, as certain series of *trobriandensis* lack the black tip while other series from different localities possess the black tip along with the white tip form in equal or varying numbers. Only a large series of material from very carefully localized areas will point to its significance as a character for distinguishing races.

#### PAPUINA TAYLORIANA (Adams and Reeve).

*Helix tayloriana* Ad. and Reeve 1848, Voy. Samarang, Moll., p. 59, pl. 15, fig. 2.

Adams and Reeve did not assign a locality in the original description of this species. It very probably occurs only on the mainland of New Guinea, and not on the D'Entrecasteaux Islands, as was later stated by E. A. Smith (Ann. Mag. Nat. Hist. (5), 19, p. 421, pl. 15, fig. 1-1a, 1887). Smith figured two species under *tayloriana*. His figure 1 is typical, and probably a figure of the type. His figure 1a is *P. albocarinata trobriandensis* Hedley, which was quite possibly obtained from Fergusson Island, D'Entrecasteaux group. Smith mentions that all specimens possess a pinkish coloration about the parietal area. A large series of this subspecies from several islands in both the D'Entrecasteaux and Trobriand groups lacks this color character other than those from Fergusson Island. This added coloration is observed on only 2 shells in a series of 38 specimens from this island and may have been brought about by occasional hybridizing with *P. rollsiana* which possesses a large amount of such color and also occurs at this locality. This is purely inference only, as no ad-

ditional morphological characters appear to intergrade between these two forms.

Pilsbry (Man. of Conch. (2), 7, p. 58, pl. 17, fig. 40-41; pl. 2, fig. 20-21 and 27, 1891) gives measurements that agree with *trobriandensis* and not *tayloriana*. The measurements do not agree with the figures of the type which had been copied from the Samarang report.

Specimens before us of *tayloriana* from the Moso River, Humboldt Bay, Dutch New Guinea (near the Dutch-British boundary line on the north coast) measure as follows:

Greater diameter, 30, 31.5; lesser diameter, 24.8, 24.5; height, 16.3, 17.4 mm.

This species differs from *trobriandensis*, not only in its larger size, but also in possessing a definite keel, rather than an angulated periphery, having the body whorl both above and below the keel slightly concave, and having the palatal lip deeply sigmoid.

E. A. Smith (op. cit. p. 422) described *P. albocarinata* from South Cape, British New Guiana. A series of this form was collected by the Rev. Williams at Sinaketa, Kirifina, Trobriand Islands. It is evidently an albino race of the more abundant *trobriandensis*. Spiral blackish brown color bars of *trobriandensis* are replaced by more opaque though yellowish-white spiral bars on *albocarinata*. Both forms occurred at this locality, though elsewhere only *trobriandensis* was collected.

Albinistic forms of known colored species in *Papuina* appear to be rather rare. We possess nothing of this sort in a large series of this genus from the Solomon Islands though it is to be admitted that individual lots from any one locality are small. However, *P. wiegmanni* v. Mts. from Talassea, New Britain in the Bismarck Archipelago does possess an albino race, as a single specimen in a lot of three in our possession is similar in all respects to the typical form other than color, the red spiral bars being replaced by transparent spiral areas. Albinism is a common occurrence in *Liguus*, a genus of highly colored tree snails of Florida and certain West Indian Islands, though it is not particularly common in other terrestrial snails, as far as we are aware.

As Smith's *albocarinata* was first described it must become the specific name, the more abundant and probably more widespread *trobriandensis* becoming its subspecies, our canons of nomencla-

ture not allowing a shift of names to express natural relationships. The following are the localities from which we have these forms.

PAPUINA ALBOCARINATA (E. A. Smith). *Helix (Papuina) albocarinata* Smith 1887, Ann. Mag. Nat. Hist. (5), 19, p. 422, pl. 15, fig. 12 (South Cape, British New Guinea).

Sinaketa, southern Kiriwina Island, Trobriand Islands.

PAPUINA ALBOCARINATA TROBRIANDENSIS (Hedley). *Geotrochus trobriandensis* Hedley 1891, Proc. Linn. Soc. New South Wales, 6, p. 92, pl. 11, fig. 28 (Trobriand Islands).

Sinaketa, southern Kiriwina Island, Trobriand Islands; Omarakana, central Kiriwina Island, Trobriand Islands; 3 miles above Losuia, northern Kiriwina Island, Trobriand Islands; Kaileuna Island, Trobriand Islands; Seymour Bay, Fergusson Island, D'Entrecasteaux Islands.

This same sending included a large series of *Papuina rollsiana* Smith from Seymour Bay, Fergusson Island, D'Entrecasteaux Islands. Smith (loc. cit. p. 423) gave South Cape, British New Guinea as the type locality. This locality is open to question for both this species and *Papuina albocarinata*.

The following measurements are based upon a selected series of *P. rollsiana* to show a size range from this locality.

Greater diameter, 25.5, 28, 32.2, 35; lesser diameter, 19.5, 21, 23.4, 25.5; height, 18.4, 15.5, 19, 22 mm.

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## A NEW PLEISTOCENE MECOLIOTIA FROM CUBA

BY W. J. CLENCH AND C. G. AGUAYO

Dr. P. Bermudez has very kindly turned over to us a series of fossil shells collected by him in the Pleistocene formation of Matanzas,  $\frac{1}{2}$  km. south of the mouth of the Rio Canimar. Late Tertiary and Pleistocene formations in Cuba have been little studied from the conchological standpoint. We quote the following note from Dr. Bermudez who has specialized on micropaleontology: "The Yumuri river marl (Cushman 1919, Carnegie Institution, publication 291, p. 29) collected by T. W. Vaughan seems to have the same fauna found at the Rio Canimar. Cushman states that the Yumuri fauna belongs to the Miocene, but

the study of the foraminifera of Canimar shows rather a late Tertiary or Pleistocene age. The fauna of the Canimar is well developed and has about 200 well preserved species, which apparently lived in about 100 to 150 fathoms."

In addition to the new species described below, the following genera of mollusks and one brachiopod occur at this place: one *Meioceras*, apparently related to the living species *bermudezi* Pils. & Ag.; one species of *Caecum* probably in the group of *C. glabrum* Mont.; one hydrobiid and several embryonic and imperfect specimens that cannot be determined. The single brachiopod is *Argyrotheca bermudana* Dall, or at least very close to that species.

*MECOLIOTIA BERMUDEZI*, new species. Pl. 5, fig. 3.

*Description.*—Shell very small, solid, trochiform and narrowly perforate. Whorls 8, nuclear whorls ( $2\frac{1}{2}$ ) smooth, convex, the second whorl noticeably larger than the third whorl. Third to eighth whorls nearly flat sided. Sculpture: third to eighth whorl nodulose, the nodules arranged spirally in three rows on the body whorl and two rows on the two preceding whorls. In addition to the spiral arrangement, the nodules are in an axial pattern, set somewhat obliquely to the axis. The middle spiral row is slightly more elevated than the remaining marginal rows and tends to form a somewhat noticeable angulated periphery on the body whorl. The two post embryonic whorls have an axial arrangement of the nodules or bosses which are more pronounced than the spiral formation, the two opposing nodules being connected by a depressed ridge. No microscopic sculpture is visible under high power. Perforation small and margined by a small ridge. Base with a series of small, rounded nodules surrounding the umbilical ridge. Aperture circular, duplex with an expanded circular varix behind. Inner lip thrust up through the second, producing a flange.

Height, 2.5; width, 1.1; aperture, .4 mm. Holotype.

*Holotype.*—Mus. Comp. Zoöl. no. 110615,  $\frac{1}{2}$  km. south of the mouth of the Rio Canimar, Matanzas, Cuba. P. J. Bermudez collector, 1934.

*Remarks.*—This is the first recorded species in this genus, either fossil or recent, from the Atlantic. It appears to be most closely related to *Mecoliotia halligani* Hedley from Tutaga Island, Funafuti atoll, Ellice Group, western Pacific. It differs from that species by being larger and proportionately more slender. In

addition, the second nuclear whorl in *M. bermudezi* is larger than the third whorl, a character not exhibited by *M. halligani*. Sculpture characters differ slightly. In *bermudezi* the middle spiral line of nodules is about equal in size and height to the two marginal rows; in *halligani*, the middle row is more elevated and tends somewhat to produce a peripheral angulation. This latter species has the whorls more convex and more sharply differentiated. Apertural characters appear to be similar. The only other species known to us are those described by Iredale from Christmas Island, south of Java, as *Pickworthia andrewsi*, *P. kirkpatricki* and *Reynellona natalis*. All of these latter species are *Mecoliotia* according to Thiele. They differ from our form by possessing entirely different sculpture, and not having the nuclear whorls particularly differentiated from the later portion of the shells.

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**STUDIES OF AFRICAN LAND AND FRESH-WATER  
MOLLUSKS, X.—GULELLA PUMILIO (GOULD)  
AND TWO SPECIES CONFUSED WITH IT**

BY J. BEQUAERT AND W. J. CLENCH

While arranging the African Streptaxidae in the Museum of Comparative Zoölogy, two different species were found labelled "*Pupa pumilio* Gould," one being a *Gulella*, the other a *Ptychotrema*. Gould's description is too indefinite to decide which he had before him, and he might even have had both. Fortunately, the types of *Pupa pumilio* are at the New York State Museum, in Albany, where the senior author was privileged to study them, through the kindness of Dr. Chas. C. Adams, Director of the Museum.

*GULELLA PUMILIO* (Gould). Plate 6, Figs. 1 and 2.

*Pupa pumilio* Gould, 1843, Proc. Boston Soc. Nat. Hist., I, p. 158 ("Africa"; part of a lot collected by Dr. George A. Perkins, which on p. 153 is stated to have come from Cape Palmas, Liberia). Pfeiffer, 1853, Mon. Helic. Viv., III, p. 541 (description of a specimen in Cuming's collection). Küster, 1854 (?), Syst. Conch.-Cab., I, Abt. 15, p. 160, Pl. XIX, figs. 13-15 (specimen from Cuming's collection).

*Pupa* [*Ennea*] *pumilio* Gould, 1862, Otia Conchol., p. 193. E. v. Martens, 1860, in Albers, Die Heliceen, 2nd Edition, p. 302.

*Ennea pumilio* Pfeiffer, 1855, Malak. Blätter, II, p. 61; 1859, Mon. Helic. Viv., IV, p. 338; 1868, *Op. cit.*, V, p. 452; 1876, *Op. cit.*, VII, p. 500.

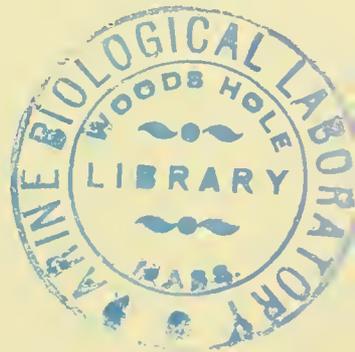
*Ennea (Uniplicaria) pumilio* Pfeiffer, 1878, Nomencl. Helic. Viv., p. 18. Tryon, 1885, Man. of Conch., (2) I, p. 90, Pl. XVIII, fig. 49 (copy of Kuster's figure).

*Pupa (Oracula) pumilis* "Gould" H. and A. Adams, 1858, Genera Rec. Moll., II, p. 170.

In the Gould collection, now at the New York State Museum *Pupa pumilio* is represented by three cotypes, from "Liberia," all belonging to the same species of *Gulella*. They are divided into two lots bearing the Museum Catalogue numbers 216 (Gould's original No. A1265) and 217 (Gould's original No. 1257). Through the courtesy of Dr. Chas. C. Adams, we are enabled to figure one of these cotypes. Three specimens at the Museum of Comparative Zoölogy (No. 8664), part of the E. R. Mayo collection (received from the Boston Society of Natural History), and named "*Pupa pumilio* Gould," agree with Gould's types. Dr. H. A. Pilsbry informs us that similar specimens are under the name "*Pupa pumilio*" at the Academy of Natural Sciences in Philadelphia, from two sources, the Bland collection and the Jeanes collection. Dr. E. Degner writes us that the true *Gulella pumilio* is likewise represented in the Hamburg Museum. It seems probable that all these specimens, as well as those in other collections, were part of the original lot distributed by Gould, and may therefore be paratypes. So far as we could ascertain, *Pupa pumilio* was never collected again, either at Cape Palmas or elsewhere.

As pointed out to us by Dr. Pilsbry, Gould's measurements, both in the original description and in the *Otia*, are obviously erroneous: "Long.  $\frac{13}{20}$ ; lat.  $\frac{7}{10}$  poll." [= 16.5 mm. long and 17.5 mm. wide]. The three cotypes in Albany measure: Length, (a) 11.5 mm.; (b) 12.0 mm.; and (c) 12.0 mm. Greatest width, (a) 5.5 mm.; (b) 5.5 mm.; and (c) 5.5 mm. The three specimens at the Mus. Comp. Zoöl. measure: Length, (a) 11.0 mm.; (b) 11.0 mm.; and (c) 11.7 mm. Greatest width, (a), (b), and (c) 5.0 mm. Pfeiffer's specimen (1853) measured: Length, 13.0 mm. Diameter, 5.0 mm. Aperture, 5.0 by 4.0 mm.

While Gould's description is rather ambiguous, there can be no doubt about Pfeiffer's description being based upon the *Gulella*





1, 2, *Gulella punilio* (Gld.), cotype, p. 93.

3, 4, *Ptychotrema degneri* B. & C., holotype, p. 96.

5, 6, 7, *Gulella pilsbryi* B. & C., paratype and holotype, p. 95.

Figures 3, 5, 6  $\times 10$ , the rest  $\times 5$ .

represented by Gould's cotypes. The same is true of Küster's description and figures.

*GULELLA PILSBRYI*, new species. Plate 6, Figs. 5, 6, and 7.

Shell cylindric-oblong, slightly wider above the middle, the summit obtusely conic. Color milk-white, somewhat shiny. Whorls 8 to 9, very slightly convex. Sutures slightly impressed, not crenulate, ascending somewhat to the aperture. Aperture roundly triangular, nearly as wide as high. Peristome slightly thickened, expanded and reflexed basally. Columella short, situated well within the aperture, supporting two low, equal plaits or lamellae, the lower one about midway on the columella, the upper one close to the extreme upper portion. Basal area and palatal lip toothless. Parietal wall supporting a strong, deeply entering and twisted lamella, situated almost exactly in the mid region, but far below the upper edge of the parietal callus; close to the upper edge of the outer lip, and shallowly separated from it, the parietal callus is thickened into a low tubercle. The columellar and parietal lamellae are carried back deep on the axis of the shell, to as far as three or more whorls. Umbilical region minutely, rimately perforate. Body-whorl even behind the lip, not contracted, without pit or furrow. Sculpture: first  $1\frac{1}{4}$  whorls appearing smooth under the hand-lens, but with microscopic spiral striae; remaining early whorls finely costulate with oblique axial ridges, strongest at the suture; last two whorls with this sculpture present but very much fainter and somewhat more irregular; under a 12 power lens there appears to be no other sculpture.

Height	Greatest Width	Aperture Height	Aperture Width	
10.0 mm.	4.5 mm.	3.0 mm.	2.6 mm.	9 whorls; holotype.
8.9	4.1	2.3	2.2	8 " paratype.
9.4	4.0	2.3	2.1	$8\frac{1}{2}$ " "
8.7	4.0	2.6	2.0	$8\frac{1}{4}$ " "

Holotype: Ac. Nat. Sci. Phila. No. 23891, Liberia (from the John Ford collection). Paratypes at the Ac. Nat. Sci. Phila. and Mus. Comp. Zoöl., Cambridge, Mass., No. 106384, with the same data.

Closely related to *G. pumilio* (Gould), with which it appears to have been confused. It differs in shape, in the lack of crenulation below the suture, and in the presence of two (instead of one) immersed lamellae on the columella.

PTYCHOTREMA (PTYCHOTREMA) DEGNERI, new species. Plate 6, Figs. 3 and 4.

Shell cylindric-oblong, widest above the mid region, with a short tapering, obtusely conic summit. Color a flat white. Whorls 8, very slightly convex. Sutures scarcely impressed, not crenulate, ascending to the aperture. Aperture triangular with rounded base, higher than wide, somewhat irregular on the outer lip. Peristome expanded and slightly reflexed. Columella short, situated well within the aperture, and supporting two subequal, obtuse plaits, which are very deep-seated on a common basal swelling and can only be seen with difficulty from the aperture; both situated well up on the upper portion of the columella. Basal area and palatal lip toothless. Parietal wall supporting a very strong, curved lamella, which is brought forward and folded to meet the upper edge of the outer lip. Three deeply immersed palatal plaits the two upper ones the strongest and longest, the lower one much weaker and shorter; all end very far from the outer lip. Back of the body-whorl in the basal half with two deep spiral furrows, separating two blunt spiral carinae; the upper furrow, placed near the periphery, bears inside the middle (or upper) palatal plait (as seen by transparency) and ends far from the outer lip; the lower furrow, as well as the carinae which limit it above and below, continue to right behind the outer lip; inside the lower palatal plait is placed on the carina separating the two outer furrows (as seen by transparency). Sculpture: first  $1\frac{1}{2}$  whorls smooth; remaining whorls with low, regular, oblique and slightly curved axial rib-striae, more widely spaced on the later whorls; on the face of the body-whorl there are 4 or 5 riblets in one millimeter; there appears to be no other sculpture.

Height	Greatest Width	Aperture Height	Aperture Width	
14.2 mm.	6.3 mm.	3.5 mm.	2.5 mm.	8 whorls; holotype.
12.8	6.2	3.8	2.0	8 " paratype.

Holotype: Mus. Comp. Zoöl. No. 10939, Africa, without more definite locality. Paratype at the Ac. Nat. Sci. Phil. with the same data.

Related to *P. affectatum* (Fulton, 1902) (syn.: *rosenbergiana* Preston, 1910), of Angola; but a comparison of specimens (paratypes of *rosenbergiana*) shows that this is more strongly rib-striate and lacks the double columellar plait of *P. degneri*. From the description, *P. dohrni* (v. Martens) (*Ennea dohrni* v. Martens, July, 1882), also from Angola, is very similar to *P. degneri*, if not the same, although the columella is described as trituberculate.

*P. dohrni* has not been figured. The name, moreover, is antedated by *Ennea dohrni* Smith, April 1882, a species of *Gulella*.

### THREE MEXICAN EUGLANDINAS

BY H. A. PILSBRY AND E. G. VANATTA

Mr. Ralph W. Jackson has given to the Academy of Natural Sciences a small collection of land shells picked up some years ago at Gonzales, State of Tamaulipas, Mexico, which contained the species noticed herein. The specimens are bleached white but otherwise in good condition.

*EUGLANDINA JACKSONI*, new species. Pl. 7, figs. 4.

This species is closely similar to *E. mazatlanica*, but it differs by having one whorl more, and a longer, narrower aperture, the last whorl being less full below than in *mazatlanica*. The outlines of the spire are nearly straight. The embryonic shell consists of  $3\frac{1}{3}$  smooth whorls. Following whorls with fine smooth axial striae which crenulate the suture very slightly or not at all; their regularity is often interrupted by slightly marked growth-rests. The narrow aperture occupies slightly more than half the total length. Columella is concave, abruptly truncate.

Length 36.3 mm., diam. 12.9 mm.; aperture 19 mm. long, the greatest width 5.7 mm.;  $7\frac{1}{2}$  whorls. Type, 162639 ANSP.

Length 32.5 mm., diam. 12.4 mm.; aperture 17.5 mm. long;  $7\frac{1}{2}$  whorls.

*E. immemorata* Pils. has a wider, shorter mouth and far more irregular striation. *E. delicata* (Pils.) is a smaller species with much more acute apex. *E. texasiana* (Pfr.) is less fusiform with a wider aperture. Named for Mr. Ralph W. Jackson.

*EUGLANDINA TEXASIANA ANGUSTIOR*, new subsp. Pl. 7, fig. 4a.

The shell is narrower and longer than *E. texasiana*, the last whorl being compressed laterally. Length 34.5 mm., diam. 11.5 mm., aperture 16.5 mm. long; 7 whorls. Type 162640 ANSP.

Besides the type lot from Gonzales received from Mr. Jackson, there are specimens in the museum collected by A. A. Hinkley at Valles, San Luis Potosi, in 1907. One of this lot measures: length 30.7 mm., diam. 10.5 mm., aperture 14.8 mm.;  $6\frac{3}{4}$  whorls.

This form holds the same relation to *E. texasiana* as the variety *parallela* to *E. rosea*.

EUGLANDINA PYGMAEA, new species. Pl. 7, fig. 5.

The shell is very small, oblong, with sculpture of short, unevenly spaced axial grooves, below the suture, elsewhere smooth except for very faint growth lines and sometimes grooves marking growth-rests. Apex obtuse. Whorls slightly convex. Suture impressed, its last turn descending more than those preceding. Aperture rather narrow, the outer lip with blunt, smooth finish, arching forward rather strongly in the middle. Columella nearly straight, abruptly truncate.

Length 9 mm., diam. 3.2 mm., aperture 4 mm.;  $6\frac{1}{2}$  whorls. Type, 162641 ANSP.

Length 8.5 mm., diam. 3.3 mm., aperture 4.2 mm.;  $6\frac{1}{2}$  whorls.

*E. dalli* and *E. oblonga tamaulipensis* have the columella much more strongly concave, and both are decidedly larger shells. This species is the smallest *Euglandina*. It does not look like a *Salasiella*. It was found on ant hills.

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## TWO NEW JAMAICAN LAND SHELLS

BY E. G. VANATTA

SAGDA BONDI, new species. Pl. 7, fig. 6.

The shell is large solid, high, dull white, imperforate; apex obtuse; spire dome-shaped, of  $8\frac{1}{2}$  whorls, joined by a moderately impressed suture, the first whorl smooth, the following whorls with strong, arcuate costulae which disappear on the last whorl, and a fine, diagonal network of microscopic scratches covers the lower whorls and the base. The periphery is evenly rounded. The base is excavated around the thick columella. Aperture transversely lunate; lip acute; columella provided with a very low, broad fold in the last whorl; parietal and palatal regions without lamellae. Height 18 mm., diam. 21 mm.

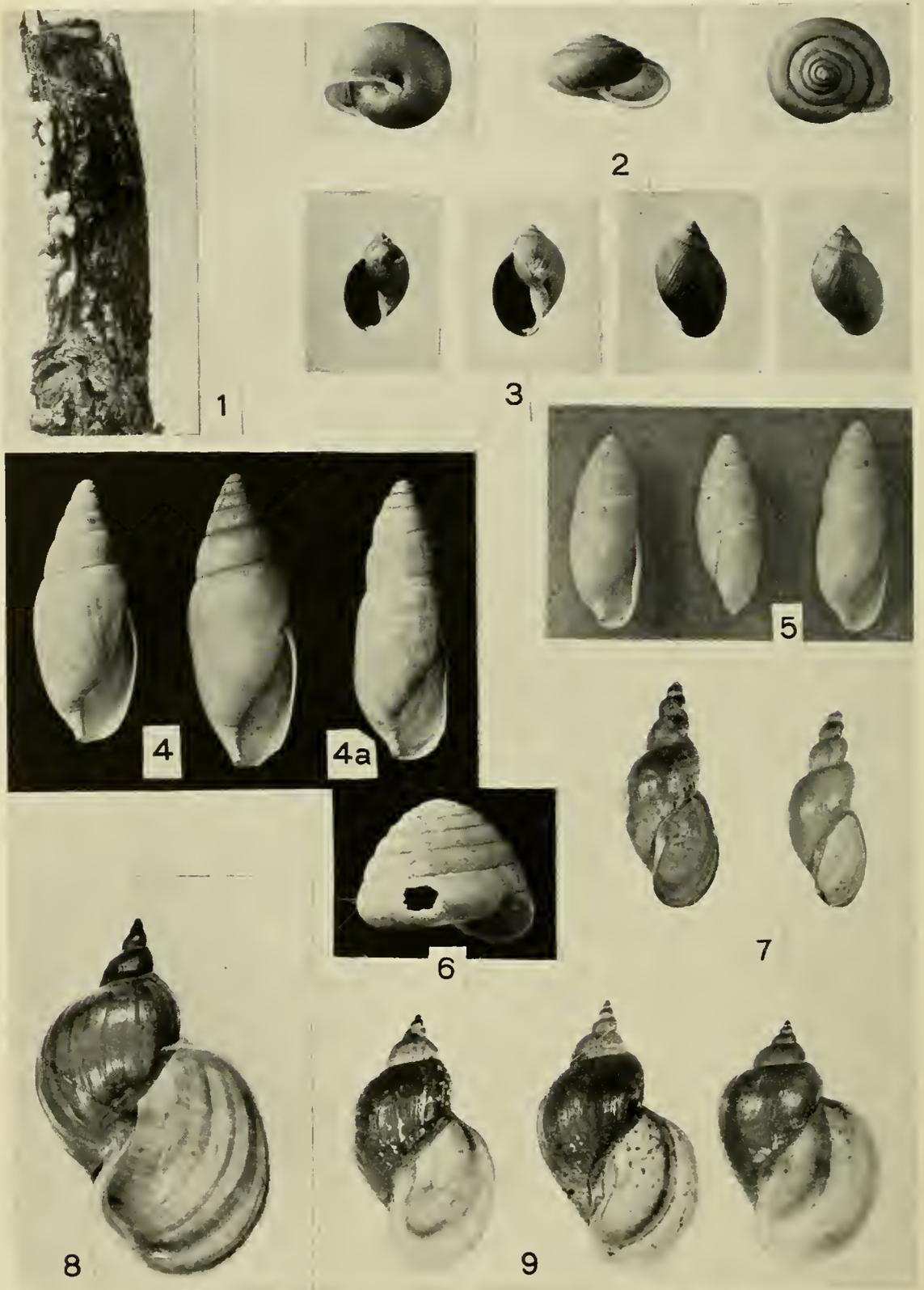
Type 164606 ANSP., from the Cockpit country between Kinloss and Albert Town, Trelawny Parish, Jamaica, collected by James Bond, December, 1934.

This species is smaller and narrower than *Sagda maxima* Simps., and has stronger microscopic sculpture, resembling that of *S. grandis* Pils. & Brn.

POTERIA (CROCIDOPOMA) BONDI, new species.

The shell is small, broadly umbilicate, discoidal, of  $3\frac{1}{2}$  whorls; suture impressed; apex mamillate, smooth; last whorl flat, with a strong, spiral, cord-like rib parallel to the suture; periphery





1, *Bulimulus alternatus mariae* (Alb.), p. 105. 2, new subsp. of *Polygyra*. 3, *Physa columbiana* Hemph., p. 86. 4, *Englandina jacksoni* P. & V., p. 97. 4a, *E. texasiana angustior* P. & V., p. 97. 5, *E. pygmaea* P. & V., p. 98. 6, *Sagda bondi* Van., p. 98. 7-9, F. C. Baker, new *Lymnaeidae*.

rounded; umbilicus perspective. The circular aperture has a notch under the subsutural cord. Height 5 mm., diam. 9 mm., height of aperture 4.5 mm.

Operculum with high, sharp, multispiral lamella and a central nucleus, the furrow between the turns of the lamella crossed by many thin transverse laminae.

Type 164695 ANSP., from the Cockpit country between Kinloss and Albert Town, Trelawny, collected by James Bond.

A fresh specimen, 7804 ANSP., labelled "Jamaica," shows that the shell is dull brown, with 4 whorls and very close, fine, thread-like raised growth lines. Height 6.5 mm., diam. 12.5 mm., height aperture 5.5 mm.

The species differs from *Poteria* (*Crocidopoma*) *suturalis* (Sowb.) by having the rounded spiral cord removed from the suture. In *P. suturalis* the suture has a sharp overhanging keel, which is smooth on the outer side and transversely laminate on the side next the suture.

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## A NEW SUBSPECIES OF ZONITOIDES (VENTRIDENS) SUPPRESSA (SAY)

BY E. G. VANATTA

Some years ago Dr. Geo. H. Clapp sent in a series of *Ventridens* which he collected September, 1906, at Berryville, Virginia. He called attention to the strongly bifid baso-columellar tooth, which in typical *suppressa* is a simple nodule, though variable in shape. Dr. Pilsbry at that time left a note in the collection to the effect that these shells were "probably a valid subspecies," adding that as the final, fully developed stage was not present in the lot, he was leaving the form nameless.

Recently Mr. J. B. Clarke collected a series of the same snail in the hills near Endless Caverns, New Market, Shenandoah Co., Virginia, containing several fully adult shells besides more numerous specimens in earlier stages of growth. These specimens, 145074 ANSP., are made the type and paratypes of a new subspecies.

*ZONITOIDES SUPPRESSUS VIRGINICUS*, new subsp.

The adult stage has a long nodule within the columellar lip and a rather short, obtuse horizontal lamella within the outer lip,

more remote from the columellar nodule than is the case with the outer tooth of *suppressus*. Other characters as in *Z. suppressus*. Alt. 3.4 mm., diam. 6 mm.; slightly over 6 whorls.

In some individuals this two-toothed stage is seen in somewhat smaller shells, but the strong callous lining of the throat is usually not well developed. At an earlier stage, diam. 4.3 mm., more or less, the columellar tooth is conspicuously bifid, or in some shells trifid; there is a long and high entering lamella within the outer lip with generally one or two small laminae above it, and the callous lining is heavy. In old individuals of *Z. suppressa* there is no tooth within the outer lip, only the columella nodule remaining. The small laminae above the large outer tooth of the young stage disappear in *suppressus* at a much earlier age than in *virginica*.

Like *Anguispira clarki* Van., this appears to be a form belonging to a northward extension of the "Cumberland subregion" of Binney. It will probably turn out to be generally distributed in the Shenandoah valley.

Mr. Clark found the following species associated with *Z. s. virginica* at New Market:

<i>Polygyra albolabris</i> (Say)	<i>Polygyra hirsuta</i> (Say)
<i>Polygyra thyroidus</i> (Say)	<i>Discus patula</i> (Desh.)
<i>Polygyra tridentata</i> (Say)	<i>Helicodiscus parallelus</i> (Say)
<i>Polygyra fallax</i> (Say)	<i>Retinella burringtoni</i> (Pils.)
<i>Polygyra fraudulentata</i> (Pils.)	<i>Zonitoides arboreus</i> (Say)
	<i>Haplotrema concavum</i> (Say)

A single example of *Z. s. virginicus* was taken at Staunton, Augusta Co., Va. Also the two introduced species *Helix nemoralis* L. and *Oxychilus draparnaldi* (Beck).

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## LAND SHELLS FROM TEXAS AND NEW MEXICO

BY H. A. PILSBRY

### POLYGYRA CHISOSENSIS, new species.

The shell is depressed, about like *P. texasiana* in shape, the umbilicus contained about  $4\frac{3}{4}$  times in the diam.; light brown, feebly translucent, of 5 convex whorls, the last equably rounded at periphery, descending rather deeply in front, constricted behind the outer and basal margins of lip. Surface glossy, the first whorl smooth, the rest with very low, unequal ripples of growth,

and close behind the peristome with a group of sharp but fine striae. Under the microscope a minute granulation is seen on post-embryonic whorls, weak or nearly effaced on the last whorl. The aperture is strongly oblique, the outer and basal margins of the peristome reflected, the basal conspicuously recurved. Within the outer margin there is a broad, inwardly bent, concave ledge, which is thickened at its lower margin into a rounded, projecting tooth. In the basal margin an erect, narrower tooth stands. There is on the parietal wall a biramose or v-shaped tooth, the branch towards the columella being very high and longer than that towards the upper lip-insertion. A short distance within, a callous tubercle stands on the wall of the columellar axis. Height 5 mm., diam. 11.8 mm.

Texas: Chisos Mts., Brewster Co., the type 166097 ANSP from a northeast slope N. E. of Naill's ranch house, coll. by Ferriss and Pilsbry, 1922.

*P. texasiana* has stronger sculpture and differs in shape of the tooth in the outer lip, which in *P. chisosensis* forms a concave, inflected plate. The smoothish western forms of *texasiana* have coarser riblets behind the lip, besides the difference in teeth. All forms of that species differ by lacking an internal tubercle on the columella. *P. mooreana* has a callous ridge on the columella, within, doubtless homologous with the tubercle of *P. chisosensis*.

It occurs in stony talus slopes in some abundance, and was hibernating when we were there late in November. The extremes of size in a large lot are 9.5 to 13.4 mm. diam.

#### POLYGYRA CHISOSENSIS DISCOBOLUS, new subsp.

The shell is flatter and usually larger than *P. chisosensis*, the umbilicus wider, contained  $3\frac{2}{3}$  times in the diam. The parietal tooth is further from the columellar lip, which does not bend forward at its insertion. Internal tubercle weaker.

Height 4.8 mm., diam. 14.2 mm. Type.

“ 4.5 mm., diam. 12.3 mm. Smallest shell.

Foothills of the south side of the Chisos Mts., in the Blue Creek region, Brewster Co., Texas. Type 144355 ANSP., coll. by J. H. Ferriss, 1925.

#### ASHMUNELLA ORGANENSIS, new species.

The shell is depressed, the narrow umbilicus contained 6 (to 7) times in the diam.; thin; buckthorn brown, translucent; of 5 to  $5\frac{1}{3}$  moderately convex whorls, the last rounded at the periphery,

above the middle, descending very little in front, constricted behind the lip. Surface *very glossy*; the embryonic  $1\frac{1}{2}$  whorls appear smooth except for weak radial wrinkles below the suture, but under the microscope close spiral lines of punctures are seen; following 1 or  $1\frac{1}{2}$  whorls have weak growth wrinkles and an indistinct pattern of low papillae. The remaining whorls have weak, fine growth wrinkles, which become rather close, sharp striae behind the prelabial constriction, the base more glossy with the striation weaker. All post-embryonic whorls have a microscopic sculpture of close spirals, which appear more or less punctate under sufficient magnification. The aperture is rounded-lunate. Peristome faintly flesh tinted, reflected, a little thickened within, with a low, tubercular tooth in the outer part of the basal lip. Parietal callus thin, transparent, bearing a very weak, short, obliquely placed parietal tooth.

Height 5.8 mm., diam. 13 mm. Type. Other topotypes measure from  $6.4 \times 12$  mm. to  $7 \times 14$  mm.

New Mexico: western slope of the Organ Mts. above Dripping Spring (La Cueva), in the N.-E. branch of the canyon, estimated elevation 7000 to 7500 ft. Type 165909 ANSP., coll. by Ferriss and Pilsbry, 1922.

The brilliant gloss of "live" shells is a conspicuous feature. The basal tooth is often reduced to a mere vestige; when strongly developed there is usually also the trace of an inner basal tooth. The parietal tooth is variable, rarely distinct, and entirely wanting in a few shells.

There seems to be no nearly related species. Probably other more fully toothed forms may turn up in the Organ Range, which has been explored for shells only in one place; if so, they may give a clue to the relationships of *A. organensis*.

It occurred in long, narrow slides of small stone on a very steep incline. There is sparse growth of scrub oak, scrub maple, and a few yellow pines, pinyons and cedar. Though this station is not very high, it is one of the steepest climbs anywhere.

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## THE TYPE OF POLYGYRA SAY

BY HARALD A. REHDER

Pilsbry (Proc. ANSP., vol. 82, 1930, p. 311) credits the type designation for *Polygyra* to Herrmannsen (Ind. Gen. Malac. Prim., vol. 2, 317 (1847)) who gave *Helix septemvolva* Say as

type. Herrmannsen's work appeared in parts at different times, and according to Herrmannsen himself (op. cit., Suppl., p. iv) the signature containing the above type designation appeared on December 7, 1847. The type designation of Gray (Proc. Zool. Soc. London, vol. 15, 1847, p. 173), who gave *Helix auriculata* Say as type, appeared in November, 1847, which has a month's priority. *Polygyra* s.s. will therefore replace *Daedalochila* Beck, and for the group typified by *Polygyra septemvolva* Say we will have to use *Ulostoma* Albers (Die Heliceen, 1850, p. 95), of which *Polygyra septemvolva* was designated as type by Pilsbry in 1930 (op. cit., p. 312).

*Cyclodoma* Swainson (Treat. Malac., 1840, p. 193) is listed as an available name for this group by Pilsbry (loc. cit.), but it is very unsatisfactory. Swainson erected it as a subgenus of *Lucernella*, which was characterized as having a depressed spire, the sides convex and not carinated, and the outer and inner lips with teeth. *Cyclodoma* was further characterized as being depressed, small, and usually striate, and inhabiting the mountains of North America and Madeira. Later (op. cit., p. 329), he united it with *Lucernella*, and on the next page added the subgenus *Polygyra* with *septemvolva* listed under it. This incorporation with *Lucernella*, (typified by *Helix hippocastaneum* Lam.) and the earlier (op. cit., p. 193), mention of its "obvious union" with the toothless *Hemicycla plicaria* Lam. from the Canaries, lead one to suspect that the author may have had before him some of the *Polygyras*, but hardly *septemvolva* which is quite different in shape and apertural characters, and which he considered distinct. But just what species of *Polygyra* he included we can not know, and what similar Madeiran forms he had in mind is hard to say. Altogether it is a highly uncertain group and I suggest that it be considered a *genus dubius*.

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## NOTES

OSTREA KAMEHAMEHA, new name for *Ostrea bryani* Pils., Proc. A.N.S. Phila. 1917, p. 329; not *O. bryani* Gabb, 1876. The type of this big oyster from Waianae (Oahu), is in the B. P. Bishop Museum at Honolulu. A fine series of topotypes in the museum of the Academy was collected by Mr. Tha anum and myself in

1933. In naming it for Prof. Bryan I overlooked the Cretaceous oyster bearing the same name.—PILSBRY.

PANOPE BITRUNCATA Conrad at SANIBEL, FLORIDA.—A valve of this species was sent to us recently by Dr. Louise M. Perry, of Sanibel, Fla. It is of interest because it extends the range of this species about 300 miles south of Crooked Island, Calhoun County, the northern record for western Fla. This is the common Pliocene *Panopea* of the Caloosahatchie, Shell Creek and Alligator Creek formations and recently been found sparingly in canal dredgings at Clewiston near Lake Okeechobee, Fla.—R. A. McLEAN.

THE GENERIC POSITION OF PLANORBIS OBSTRUCTUS MORELET.—This small planorbid has been placed in the genera *Segmentina* or *Planorbula* by most conchologists on account of the lamellae within the aperture. Pilsbry (Proc. Acad. Nat. Sci. Phil., 86, p. 54, 1934) has recently questioned this disposition and an examination of the animal shows conclusively that it cannot be included in *Planorbula*, since it lacks the peculiar penial gland, has a differently shaped penial complex, prostate and ovotestis. As suspected by Pilsbry, it belongs in the genus *Tropicorbis*, having the same form of genitalia as in *Tropicorbis pallidus* and *havanensis*. Several specimens of both *obstructus* and *havanensis* have been dissected. Specimens of these species were collected near New Orleans by Dr. Ernest Carroll Faust of the School of Tropical Medicine, Tulane University.—FRANK C. BAKER.

THE VIABILITY OF A SNAIL IN A KILLING SOLUTION.—During March, 1934, while collecting amphibians on Barro Colorado Island, Panama Canal Zone, I secured a number of snails. One large water snail was later determined by Mr. James Zetek, Resident Custodian of Barro Colorado Island, as *Ampullaria cumingii* King. This snail was dropped into my killing solution for amphibians, a mixture of weak alcohol and weak formalin, and allowed to remain in the liquid for well over an hour. The proportionate amounts of alcohol and formalin in this killing fluid were not measured, but I judge that the solution contained approximately ten per cent alcohol and about two per cent formalin. A day or so later the snail was given to Mr. Zetek in a presumably dead condition. Fully ten days afterwards, during a visit to Mr. Zetek's laboratory, the discussion having veered to the sub-

ject of snails remaining dormant in museum collections for many years and then becoming active once more because of some change in humidity, I remarked that the specimens which I had collected and killed would not trouble museum curators in this respect. Mr. Zetek promptly corrected my rash statement by showing me my specimen of *Ampullaria*, which was alive and feeding in a vivarium on his table, and thereby greatly increased my respect for the ability of operculate snails to resist unfavorable environmental conditions. Mr. Zetek remarked that this species was known to crawl into the mud when the water in which it had been living evaporated, but that this evidence of its ability to resist a killing solution might be of interest to the readers of the NAUTILUS. If it should prove otherwise, I trust that my first excursion into the field of conchology will be laid at his door.—M. GRAHAM NETTING, Carnegie Museum.

BULIMULUS IN TEXAS.—In October, 1935, we found a very interesting occurrence of *Bulimulus alternatus mariae* (Alb.) in the region west, south, and east of Corpus Christi, Texas. The finest colony was nine miles west of the city, on the road to Calellan, where they occurred in abundance in estivation, sealed to large cactus, mesquite, coarse grass and shrubs, and on fence posts and telephone poles, even to the very top, in the full glare of the hot sun. The colony extended for a mile or two, and the white shells of the snails could be easily seen along the roadside as we drove past in the automobile, sometimes in clusters of a dozen or more on posts, more scattered in other situations. We found them again in the same sort of habitat seven miles north of Premont on the Alice-Falfurrias road, continuing for several miles southward, and seven miles east of Falfurrias, extending more or less continuously eastward to Riviera and northward to Kingsville, for many miles, a few on fence posts even where there were no trees or shrubbery, only grass and short weeds. We found another fine colony five miles east of Corpus Christi, on cactus, mesquite, etc. *Helicina* occurred with them nearly everywhere around the cactus, and *Polygyra* at the first locality. See Plate 7, fig. 1.—JUNIOUS HENDERSON.

CEPOLIS (PLAGIOPTYCHA) IMPERFORATA, new species.—The shell is imperforate, moderately depressed but more capacious

than most of the subgenus, of a uniform dark chestnut-brown color. Embryonic  $1\frac{1}{2}$  whorls smooth, glossy, the remaining whorls dull, with sculpture of thread-like striae, about three in one millimeter at the periphery. Whorls  $4\frac{1}{2}$ , convex, the last rounded peripherally, deeply descending in front. Aperture strongly oblique. Peristome pink, expanded, the upper and basal margins straightened and subparallel, the basal margin reflected, spreading and adnate over the umbilicus, its inner edge with a long callus or low tooth, which is higher and runs inward a little at its axial end. Height 9.3 mm., diam. 15 mm.

Terre Rouge, Haiti, collected by Dr. James Bond, 1933. Type No. 161009 ANSP., received through Mr. David C. Pease.

The complete closure of the umbilicus and the rather capacious shape distinguish this species, which has the color, sculpture and basal tooth of the typical forms of *Plagioptycha*.—H. A. PILSBRY.

THE CONCHOLOGICAL CLUB OF SOUTHERN CALIFORNIA has issued its program of meetings for 1936. The subjects for monthly meetings include talks on many families of marine, land and freshwater shells, California index fossils, Del Rey fossils, shells used for wampum, and other interesting topics. The roll gives 45 regular members, 11 associates and 1 honorary member. Mr. H. N. Lowe is President for the year.

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### PUBLICATIONS RECEIVED

WEST COAST SHELLS. A DESCRIPTION IN FAMILIAR TERMS OF THE PRINCIPAL MARINE, FRESH-WATER, AND LAND MOLLUSKS OF THE UNITED STATES, BRITISH COLUMBIA, AND ALASKA, FOUND WEST OF THE SIERRAS. By Josiah Keep. Revised by Joshua L. Baily, Jr. Stanford University Press. 1935. (\$3.75.) This thorough revision of a well known manual brings both content and nomenclature remarkably up-to-date. Its small size and flexible binding will lend themselves admirably to its use in the field. The 334 figures are, in main, beautifully clear and well selected, but a perusal of one or two pages of text is necessary to find their names. However, this is a joy, rather than a labor. The brief glossary is good, even without illustration, and the index wisely gives both old and new names. We ought to have a Keep or a Baily in the East.—H.B.B.



# THE NAUTILUS

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## NOTES ON GROWTH OF A JAMAICAN SLUG

BY E. A. ANDREWS

*Where eggs were found.* July 28, 1932, in Jamaica, B. W. I., a batch of large, clear eggs was found under a piece of limestone in a rocky banana patch close to the right of the road leading up from Kingston to Stony Hill. Because the eggs were close to a living *Pleurodonte*, they seemed as if laid by that snail, but when brought to Baltimore, Md., they hatched, August 8-9, as very active little slugs; later identified as *Veronicella laevis* Blainville. The eggs not hatched by Aug. 12 measured 8 by 4 mm. and the young slugs 13 by 4, when actively crawling upon lettuce.

*Methods of rearing and feeding.* The 44 little slugs were kept in a glass jar of 9 litres capacity, with moist towelling paper, slaked lime, some decayed wood and, for food, lettuce, sweet potato, sweet corn, dock leaves, etc. The slugs ate their way into the hard, raw sweet potato in a surprising manner, making round holes into which they disappeared entirely, penetrating as if they were beetle larvae. One was accidentally cut in two, but though the pieces lived many days they did not regenerate.

*Color and habits.* Most of the slugs became grey and developed more or less evident, lengthwise, darker streaks, but a few showed a yellow color, which was possibly a change due to physiological states assumed by the grey ones. In the daytime, the slugs remained inactive, hidden under stones, etc., but at night they ate, and crawled extensively. When a glass cover was used, they often crawled up to the top and remained there. As they seemed to avoid too much wetness, aeration was later provided by cloth or wire screen over the jar top, but they eventually managed to jam themselves under its edge and hence, from time to time, some of them escaped and the numbers fell off, solely from

death outside in the dry laboratory. Over table and floor, the wanderers were traced by their trail of shining slime for 10 to 12 feet and, when found, were generally quite dead and dry. One managed to find a milk bottle containing water and kept alive inside, near the water, until found, several days later. After eating lettuce, the faeces were green or black and dry; they measured a third the length of the animal.

The colorless lower tentacles had a rounded tip, like an eye, but with no colored retina, while near the tip, on the inner face, a side branch constantly felt about, thumb-like, over the substrate. The eyes were yellowish, on stalks 5 mm. long. The locomotor waves along the sole were very interesting.

#### RECORD OF GROWTH

<i>Days after hatching</i>	<i>Condition</i>	<i>Length (in millimeters)</i>	<i>Width</i>	<i>Depth</i>	<i>Numbers</i>
- 15	Eggs .....	6	4	—	—
+ 3	Crawling young .....	13	4	—	—
25	Crawling young .....	26	7	—	42
25	Runts .....	11	4	—	2
37	Resting young .....	32	2	6	41
49	One resting young .....	28	3	4.5	—
	Same one crawling .....	36	7	4	—
	Another resting .....	35	12	7	—
69	Crawling young .....	38	11	6	28
79	.....	29-43	13-26	4-8	9
112	Resting .....	35-53	13-23	3-9	12
133	Crawling .....	46-73	14-23	5-7	12
155	Extended .....	52-68	13-26	4-10	8
175	.....	57-70	13-20	3-10	9
227	.....	40-67	11-20	6.5-9	5
298	Crawling .....	60-78	15-19	7-18	2
336	Sexually mature .....	60	22	9	1

*Increase in weight.* When ten weeks old, three slugs that escaped and dried up completely had then an average weight of 236 milligrams and measured 21, 26 and 30 mm. in length, 8, 8 and 9 in width, and 1, 2 and 2 in depth. When 30 weeks old, five living slugs weighed from 2550 to 4650 milligrams. Two sur-

vivors, 44 weeks old, weighed 5000 and 5200 milligrams; less than a month later, when about a year old, these same two weighed 9700 and 10,000 milligrams.

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## A NEW POLYGYRA FROM FLORIDA

BY H. A. PILSBRY

Last year Miss Marguerite Robinson spent some time at Pompano, Florida, in company with her father, Mr. Anthony Wayne Robinson, of Haverford, Pa. This place is in Broward Co. about 8 miles north of Ft. Lauderdale. Besides many marine shells, she found snails of the *Polygyra auriculata* group, equalling the largest specimens of that species in diameter, and more obese in figure than any of that group known hitherto. It appears to be a well-marked subspecies of *P. uvulifera*, but much larger and especially higher than typical *uvulifera*. Around Miami I have found only a small form of that species, height 5 mm., diam. 10 to 11 mm.

*Polygyra uvulifera margueritae*, new subspecies. The shell differs from *P. uvulifera* by the much greater elevation of the last whorl, which is decidedly more inflated. It is regularly and strongly striate. Height 9.7 mm., diam. 16.5 mm.; 6½ whorls; type and paratype 166479 ANSP. A smaller paratype measures: height 8.5 mm., diam. 14.8.; barely 6 whorls.

Miss Robinson tells me that the shells were found along a path to the beach which had been cut through the rather thick growth of shrubs, grass, vines and wild flowers, growing on clean white sand. This is about three minutes walk from the main road.

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## THE EASTERN LIMIT OF SONORELLA

BY H. A. PILSBRY

The eastern limit of *Sonorella* has hitherto been thought to be the Organ Mountains, east of Las Cruces, New Mexico, where C. H. T. Townsend found a specimen in 1897, which reached me through Professor Cockerell.<sup>1</sup> In 1922 Mr. Ferriss and I visited

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<sup>1</sup> See Proc. Acad. Nat. Sci. Phila. 1905, p. 257; shell and anatomy figured as a variety of *S. hachitana*.

the Organs, finding *Sonorella* near the western foot at Dripping Spring, also further north in the western foothills of the San Andres range.

In his last field trip Mr. Ferriss worked in the Big Bend country of western Texas. On March 19th, 1925, he wrote from a camp on Terlingua Creek (south of Alpine): "We are heading towards home via Sierra Blanca and perhaps the Guadelupes by easy stages." "Will stay a few days in the Davis Mountains, and return by another route, north of the San Antonio route." He never wrote me any details of this return trip, but among the shells sent in there are two lots labelled "Sierra Blanca, lowest slide" and "upper slide." To get on the northern route east by a good road one has to go west from Alpine to Van Horn, thence turning east in the highway by way of Pecos. Sierra Blanca is about 20 miles west of Van Horn on the road to El Paso. Sierra Blanca Peak is about 5 or 6 miles northwest of the railroad station. It runs up to nearly 6800 feet. This is evidently where he found the sonorellas. It is the only locality for the genus in Texas, and is furthest east known for *Sonorella* anywhere. The species Ferriss found here appears to me identical with the Organ Mountain form, which I call:

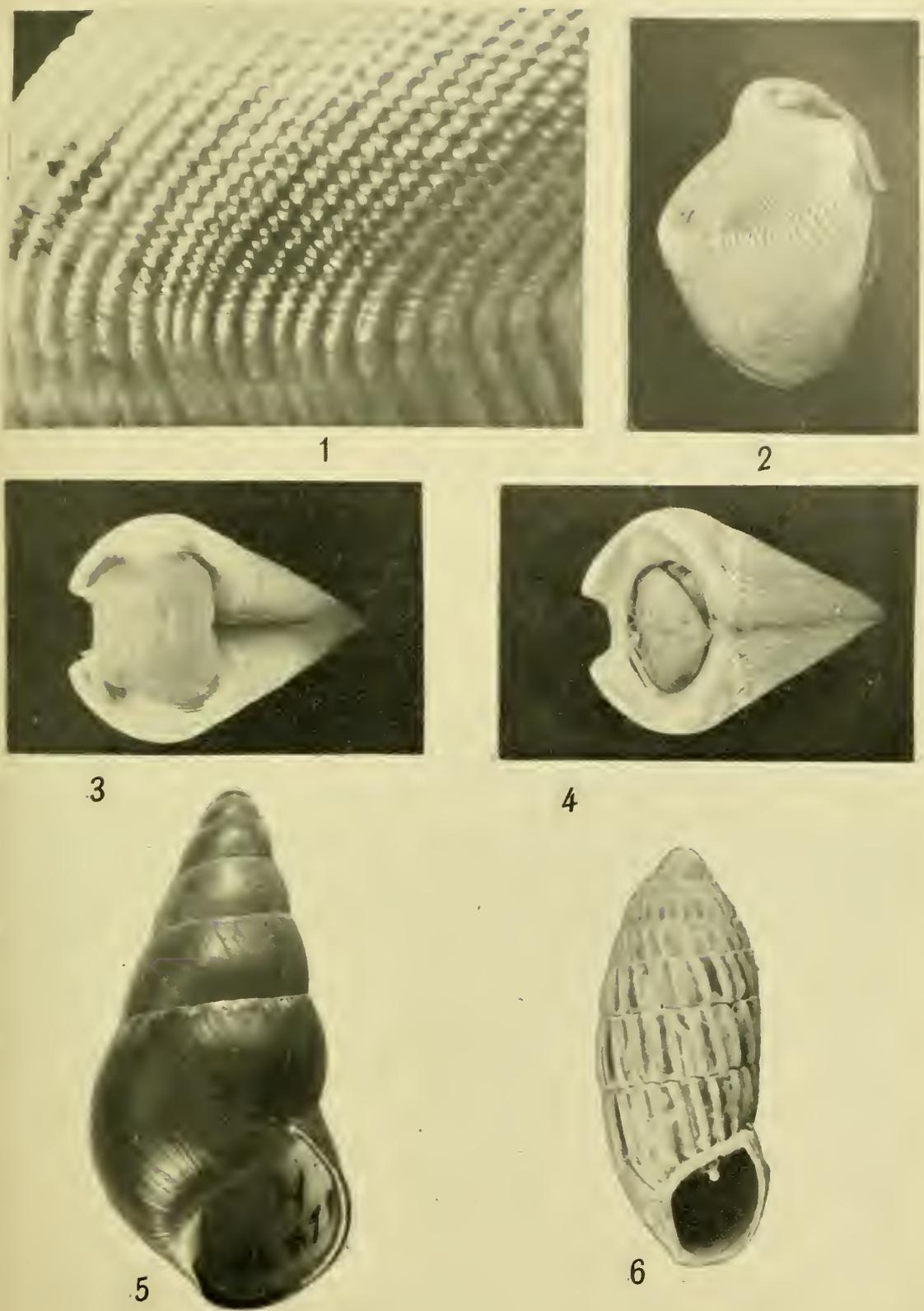
*SONORELLA HACHITANA ORIENTIS*, new subspecies. The shell has the aperture noticeably larger than that of *hachitana*, and the last whorl descends less in front. Height 13.4 mm., diam. 24.4 mm. Type 165931 ANSP. The species has been figured in the article referred to in footnote 1. The specimens from Sierra Blanca measure from 22 to 24 mm. diameter.

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**HIATA, A NEW GENUS OF THE FAMILY PHOLADIDAE FROM THE PACIFIC AT PANAMA,  
WITH A DESCRIPTION OF A NEW  
SPECIES**

BY J. ZETEK AND R. A. McLEAN

The presence of a callum is one of several characters heretofore possessed by all species in the genus *Martesia*. Our present new form has all of the characters of this genus other than a callum. In this case this character appears to be of more than



1, 2, 3, *Hiata infelix* Zetek & McLean, holotype: 4, paratype. 5, *Helicostyla subcarinata archeri* Clench, holotype. 6, *Cerion (trophlops) juliae* Clench, holotype.  
 Fig. 1.  $\times 7$ ; 2-4  $\times 1\frac{1}{2}$ ; 5, 6,  $\times$  about  $1\frac{1}{2}$ .



specific value, in fact it is a character which heretofore has been considered of subfamily value.

#### HIATA, new genus

*Description*.—Valves each with one radial sulcus, a single large protoplax, a narrow metaplax, and no mesoplax or siphonoplax. The callum is wanting even in the adult. Genotype.—*H. infelix* Zetek and McLean.

HIATA INFELIX, new species. Pl. 8, figs. 1–4.

*Description*.—Shell obtusely wedge shaped, thin, truncated anteriorly, cordate, with sinuous elevated, crenulated ridges, slight radial sculpture anteriorly. Radial sulcus slight. Minute sculpture as in fig. 1, similar to but coarser than *Martesia striata* L. The posterior portion of the shell marked only by somewhat irregular concentric undulations or growth lines. Callum lacking. Protoplax wide and bilobed behind, intercalated between the valves anteriorly. Metaplax narrow. Color white. *Measurements*.—Length 21, height 16, width 16 mm.

*Holotype*.—Mus. Comp. Zoöl. No. 100,088, Balboa, Canal Zone. Paratypes in the Mus. Comp. Zoöl. and the collection of James Zetek.

*Remarks*.—The conclusions of this article do not agree in some respects with the present classification of the *Pholadidae* but under the circumstances it seems advisable to call attention to this form for the benefit of future workers for, as Grant and Gale (Pliocene and Pleistocene Moll. Calif., 1931, p. 430) point out, "Much further study appears to be necessary before the relative systematic value of the several characters used in classification can be determined." The characters of our present species all seem to indicate an immature *Martesia*, but surely adults would be found among the large series of animals that we have. The senior author, in the course of extensive collecting, has never taken this form with a callum. The large immature *M. intercallata* mentioned by Carpenter (Cat. Mazatlan Moll., 1855–1857, p. 13), may belong to our new species. These pholads have been taken from very resistant timbers such as greenheart (*Nectandra rodioe*) from Demarara and some of the extremely hard woods from Dutch Guiana.

## A NEW CERION FROM THE BAHAMAS

BY WILLIAM J. CLENCH

CERION (STROPHIOPS) JULIAE, sp nov. Plate 8, fig. 6.

Shell medium to large, solid, ribbed, cylindro-conic and rimately perforate. Color a dull white with rather faint axial bars of pale brown between most of the ribs. Whorls 11, widest at the mid area of the shell, tapering slightly below and tapering convexly to a slightly acute apex above. Interior of aperture a dull, creamy brown. Nuclear whorls dull white and smooth. From the second whorl onward the ribs appear, first very faintly and then becoming very strong on the later whorls. Umbilical rimation fairly deep but definitely closed within and *very faintly* margined by a basal ridge. Parietal ridge central and very well developed and not continued within for more than one-half whorl. Columellar lamella centrally located and only slightly developed at the aperture, much stronger within and is continued back for two whorls where it gradually and smoothly merges with the axis at its upper point. Lip subquadrate, slightly collared, ridged or complete along the parietal region. Sculpture of strong axial ribs numbering 15 on the body whorl with numerous and very fine supplementary short ribs interposed between the larger ribs at the base of the last whorl. Length 32.1, width 12, aperture 9 x 6.5 mm.

*Holotype*.—Mus. Comp. Zoöl. no. 10369, Great Ragged Cay, southeastern part of the Great Bahama Bank, Bahama Islands, Alexander Agassiz collector, Feb. 10, 1893, "Wild Duck" Expedition.

*Remarks*.—Unfortunately, only a single specimen of the new species is available for study. Dall<sup>1</sup> who worked up the material collected by the "Wild Duck" Expedition referred this specimen to *C. cinereum* (Maynard) (p. 119), *C. cinereum*, however, is only a colonial form of the more wide spread and abundant *C. glans* (Küster) of the New Providence and Andros Islands. Though a member of the *glans* assemblage, it bears no direct relationship with that species.

It appears to be fairly close to *C. josephinae* Clench from Long Island, a relationship which is expressed geographically as well. It differs from this latter species by being colored, possessing

<sup>1</sup> Dall, W. H., 1894, Bull. Mus. Comp. Zoöl. 25, pp. 113-123 and plate.

fewer and somewhat coarser ribs, a much stronger axial lamella and not having the inner margin of the umbilical rimation definitely margined. All other characters approximate *C. josephinae*.

Great Ragged Island is one of the last of a chain of islands on the southeast end of the Great Bahama Bank, an area known as the Columbus Bank. From this island there is a long series of small Cays forming an arc which reaches nearly to Long Island.

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## THE STATUS OF POMATIA ASPERSA (MULLER) IN MAINE

BY ARTHUR H. NORTON  
Museum Natural History, Portland Maine

Almost a century ago the common European snail, *Helix aspersa* Müller, was admitted to the fauna of Maine, having been found at Portland, where apparently, it has not been seen since 1838. This fact has been nearly forgotten, yet the question of its occurrence here arises from time to time, and it may seem that a review of the citations of the snail in Maine may be helpful to future, and perhaps some present students.

Citations usually refer to "Binney." We find that Amos Binney<sup>1</sup> in a "Table of Foreign Species Recorded<sup>2</sup> by Authors as Observed in the United States" enters *Helix aspersa*, "Maine." And again, "it has been found on the coast of Maine."<sup>3</sup> Prof. E. S. Morse in his *Pulmonifera of Maine*,<sup>4</sup> remarks, "Dr. Binney mentions the occurrence of this species on the coast of Maine; otherwise than this, I have never heard of its presence in the State." It is evident that he refers to the second of the previous citations. W. G. Binney<sup>5</sup> and Thomas Bland mention the species as, "has been found" at Portland. This evidently is the citation which Mr. Johnson refers to, beyond. Again W. G.

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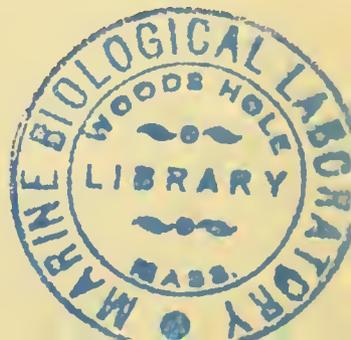
<sup>1</sup> 1851, A. Binney, *Terrestrial Air Breathing Moll. U. S. I*, 159.

<sup>2</sup> Italics mine.

<sup>3</sup> 1851, A. Binney, *Ibid.*, II, 117.

<sup>4</sup> 1864, Morse, *Journ. Portland Soc. Nat. Hist. I*, 9.

<sup>5</sup> 1869, Binney & Bland, *Smiths. Misc. Coll. VIII (194)*, 183.



Binney,<sup>6</sup> refers to the creature as, "has been found" at Portland.

Mr. C. W. Johnson<sup>7</sup> in a "Note," in his *New England Mollusca*," says, "was recorded by Binney from Portland, Me., in 1869," and referring to an introduction at Wood's Hole, Massachusetts, he adds, "there is now no evidence of its occurrence at either locality. It should be pointed out that, beginning about 1843, there has been a long line of active conchological collectors in Portland, including Dr. J. W. Mighels, E. S. Morse, John M. Gould, Henry Willis, and Charles B. Fuller, who knew nothing of the occurrence of the snail in this city. It seems quite certain that all of the foregoing citations trace back to Amos Binney, 1851, who very evidently took his "record" from Jeffries Wyman,<sup>8</sup> 1839. Dr. Wyman who, in his capacity as Secretary of the Boston Society of Natural History, presented an abstract of the early meetings of that Society, reports a meeting on October 22, 1838, as follows: "Dr. A. A. Gould stated that he had recently received a specimen (italics mine) of *Helix aspersa* from Portland, Maine, from a gentleman who assured him that it was very common in that vicinity; and appeared in great numbers after the ground had been burned over." It is not to be supposed that Dr. Gould could have been mistaken in the identification of the single specimen which he received.

It seems apparent that the promise of a colony of *Pomatia aspersa* (Müller) existed at Portland in 1838, and about equally certain that it terminated completely and abruptly about the same time, due either to the burning of the land referred to, or to some other cause or causes.

It is a curious fact that this species was given no mention by Dr. Mighels<sup>9</sup> in his catalogue published but a few years later.

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<sup>6</sup> 1885, W. G. Binney, U. S. Nat. Mus. Bull. 28, 470.

<sup>7</sup> 1915, Johnson, Occ. Papers Boston Soc. Nat. Hist. VII (13), 194.

<sup>8</sup> 1839, Wyman, Am. Journ. Sci. XXXVII, 392.

<sup>9</sup> 1843, Mighels, Journ. Boston Soc. Nat. Hist. IV, 308-345.

## WEST VIRGINIAN CARYCHIIDAE IN THE CARNEGIE MUSEUM COLLECTION—1936

BY STANLEY TRUMAN BROOKS

Curator, Recent Invertebrates, Carnegie Museum

Among the collections made this past summer by Mr. Gordon Kutchka, of this Museum, and Professor G. R. Hunt, of Fairmont Teachers College, Fairmont, West Virginia, are some seventeen lots of *Carychium*. These constitute three new records for the State.

*Carychium exiguum* (Say). Found at only one of the stations represented: Romney, Hampshire County, in drift along the east bank of the South Branch of the Potomac River.

*Carychium nannodes* G. H. Clapp. Collected at Talcott, Summers County; at Kingmont, Marion County; Mill Point, Pocahontas County, and Renick, Greenbrier County. The shells and internal lamellae of all four lots are quite typical and compare well with the types and with Miss Winslow's figures (Occ. Pap. U. of Mich., 128, pp. 1-16, pl. 5).

*Carychium exile* H. C. Lea. Twelve of the lots were *C. exile* and vary in size from 1.6 mm.  $\times$  0.6 mm. to 1.9 mm.  $\times$  0.6 mm. At first glance their relatively narrow form seemed to separate them from *C. exile*, but upon opening the body whorl the lamella was found to be of the *exile* type. Within this series, however, the lamellae varied from the form figured as typical of *exile* to a form close to *C. exile canadense* G. H. Clapp. The shorter ones had the leaf-like, deflected portion of the lamella in front of or slightly to the right of the columella; the longer the specimens the farther this deflection occurred from the aperture. Comparing these with our series of *canadense* it was found that almost every step from the *exile* form to the *canadense* form was present. The extremes among the West Virginia specimens approached closely to the less typical *canadense*. The types of *canadense* from Maine are typical but several in the series opened for study vary in the position of the "dip" of the lamella. Comparison of my specimens with the large form mentioned by Dr. Clapp from Princeton, Alabama, showed a difference in the body proportions; the Princeton specimens have the *exile* type of lamella and are not as heavily ribbed.

## SOME MARINE BIVALVES FROM THE BAHAMA ISLANDS

BY RICHARD A. McLEAN

This list is based mainly on collections made by Glover M. Allen, Thomas Barbour and Owen Bryant in 1904. Additional material collected by Dr. Barbour and James Greenway during two winter cruises of Mr. Allison V. Armour's yacht, the "Utowana," has also been included. The name Utowana in parenthesis is placed after localities given for this material.

All the specimens are deposited in the collections of the Museum of Comparative Zoology, Cambridge, Mass.

Great care must be used to give specific localities in the Bahama Islands as there is considerable duplication of names; *e.g.*, there is a Whale Cay and a Whale Cay Channel in the Berry Islands and both of these names occur again north of Great Abaco Island, and there are several Mangrove Cays throughout the Bahamas. Localities as follows:

Marsh Harbor, east coast of Great Abaco Island opposite the Marls.

Hopetown, Elbow Cay, east of Marsh Harbor, Great Abaco Island.  
Water Cay, close inshore north of Marsh Harbor, Great Abaco Island.

Whale Cay Channel, northeast of Great Abaco Island.

Sweeting's Village, east coast of Great Abaco Island south of Marsh Harbor.

Moraine Cay and Strangers Cay, northeast of Little Abaco Island.

Riding Point, north coast of Grand Bahama Island.

High Rock, south coast of Grand Bahama Island.

Mangrove Cay, Middle Bight, Andros Island.

*Arca auriculata* Lam. Dredged in Whale Cay Channel and at other localities northeast of Great Abaco Island.

*Arca occidentalis* Phil. Dredged in Whale Cay Channel.

*Arca umbonata* Lam. Fortune Island (Utowana).

*Arca barbata* Linn. Sweeting's Village; Moraine Cay; Whale Cay Channel; Fortune Island (Utowana).

*Arca reticulata* Gmel. Moraine Cay; Sweeting's Village.

*Arca adamsi* 'Shuttleworth' Smith. Sweeting's Village; Whale Cay Channel.

*Glycymeris pectinata* (Gmel.). Mangrove Cay; Whale Cay Channel; Fortune Island and Watling Island (Utowana).

- Limopsis antillensis* Dall. Dredged in Whale Cay Channel.
- Musculus lateralis* (Say). Dredged northeast of Great Abaco Island.
- Lithophaga nigra* (Orb.). Whale Cay Channel.
- Botula fusca* (Gmel.). Mangrove Cay.
- Mytilus cxustus* Linn. South side of Abaco; Sweeting's Village; Mangrove Cay; Fortune Island and High Rock, Grand Bahama Island (Utowana).
- Pedalion alata* (Gmel.). Marsh Harbor.
- Pedalion listeri* (Hanley). Sweeting's Village.
- Pedalion semiaurita* (Linn.). Sweeting's Village.
- Pteria colymbus* (Röding). Marsh Harbor.
- Margaritifera radiata* (Leach). Marsh Harbor.
- Pinna carnea* Gmel. Marsh Harbor; Sweeting's Village.
- Pecten imbricatus* (Gmel.). Fortune Island (Utowana).
- Pecten nucleus* (Born). Whale Cay Channel and other localities north of Great Abaco Island; Moraine Cay.
- Pecten antillarum* Recluz. Whale Cay Channel and other localities north of Great Abaco Island.
- Spondylus echinatus* (Martyn). Watlings Island and Fortune Island (Utowana).
- Lima hians* (Gmel.). Whale Cay Channel.
- Anomia simplex* (Orb.). Moraine Cay.
- Crassinella parva* (C. B. Adams). Moraine Cay.
- Taras punctata* (Say). Whale Cay Channel; Hopetown; Moraine Cay.
- Phacoides adansoni* (Orb.). Whale Cay Channel.
- Phacoides pensylvanicus* (Linn.). Moraine Cay; Water Cay; Strangers Cay; Sweeting's Village; Mangrove Cay; Whale Cay Channel and other localities north of Great Abaco Island; Fortune Island and High Rock, Grand Bahama Island (Utowana).
- Phacoides nassula* (Conr.). Whale Cay Channel and other localities north of Great Abaco Island; Lake Cunningham, New Providence Island; Moraine Cay; Hopetown; Sweeting's Village.
- Phacoides radiata* (Conrad). Sweeting's Village; Moraine Cay; Whale Cay Channel.
- Lucina radiata* Conrad, Medial Tertiary, Jan., 1845, p. 70, pl. 40, f. 3.
- Lucina radians* Conrad, Amer. Journ. Sci. 41 (2), Oct., 1841, p. 347. Not *Lucina radians* Bory de St. Vincent, Ency. Meth. (Vers), 1824, p. 154.

The name *Lucina radians* Conrad 1841 applies to the same species as *L. radiata* of Conrad in his Medial Tertiary, 1843.

*Lucina radians* Deshayes [in Melleville] 1843 is not this species but a *Felaniella*. All of these names are antedated by *Lucina radians* Bory de St. Vincent 1824. There are no specimens of Bory de St. Vincent's species in the collection of the Museum of Comparative Zoology but figures given by this author seem to place his species in or near the genus *Divaricella*. *L. radiata* Conrad 1845 must take the place of Conrad's earlier name which becomes a homonym of *L. radians* Bory de St. Vincent.

*Phacoides crenella* Dall. Whale Cay Channel.

*Myrtaea compressa* (Dall). Moraine Cay.

*Divaricella quadrisulcata* (Orb.). Mangrove Cay.

*Divaricella dentata* (Wood). Mangrove Cay; Hopetown.

*Codokia orbiculata* (Mont.). Mangrove Cay; Moraine Cay; Strangers Cay; Sweeting's Village; Lake Cunningham, New Providence; dredged in Whale Cay Channel and at other localities northeast of Great Abaco Island.

*Codokia costata* (Orb.). Hopetown; dredged in Whale Cay Channel and at other localities northeast of Great Abaco Island.

*Codokia orbicularis* (Linn.). Watlings Island and High Rock, Grand Bahama Island (Utowana).

*Chama ferruginea* Reeve. Strangers Cay; Marsh Harbor.

*Cardium leucostoma* Born. Strangers Cay.

*Cardium muricatum* Linn. Moraine Cay; Mangrove Cay; Hopetown; Whale Cay Channel.

*Papyridea spinosa* (Meuschen). Dredged north of Great Abaco.

*Trigoniocardia antillarum* (Orb.). Riding Point, Grand Bahama Island; Hopetown; Moraine Cay; Mangrove Cay; dredged in Whale Cay Channel and other localities northeast of Great Abaco Island.

*Trigoniocardia medium* (Linn.). Strangers Cay; dredged in Whale Cay Channel and other localities northeast of Great Abaco Island.

*Laevicardium serratum* (Linn.). Strangers Cay; Mangrove Cay; dredged in Whale Cay Channel and at other localities northeast of Great Abaco Island; Watlings Island (Utowana).

*Gouldia cerina* (C. B. Adams). Dredged in Whale Cay Channel and at other localities northeast of Great Abaco Island.

*Pitar fulminata* (Menke). Moraine Cay; dredged in Whale Cay Channel and at other localities northeast of Great Abaco Island.

*Macrocallista maculata* (Linn.). Marsh Harbor.

*Transenella cubaniana* (Orb.). Whale Cay Channel.

- Tranzenella stimpsoni* Dall. Moraine Cay.  
*Tivela abaconis* Dall. Moraine Cay.  
*Venus listeri* (Gray). Marsh Harbor.  
*Venus cancellata* Linn. Riding Point, Grand Bahama Island; Hopetown; Moraine Cay; dredged in Whale Cay Channel and at other localities northeast of Great Abaco Island; Fortune Island and High Rock, Grand Bahama Island (Utowana).  
*Venus grus* (Holmes). Whale Cay Channel.  
*Venus pygmaea* Lam. Mangrove Cay; Lake Cunningham, New Providence.  
*Venus paphia* Linn. Whale Cay Channel.  
*Petricola lapicida* (Gmel.). Mangrove Cay.  
*Ervilia subcancellata* Smith. Mangrove Cay; Moraine Cay; Hopetown; Whale Cay Channel.  
*Heterodonax bimaculata* (Linn.). Strangers Cay; Mangrove Cay.  
*Asaphis deflorata* (Linn.). Mangrove Cay; Marsh Harbor.  
*Tagelus divisus* (Spengl.). Moraine Cay; dredged in Whale Cay Channel and at other localities northeast of Great Abaco.  
*Semele bellastrata* (Conr.). Moraine Cay; dredged in Whale Cay Channel and at other localities northeast of Great Abaco Island.  
*Tellina interrupta* Wood. Marsh Harbor.  
*Tellina radiata* Linn. Lake Cunningham, New Providence; Marsh Harbor.  
*Tellina martinicensis* d'Orb. Moraine Cay.  
*Tellina sayi* 'Deshayes' Dall. Whale Cay Channel.  
*Tellina promera* Dall. Dredged in Whale Cay Channel and at other localities northeast of Great Abaco Island.  
*Tellina iris* Say. Whale Cay Channel.  
*Tellina candeana* Orb. Mangrove Cay.  
*Strigilla flexuosa* (Say). Moraine Cay.  
*Pandora arenosa* Conrad. Moraine Cay.  
*Cuspidaria perrostrata* Dall. Inside the keys north of the Abacos.

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## COMPARATIVE STUDIES OF LOESS AND RECENT MOLLUSKS. II

BY B. SHIMEK

### 2. POLYGYRA MULTILINEATA (Say).

This species is even more variable in size and color than *P. profunda*, in both fossil and recent faunas. This has given rise to a number of varietal names.

It now extends from northeastern Kansas northward to eastern Nebraska and eastward across Iowa and southern Minnesota to western New York.

In the loess it ranges from Iowa to Arkansas and from southwestern Indiana to eastern Nebraska, thus coinciding quite closely with the present distribution, excepting in the east where there is no loess.

It also varies somewhat in habitat. The usual larger form (approaching or embracing the type) is usually found in rather low alluvial woods, even where subject to annual inundation, favoring particularly the places occupied by the soft maple (*Acer saccharinum* L.) and its associates. It may, however, also extend to higher ground where it grades into a form approaching the smaller form known as *var. algonquinensis* of Nason.

The latter seems to extend chiefly through the prairie region from northern Illinois and southern Wisconsin through northern Iowa and southern Minnesota to eastern Nebraska, in which it usually inhabits the thickets or groves which border the margins of prairie swamps—less frequently entering similar emerging places within the swamp itself. In the portion bordering the Mississippi and Missouri Rivers, however, this form grades into the larger type.

The variation in color is also great in the recent forms. The shell varies from a very light horn color to a deep brownish red, and it is usually marked by numerous unequal lines, often blended into broader bands, and varying greatly in number, which may appear on all parts of the shell, or on the upper or lower side alone, or only on the apical whorls or the body whorl. Unicolored forms are frequent, especially in the smaller variety. These have received the names *var. alba* and *var. rubra*. The various color-patterns intergrade completely, however, and moreover do not represent distinct ecological conditions and are mere variants unworthy of special rank.

The fossils, especially the larger forms, often show the color lines, but rather more frequently they are unicolored, in some cases probably as a result of complete bleaching.

Several varietal names, based chiefly on size, have been proposed. Of these *var. algonquinensis* Nason (*Nautilus*, 19: 141;

1906), the recent smaller form, is probably most deserving of varietal rank as it represents an ecological condition, but it also blends perfectly with the typical form, and in any larger series there will always be specimens which cannot be placed definitely.

There is, however, less excuse for two more recent varietal names, namely *wanlessi* and *altonensis*.

Var. *wanlessi* F. C. Baker (NAUTILUS, 41: 132; 1928). This was based on the smaller form of *P. multilineata* which is the common representative of the species in northern loess. It was said to differ from *algonquinensis* in its larger size, more gibbous whorls, especially the body-whorl, and the deeper indentation of the umbilical region.

The greatest diameter was given as 18.5 to 21.5 mm., but the same author (*ibid.* 36: 21, 1922) had previously recorded the same dimension of *var. algonquinensis* as 18.5–22.0 mm.!

Later the same author (1929, p. 295) somewhat modified the description as follows: "The fossil variety differs (from *algonquinensis*) in having a deeply impressed umbilical region and in being widely perforated, characteristics lacking in the recent variety. The fossil form ranges both larger and smaller than *algonquinensis* but is on the whole somewhat larger and in many examples has a more depressed spire."

Still later (Jour. of Paleontology 5: 273; 1931) he calls it a "race," and has it differ from *algonquinensis* "in its larger size, smaller, less rounded aperture," and in sculpture being "much coarser." The dimensions of six shells, each, of "*wanlessi*" and "*algonquinensis*" are given the following range in dimensions:

	<i>Gr. diam.</i>	<i>Height</i>
" <i>Wanlessi</i> " .....	21.5–15.1 mm.	14.9–9.0 mm.
" <i>Algonquinensis</i> " ...	19.3–16.5	8.0–5.2

In the original description of the latter, Nason (*ibid.*) reported 223 shells ranging from 19 to 17 mm. in diameter, and 61 which extended beyond these limits from 21.0 to 14.5 mm.

The following table shows that, with one exception, the recent and fossil shells of the smaller form show essentially the same range in dimensions. The exception, the Henderson Co., Ill.,

fossil set, has both extremes lower, but the majority of its shells falls within the limits of the remaining sets.

It will also be noted that the dimensions given in the table embrace all the dimensions noted above.

<i>Locality</i>	<i>No.</i> <i>meas.</i>	<i>Gr.</i> <i>diam.</i>	<i>Height</i>	<i>No. of</i> <i>whorls</i>
<i>“Algonquinensis”</i>				
(recent)				
Iowa City, Ia. ....	153	23.0–15.5 mm.	15.0–11.0 mm.	5.4–4.8
Mason City, Ia. ....	637	21.0–14.0	14.5– 9.5	5.2–4.7
Council Bluffs, Ia. ....	38	20.5–16.5	14.0–11.0	5.3–4.8
E. Nebraska (3 loc.)	79	23.0–16.0	14.5–11.5	5.5–5.1
<i>“Wanlessi”</i>				
(fossil)				
Fulton Co., Ill. ....	186	22.5–15.0	13.5– 9.0}	5.3–4.8
Cass Co., Ill. ....	159	22.0–15.0	14.0– 9.5}	
Henderson Co., Ill. ....	66	18.5–11.5	11.5– 7.0	5.0–4.3
St. Joseph, Mo. ....	86	21.5–14.0	14.5–10.0	5.6–5.0
Iowa City, Ia. ....	30	23.5–12.0	15.0– 8.5	5.2–4.5
Council Bluffs, Ia. ....	26	20.0–13.5	13.0–10.0	5.3–5.0
E. Nebraska (4 loc.)...	38	21.5–12.5	14.0–10.0	5.2–4.7

It is therefore evident that size does not distinguish the recent and fossil forms of this series.

The other characters noted in F. C. Baker's several descriptions of *“wanlessi”* are equally devoid of value.

The gibbosity of the body-whorl, the indentation of the umbilical region, the size and shape of the aperture, and the depression of the spire, are equally variable in the fossil and recent forms, as shown in large series of both, and they cannot be recognized as distinguishing characters. The same is true of the umbilicus.

How worthless the umbilicus is as a distinguishing character in this case is shown in the following table giving the number of shells with closed and open umbilicus in each set—fossil and recent.

The first fossil set, marked Lewistown, was obtained from two cuts respectively 4.5 and 3.5 mi. southeast of Lewistown, Illinois. This is in the region from which types of *“wanlessi”* were

obtained—"Fulton County, Illinois, east of Havana" (evidently a misprint, as Fulton County is west of Havana) the second set was collected two miles south of Chandlerville, about 21 miles south of Havana. Both evidently include the type forms of "*wanlessi*." The remaining fossil sets are manifestly the same form from western localities.

The recent sets represent "*var. algonquinensis*."

<i>Fossil</i>			<i>Recent</i>		
<i>Locality</i>	<i>Closed</i>	<i>Open</i>	<i>Locality</i>	<i>Closed</i>	<i>Open</i>
Lewistown, Ill. ...	111	65	Iowa City, Ia. ....	150	7
Chandlerville, Ill.	109	52	Mason City, Ia.....	614	91
Iowa City, Ia. ....	25	11	Council Bluffs, Ia.	41	4
Council Bluffs, Ia.	38	5	Bellevue, Neb. ....	24	7
Hamburg, Ia. ....	26	0	West Point, Neb.	39	2
Omaha, Neb. ....	24	10			
St. Joseph, Mo. ...	145	10			

In most of the shells with open umbilicus the latter is reduced to a mere slit. In the first two fossil sets (from the type region) most of the 117 umbilicated shells show a mere slit, and only 8 could be described as "widely perforate," and in some of these it is quite evident that the callus was broken. The modern shells also occasionally show a wide umbilicus, but in both cases the shells are probably not quite mature—which is also suggested by the usually narrow reflexed lip.

The original description of "*wanlessi*" is also accompanied by the statement that the "immature shells appear to be always umbilicated." As this is true of *all Polygyras*, including those which have a closed umbilicus at maturity, it scarcely constitutes a distinguishing character!

The last remaining character, the coarseness of the sculpture, is quite as worthless. The ribs which cross the whorls vary greatly in size, etc., not only in different shells, but often on the same shell. Some are fine, others coarser; some are incomplete and some forked; those on one part of the shell may be fine, and on another quite coarse; sometimes the fine and coarse ribs alternate irregularly; and the ribs may be rather sharp, or (more fre-

quently) they may be rounded, or they may have a longitudinal groove along the crest. Only rather rarely are they quite regular. All this applies to both fossil and recent forms.

The number is also variable, even on different parts of the same shell. The following table gives the variation in number of ribs per unit of 3 mm. The first column gives this number for the body whorl, and the second column for the second whorl.

*No. of ribs per each 3 mm.*

<i>Fossil</i> ( <i>wanlessi</i> )	<i>Body-</i> <i>whorl</i>	<i>Second</i> <i>whorl</i>	<i>Recent</i> ( <i>algonquinensis</i> )	<i>Body-</i> <i>whorl</i>	<i>Second</i> <i>whorl</i>
Fulton Co., Ill. ...	7-13	10-13	Mason City, Ia. ...	8-10	11-13
Cass Co., Ill. ....	8-10	10-12	Bellevue, Neb. ....	7-10	7-12
St. Joseph, Mo. ...	7-10	9-14	West Point, Neb.	7-11	9-14
Council Bluffs, Ia.	8-10	10-12	Council Bluffs, Ia.	7-10	10-14
Iowa City, Ia. ....	8-13	11-15	Iowa City, Ia. ....	6-11	10-13

Usually the larger shells or larger whorls have fewer and coarser ribs.

Sculpture manifestly does not differentiate the fossil as a variety.

In all essential characteristics "*wanlessi*" and "*algonquinensis*" are alike, and if this smaller variant of *P. multilineata* is to be recognized at all, it should bear the latter varietal name. There is no valid reason for recognizing "*wanlessi*." It was evidently set apart merely because it is a fossil, and it has been repeatedly reported as extinct because of a lack of full understanding of the modern molluscan fauna of the general prairie region embracing the northern loess.

Var. *altonensis* F. C. Baker (NAUTILUS, 34: 65; 1920). This was based on the following deviations from the type, which were observed in four fossil shells from Alton, Illinois: Shell larger; whorls more gibbous; spire more depressed; suture between later whorls more deeply impressed; rapidly descending last whorl; heavier reflected lip and umbilical callus; spiral color lines apparently much less numerous. That size was considered an important character is shown by the further statement that "this form of *multilineata* is so uniformly different from the usual

form and size of this species that it seems to require a special designation"; and that the "greater size and gibbous-shaped whorls are sufficiently characteristic to cause its immediate recognition." The following dimensions of two shells, apparently the extremes of the small set, were given:

<i>Gr. diam.</i>	<i>Height</i>	<i>Aperture height</i>	<i>Aperture breadth</i>
32 mm.	19.5 mm.	14 mm.	14 mm.
28	15.5	11	12

Later (*Jour. of Paleontology* 5: 273, 1931) the same writer practically repeated the original description with only minor modifications.

Size, again, seems to be the major factor. The present writer has collected several sets of this large fossil form from the loess, two of them from Alton, Ill., the type locality. A fine set was also collected at Helena, Ark., in 1907. This originally contained 46 shells, but a few were broken and some were sent to correspondents.

The following table gives the dimensions of the extremes of each set. The fossils marked Alton (a) are from the type exposure. Those marked Alton (b) are from the "pink" loess at Market and E. 6th streets. The latter set contains 13 additional broken shells ranging from 30 to 25 mm. in gr. diam.

The two large recent shells reported by F. M. Witter were originally a part of the other (large) Muscatine set, but they were evidently burned in the Muscatine High School fire in 1896. The first was published in 1878 (*Quar. Jour. of Conch.* 1: 384) and the second in 1883 (*The Mollusca of Muscatine County and Vicinity*, 6). Witter at first reported 25 mm. as the smallest diameter, but later added much smaller shells from the same bottomland. The set is now in the writer's collection.

The intergradation between each of the four locality sets is perfect at least to the mm.

The aperture in Witter's specimens was probably somewhat larger than that of the largest shell now in the writer's possession.

<i>Locality</i>	<i>No. of spec.</i>	<i>Gr. diam.</i>	<i>Height</i>	<i>Aperture</i>	
				<i>Height</i>	<i>Width</i>
<i>Fossil</i>					
Baker's types .....	4	32.0 mm.	19.5 mm.	14 mm.	14 mm.
		28.0	15.5	11	12
Alton, Ill. (a) .....	2	29.0	.....	11	12
		28.5	19.5	11	12
Alton, Ill. (b) .....	3(+13)	28.0	19.0		
		25.5	16.0		
Helena, Ark. ....	20	32.0	21.6	13	14
		24.5	15.0	9	10
<i>Recent</i>					
Knox Co., Ind. ....	21	29.0	19.0	11.5	11.5
		20.5	12.0	8	8.5
Muscatine, Ia. ....	276	28.5	19.0	12	12
		18.0	13.0	7	8
Muscatine (Witter)		30.0	17.0	.....	.....
		30.0	15.6	.....	.....

It will be noted that the largest shells in both the fossil and recent sets are nearly equal in size and that both series grade down into typical *multilineata*, which is usually described as 25 or 21–25 mm. in greatest diameter.

It is again evident that size is not a varietal criterion in this variable species.

The remaining characters noted in the original description of "*altonensis*" are equally unreliable and variable in both fossil and modern forms.

The color-lines are said to be "apparently much less numerous." In the Helena fossil set (including imperfect specimens) 14 shells show numerous lines and narrow bands, in 6 they are faint and few, and 2 have none. This character is so variable (as shown most clearly in recent shells), even in individuals of the same set or colony, that it has no diagnostic value.

As to form, larger shells, both fossil and recent, are likely to show more gibbous whorls and deeper sutures, a more rapidly descending last whorl, and sometimes an apparently more depressed spire—all evidently chiefly due to the greater enlargement of the body whorl. All, however, are so variable that no

one, or any combination of them, is sufficiently stable to warrant a segregation.

There is, therefore, no possible consistent line of demarkation between "typical" *multilineata* and the "var. *altonensis*," and the latter should be dropped, despite Dr. F. C. Baker's positive statement that it "is different from anything now living" (NAUTILUS 44: 22; 1930).

Furthermore, whether any of these "varieties" are recognized or not, the fact remains that the fossil forms of this species present no characters or variations which are not duplicated in its modern representatives in the same general region, and there is no warrant for the assumption that certain "varieties" are extinct or offer any indications of a different climate. The existing variations merely point to certain diversities in local conditions such as exist today in the same region, but are in no way indicative of general climatic differences.

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## NEW LYMNAEIDAE FROM THE UNITED STATES AND CANADA. II. MICHIGAN, MINNESOTA, AND MONTANA

BY FRANK C. BAKER

STAGNICOLA EMARGINATA BRYANTWALKERI nov. var. Pl. 7, Figs. 9.

Shell elongate-ovate, wide; whorls 7, rounded; sutures well impressed; spire sharply pointed, broadly conic, shorter than the aperture; body whorl rounded, bulbous; aperture roundly ovate; outer lip thin; inner lip wide, broadly reflected over the umbilical region either entirely closing the umbilicus or leaving a small chink; columella with distinct plait; parietal wall with wide callus which is sometimes raised to make the aperture continuous; color yellowish horn, spermaceti-like in some specimens; sculpture with coarse lines of growth often raised into ridges in senile specimens; spiral striae distinct; there are several raised spiral ridges on the lower part of the body whorl in some specimens.

<i>Length</i>	<i>Diameter</i>	<i>Aperture Height</i>	<i>Aperture Diameter</i>	
32.0 mm.	18.2 mm.	18.2 mm.	10.3 mm.	Holotype.
30.0 mm.	17.0 mm.	18.1 mm.	10.0 mm.	Paratype.
29.0 mm.	19.5 mm.	20.0 mm.	12.0 mm.	Paratype.

Type locality: Millecoquin Lake, Mackinac Co., Michigan, collected by Dr. Bryant Walker. Types: Museum Natural History, University of Illinois, No. 38973; Collection of F. C. Baker, No. 1766; Academy of Natural Sciences of Phila., No. 166257.

This striking race of *emarginata* was sent to the writer several years ago by Dr. Walker. It varies somewhat in height of spire and width of shell and aperture, but all have the peculiar pointed spire which is diagnostic of the race. It is most nearly related to *Stagnicola emarginata serrata* (Haldeman), specimens of which, from Higgins Lake, Roscommon Co., Mich., resemble it in general form, but differ in the form of spire which in *serrata* is wide and bluntly dome-shaped and the aperture is more rounded. The columellar plait is also more marked in *bryantwalkeri*. The new race somewhat resembles the *canadensis* race of *emarginata* in the form of the spire, but the body whorl in *canadensis* is narrower and flat-sided and the aperture is longer and narrower. I take great pleasure in dedicating this distinct form of *emarginata* to my friend and colleague Dr. Bryant Walker of Detroit, Michigan.

STAGNICOLA EMARGINATA MAGNIFICA nov. var. Pl. 7, Fig. 8.

Shell resembling the wide form of *bryantwalkeri* in general form but much exceeding that race in size; whorls 6; spire short and sharply pointed, body whorl very large, expanding abruptly from the spire whorls; aperture very large, rounded or roundly ovate; outer lip thin; inner lip thickened and reflected completely closing the umbilical region; there is a very heavy, ascending plait on the columella; parietal wall with a slight wash of callus; color yellowish horn; surface roughened by longitudinal plications which sometimes form heavy ridges; growth lines coarse and spiral lines well impressed.

<i>Length</i>	<i>Diameter</i>	<i>Aperture Height</i>	<i>Aperture Diameter</i>	
43.0 mm.	25.0 mm.	28.0 mm.	17.5 mm.	Holotype.
48.0 mm.	30.0 mm.	32.2 mm.	21.6 mm.	Paratype.

Type locality: Pelican Lake, Crow Wing Co., Minnesota, collected by W. A. Nason; Types: Museum Natural History, University of Illinois, No. Z38974; Collection F. C. Baker, No. 3544; Academy of Natural Sciences, Philadelphia, No. 166256.

This race is the giant of the *emarginata* group, exceeding the race called *vilasensis* F. C. Baker, which is also found in Pelican Lake (see Freshwater Mollusca of Wisconsin, I, pl. 16, figs. 21–26). *Magnifica* differs from all races of the *emarginata* group yet known in its size, pointed spire, large, wide aperture, and heavy columellar plait. It resembles *bryantwalkeri* but differs in its size, narrower and more pointed spire, larger aperture, and twisted columellar plait.

These two races are examples of the great variation of *emarginata* in the lakes of Minnesota, Wisconsin, and Michigan, the center of distribution of the group. Almost every large lake has its own peculiar form which is often quite distinct from the same species from nearby lakes. The race *canadensis* appears to be the oldest, geologically, occurring commonly in late Pleistocene deposits in Michigan and Wisconsin. Many of the races appear to have evolved very late in Post Glacial time. The ancestor of *emarginata* may possibly be *Stagnicola catascopium* which is found outside of the glaciated territory.

#### STAGNICOLA EMARGINATA SERRATA (Haldeman).

*Limnea serrata* Haldeman, Mon. F. W. Univalve Moll.,  
Limnea, p. 12, pl. 2, figs. 6–8, 1842; Binney, L. & F. W.  
Shells N. Amer., II, p. 52, fig. 78, 1865.

*Limnaea angulata* Sowb., Conch. Icon., XVIII, Lim., No. 47,  
pl. 7, fig. 47, 1872.

There seems little doubt that the shell so common in Michigan and Wisconsin which has borne the name *angulata* Sowb. should be called by an earlier name, that of *serrata* Haldeman. Its type locality is "Northwest Territory," which at that time (1842) embraced the region now included in Minnesota and part of Wisconsin. Haldeman's figure can be duplicated by many specimens from both Michigan and Wisconsin, especially from Douglas Lake, Michigan, in which the body whorl has the heavy spiral lines described by Haldeman. In the author's Monograph of the Lymnaeidae (p. 409) *serrata* was made a synonym of typical *emarginata*, but wrongly so, the true *emarginata* being quite different in form of shell, aperture, and umbilical region.

FOSSARIA OBRUSSA RODECKI var. nov. Pl. 7, figs. 7.

Shell small, elongated, narrow; spire and aperture about equal in length; whorls 5-5½, loosely coiled, rounded, with distinct sutures; spire sharply pointed, somewhat scalariform in many specimens; body whorl flattened, elongated; aperture long ovate, narrow, wider at lower part; outer lip thin without varix; inner lip narrow, triangular, reflected over umbilical region leaving a small umbilical chink; columella with slight twist resembling a plait; a thin wash of callus on parietal wall; surface shining, sculpture of fine growth lines without spiral lines; color yellowish horn.

<i>Length</i>	<i>Diameter</i>	<i>Aperture Height</i>	<i>Aperture Diameter</i>	
10.0 mm.	4.1 mm.	5.0 mm.	2.0 mm.	Holotype.
9.0 mm.	3.6 mm.	4.1 mm.	1.6 mm.	Paratype.

Type locality: Swan Lake, Montana, collected by Junius Henderson and Hugo G. Rodeck. Types: Museum of Natural History, University of Illinois, No. Z38975; Baker collection, No. 3545; Academy of Natural Sciences of Philadelphia, No. 166255.

This interesting little *Fossaria* is another form discovered by that indefatigable worker, Professor Junius Henderson. It appears to be a marked variety of *obrussa* characterized by its narrow shell, long, narrow and pointed spire and narrow aperture. Typical *obrussa* occurs in Montana, Idaho, and Utah, but differs uniformly in its wider shell, aperture, and spire. Hannibal's *cooperi* from California has a rounded aperture, more flattened whorls and a wider inner lip which is not triangular but flatly, evenly rounded, emarginating the umbilical opening. *Fossaria exigua* has a much rounder aperture, more rounded whorls and a less acute spire. The name is in honor of Mr. Hugo G. Rodeck, Curator of the University of Colorado Museum.

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## SOME SHELLS FROM THE NORTH CAROLINA "BANKS"

BY HORACE G. RICHARDS  
New Jersey State Museum, Trenton, N. J.

Several times during the last few years the writer has had occasion to collect shells from certain of the beaches along the

North Carolina coast as well as at Virginia Beach, Va., Myrtle Beach, S. C., and elsewhere in the southern states. On all occasions he was impressed with the large percentage of shells that appeared to be fossil. Many were very worn; others were black in color and resembled those often found on the New Jersey beaches and which were considered as having been washed from some nearby Pleistocene deposit.<sup>1</sup>

In July, 1935, he had the opportunity of making a more complete collection of these shells on a trip along the North Carolina "Banks" from Cape Hatteras Light to Bogue Beach, a distance of about 100 miles. In October, 1935, a briefer trip was taken between Nags Head and Oregon Inlet. On both trips he was accompanied by Allen L. Midyette, Jr., of Swan Quarter, N. C., who assisted in the collecting. The collecting was part of a more extensive study of the Pleistocene of the Atlantic Coastal Plain and was made possible by a grant from the Carnegie Institution of Washington.<sup>2</sup>

To the United States Coast Guard also belongs much of the credit for the July trip. Through the kindness of Acting Commandant L. C. Covell, the officers in charge of the various stations along the coast provided us with transportation facilities as well as numerous other courtesies. Without this valued cooperation this paper could never have been written. Dr. Herbert Prytherch, Director of the Bureau of Fisheries Laboratory at Beaufort, N. C., also provided us with collecting facilities.

The barrier beaches along the North Carolina coast are locally known as "banks" and are separated from the mainland by Pamlico Sound and similar bodies of water. Some parts of the "banks," for instance, Hatteras and Ocracoke, are as much as 30 miles from the mainland; other parts, such as Bogue Bank, are much closer. West of Pamlico Sound the land is very flat and appears to form a low terrace plane (Pamlico) limited westward by a slight escarpment where the land rises to the next terrace plane (Talbot). The Pamlico terrace is everywhere under 25 feet in elevation and is composed of sand and clay in many

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<sup>1</sup> Colton, H. S., *Nautilus* 28, 52-54 (1914); Richards, H. G., *Proc. Amer. Philos. Soc.* 72, 181-214 (1933).

<sup>2</sup> Complete report in press, *Bull. Geol. Soc. Amer.*

places overlain by a muck deposit. The sands and clays (Pamlico formation) are highly fossiliferous and are thought to have been deposited during the last interglacial stage. The fauna consists of numerous species now extinct in North Carolina waters but living in warmer seas farther south. It seemed logical to suppose that this marine formation (Pamlico) would extend seaward, probably dipping beneath the recent deposits of the sea floor, and that this might have been the source of some of the fossils on the North Carolina Banks.

At the exact tip of Cape Hatteras we collected some unusually large specimens of *Fulgur perversum* L., 11 inches long, and *Venus campechiensis* Gmel., 5 by 6 in. While these two species do live in North Carolina water to-day, they rarely if ever attain such proportions. Furthermore the specimens resembled those found on the spoil banks of the Intra-Coastal in Hyde County, N. C., where the best Pamlico fossils have been obtained. Still stronger evidence that at least some of the shells on the "Banks" were derived from the Pleistocene was the finding of large pieces of coquina at several places along the beach between Hatteras and Ocracoke. The coquina was very similar to that of the Anastasia formation of the coast of Florida which has been correlated with the Pamlico. Similar coquina occurs at several places in the Pamlico, notably near Myrtle Beach, S. C., and Old Fort Fisher, N. C., and is not reported north of Carolina Beach, N. C. The presence of the coquina near Cape Hatteras may indicate that this deposit extends north of Carolina Beach below present sea level and that fragments from the deposit are occasionally washed onto the beaches. The following species were identified from the coquina collected from the banks: *Venus mercenaria* Linné, *Donax variabilis* Say, *Mulinia lateralis* Say, *Ostrea virginica* Gmelin, *Pecten gibbus* Linné, *Dosinia discus* Reeve and *Rangia cuneata* (Gray)(?). All these are known from the coquina at Old Fort Fisher. *Rangia* is a Gulf of Mexico species; the others live in the region to-day.

The Pliocene (Waccamaw formation) is probably not very deeply buried near the shore line and it may form the sea bottom some miles offshore, thereby accounting for the presence of certain Pliocene species on the "banks."

The fossil shells were more numerous south of Cape Hatteras than north of that cape. Among the loose shells which were probably fossils collected from the above-mentioned beaches the following are especially interesting:

*Arca secticostata* Reeve. Bogue Beach; Pliocene or Pleistocene, probably the latter; not known to-day north of Cape Fear.

*Arca auriculata* Lamarck(?). One shell closely resembling this species was found at Kill Devil Hills, N. C., in May, 1932; probably Pleistocene: the species at present is known only from the Florida Keys and the West Indies.

*Arca occidentalis* Philippi. Probably Pleistocene; present range North Carolina to West Indies, but rare north of Florida.

*Arca limula* Conrad. Resembles those found in the Waccamaw (Pliocene).

*Arca ponderosa* Say. Typical form (Pleistocene and Recent); two shells, possibly intermediate between *A. ponderosa* Say and *A. limula* Conrad found at Nags Head and near Oregon Inlet.

*Pecten eboreus* Conrad var. Pliocene; similar to specimens from the Caloosahatchie of Florida and the Waccamaw of the Carolinas.

*Glycymeris americana* DeFrance. Pliocene or Pleistocene.

*Rangia cuneata* (Gray). Common in the Pleistocene of North Carolina; at present confined to the Gulf of Mexico.

*Lucinia chrysostoma* Philippi. Probably Pleistocene; present distribution, Florida and West Indies.

The following are probably Pleistocene: *Arca campechiensis* Gmelin, *A. transversa* Say, *A. incongrua* Say, *Callocardia morrhua* Linsley, *Cardium muricatum* Linné, *Pecten gibbus* Linné, *Fulgur perversum* Linné, *Venus campechiensis* Gmelin, *Pholas campechiensis* Gmelin, *Cassis madagascarensis* Lamarck, *C. inflata* Shaw, *Panope bitruncata* Conrad, *Strombus pugilis alatus* Gmelin, *Polynices heros* Say. In addition other species, too numerous to be listed here, were probably Pleistocene fossils.

The mixed character of the fauna of these beaches is very confusing to the collector. It is difficult, if not impossible, to tell whether a shell is recent or fossil. A great many southern species have their recorded northern limit in North Carolina. While it is undoubtedly true that many warm water species do occur near Cape Hatteras, it is probable that some of these records are based upon Pleistocene fossils found on the beaches. As we have

seen the late Pleistocene seas appear to have been warmer than the present and such species as *Arca auriculata* Lamarck, *A. secticostata* Reeve, *Lucina chrysostoma* Philippi and *Rangia cuneata* (Gray), not positively known alive in the region to-day, probably belong to deposits laid down at this time. It is therefore very desirable that living specimens be obtained when recording a new northern or southern limit for a species.

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### POLYGYRA COLUMBIANA DEPRESSA, NEW SUBSPECIES, FROM OREGON

BY HENRY A. PILSBRY AND JUNIUS HENDERSON

Shell small, thin, compact, light brown or tan; surface dull, covered evenly and rather closely with very short hairs which are weaker on the base and show in some specimens a slight tendency toward arrangement in parallel diagonal rows at about right angle with the fine growth lines; no other spiral sculpture. Spire low, but variably elevated. Whorls  $5\frac{1}{2}$  or 6, closely, regularly coiled, increasing regularly in size, somewhat contracted behind the outer lip, which is reflected about one millimeter, and is evenly rounded from the upper termination over the periphery, slightly flattened on the base and passes by a more abrupt curve into the columella. Umbilicus small, open, but little covered by the slightly reflected columella. There is no trace of parietal or other apertural denticle on any specimen examined. (Plate 7, fig. 2.)

Holotype, Stanford University type collection, No. 5870: Alt. over all, 9 mm.; from umbilicus to apex, 6.5 mm.; diam. behind reflected lip, 13 mm. Topotypes, Stanford University type collection, No. 5871. Paratype, Philadelphia Academy of Sciences, No. 162435: Alt. 8.7 mm., diam. 14.7 mm. Figured specimens in University of Colorado Museum. All the specimens at hand are from The Dalles, Oregon, Henry Hemphill, collector. He labelled them *Mesodon columbiana depressa*, but apparently never described them, so we retain the name.

This form is quite unlike *P. mullani hendersoni* Pils., which was described from The Dalles. It is closely related to *P. columbiana pilosa* Henderson, but is smaller and decidedly more depressed, less dome-shaped, though somewhat variable in this respect.

## NEW TERTIARY SHELLS FROM FLORIDA

BY MAXWELL SMITH

Recent government construction of dikes adjacent to Lake Okeechobee has resulted in a considerable amount of Tertiary material being brought to the surface. Frequent visits to this region early in 1935 by the writer and his friends have resulted in the acquisition of between three and four hundred species of shells. Practically all of these were in a remarkably good state of preservation.

Most of the shells obtained appear to belong to the Pliocene and parallel those which were collected in the Shell Creek area by Heilprin, Willcox and Dall. Species which were considered rare there have turned up at Clewiston in comparative abundance. Others which are supposed to be common at Shell Creek are, in the Okeechobee district, conspicuous by their absence.

Under the circumstances it is deemed advisable not to at present associate this material with any definite period. Further and more complete investigations, together with actual supervised excavation, will eventually settle these problems. Tuomey and Holmes in their monumental work upon the South Carolina "Pliocene" did not realize the frequent overlapping of the beds and Dall has already pointed out the confusion which resulted in consequence.

It is highly gratifying to associate with some of the new species the names of those persons who have assisted largely in their discovery. These students and collectors are permanent residents of Florida or else annual winter visitors to the state.

At Loxahatchee, west of the Palm Beach mainland city, road construction has uncovered additional material. Here were secured apparent representatives of both the Miocene and Pliocene, the area being comparatively near the present coast. Among species new to these regions may be mentioned:

*Labiosa (Raeta) canaliculata* Say. Clewiston. Dall suspected that eventually this species would be found in the Pliocene. The specimens collected at Clewiston, almost under the dredge, undoubtedly belong to that formation. They are unusually large in size and retain a chocolate brown color.

*Conus verrucosus* Hwass. Loxahatchee. Compared with specimens from the West Indies this shell agrees well. It also is found recent upon the Florida Keys. The fossil examples are apparently new to Tertiary records for the United States. Pl. 9, fig. 1.

*Littorina irrorata* v. *carolinensis* Conrad. Clewiston. Pl. 9, fig. 1. Reported from Volusia County, Florida. The specimen figured is only 18 mm. in length.

*Cassis inflata* Shaw. Clewiston. The two specimens taken lack the frequent varices but are otherwise normal. No mention is made of this species in Dall's work.

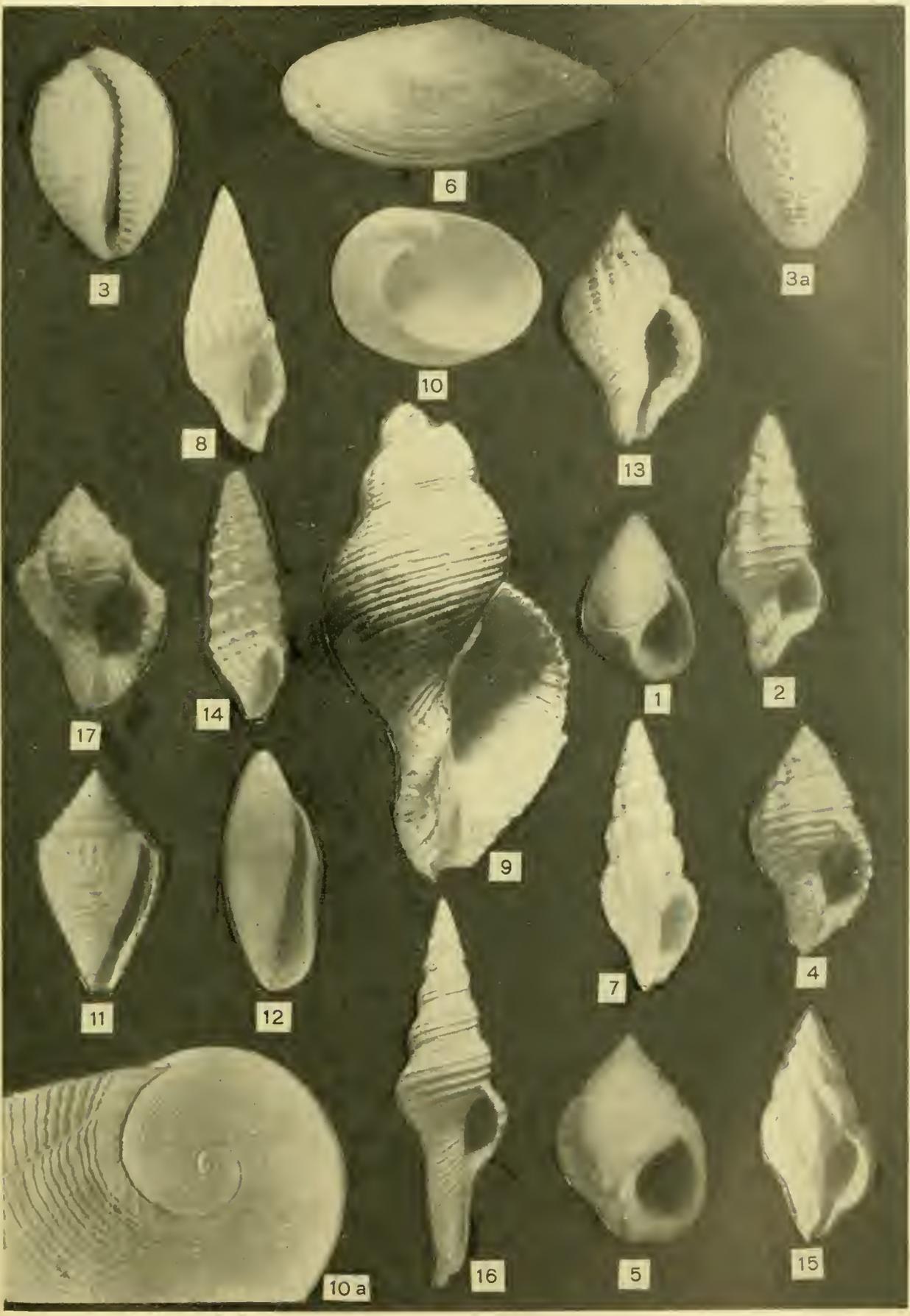
*Tonna* sp. Fragments of a large species indicate its presence in the marls at Clewiston. Possibly larger pieces will later be taken and permit identification.

*Tellina perryae* n. sp. Shell elongate, umbones inconspicuous, rostrate; concentric lamellae closely placed, raised slightly, present on final two-thirds of growth, remainder of surface adjacent to umbones much smoother and with finer sculpture; also more shining; lunule long and narrow, moderately deep; posterior dorsal area with two folds, the concentric sculpture bridging these sharply cut, almost entire surface covered with fine radial lines which become very much stronger in the right valve toward the posterior folds. Length 49 mm., height 23.5 mm. Pl. 9, fig. 6.

A very beautiful shell, possibly near *T. strophia* Dall from the Oligocene. In the description of that species there is no mention of radial sculpture which is a characteristic feature of the present one. Unfortunately it is impossible to separate the valves, in order to examine the interior, without destroying the specimen. Holotype in the writer's collection. Clewiston, Florida.

It is named after Dr. Louise Perry, of Sanibel, Florida, whose studies of west Florida mollusks have resulted in many contributions to our knowledge of that fauna.

*Sinum polandi* n. sp. Shell of medium size, whorls rapidly increasing in size, somewhat compressed; nuclear whorls smooth and apparently partly keeled, adjacent suture well impressed, later becoming less apparent and then broken or puckered by the obliquely variable and irregularly placed growth lines; spiral sculpture consisting after nucleus of regularly placed broad, flattish, indented, ribs, the interspaces narrower, these ribs on



Maxwell Smith: Tertiary Shells from Florida.



the body whorl varying more in width; base destitute of the spiral ribs but with slight indications of lines toward the periphery. Length 25 mm., breadth 20 mm., height 15 mm. Holotype in the writer's collection. Clewiston, Florida. Pl. 9, figs. 10, 10A.

Dall in his Tertiary Mollusca states on p. 379 that *Sinum perspectivum* does not antedate the Post-pliocene. *S. polandi*, apparently its progenitor, actually was dug out with a Pliocene assemblage. Named after William Poland, of West Palm Beach.

*Cypraea (Pustularia) gabbiana (?) loxahatchiensis* n. subsp. Shell rather solid, dorsal line distinct but not wide, upper surface strongly pustulate, lower extremity slightly compressed at sides; narrow margin of base with about 22 raised ribs, some of the ribs interrupted, possibly due to wear, extending around to a projecting edged thinner margin with fewer ribs farther apart. Length 29 mm. Holotype in the writer's collection. Pl. 9, figs. 3, 3A. Loxahatchee, Florida.

This interesting shell, apparently the first *Pustularia* reported from the United States, is placed for the present under *gabbiana* of Guppy, a West Indian species. Gabb confused that species with *P. nucleus*. In view of the fact that these shells belong to the West Indian Miocene it is remarkable to find the Florida example associated with Pliocene species. Loxahatchie, however, is comparatively close to the present coast where Miocene deposits are frequent.

The resemblance of the new shell to *Pustularia nucleus* is very striking and suggests further study in connection with Panamic isthmian formation.

*Urosalpinx*. Much confusion prevails with respect to the identity of the Florida species of this group, both recent and fossil. Specimens of *U. perrugatus* uniformly possess a smaller and more contracted aperture than *U. cinereus*. The canal is also longer and more closed.

Tuomey and Holmes's reference to *U. cinereus* is dubious. Their illustration, however, appears not to be *U. trossulus* which has a relatively short spire and less prominent ribs. It is significant that *U. cinereus* has never been reported from the marls

of Florida but some of the so-called *U. perrugatus* closely approximate it.

The accompanying figures are as follows:

*U. perrugatus* Conrad. Clewiston, also recent. 27 mm. Pl. 9, fig. 15.

*U. trossulus* Dall. Clewiston, tertiary only. 17 mm. Pl. 9, fig. 13.

*Anachis clewistonensis* n. sp. Shell small, whorls 8, sutures impressed and their continuity interrupted by the terminations of the numerous rounded ribs which become nodulous immediately below the sutures; spiral ribs prominent below the periphery of final whorl, very fine lines above these on the same whorl. Outside the outer lip a strong-hump-like ridge extends outward, possibly as a protection to the aperture. Pl. 9, fig. 8. Clewiston, Florida.

In adults the outer wall of the aperture is broad and well thickened with lirae inside. Length 10 mm., often smaller, the length of the canal varying greatly.

The shell in some respects suggest *A. fusiformis* but that species lacks the prominent vertical ribs. It is not rare in the marls. Holotype in the writer's collection.

*Ilyanassa (Paranassa) floridana* n. sp. Shell obese; whorls 5; shouldered below the distinct sutures; spiral sculpture weak; transverse sculpture strong and wavy upon final whorl; outer lip strong, thickened, showing several distinct overlapping periods of growth, interior with traces of lirae. Length 30 mm., breadth 21 mm. Pl. 9, fig. 5. Holotype in the writer's collection.

A much broader shell than *I. porcina* Say which also has coarser spiral sculpture and less rounded whorls. *I. porcina* has been reported from the Miocene extending from Maryland to the Carolinas and possibly was the progenitor of *I. floridana* which is associated with Pliocene species. Clewiston, Florida.

*Pisania (Tritonidea) lymani* n. sp. Whorls 7, suture indistinct on the body whorl; about 11 distinct, evenly spaced, undulating, interrupted, sharp, spiral ridges, gently sloping off on each side: 3-6 much finer, rather continuous, lines within the interspaces; about 4 primary ridges on the spire; transverse sculpture consisting of, on the final whorl, 12 rounded, wide ribs

forming indistinct nodules at the intersection of the spiral ridges; canal oblique, moderately long, deflected; aperture lirate on both sides. Length 26.5 mm., length of aperture, including canal, 16 mm. Named after Frank Lyman. Pl. 9, fig. 4.

#### EXPLANATION OF PLATE 9

1. *Littorina irrorata carolinensis* Conrad, length 18 mm.
2. *Latirus tessellatus seminolensis* Smith. 30 mm.
3. *Cypraea (Pustularia) gabbiana(?) loxahatcheensis* Smith. 29 mm.
4. *Pisania (Tritonidea) lymani* Smith. 26.5 mm.
5. *Ilyanassa (Paranassa) floridana* Smith. 30 mm.
6. *Tellina perryae* Smith.
7. *Phos thayerae* Smith.
8. *Anachis clewistonensis* Smith. 10 mm.
9. *Fasciolaria scalarina macgintyi* Smith. 165 mm.
10. *Sinum polandi* Smith. 25 mm.
11. *Conus verrucosus* Hwass. 26 mm.
12. *Marginella clenchi* Smith. 12 mm.
13. *Urosalpinx trossulus* Dall. 17 mm.
14. *Nassarina (?) proctorae* Smith. 10 mm.
15. *Urosalpinx perrugatus* Conrad. 27 mm.
16. *Fusus watermani* Smith. 50 mm.
17. *Pisania (Tritonidea) auritula* Lam. 25 mm.

(To be concluded)

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#### LEOPOLDO A. FAUSTINO

It is with great regret that we learn of the death of Dr. L. A. Faustino which occurred in Manila early in November, 1935, in his 43rd year. At the time of his death, which was due to brain cancer, Dr. Faustino was Assistant Director of the Philippine Bureau of Science. During the past few years he had devoted much time to the study of mollusks of the Philippines and was compiling and publishing lists of all the species known to occur in the archipelago. Dr. Faustino was a native of Colamba, Laguna, Luzon. A photograph of him is published by *The Philippine Free Press* (p. 38, Nov. 16, 1935).—W. J. CLENCH.

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#### THE SIXTH ANNUAL MEETING OF THE AMERICAN MALACOLOGICAL UNION

The Sixth Annual Meeting of the American Malacological Union will be held in St. Petersburg, Florida, from Tuesday to

Friday, April 21 to 24. This decision was made after careful consideration of available hotel arrangements, climatic conditions and the state of the tides. The Detroit Hotel on lower Central Avenue, corner of 2nd Street North, has been selected as headquarters. The rates are as follows: Single room without bath, \$1.50; with bath, \$2.00. Double room without bath, \$2.50; with bath, \$3.00.

Captain W. A. Read has promised a boat trip for the last day, as well as other opportunities to enjoy a vacation in Florida to the utmost, with shell collecting and tarpon fishing not the least of the attractions.

Please send titles of papers, with approximate time required and whether lantern will be needed, to the Corresponding Secretary, Norman W. Lermond, 5028 31st Avenue South, St. Petersburg, Florida.

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## NOTES

SANGUINOLARIA BERTINI Pilsbry & Lowe.—Mr. A. E. Salisbury (Proc. Malac. Soc. 21: 88) states that this species is the *Tellina cruentae* of Solander, Portland Cat., p. 10. While it seems rather unlikely that this west American shell was possessed by Knorr prior to 1771, it is possible, and his figure is certainly very good for it. Solander mentions it twice in the Portland Catalogue, pp. 10 and 58. If his name is adopted for the species it may be best to accept the form *cruenta*, used on p. 58.—H. A. P.

PRATICOLELLA MARTENSIANA.—The Mexican snail described from Tampico as *Polygyra* (?) *martensiana* Pils. (1907, NAUTILUS 21: 26, 133, pl. 11, f. 1-3), turns out to be a *Praticolella* by the anatomy. We found it in abundance around the Ingenio Agua Buena, near Tamosopo, S. L. P., in 1934. It lives on and under herbage and vegetable trash in very wet places.—PILSBRY.

HELICOSTYLA SUBCARINATA ARCHERI, new subspecies, Pl. 8, fig. 5. Differs from typical *subcarinata* in coloring. The present form is a uniform dull brownish pink with the inferior edge of the suture margined by a narrow band of straw colored hydrophanous periostracum. The narrow reflected lip is a deep brown.

The brownish band that encircles the columella is absent. This occurs on all of the remaining forms except on the typical race, *subcarinata*, which is without any color ornamentation other than the yellowish periostracum. The holotype measures: length 41, width 20, aperture  $16 \times 10.5$  mm.

*Holotype*.—Mus. Comp Zoöl. no. 96474, Tres Reyes Islands, S. W. coast of Marinduque, Philippine Islands. P. de Mesa collector, 1934.—WM. J. CLENCH.

MY DISCOVERY AND OBSERVATION OF THE LIVING XENOPHORA IN FLORIDA WATERS.—On June first, 1935, Vera and Jack (my wife and son—fellow collectors) went with me to Treasure Island in the north end of Lake Worth, near the inlet. It was extremely hot. Live shells of various kinds were soon located and the finer specimens taken.

Jack was the first to find a *Xenophora*, or carrier shell. It had quite recently been alive. Then he got very excited at his mother finding several live *Architectonicas* ("Sun Dials"), so I had to get busy if we were to find more *Xenophoras*. With this in mind I shoved off in the skiff to a nearby sand-bar, now designated on my own personally made chart as *Xenophora* Island, little expecting to get a very great thrill. *Know* that I was greatly excited when upon looking down as I was about to step from the boat my eyes rested upon the largest *Xenophora* I had ever seen—and he was *crawling*. He was *alive*. My first living *Xenophora*, and the first I have yet heard of in Palm Beach County. But wait. There by him is another smaller, more beautiful specimen, *also alive*. I was too excited to do anything but pick them up, although it had long been my desire to watch one at work. Few have seen these highly intelligent molluscs at work cementing their shell camouflage to their house.

A complete search of the bar surrounding the little island was made. After a long time without further success I gave it up. Back into the boat and "up-anchor"—but hold on, what is this? *Another Xenophora*. A living one, and he seems busy. I watched him very patiently. He seemed to be doing something. No he was not putting on his shells. His load was complete. He was moving his movable parts about. Gluing on his shell load? He

must have been, for after watching him work for some time I picked him up and one of his camouflage shells dropped off. All the rest of the shells around the bottom were stuck, but on this one the cement had not hardened. All other shells from there to the apex were quite rigid. I had not seen him actually pick up a shell and fit it into place, but I was perfectly satisfied. Three living *Xenophoras* in one day in *Florida*.

Vera and Jack had been finding rare specimens too. I know I had them beaten, so I carefully placed my large sun hat over my three prize winners. After they had "crowed" over their rich finds and laughed at the really fine specimens I showed them with some pride, I decided I needed a hat on. Imagine the expression of surprise on their faces when they beheld what was hidden all the time under the hat. *It was a great day!*—FRANK B. LYMAN, Lantana, Florida.

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### PUBLICATIONS RECEIVED

CLASSIFICATION OF THE PELECYPOD FAMILY ARCIDAE, by P. W. Reinhart. (Bull. Mus. Royal d'Hist. Nat. Belgique, **11**, no. 13, Aug., 1935, pp. 1-68, pl. 1-5.) A synopsis of the family Arcidae both fossil and recent is given through and including the subgenera with critical notes, opinions on the various groups, their synonymies and type designations. A very excellent feature is the pen drawings of the various generic and subgeneric types associated with skeletal text outlines of the differentiating characters. The subfamily *Anadarinae* and the subgenus *Larkiana* are proposed as new.—W. J. CLENCH.

NEW SPECIES OF MOLLUSKS OF THE GENUS TRIPHORA. By Fred Baker and V. D. P. Spicer. Trans. San Diego Soc. Nat. Hist. 8: 35-44. Two species from the Gulf of California and five from Ofu I., Samoa group, are defined and figured. The function of the tubes is discussed.

NEW UROCOPTIDAE FROM HISPANIOLA, by Wm. J. Clench. (Proc. Bost. Soc. N. H., 41: 1.) Fifteen new species and subspecies of *Urocoptis*, *Brachypodella*, *Macroceramus* and *Archegocoptis* are introduced. The discovery of three new forms of *Archegocoptis*, on the southwest peninsula of Haiti, is a notable addition to this peculiar genus.—P.

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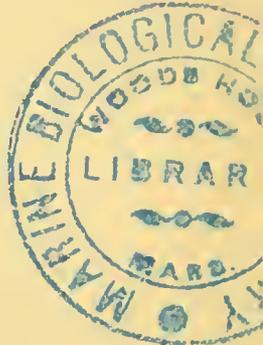
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