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LIST OF THE CONIDAE OF PUERTO RICO

By GERMAINE L. WARMKE

Institute of Marine Biology, University of Puerto Rico, Mayaguez

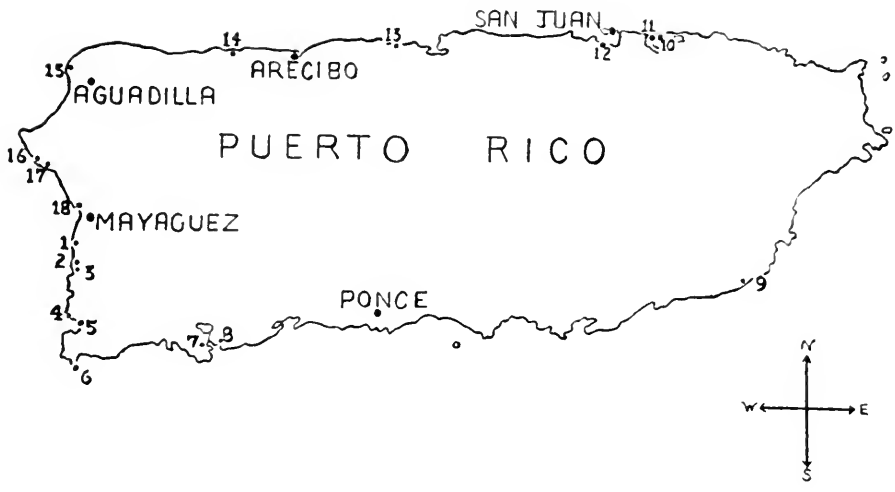
The present report adds five species of Conidae not previously listed for Puerto Rico and several new locality records. The finding of *Conus juliae* Clench in Puerto Rico extends the range of this species from Florida to the West Indies. The range of *Conus centurio* Born is also extended, as it had been reported previously only from Santo Domingo, (Clench, 1942). A total of 11 species of cones have been found to date in Puerto Rico. Locations of collecting sites are shown in figure 1. The species reported are as follows:

Conus regius Gmelin

Reported as *C. nebulosus* Solander by Dall and Simpson (1901) from Aguadilla. Additional records: Between Boquerón and Cabo Rojo Light House; Guánica; Punta Cuchara, near Ponce; between Patillas and Maunabo; Punta Maldonado; Palmas Altas; Arecibo; West of Camuy; Ramey Air Force Base, (found alive by A. Phares); Rincón Light House; Punta Cadena; Mona Island, (found alive by M. McDowell). Dead shells very common on the beach. Live shells found in reefs.

Conus mus Hwass

Reported by Dall and Simpson (1901) from San Juan; Aguadilla; Ponce; and by Clench (1943) from San Juan and Mona Island. Additional records: Mayaguez; Punta Guanajibo; Punta Arenas; Cabo Rojo Light House; Guánica; between Patillas and Maunabo; Boca de Cangrejos; Punta Maldonado; Palmas Altas; Arecibo; West of Camuy; Ramey Air Force Base, (A. Phares); Rincón Light House; Mona Island, (found alive by M. McDowell). Dead shells very common on the beach. Live shells found at night in reefs.



LOCATION OF COLLECTING STATIONS IN PUERTO RICO

1. Punta Guanajibo. 2. Punta Arenas. 3. Joyuda. 4. Guaniquilla. 5. Boquerón. 6. Cabo Rojo Light House. 7. Ensenada. 8. Guánica. 9. Between Patillas and Maunabo. 10. Punta Maldonado. 11. Boca de Cangrejos. 12. Cataño. 13. Palmas Altas. 14. Camuy. 15. Ramey Air Force Base. 16. Rincón Light House. 17. Punta Cadena. 18. Punta Algarrobo. 19. Mona Island (located 40 miles west of Puerto Rico).

Conus jaspideus Gmelin

Reported as *C. pygmaeus* Reeve by Dall and Simpson from Aguadilla and by Clench (1943) from San Juan. Additional records: Punta Guanajibo; Ramey Air Force Base; Rincón. Dead shells fairly common on the beach.

Conus verrucosus Hwass

Reported by Dall and Simpson from Mayaguez. Additional records: Guanajibo (alive); Punta Arenas; Joyuda; Guaniquilla; Ensenada; Guánica; Boca de Cangrejos; Cataño; Ramey Air Force Base; and dredging around Piñero Island, off Joyuda. Dead shells very common on the beach.

Conus granulatus Linné

New Record. Punta Arenas, (A. Phares); Rincón, (G. Garrison, K. Yates); Mona Island, (K. O. Phares). Rare.

Conus spurius Gmelin

New Record. Punta Arenas; Punta Guanajibo, (found alive by H. F. Winters and by G. L. Warmke). An unusually large specimen (2¾ inch) was found at Bahía Bramadero, between Punta Arenas and Joyuda. Dead shells fairly common at localities mentioned.

CONUS DAUCUS Hwass

New Record. Cabo Rojo Light House; West of Camuy; Ramey Air Force Base, (found alive by A. Phares); Rincón, (found alive by K. Yates). Dead shells fairly common on the beach.

CONUS CENTURIO Born

New Record. Found at Ramey Air Force Base by K. Yates and by A. Phares, also at Rincón by A. Phares and G. Garrison. Rare.

CONUS VILLEPINII Fisher and Bernardi

Reported as *C. agassizii* Dall by Dall and Simpson from Mayaguez. Rare.

CONUS JULIAE Clench

New Record. Guanajibo, (found alive by G. L. Warmke); Rincón, (found alive by A. Phares), (Mary Warmke found one dead specimen, olive colored instead of the usual bright orange); Ramey Air Force Base, (found alive by G. Garrison). Dead shells fairly common at localities mentioned. Live shells probably live in the reefs.

CONUS RANUNCULUS Hwass

Reported as *C. puertoricanus* Hwass (Kiener) by Dall and Simpson. Additional record: Rincón, (A. Phares); Mona Island, (K. O. Phares), and Mona Island (alive) by M. McDowell. Rare.

The author wishes to express her appreciation to the many friends in Puerto Rico who made their shells and location data available for this list and also to Dr. Ruth D. Turner for checking identifications and for critically reading the manuscript.

CITATIONS

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TAXONOMY OF SALT MARSH SNAIL, OVATELLA MYOSOTIS, IN CENTRAL CALIFORNIA

By EDWARD G. PAULSON
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Early in the course of an investigation of the ecology of the ellobiid, *Ovatella myosotis,* in central California salt marshes, it became apparent that a number of different names are in current usage for this species. Most commonly applied is *Phytia setifer* Cooper, 1872, but also to be found are *Phytia myosotis, Alexia setifer* and *Alexia myosotis.* The following is an attempt to clarify this situation.

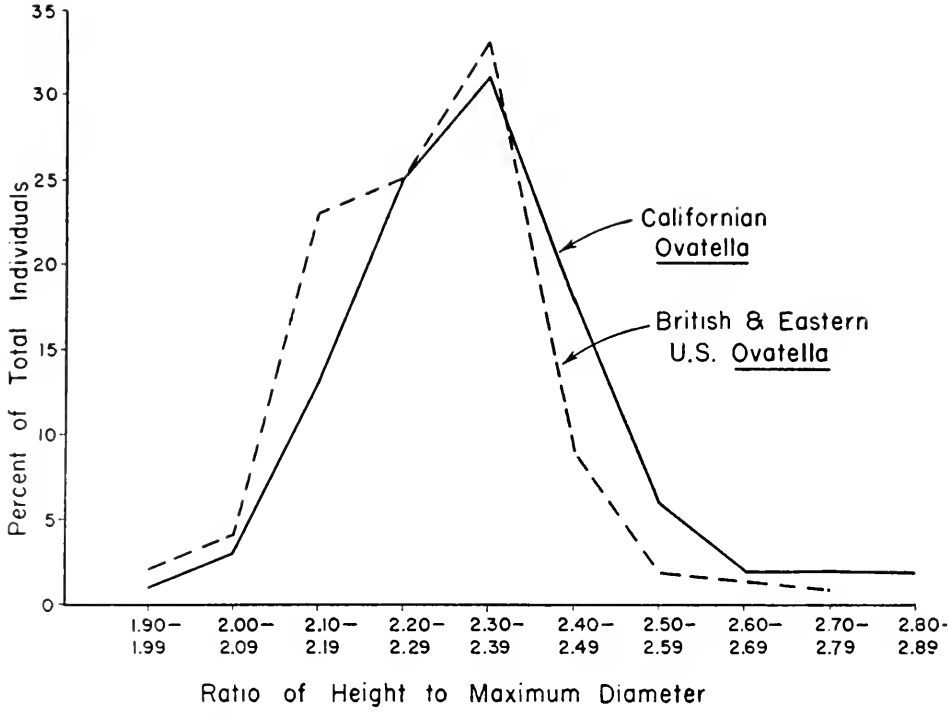
The history of the genus *Phytia* Gray 1821 has been recently reviewed by Watson (1943). In confirming the observations of several previous workers, particularly those of Woodward (1903), he made the following points: (1) The generic name *Alexia* Leach is clearly unavailable for this group since it had been used by Stephens for a genus of Coleoptera before its first publication by Gray in 1847, and (2) the name *Phytia* originated through Gray's unintentional misspelling of *Pythia* and hence must be dropped under article 19 of the International Rules. While his first point must be considered definitely established, some doubt has been expressed of his interpretation of the mode of origin of *Phytia* (see Burch, 1945). Although direct proof of Gray's original intent appears lacking, seemingly the indirect evidence on this point, as amassed by Watson, is quite conclusive. Particularly pertinent is the fact that Gray, himself, twice corrected his error by listing *Pythia* Gray, 1821 (not *Phytia*) in the synonomy of this genus (in 1847, *Pythia* for *Alexia* and in 1857 for *Conovolus*). In place of *Phytia*, Watson proposed *Ovatella* Bivona Bernardi, 1832, as the oldest available name for this genus, in so doing accepting *Ovatella punctata* Bivona Bernardi, 1832 (= *Auricula firmini* Pyaredeu, 1826) as the type of this originally typeless and heterogeneous assemblage. Watson's suggestion, however, has not met with universal adoption, and thus some, such as Harry (1947) and Morton (1955), follow him in the use of *Ovatella* while others, including Burch (1945) and Morrison (1951), retain *Phytia*. Watson is followed here in the application of the name *Ovatella,* not only because such a change has been shown to be technically necessary, but also

because, as pointed out by Morton (1955), this eliminates the frequent source of confusion inherent in the retention of two such similar names as *Phytia* and *Pythia* in the Ellobiidae.

The trivial name *setifer* has had a rather confusing history. In his original description of *Alexia setifer* Cooper (1872) stated, "Shell very similar to *A. myosotis* (of the northern Atlantic states) but the young provided with short deciduous bristles arranged in a spiral line just in front of the suture." Such bristles, however, had long been known in the better preserved specimens of *Ovatella myosotis* (see Clarke, 1855). Dall (1885), after comparing the shells of the two forms, decided that they were identical and listed *Alexia setifer* as a synonym of *Alexia myosotis*. In 1894, Cooper, apparently accepting Dall's observations, listed this form as *Alexia myosotis,* var. *setifer* Cooper, 1872. With the question apparently settled then, Dall (1921) inexplicably resurrected *Phytia setifer* as a distinct species. In this he has been followed by most later workers such as Oldroyd (1927), Keen (1937), and Morrison (1950). Hanna (1939), however, included *Phytia myosotis* in his list of "Exotic Mollusca in California" with the statement that no recent published record of a careful comparison of shells could be found. Burch (1945) recently has discussed this problem, and while retaining *Phytia setifer* as a distinct species, he expressed the need of a comparative study to settle this question.

Such a study was undertaken by the author. Forty specimens of *Ovatella myosotis* from Europe and 12 specimens from the east coast of the United States were compared with over 300 California specimens collected from San Francisco Bay, Bodega Bay and Elkhorn Slough. In making this comparison, specimens of height greater than 6.8 mm., possessing a thickened outer lip, were arbitrarily considered to be mature. The possession of a thickened outer lip was not invariably an adequate indication of maturity. In the first place, a thin outer lip was not found to be a certain indication of sexual immaturity since such individuals were frequently found copulating. Furthermore, the resumption of growth in individuals with a thickened outer lip, with apparent resorption of the thickening, was found not to be uncommon.

Comparison of the two forms revealed complete uniformity with respect to the following characters:



Color: Hyaline through brown and purple, with complete intergradation between. Apex: Asymmetrical, exhibiting reduced heterostrophy. Sculpture: Apical bulb smooth, toward end of first whorl acquiring spiral punctuations which in the third and later whorls are obscured by faint longitudinal striations. Bristles present below the suture. Apertural teeth: Inner lip (columella) 2–4. Outer lip 0–3.[1]

In addition the ratio of height to maximum diameter was computed for all specimens. The results are plotted in figure 1, which compares on a percent basis the British and eastern U. S. samples with the California specimens.

From the foregoing, it can be seen that there is sufficient uniformity and/or overlap in all critical characters examined to demand the decision that the two forms are conspecific. Therefore, I suggest that the form previously known as *Phytia setifer* Cooper, 1872 should be designated as *Ovatella myosotis* Draparnaud.

[1] In Europe two subspecies of *Ovatella myosotis* have been recognized on the basis of the number of teeth on the outer lip. *Ovatella myosotis myosotis* possesses 0–3 teeth and *Ovatella myosotis denticulatus* has 3–6 teeth on the outer lip. There is no evidence that such a distinction can be made in Californian material, and all specimens examined must be referred to *Ovatella myosotis myosotis.*

This study was made possible through the generous response of many people to my requests for comparative material. Especially to be thanked are Dr. Myra Keene, Stanford University; Dr. Leo Hertlein and Mr. Allyn Smith, California Academy of Sciences; Dr. Rees and Dr. Galbreath of the British Museum; and Dr. Paul Holle, University of New Hampshire. Finally I should like to thank Dr. Cadet Hand, University of California, for his advice and reading of the manuscript.

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ANATOMY OF MOELLENDORFFIA (TRIHELIX) EUCHARISTUS (PILSBRY)

By TADASHIGE HABE

Amakusa Marine Biological Laboratory

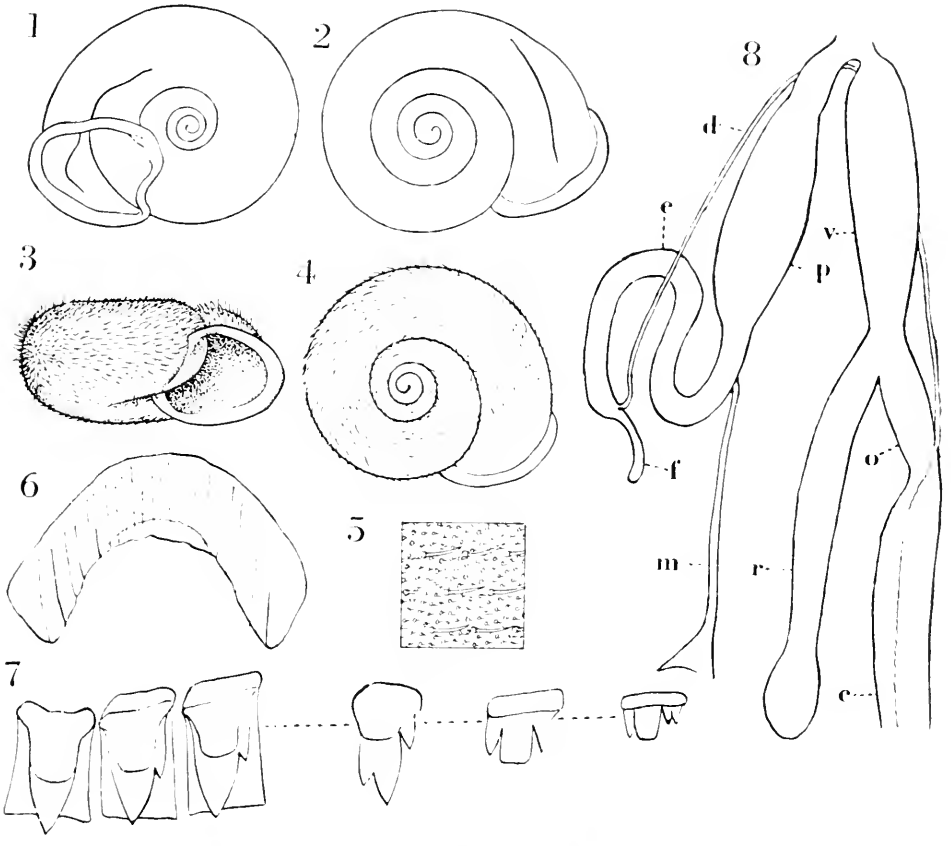
Through courtesy of Dr. Tokubei Kuroda, a living specimen of *Moellendorffia* (*Trihelix*) *eucharistus* (Pilsbry) from Sayomura, Amami-Oshima, one of the Ryukyu chain, has been forwarded to me. This species is rather rare, but was fortunately discovered by Mr. Masataka Ishimori during the tour of his collection in 1956–57. This is a first opportunity for examination of the soft parts of the group, as well as the species.

This species seems to be endemic to the Amami group, and the other known species are distributed in Formosa, southern China and Cambodia. This group of species is known under the subgeneric term *Trihelix* in the genus *Moellendorffia*.[1] *Trihelix* differs from the typical *Moellendorffia* in having smooth and shining embryonic whorls and in the aperture, the free and very peculiar margin of the parietal wall at the penultimate whorl, which bears two transverse sulci outside of the last part of the last whorl and forming two tooth-like folds inside of the aperture. However, in this Japanese species the peculiar armature of the aperture is somewhat reduced.

The general features of the genitalia of this species resemble rather closely those of the Japanese genera *Yakuchloritis* and *Nipponochloritis,* but distinctly differ in the short but thick receptaculum seminis, stout penis sheath, the very short flagellum on the penis, etc.

Animal long and narrow, black in colour; mantle with three black bands on the white lung area; common duct (fig. 8, c) very long, but oviduct (o) short (only 2.9 mm.) and thick stalk of the receptaculum seminis (r) comparatively short, the length about three times the oviduct, with swollen sac on the distal end; vagina (v) swollen towards the genital pore and two times the length of the oviduct; vas deferens (d) very long (nearly 17.9 mm.); penis (e) 10 mm. long with finger-shaped flagellum (f), which measures only 0.8 mm. in length; insertion of penial retractor near basal end of penis; penis sheath (p) thickish fusiform, but the closer part of the genital pore is narrowly con-

[1] In his famous work, Handbuch der syst. Weichtierkunde, Thiele omitted citation of this genus.



FIGS. 1, 2. *Moellendorffia* (*Trihelix*) *hiraseana* Pilsbry; outlines of shell, showing the two sulci behind the aperture. 3–8, *M.* (*T.*) *eucharistus* (Pilsbry), 3, 4. shell of the examined specimen which measures 7.2 mm, in height and 14 mm. in diameter, 5. the enlarged hairy periostracum showing the two kinds of hairs, 6. jaw, 7. radula showing the central tooth with first and second lateral teeth and three marginals, 8. terminal genitalia.

stricted. Jaw distinctly arched and with 12 vertical ribs on the surface. Radula with unicuspid central tooth and 16, one or two cusped laterals; 19 marginals, decreasing in size outwardly, the cusps of which are three to four in number.

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NEW SPECIES OF FONTIGENS FROM SHENANDOAH NATIONAL PARK

By LESLIE HUBRICHT

Fontigens orolibas, new species

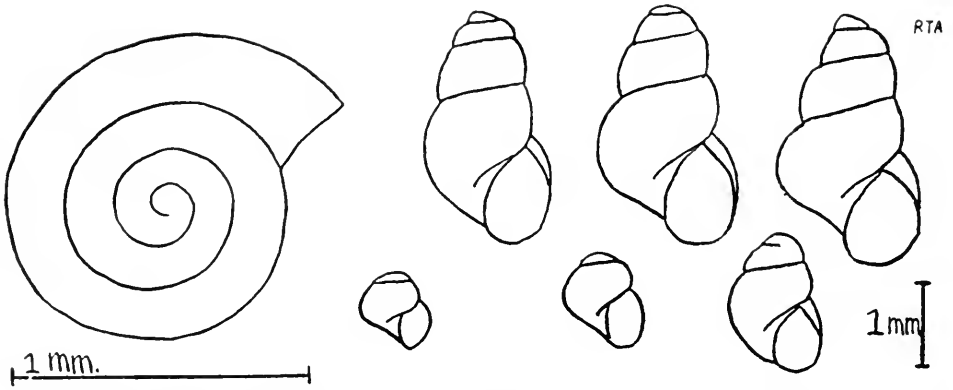
Shell: Elongate, turreted; color whitish-corneous, subhyaline; surface smooth, lines of growth numerous; spire conical, apex appearing truncated; whorls 4.5, flatly convex, separated by deep sutures; first whorl coiled in the same plane forming a flat apex; body whorl often somewhat expanded; aperture ovate, peristome continuous, sharp, a little thickened on the inside, free or appressed to the parietal wall for a short distance; immature shells umbilicate, becoming rimate at maturity.

Operculum: Hyaline, ovate, paucispiral, of about two whorls, sculpture consisting only of growth lines, which are almost invisible except near the end of growth; nucleus placed near the left side about one-third of the distance from base to apex.

Animal: Whitish with black flecking over the upper surface.

Height	Diameter	Aperture Ht.	Aperture Diam.	
2.4 mm.	1.4 mm.	1.0 mm.	0.8 mm.	Holotype.
2.3 mm.	1.3 mm.	1.0 mm.	0.8 mm.	Paratype.
2.3 mm.	1.5 mm.	1.0 mm.	0.8 mm.	Paratype.

Virginia: Shenandoah National Park: Warren Co.: spring, near Browntown Valley Overlook. Rappahannock Co.: Gravel Spring; spring, Indian Run Shelter; spring, below Little Hogback Overlook. Page Co.: David Spring, Big Meadow Camp Grounds; spring, Hawksbill Gap; spring, Skyland; spring, Elkwallow Gap Shelter; Furnace Spring; Lewis Spring. Madison Co.: spring, Hawksbill Shelter, Holotype 618868, Paratypes 618869, U.S.N.M., other paratypes 12059, collection of the author; spring, Pocosin Cabin; Little Stony Man Spring; Spring, Bear Fence Mtn. Shelter. Rockingham Co.: roadside spring, 0.2 mile north of milepost 80. Greene Co.: spring, Pine-



Fontigens orolibas Hubricht. Paratypes from Hawksbill Shelter Spring, ANSP no. 224662. Left fig., apical view of shell; other figs., apertural view of 6 shells.

field Shelter; spring, 0.3 mile south of milepost 62. Albemarle Co.: spring, Doyle River Cabin. Augusta Co.: spring, 0.6 mile north of Calf Mtn. Overlook. *Blue Ridge Parkway:* Augusta Co.: spring in pasture at milepost 6; roadside spring, 0.3 mile south of milepost 6; roadside spring, 0.3 mile north of milepost 8.

Fontigens orolibas may be readily distinguished from *Fontigens nickliniana* (Lea) by its smaller size, truncated spire, expanded body whorl, and lighter colored animal.

This is a species of high altitude springs in the Shenandoah National Park. It was found in every spring examined above 2000 feet, on both sides of the divide, even in springs that dried up during the summer. On the Blue Ridge Parkway, it was not found in any spring beyond milepost 8.

LARGER LAND SNAILS OF SLEEPY HOLLOW, KENTUCKY

By JAMES E. CONKIN

Paleontologist, Union Producing Co., Beeville, Texas

On November 29, 1953, in the course of investigating the geology and paleontology of Sleepy Hollow (2.5 miles north of Worthington), Oldham County, Kentucky, I collected the "dead shells" of several larger land snails from the surface of the hill slopes at Black Bridge on the south fork of Harrods Creek.

The geology and paleontology of the area has been described (Conkin, 1948, 1950). The soil is formed from the residuum of the Silurian Louisville limestone and Laurel dolomite; the latter forms the present surface outcrops of the flat uplands. On the valley slopes and bottoms, the Ordovician limestones and shales of the Richmond group (Waynesville, Liberty, and Whitewater [Saluda] formations) are exposed. Calcareous salts are therefore abundantly distributed in the soil of the area for use by the snails in building their shells. The bushy and forested slopes and creek bottoms provide excellent habitats for the mollusks of the area.

Because no work has been published on the snails of the area, and very little on Kentucky snails as a whole, the recording of even my cursory examination of the snails of Sleepy Hollow seems worthy of notice. Perhaps this note will engender individual or group study on the part of the local natural history students, or at least prompt collection of mollusks and their donation to workers interested in pursuing molluscan studies in the region.

A list of larger land snails from Sleepy Hollow follows:
Anguispira kochi (Pfeiffer)
Haplotrema concavum (Say)
Mesodon elevatus (Say)
Mesodon inflectus (Say)
Mesodon thyroidus (Say)
Stenotrema stenotrema (Pfeiffer)
Triodopsis albolabris (Say)
Triodopsis fraudulenta (Pilsbry)

With the exception of a few duplicate shells retained by the writer, all specimens collected at Sleepy Hollow were deposited in the mollusk collection of the Natural History Museum at the University of Kansas.

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——. 1950. Annals Ky. Nat. Hist., v. 1, pp. 45–48, fig. 6.

THE MOLLUSCA OF TETON COUNTY, WYOMING

By DOROTHY E. BEETLE

Teton County, in northwestern Wyoming, has an area of 2,815 square miles, and is somewhat larger than the State of Delaware. Most of the land is in the Teton National Forest, the Tanghee National Forest, the Grand Teton National Park, and the National Elk Refuge. There are a few towns and ranches with an approximate population of 3,000.

The Teton Range runs in a north south direction for over forty miles down the western half of the county. One of the most precipitous mountain fronts in the world, it came into being during the Tertiary when faulting along a north south fracture lifted the west block over 7,000 feet and tilted it westward. The chain of high peaks so formed culminates in the Grand Teton, elevation 13,776 feet. The east block was depressed, and formed the valley of Jackson Hole.

Stretched along the eastern base of the mountains are seven piedmont lakes. These lakes came into being as glaciers, hemmed in by moraines, melted back during the Pleistocene. Jackson Lake, the largest, is 400 feet deep. String Lake is only 10 feet deep.

The eastern half of the county is entirely mountainous, containing the Gros Ventre Range, Pyramid Peak, Darwin Peak, Sheep Mountain, Mt. Leidy, and the high ridges of the Continental Divide. The northern boundary of the county is overlaid by lava flows, a continuation of the volcanic cover of Yellowstone Plateau.

Jackson Hole is encompassed by these highlands. It is centrally located, and is approximately forty-eight miles long and six to eight miles wide. The Valley floor is comparatively flat, covered with cobbles left by the glaciers and occupied now by sage-brush, grasses and herbs. It is drained by the Snake River and the many streams flowing into the Snake from the surrounding mountains. With the exception of minor areas in the northeast and northwest corners of the county, all waters flow into the Snake, which turns west through the Grand Canyon of the Snake River into Idaho, and eventually joins the Columbia River. The minimum elevation of 5,800 feet is recorded near Hoback in the Grand Canyon of the Snake.

The average annual precipitation is 21.5 inches, more than that received by any other county in Wyoming. It is distributed rather evenly throughout the year as snow or rain. Snow has occurred every month of the year.

The monthly mean temperature varies from 13.6 to 61.3 degrees Fahrenheit. The summers are cool and short, with an average growing period of sixty days in the valley. The shortest growing season recorded at Moran since 1911, when weather records were initiated, was four days. The longest was 112 days. Temperatures in winter may descend to − 40 and − 50 degrees F., with a minimum temperature recorded in the valley of − 63 degrees F. The low temperatures, short frost-free periods and the deep snows are critical factors in the development of a molluscan fauna.

The soils of Teton County have not been described in detail. In general, the Teton Range and the Continental Divide in the northeastern corner have acid mountain soils lying on granite or ryolite. The mountains in the eastern section have a granitic core overlain by sandstones and limestones. The soil is a brown sandy loam. In the north, the volcanic cover has a mixture of acid mountain, sandy loam, and some limey valley soils. The central valley of Jackson Hole shows limey valley soils overlying recent terrace, bench and bottom deposits.

Four life zones are recognized, the Transition, Canadian, Hudsonian and Arctic-Alpine.

Terrestrial Mollusca

Oreohelix strigosa depressa (Cockerell): Pacific Creek, under sagebrush, D. Beetle 55–486; Hillside above Flat Creek along Highway 187, J. Henderson.

Oreohelix subrudis ("Pfr." Reeve): General in the area. Considerable variation in size and color patterns exist.

Oreohelix carinifera Pilsbry: 15 miles south of Jackson, A. Beetle 48–7.

Microphysula ingersolli (Bland): Aspen grove at Signal Mountain Pond, D. Beetle 54–416; North slope of Signal Mountain, D. Beetle 54–455; West fork of Crystal Creek, R. Honess.

Euconulus fulvus (Müller): Aspen grove at Signal Mountain Pond, D. Beetle 54–411; East of Jackson Hole Station in willows, D. Beetle 54–411; Emma Matilda Lake (reported as *E. fulvus alaskensis*) Levi; Trail to Hidden Falls, D. Beetle 55–489; Cascade Canyon, A. Beetle 50–363.

Euconulus fulvus alaskensis (Pilsbry): General in the area.

Retinella electrina (Gould): Northeast of Jackson Hole Station on the old road to Moran, D. Beetle 54–434; Cottonwood Creek, Levi.

Retinella binneyana occidentalis H. B. Baker: Road to Two Ocean Lake, D. Beetle 55–462; Snake River floodplain south to Wilson, Roscoe.

Zonitoides arboreus (Say): General in the area.

Vitrina alaskana Dall: General in the area.

Deroceras laeve (Müller): Northeast of Jackson Hole Station on the old road to Moran, D. Beetle 54–432; Wildlife Park, Levi; Road to Two Ocean Lake, D. Beetle 55–465.

Deroceras laeve gracile (Raf.): Snake River floodplain south of Wilson, Roscoe.

Discus cronkhitei (Newcomb): General in the area.

Discus shimeki (Pilsbry): Collections of *D. shimeki* and *D. shimeki cockerelli* are herein reported separately. However, a series collected shows a transition from a high to a depressed spire, and variations in umbilical diameter and rib striations. Probably the subspecies *cockerelli* should not be retained. Aspen grove above Signal Mountain Pond, D. Beetle 54–408; Northeast of Jackson Hole Station on the old road to Moran, D. Beetle 54–468; North slope of Signal Mountain, D. Beetle 54–458; Trail around Jenny Lake, D. Beetle 55–495; Trail to Hidden Falls, D. Beetle 55–487; Snake River floodplain south of Wilson, Roscoe.

Discus shimeki cockerelli (Pilsbry): North slope of Signal Mountain, D. Beetle 55–436, and Levi; Curr Canyon, Gregg.

Punctum minutissimum (Lea): Aspen grove at Signal Mountain Pond, D. Beetle 54–412A, and Levi; Northeast of Jackson Hole Station on the old road to Moran, D. Beetle 55–469; North slope of Signal Mountain, D. Beetle 54–457, and Levi; Emma Matilda Lake, Levi; Trail to Hidden Falls, D. Beetle 55–495.

Oxyloma decampi gouldi Pilsbry: Bog off Snake River east of Jackson Hole Station, D. Beetle 54–463; Wildlife Park (reported as *Succinea avara*), Levi; Gros Ventre Creek west of Highway 187 bridge (reported as *S. avara*), Levi; Ditch at Jackson Airport, D. Beetle 55–430; Pond 20 miles south of Jackson (reported as *S. retusa*), Henderson; Snake River floodplain south of Wilson, Roscoe; Hoback Canyon, *Typha* pond near Camp Davis, Gregg.

Succinea grosvenori Lea: Grand Canyon of the Snake near Hoback, cottonwood association, Gregg.

Succinea stretchiana Bland: Gros Ventre Creek (identified by J. P. E. Morrison), R. Honess.

Succinea avara Say: Aspen grove at Signal Mountain Pond, D. Beetle 54–412; Aspen grove northeast of Jackson Hole Station on old road to Moran, D. Beetle 54–436; Two Ocean Lake, Levi.

Pupilla blandi Morse: Aspen grove at Signal Mountain Pond, D. Beetle 54–407; 1 mile south of Moran, Gregg; Moose, Levi; Sheep Mountain, Levi.

Pupilla muscorum (L.): 7 miles north of Moran, Henderson; Aspen grove at Signal Mountain Pond, Levi; Wildlife Park, Levi; North slope of Signal Mountain, Levi; Gros Ventre Slide, Levi; Gros Ventre Creek, R. Honess; Mount Baldy, Levi.

Pupilla hebes (Ancey): Aspen grove at Signal Mountain Pond, D. Beetle 54–407A; Riverbank below Jackson Hole Station, D. Beetle 54–429; Togowottee Pass, D. Beetle 50–397.

Vertigo gouldi coloradensis (Cockerell): Aspen grove at Signal Mountain Pond, D. Beetle 54–413; Bog off Snake River east of Jackson Hole Station, D. Beetle 54–466; Willows east of Jackson Hold Station, D. Beetle 54–442.

Vertigo gouldi basidens Pilsbry & Vanatta: Hoback Canyon, *Typha* pond near Camp Davis, Gregg.

Vertigo concinnula Cockerell: Pilgrim Creek, Levi; 1 mile south of Moran, Gregg; North slope of Signal Mountain, Levi; Emma Matilda Lake, Levi; Elk, Levi; Leigh Lake, Levi; Gros Ventre Slide, Levi; Mt. Baldy, Levi; Sheep Mountain, Levi, 29 miles south of Jackson, Gregg.

Vertigo modesta (Say): Trail to Hidden Falls, D. Beetle 55–491. Under the bark of a fallen aspen tree lying in a seep were 45 specimens of *Vertigo modesta* and form *parietalis,* the greatest concentration of this species seen by the author. Thirty shells had 5 teeth, eight had 4 teeth, one had 3 teeth, four juvenile had spine-like teeth and two were toothless. On this same log were *Oreohelix subrudis, Euconulus fulvus, Zonitoides arboreus, Vitrina alaskana, Discus shimeki, Punctum minutissimum,* and *Columella alticola.*

Vertigo modesta parietalis Ancey: Road to Two Ocean Lake, D. Beetle 55–461; Trail around Jenny Lake, D. Beetle 55–493; Cascade Canyon, A. Beetle 50–361.

Columella alticola (Ingersoll): Trail to Hidden Falls, D. Beetle 55–492; Cascade Canyon, A. Beetle 50–361A.

Vallonia gracilicosta Reinhardt: Aspen grove at Signal Mountain Pond, D. Beetle 54–410; Road to Two Ocean Lake, D. Beetle 55–464; Snake River floodplain south of Wilson, Roscoe.

Vallonia albula Sterki: Road to Two Ocean Lake, D. Beetle 55–460; Snake River floodplain south of Wilson, Roscoe.

Vallonia cyclophorella Sterki: Pilgrim Creek, Levi; 7 miles north of Moran, Henderson; Aspen groove at Signal Mountain Pond, D. Beetle 54–410A; East of Jackson Hole Station, D. Beetle 54–445; Pacific Creek, D. Beetle 54–451; Emma Matilda Lake, Levi; Uhl Hill, Levi; Gros Ventre Slide, Levi; Gros Ventre Creek, R. Honess; Teton Pass, Olsson.

Zoogenetes harpa (Say): Emma Matilda Lake, Levi; Leigh Lake, Levi; Gros Ventre Slide, Levi.
Cionella lubrica (Müller): Road to Two Ocean Lake, D. Beetle 55–463.

AQUATIC MOLLUSCA

Margaritifera margaritifera (L.): Flagg Ranch, C. Thurston; Flat Creek (reported as *M. margaritifera falcata*), Henderson; Snake River at the mouth of Flat Creek, Gregg.
Sphaerium lacustre rykholti Normand: Swan Lake, in the mud and roots of vegetation on a floating island, Baxter and D. Beetle 55–444; Signal Mountain Pond, D. Beetle 55–434; Pacific Creek, R. Fautin; Two Ocean Lake, D. Beetle 44–457.
Sphaerium occidentale Prime: Togowottee Pass, D. Beetle 50–399A.
Pisidium casertanum Poli: General in the area.
Pisidium subtruncatum Malm: Christian Meadows, D. Beetle 55–452.
Pisidium variable Prime: Elk Island, A. Beetle 55–480; Snake River at Jackson Hole Station, dead specimens, D. Beetle 54–424.
Lymnaea stagnalis jugularis Say: Signal Mountain Pond, D. Beetle 54–447.
Lymnaea caperata Say: Snake River at Jackson Hole Station, A. Beetle 54–421; 20 miles south of Jackson, Henderson.
Lymnaea humilis modicella Say: Snake River at the mouth of Flat Creek, Gregg.
Lymnaea humilis rustica Lea: Snake River at the mouth of Flat Creek, Gregg, Snake River, below mouth of Flat Creek, on rocks, Gregg.
Lymnaea palustris Müller: General in the area.
Lymnaea palustris wyomingensis Baker: General in the area.
Lymnaea jacksonensis Baker: Swan Lake, Baxter and D. Beetle 55–443; Coulter Bay Lake, D. Beetle 55–446; Jackson Lake, Henderson, A. Beetle 55–483; Wildlife Park, Levi; Phelps Lake, Henderson; Snake River south of Wilson, Roscoe; Snake River ½ mile below Flat Creek, Gregg; Snake River below Hoback Creek, Gregg; Grand Canyon of the Snake, Gregg.
Lymnaea montana Elrod: Jenny Lake (reported as *L. elrodiana*), Henderson.
Lymnaea binneyi Tryon: Fish Creek south of Wilson, Gregg; ½ mile below mouth of Flat Creek, Snake River, Gregg.
Lymnaea apicina Lea: Snake River below Flat Creek, D. Beetle 55–429.
Helisoma trivolvis (Say): Swan Lake, Baxter and D. Beetle 55–439; Coulter Bay Lake, Baxter and D. Beetle; Christian Meadows, D. Beetle 55–451.
Helisoma trivolvis macrostomum (Whiteaves): Two Ocean Lake,

Beetle and Beetle 50–370; Swamps of Flat Creek along Highway 187, D. Beetle 50–344.

Helisoma subcrenatum (Carpenter): Flagg Ranch, D. Beetle 55–454; Two Ocean Lake, D. Beetle 55–456; Gros Ventre Slide, D. Beetle 54–468.

Helisoma subcrenatum disjectum (Cooper): Gladel Creek, Levi.

Planorbula christyi (Dall): Signal Mountain Pond, D. Beetle 54–418. Dr. H. van der Schalie, who identified the *Planorbula,* reports (personal communication) that it has only been found previously in Alberta, Manitoba, Saskatchewan, and the Dakotas. The snail was abundant in this pond, climbing on the vegetation and floating at the surface. Collections made here on July 27, 1950, did not reveal its presence.

Gyraulus arcticus (Müller): Leigh Lake, on driftwood, Levi.

Gyraulus similaris (Baker): Snake River at the mouth of Flat Creek, Gregg.

Gyraulus vermicularis (Say): General in the area.

Carinifex jacksonensis Henderson: Coulter Bay Lake, D. Beetle 55–448; Jackson Lake, crawling on coarse gravel, Henderson; Elk Island, A. Beetle 55–473; Snake River at Jackson Hole Station, D. Beetle 54–423.

The specific identity of the following *Physa* is as accurate as is possible under the present nomenclatorially confused state of the genus:

Physa ampullacea Gould: Northeast of Moran, Henderson; Elk Island, A. Beetle 55–477.

Physa anatina Lea: Christian Meadows, D. Beetle 55–450; Pacific Creek, D. Beetle 55–466.

Physa forsheyi Lea: Spring Creek near Moran, A. Beetle 50–373.

Physa gyrina Say: General in the area.

Physa sayi warreniana Lea: Two Ocean Lake, Beetle and Beetle 50–371.

Physa warreniana gouldi Clench: Snake River near Moran, Levi; Two Ocean Lake, D. Beetle 55–499; Warm Springs near Moose, Levi; Grand Canyon of the Snake, approximately ½ mile south of Hoback, Gregg.

Physa virgata traskii Lea: North of Moran, Henderson.

Aplexa hypnorum Say: Swamps of Flat Creek along Highway 187, Henderson.

Amnicola robusta Walker: Jackson Lake, Henderson; Elk Island, A. Beetle 55–479; In the digestive tract of a Rosyside Sucker taken at the foot of Jackson Lake Dam, Bangham.

Fluminicola fusca Haldeman: Snake River south of Wilson, Roscoe; Snake River at Flat Creek, Gregg.

Valvata humeralis californica Pilsbry: Jackson Lake, Henderson.

SPECIES	PLANT ASSOCIATION										
	ASPEN	SPRUCE-FIR	COTTONWOOD	WILLOW	LODGE POLE PINE	ASPEN-WILLOW	GRASS	LIMESTONE TALUS	SHORELINE OF POND OR BOG	GRAVEL OF RIVER BOTTOM	SAGE BRUSH
OREOHELIX SUBRUDIS	7	4	1	2	2	1	2	1		3	4
ZONITOIDES ARBOREUS	7	4	6	2	4	1	1		1	1	
VITRINA ALASKANA	7	5	5	2	4	1	1	1		1	
EUCONULUS FULVUS ALASKENSIS	3	2	2	1	3		1	1			
DISCUS CRONKHITEI	4	4	3	3		1			1		
EUCONULUS FULVUS	2	1	1	2							
DISCUS SHIMEKI	2	2	1			1					
PUNCTUM MINUTISSIMUM	3	1		1	2	1		1			
VALLONIA CYCLOPHORELLA	2	2		2	1		1			1	
VERTIGO CONCINNULA	4	2			4		1	1	1	1	
PUPILLA HEBES	1	1		1							
VERTIGO MODESTA	1	1									
V. MODESTA PARIETALIS	2	2									
MICROPHYSULA INGERSOLLI	1	1									
COLUMELLA ALTICOLA	1	1									
RETINELLA BINNEYANA OCCIDENTALIS	1		1								
DEROCERAS LAEVE	2		1			1					
PUPILLA MUSCORUM	3		1					1			
VALLONIA ALBULA	1		1								
VALLONIA GRACILICOSTA	2		1								
SUCCINEA AVARA	2					1	1				
PUPILLA BLANDI	2				2						
ZOOGENETES HARPA	1				2						
VERTIGO GOULDI COLORADENSIS	1			2					1		
CIONELLA LUBRICA	1										
RETINELLA ELECTRINA			2			1					
OXYLOMA DECAMPI GOULDI			4				1		2		
SUCCINEA GROSVENORI			1								
DEROCERAS LAEVE GRACILE			1								
DISCUS SHIMEKI COCKERELLI		1			1			1	1		
VERTIGO GOULDI BASIDENS									1		
OREOHELIX STRIGOSA DEPRESSA											2
TOTAL NUMBER OF SPECIES PER HABITAT	25	16	16	10	10	9	8	7	7	5	2

THE NUMBERS INDICATE TIMES A SPECIES WAS PRESENT IN A HABITAT, BUT NOT THE FREQUENCY OF INDIVIDUALS

Valvata lewisii helicoidea Dall: Swan Lake, Baxter and D. Beetle 55–445; Two Ocean Lake, D. Beetle 55–458.
Valvata sincera Say: Elk Island, A. Beetle 55–478.
Hydrobia greggi Pilsbry: Snake River at the junction of Hoback Creek, Gregg.

Prior to 1956, the locality, Moran, refers to the town at the foot of Jackson Lake Dam. This town is being relocated farther north on Highway 87–287.

Aspen groves provided the most favorable habitat for terrestial snails. The groves are of limited extent, occurring as narrow bands or clumps around a valley between the sagebrush and grass below and the coniferous forest above, or in openings in the forest. Furthermore, the groves must be divided into two ecotypes. According to Dr. John F. Reed, in a paper on the vegetation of Jackson Hole Wildlife Park, two distinct types of aspen community occur there, and this seems true of the rest of the county.

The aspen groves adjacent to meadows or water or in an opening in the coniferous forest are characterized by closed canopies, moist subsoil, and a lush undergrowth of shrubs, herbs and grasses. Dr. Reed has identified seventy-eight species of vascular plants in this assemblage. Twenty-five species of terrestial gastropods occur under these conditions.

Stands on arid slopes are usually very dry, especially in midsummer and early fall. The exposure is generally toward the south, and the drainage is rapid. Only thirty-eight species of vascular plants have been found within these groves. *Oreohelix subrudis, Vallonia cyclophorella, Vitrina alaskana,* and a broken shell of *Pupilla* were seen. The first two species are also to be seen under similarly xeric conditions in the sagebrush and under talus of sedimentary rock.

An aspen grove on a morainal deposit at Signal Mountain Pond yielded sixteen species of gastropods, the greatest number seen in any particular grove. Almost all these species could be found under the bark and debris beneath any decaying aspen log. The animals were scattered apparently at random, seemingly without competition for food or space. In the leaf litter between logs, only *Oreohelix subrudis* and *Discus cronkhitei* were encountered. As should be borne in mind, 1954 and 1955 occurred in a period of dry years.

Spruce fir forests lie in moist pockets of the mountain ranges,

usually on the north slopes. In this community, mollusks are generally confined to seeps, moist protected areas, and the banks of mountain rivulets, preferably where shrubs and an occasional hardwood tree grow. Sixteen species were identified from this assemblage. The river bottoms, with an edging of cottonwoods and an undergrowth of willow and grasses also yielded sixteen species. Snails were scattered widely through the leaf litter, debris, in the grass and even under cobblestones piled in the dry section of the river beds. This habitat is probably less mesic than might appear, as the cottonwoods form an open canopy.

In places along the rivers and lakes and in wet meadows, dense thickets of willow form a growth approximately ten feet high. In the thick piles of moldering leaves, ten species of mollusks live.

Lodgepole pine forest and the sagebrush communities occupy the largest areas in the county. While only two species were found in the sagebrush, ten species were found in the lodgepole, these in limited quantities. The dense young stands of lodgepole admit almost no understory of plants and no snails. Mature forests are dry and open with a more abundant understory. Snails were most likely to be located under decaying logs, particularly hardwoods, and not in the pine duff.

Grassy areas along ditches and in meadows yielded eight species. These usually lived under stones and old logs in the area. Exceptions were *Oxyloma decampi gouldi* which crawls about on the rushes and grasses in damp places, and *Oreohelix subrudis* which is to be found at the base of plants in the scant protection afforded. Six species were found in small patches of *Sphagnum* bog. Here the mollusks were crawling through the moss.

Under the rather arid conditions that prevail in Wyoming, moisture appears to be the limiting factor in the distribution of terrestial gastropods. United States Weather Bureau Statistics (1950) of the annual average precipitation within the twenty-three counties range from 6.47 to 20.77 inches. Other conditions being equal, hardwoods, particularly aspen, provide a preferred habitat. Limestone or sedimentary rocks offer a more favorable substratum than granitic rocks.

Thirty-four species of terrestrial mollusca were identified, the most common being *Zonitoides arboreus, Discus cronkhitei, Oreo-*

helix subrudis, Vitrina alaskana, and *Euconulus fulvus* var. *alaskensis.*

Aquatic habitats with a mud or silt bottom seemed to provide a more favorable location for fluvial species than did gravel or sand bottoms. The latter conditions may be a reflection of the swifter currents, leaving behind bare creek bed with a minimum of vegetation to provide food and shelter. Only live mollusks were counted as being present at any station, although dead ones washed down from other localities were often present. Thirty-nine species were collected, the most common being *Pisidium casertanum, Lymnaea palustris* and var. *wyomingensis, Gyraulus vermicularis* and *Physa gyrina.*

Field work for this report was carried out during a week's stay in August of 1954 and 1955 at the Jackson Hole Biological Research Station.

The author wishes to thank Dr. Alan A. Beetle for specimens he and his students have collected in the course of his studies at Jackson Hole. Mr. Ernest Roscoe, Dr. Herbert and Lorna Levi, Dr. Wendell Gregg and Dr. George Baxter have contributed material for identification and examination from their collections. Some of Dr. Junius Henderson's material in the University of Colorado was examined. Reverend H. B. Herrington identified the *Sphaeriidae,* and Mr. Roscoe identified the *Oreohelix.*

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CATALOGUE OF THE LAND MOLLUSCA OF ARGENTINA

By J. J. PARODIZ

(Continued from April number)

Protoglyptus munsteri (Orbigny). *Bulimus m.* Orb., 1837, p. 14, figs. 4–7. Type loc.: Cordillera W. of Santa Cruz, Bolivia. Distr.: S. Bolivia; Salta.

P. crepundia (Orbigny). *Helix* (*Cochlogena*) *c.* Orb., 1835, p. 14; *Bulimulus* (*P.*) *c.* Pilsbry, 1897, p. 90. Type loc.: Llanos de Chiquitos, Bolivia. Distr.: S. Bolivia; E. Salta.

P. punctustriatus Parodiz, 1946, p. 6, fig. 2. Type loc.: Puesto Viejo, Jujuy.

P. ramosae, Hylton Scott, 1952, p. 23, fig. 6. Type loc.: Pocitos, Salta.

P. (*Rimatula*) *montivagus* (Orbigny). *Helix* (*Cochlogena*) *m.* Orb., 1835, p. 14; *Bulimulus* (*P.*) *m.* Pilsbry, 1897, p. 90. Type loc.: Cavallu Cuatia, N.W. Entre Rios. Distr.: S. Brazil; Bolivia; Paraguay; Tucuman; Stgo. del Estero, Entre Rios, Corrientes.

P. (*R.*) *oxylabris* (Doering). *Bulimulus* (*Scutalus*) *o.* Doer., 1879, p. 65. Type loc.: Sierra Chica, Córdoba. Distr.: N.W. Córdoba. *Bul. centralis* Doering is the same species.

P. (*R.*) *pollonerae* (Ancey). *Bulimulus p.* Anc., 1897, pl. 17, fig. 10; *Bulimulus* (*P.*) *p.* Pilsbry, 1901, p. 148. Type loc.: San Lorenzo, Jujuy. Distr.: E. Jujuy, Salta.

P. (*Obstrussus*) *rocayanus* (Orbigny). *Helix r.* Orb., 1835, p. 13; *Bulimulus r.* Pilsbry, 1897, p. 321, pl. 44, figs. 4–5. Type loc.: Woods along Rio Grande, Bolivia. Distr.: Bolivia; Salta.

P. (*O.*) *chacoensis* (Ancey). *Bulimulus montivagus c.* Anc., 1879, p. 16 (not *B. c.* Preston = *Drymaeus borellii* Anc.); *P.* (*O.*) *c.* Parodiz, 1946, pl. 1, fig. 9. Type loc.: Caiza, Bolivia. Distr.: Salta.

Peronaeus scalarioides (Philippi). *Bulimulus s.* Phil., 1867, p. 67; *P. s.* Parodiz, 1946, p. 336, pl. 2, fig. 8. Type loc.: Conchuco, Peru. Distr.: Catamarca.

P. famatinus (Doering). *Bulimulus* (*P.*) *f.* Doer., 1879, p. 63. *P. f.* Parodiz, 1947, p. 339, pl. 1, fig. 3. Type loc.: Sierra Velazco, La Rioja.

P. calchaquinus (Doering). *Bulimulus* (*P.*) *c.* Doer., 1879, p. 64. Type loc.: Sierra Belén, Catamarca. References under *famatinus*, Par. 1947.

P. monticola (Doering). *Bulimulus m.* Doer., 1879, p. 69; *P. m.* Parodiz, 1947, p. 8, pl. 1, fig. 4. Type loc.: Sierra de Granadillos, Famatina, Catamarca. Distr.: Catamarca, Mendoza, San Juan, (La Rioja ?).

P. cordillerae (Strobel). *Bulimulus* (*Mesembrinus*) *c.* Str., 1874, p. 22, pl. 1, fig. 3; *P. c.* Parodiz, 1947, p. 8, pl. 1, fig. 5. Type loc.: Villavicencio, Mendoza. Distr.: Mendoza, San Juan.

P. (*Lissoacme*) *albicans* (Broderip). *Bulimus a.* Brod., 1832, p. 105; *P.* (*L.*) *a.* Parodiz, p. 339. Type loc.: Copiapó, Chile. Distr.: San Juan.

P. (*L.*) *torallyi draparnaudi* (Pfeiffer). *Bulimulus d.* Pfr., 1846, p. 113; *P.* (*L.*) *t. d.* Parodiz, 1947, p. 18. Type loc.: Chilón, Bolivia. Distr.: Bolivia; Salta, Jujuy.

P. (*L.*) *t. nigroumbilicatus* (Preston). *Bulimulus* (*Drymaeus*) *n.* Preston, 1907, p. 491 (homonym: *P.* (*L.*) *t. n.* Parodiz, 1947, p. 20, fig. 10). Type loc.: Embarcación, Salta. Distr.: Bolivia; Salta, Jujuy.

P. (*L.*) *t. corrugatus* Parodiz, 1947, p. 19, pl. 1, fig. 9. Type loc.: Villa Nogués, Tucumán.

P. (*L.*) *t. avus* Parodiz, 1947, p. 20. Type loc.: Cachi, Salta.

P. (*L.*) *tortoranus* (Doering), 1879, p. 71; *P.* (*L.*) *t.* Parodiz, 1947, p. 12. Type loc.: Sierra Pocho, Córdoba. Distr.: S. Catamarca, Córdoba, San Luis, (E. La Rioja ?).

P. (*L.*) *mendozanus* (Strobel). *Bulimulus* (*Eudioptus*) *m.* Str., 1874, p. 23; *P.* (*L.*) *m.* Parodiz, 1947, p. 26. Type loc.: Villavicencio, Mend.

P. (*L.*) *azulensis* (Doering). *Eudioptus mendozanus azulensis* Doering, 1881, p. 62; *P.* (*L.*) *a.* Parodiz, 1947, p. 27. Type loc.: Cerro Sotoya, between Azul and Olavarría, Buenos Aires. Distr.: Sierras of Tandil and La Ventana. *E. m. bonaerensis* Doer., 1884, p. 111 from Cerro Las Aguilas, Tandil, is only a form of *azulensis*. Another related species is the very rare "*Bulimus fayssianus*" Petit de la Saussaye, 1853, p. 251, from the "zone of the Plata." If proved all these are one and the same species, then the name *fayssianus* shall have priority.

P. (*L.*) *curamalalensis,* **new name** pro *Bulimulus bonaerensis* Holmberg, 1909, p. 10 (not *Eudioptus mendozanus bonaerensis* Doer., now syn. of *P.* (*L.*) *azulensis* Doer.); *P.* (*L.*) *bonaerensis* Parodiz, 1947, p. 22, pl. 1, figs. 11–12. The name *Bulimulus bonariensis* (Rafinesque) is to be maintained on account of its different spelling.

P. (*L.*) *borellii* (Ancey). *Bulimulus b.* Anc., 1895, p. 13; *Drymaeus b.* Pilsbry 1898, p. 279, pl. 26, figs. 77–78. Type loc.: Mission San Francisco, Pilcomayo River. Distr.: Jujuy.

P. (*L.*) *aguirrei* (Doering). *Eudioptus a.* Doer., 1884, p. 112; *P.* (*L.*) *a.* Parodiz, 1947, p. 24. Type loc.: Sierra Tandil, S. Buenos Aires. Distr.: Buenos Aires, S.E. La Pampa.

P. (L.) ameghinoi (Ihering). *Bulimulus a.* Ih., 1908, p. 430; *P. (L.) a.* Parodiz, 1947, p. 23. Type loc.: Ravines of Arroyo Chapalmalal, Buenos Aires (pleistocene). Distr.: (living) along the coast from Gulf San Matias to Sanguinetto Bay, Santa Cruz.

Pa. (L.) a. madrynensis (Parodiz), 1944, p. 3 (as *Bulimulus (L.)*; *P. (L.) a. m.* Parodiz, 1947, p. 24. Type loc.: El Doradillo, near Puerto Madryn, Golfo Nuevo, Chubut.

P. (L.) climacographus (Holmberg). *Bulimulus (Mesembrinus) c.* Hol., 1912, p. 147; *P. (L.) c.* Parodiz, 1947, p. 15. Type loc.: Rio de las Piedras, Salta. Distr.: Salta, Tucumán.

P. (L.) reedi Parodiz, 1947, p. 10, pl. 1, fig. 6. Type loc.: La Cueva, Mendoza.

P. (L.) puntanus Parodiz, 1947, p. 13, pl. 1, fig. 8. Type loc.: Cerro del Morro, N.E. San Luis.

P. (L.) birabeni Hylton Scott, 1948, p. 272, figs. 4–10. Type loc.: Embarcación, N.E. Salta.

Platybostryx[4] *cuyana* (Strobel). *Helix c.* Str., 1874, p. 11, pl. 1, fig. 2; *Bostryx (P.) c.* H. Scott, 1954, p. 408, figs. 5–6. Type loc.: Villavicencio, Mendoza. Distr.: Pre-cordillera of Mendoza.

P. doelloi (Hylton Scott). *Bostryx (P.) d.* H. Scott, 1954, p. 412, figs. 1–4. Type loc.: Cerro Pelado, Mendoza.

Kuschelenia simulans Hylton Scott, 1951, p. 539, figs. 1–4. Type loc.: Potosi, S. Bolivia. Distr.: Bolivia; Peru; probably N. Argentina.

Plectostylus mariae S. T. Brooks, 1936, p. 124, fig. 1. Type loc.: San Esteban, S. Chile. Distr.; Neuquén. Syn: *P. argentinensis* Parodiz, 1951, p. 334, 1 fig. from San Martín de Los Andes, Neuquén.

Drymaeus abyssorum (Orbigny). *Helix a.* Orb., 1835, p. 17; *D. a.* Pilsbry, 1898, p. 192. Type loc.: Pampa Ruiz, Rio Grande, Bolivia. Distr.: Bolivia; Jujuy.

D. papyraceus (Mawe). *Helix p.* Mawe, 1823, p. 168; *D. p.* Pilsbry, 1898, p. 250. Type loc.: Probably Rio de Janeiro. Distr.: Brazil; Uruguay; Corrientes, Entre Rios, Martín Garcia Island in La Plata River.

D. p. papyrifactus Pilsbry, 1898, p. 252, pl. 51, figs. 4–5. Type loc.: Curitiba, Paraná, Brazil. Distr.: Brazil, Uruguay, Buenos Aires.

D. hygrohylaeus (Orbigny). *Helix h.* Orb., 1835, p. 18; *D. h.* Pilsbry, 1898, p. 194. Type loc.: North of Chiquitos, Santa Cruz, Bolivia. Distr.: Salta, Jujuy. *D. harringtoni* Marshall, 1930 is the same sp.

[4] The type of *Bostryx* [*Bulimus (Bostryx) solutus* Troschel] is entirely distinct from that of the type of *Platybostryx* [*Bostryx eremothauma* Pilsbry = *Helix reentsi* Phil.]. Here are separated as different genera rather than subgenera.

D. hyltoni, **new name** pro *D. alabastrinus* H. Scott, 1952, p. 25 (not *D. alabastrinus* Da Costa, 1907). Type loc.: Tartagal, Salta.

D. poecilus (Orbigny). *Helix* (*Cochlogena*) *p.* Orb., 1835, p. 11; *D. p.* Pilsbry, 1898, p. 285. Type loc.: Santa Cruz, Bolivia. Distr.: E. Bolivia to Catamarca, Argentina. *D. p. p.* is *p. major* Orb.

D. p. minor (Orbigny). *Bulimus p. m.* Orb., 1837, p. 268, pl. 31, fig. 6. Type loc.: Along Rio Grande between Sta, Cruz and Chuquitos, Bolivia. Distr.: E. Bolivia to Paraguay River.

D. p. ictericus (Ancey). *Bulimulus p. i.* Anc., 1892, p. 92. Type loc.: Matto Grosso, Brazil. Distr.: Eastern margin of Paraguay River. This subspecies belongs to figs. 5 and 9 in Orbigny, 1837.

D. oreades (Orbigny). *Helix o.* Orb., 1835, p. 11; *D. o.* Pilsbry, 1897, p. 277, pl. 44, figs. 95–96. Type loc.: "near San Roque," Corrientes. Distr.: N.E. Argentina; S. Brazil.

D. lynchi Parodiz, 1946, p. 1, pl. 1, figs. 1–3. Type loc.: Pozo de Vargas, between Rivers Parapeti and Grande, Bolivia. Distr.: E. to Matto Grosso; S. to the Argentine border.

D. interpunctus (Martens). *Bulimulus i.* Mart., 1866, p. 161; *D. i.* Pilsbry, 1898, p. 287. Type loc.: Piracicaba, Sao Paulo, Brazil. Distr.: S. Brazil; Uruguay, Misiones.

Cyclodontina (*Spixia*) *spixii* (Orbigny). *Helix s.* Orb., 1835, p. 21; *C.* (*S.*) *s.* Parodiz, 1944, p. 5. Type loc.: Chiquitos, Bolivia. Distr.: Bolivia; Paraguay; Brazil; Salta, Santiago del Estero.

C. (*S.*) *s. major* (Orbigny). *Helix s. m.* Orb., 1835, p. 21; *Odontostomus* (*S.*) *s. m.* Parodiz, 1942, p. 201, fig. 7. Type loc.: (selected) Vicinity of Santa Lucia River, Corrientes. Distr.: S.E. Bolivia; Paraguay; Corrientes, Misiones, Salta.

C. (*S.*) *s. minor* (Orbigny). 1835, p. 21; *O.* (*S.*) *S. m.* Parodiz, 1942, p. 201, pl. 2, fig. 9. Type loc.: Between Sto. Corazon and San Juan, Chiquitos, Bolivia. Distr.: Parana, Entre Rios, subfossil, pleistocene.

C. (*S.*) *alvarezi* (Orbigny). *Helix a.* Orb., 1835, p. 22; *O.* (*S.*) *a.* Parodiz, 1942, p. 202, pl. 2, fig. 10 (text fig. 2). Type loc.: Feliciano, Entre Rios. Distr.: Córdoba, Stgo. del Estero, E. Rios.

C. (*S.*) *cala* Hylton Scott, 1952, p. 12, pl. 2, fig. 2. Type loc.: Copacabana, Córdoba.

C. (*S.*) *charpentieri* (Grateloup). *Bulimus c.* Grat. in Pfeiffer, 1850, p. 14; *C.* (*S.*) *c.* Parodiz, 1946, p. 11, figs. 3–5. Type loc.: Córdoba. Distr.: San Luis, Córdoba, Catamarca; Uruguay; subfossil in pleistocene of Buenos Aires and holocene of Córdoba.

C. (*S.*) *kuhnholtziana* (Crosse). *Bulimus k.* Cr., 1870, p. 301; *O.* (*S.*) *k.* Parodiz, 1942, p. 324, pl. 4, fig. 30. Type loc.:

Montevideo. Distr.: Uruguay; closely related to the *Spixia* of Córdoba.

C. (*S.*) *columellaris* (Parodiz). *Odontostomus* (*S.*) *c.* Par., 1941, p. 94, pl. 7, figs. 1–4 and 6–7. Type loc.: Minas de Cobre, Córdoba.

C. (*S.*) *philippii* (Doering). *Odontostomus p.* Doer., 1875, p. 456; *O.* (*S.*) *p.* Parodiz, 1942, p. 205, pl. 4, fig. 29 (text fig. 4). Type loc.: Granitic hills near Totoral, Cruz del Eje, Córdoba. Distr.: Sierras of N.E. Córdoba.

C. (*S.*) *dubia* Hylton Scott, 1948, p. 235, pl. 1, figs. 9–10. Type loc.: Cerro Colorado, S.E. Salta.

C. (*S.*) *maculosa* (Doering). *Odontostomus m.* Doer., 1875, *p.* 455; *O.* (*S.*) *m.* Parodiz, 1942, p. 205, pl. 4, fig. 32 (text fig. 5). Type loc.: Valle del Arroyo Reducción, Sierra Chica, Córdoba. Distr.: Córdoba, (San Luis ?).

C. (*S.*) *pyriformis* (Pilsbry). *Odontostomus* (*S.*) *p.* Pils., (n.n. pro *Bulimus* (*O.*) *doeringi* Kobelt, 1882, not *doeringi* Kob., 1878 = *philippii*), 1901, p. 72, figs. 71–72. Type loc.: "Sierra de Córdoba," probably mislabelled since the species is not found in Córdoba. Distr.: Tucumán, Salta.

C. (*S.*) *tumulorum* (Doering). *Odontostomus t.* Doer., 1875, p. 456; *O.* (*S.*) *t.* Parodiz, 1942, p. 211, pl. 2, fig. 12. Type loc.: Western slope of Sierra de la Rioja. Distr.: Córdoba, La Rioja.

C. (*S.*) *t. champaquiana* (Doering). *Odontostomus champaquianus* Doer., 1877, p. 249; *O.* (*S.*) *t. c.* Parodiz, 1942, p. 213, pl. 2, figs. 11, 14. Type loc.: Cerro Champaqui, Córdoba. Distr.: Córdoba, San Luis, Catamarca, La Rioja.

C. (*S.*) *t. profundidens* (Doering). *Odontostomus p.* Doer., 1875, p. 455; *O.* (*S.*) *t. p.* Parodiz, 1942, p. 213, pl. 2, figs. 13, 16. Type loc.: Sierra Achala, Córdoba. Distr.: W. Córdoba.

C. (*S.*) *pyrgula* Hylton Scott, 1952, p. 8, pl. 2, fig. 1, pl. 3, figs. 1–2. Type loc.: Orcosuni, on the road to Dean Funes, N. Córdoba.

C. (*S.*) *pucarana* (Doering). *Odontostomus pucuranus* Doer., 1875, p. 454; *O.* (*S.*) *p.* Parodiz, 1942, p. 214, pl. 4, figs. 35–36. Type loc.: Valley of Rio Primero. Distr.: W. Córdoba.

C. (*S.*) *pucarana olainensis* (Doering). *O. o.* Doer., 1875, p. 454; *O.* (*S.*) *o.* Parodiz, 1942, p. 216, pl. 4, fig. 35. Type loc.: Pampa de Olaen, high plateau of Sierra Grande, Córdoba.

C. (*S.*) *doello-juradoi* (Parodiz). *Odontostomus d-j.* Par., 1941, p. 93, pl. 7, figs. 11, 14, 15, 18. Type loc.: Casa Grande, between Cosquín and La Falda, western slope of Sierra Chica, Córdoba.

C. (*S.*) *d-j. minor* (Parodiz). *O.* (*S.*) *d-j. m.* Par., 1941, p. 94, pl. 7, fig. 17. Type loc.: Pampa de Pocho, Córdoba Distr.: Córdoba, San Luis.

C. (*S.*) *martensi* (Doering). *Odontostomus m.* Doer., 1875, p. 456; *O.* (*S.*) *m.* Parodiz, 1942, p. 323, pl. 1, fig. 2. Type loc.:

Totoral, Córdoba. Distr.: Córdoba, Catamarca, Tucumán; Uruguay, (pleistocene).

C. (*S.*) *tucumanensis* (Parodiz). *O.* (*S.*) *t.* Par., 1941, p. 92, pl. 7, figs. 10–12, 13, 16. Type loc.: Margins of Rio Salí, near Tucumán city; subfossil in pleistocene of Paraná, Entre Rios.

C. (*S.*) *riojana* (Doering). *Odontostomus r.* Doer., 1875, p. 454; *O.* (*S.*) *r.* Parodiz, 1942, p. 327, pl. 4, fig. 33. Type loc.: Sierra La Rioja.

C. (*S.*) *reticulata* (Doering). *O. r.* Doer., 1877, p. 250; *O.* (*S.*) *r.* Parodiz, 1942, p. 207, pl. 4, fig. 37. Type loc.: Heights of Tablada and Plumería, eastern slope of Sierra Aconjigasta, Córdoba. Distr.: N.W. Córdoba, Catamarca.

C. (*S.*) *aconjigastana* (Doering). *O. a.* Doer., 1877, p. 245; *O.* (*S.*) *a.* Parodiz, 1942, p. 209, pl. 4, fig. 34. Type loc.: Sierra Aconjigasta. Distr.: Córdoba, San Luis.

C. (*S.*) *multispirata* (Doering). *O. m.* Doer., 1877, p. 245; *O.* (*S.*) *m.* Parodiz, 1942, p. 210, pl. 4, fig. 31. Type loc.: Aconjigasta, Córdoba.

C. (*S.*) *pervarians* (Haas). *O.* (*S.*) *p.* Haas, 1936, p. 151; Parodiz, 1942, p. 210. Type loc.: Sierra de Achala, N.W. Córdoba (not "Salta").

C. (*S.*) *holmbergi* (Parodiz). *O.* (*S.*) *h.* Par., 1941, p. 92, pl. 7, figs. 2, 5, 8, 9. Type loc.: Minas de Cobre, Córdoba.

C. (*S.*) *chancanina* (Doering). *Bulimus* (*O.*) *c.* Doer., 1876, p. 248; *C.* (*S.*) *c.* Parodiz, 1948, p. 1, figs. 1–3. Type loc.: Chancani, W. of Sierra de Pocho, Córdoba.

C. (*S.*) *achalana* (Doering). *O. a.* Doer., 1877, p. 243; *O.* (*S.*) *a.* Parodiz, 1942, p. 326, fig. 23. Type loc.: Quebrada Musi, Sierra de Achala, Córdoba.

C. (*S.*) *popana* (Doering). *O. p.* Doer., 1877, p. 244; *O.* (*S.*) *p.* Parodiz, 1942, p. 328. Type loc.: Cerro de Popa, Sierra de Pocho, Córdoba. Distr.: W. Córdoba, Catamarca.

C. (*S.*) *berghi* (Doering). *O. b.* Doer., 1877, p. 246; *O.* (*S.*) *b.* Parodiz, 1942, p. 329, pl. 3, fig. 26. Type loc.: N.W. Córdoba.

C. (*S.*) *salinicola* (Doering). *O. s.* Doer., 1877, p. 247; *O.* (*S.*) *s.* Parodiz, 1942, p. 330, pl. 2, fig. 23. Type loc.: Salinas Chancani, Córdoba.

C. (*S.*) *kobeltiana* (Doering). *Bulimus k.* Doer. in Kobelt, 1888, p. 291; *O.* (*S.*) *k.* Parodiz, 1942, p. 331, text fig. 14. Type loc.: Not indicated. Distr.: Few specimens from Salta, aff. to *kobeltiana.*

C. (*Spixinella*) *parodizi* Hylton Scott, 1952, p. 13, pl. 1, fig. 3, text fig. 3. Type loc.: Casas Viejas, Córdoba.

C. (*Bahiensis*) *guarani* (Orbigny). *Helix g.* Orb., 1835, p. 21; *Odontostomus* (*B.*) *g.* Parodiz, 1942, p. 332, pl. 3, fig. 25, text fig. 15. Type loc.: On Paraná River at Corrientes-Misiones border (probably Ituzaingó and Posadas). Distr.: Corrientes, Misiones; Paraguay.

C. (*Ventania*) *avellanedae* (Doering). *Eudioptus a.* Doer., 1881, p. 64; *Odontostomus* (*V.*) *a.* Parodiz, 1940, p. 227, figs. 1, 2, 5. Type loc.: Sierra Ventana, S.W. Buenos Aires. Distr.: Sierras Ventana, de las Tunas, Currumalal.

C. (*Plagiodontes*) *dentata* (Wood). *Helix d.* Wood, 1828, pl. 8, fig. 71; *Odontostomus* (*P.*) *d.* Parodiz, 1939, p. 715, pl. 1, fig. g. Type loc.: Not indicated. Distr.: Entre Rios, N.E. Buenos Aires; Uruguay.

C. (*P.*) *d. teisserei* (Marshall). *Odontostomus* (*P.*) *t.* Mars., 1930, p. 718; *O.* (*P.*) *d. t.* Parodiz, 1939, p. 717. Type loc.: Punta Chaparro, Uruguay.

C. (*P.*) *rocae* (Doering). *Plagiodontes r.* Doer., 1881, p. 65, pl. 1, figs. 5–6; *O.* (*P.*) *r.* Parodiz, 1939, p. 718, text. fig. 3. Type loc.: S. slope of Sierra Currumalal, S.W. Buenos Aires. Distr.: Sierras de la Ventana and Currumalal; Pigüé.

C. (*P.*) *patagonica* (Orbigny). *Helix p.* Orb., 1835, p. 32; *O.* (*P.*) *p. Parodiz,* 1939, p. 720, pl. 1, fig. f. Type loc.: Bahia Blanca. Distr.: S.W. Buenos Aires, and pleistocene of some region.

C. (*P.*) *p. magna* (Hylton Scott). *Plagiodontes p. magnus* H. Scott, 1952, p. 18, figs. 4–5. Type loc.: Sierra Ventana, S.W. Buenos Aires.

C. (*P.*) *multiplicata* (Doering). *O. m.* Doer., 1875, p. 196; *O.* (*P.*) *m.* Parodiz, 1939, p. 718, pl. 1, fig. c. Type loc.: Cerro Chepe, La Rioja. Distr.: La Rioja, Catamarca, Córdoba, Santiago del Estero.

C. (*P.*) *m. crassa* Hylton Scott, 1948, p. 236. Type loc.: Cerro Colorado, Salta.

C. (*P.*) *m. parva* (Hylton Scott). *P. m. parvus* H. Scott, 1952, p. 17, pl. 1, fig. 4. Type loc.: India Muerta, Asusques, Stago. del Estero.

C. (*P.*) *daedalea* (Deshayes). *Pupa d.* Desh. in Ferussac, 1820, p. 217; *O.* (*P.*) *d.* Parodiz, 1939, p. 721, pl. 1, figs. a, b, text fig. 6. Type loc: ?. Distr.: Córdoba, San Luis, Catamarca, Stago. del Estero, Tucumán.

C. (*P.*) *d. major* (Strobel). *Bulimus* (*O.*) *d. m.* Str., 1874, p. 16; *O.* (*P.*) *d. m.* Parodiz, 1939, p. 722, pl. 1, fig. b. Type loc.: Cerro del Morro, San Luis.

C. (*P.*) *d. costata* (Hylton Scott). *P. d. c.* H. Scott, 1952, p. 16. Type loc.: Copacabana, Córdoba.

C. (*P.*) *brackebuschi* (Doering). *O. b.* Doer., 1877, p. 240; *O.* (*P.*) *b.* Parodiz, 1939, p. 728. Type loc.: San Francisco, Sierra de San Luis. Distr.: San Luis, Córdoba, Santiago del Estero.

C. (*P.*) *weyemberghi* (Doering). *Plagiodontes w.* Doer., 1875, p. 241; *O.* (*P.*) *w.* Parodiz, 1939, p. 728. Type loc.: Sierra de Aconjigasta, Córdoba. Distr.: Córdoba, San Luis, Santiago del Estero.

C. (*P.*) *w. minor* (Parodiz). *O.* (*P.*) *w. m.* Par., 1939, p. 729, pl. 1, d. Type loc.: Capilla del Monte, Córdoba.

C. (*Scalarinella*) *cordovana* (Pfeiffer). *Bulimus cordovanus* Pfr., 1855, p. 149; *O.* (*S.*) *c.* Pilsbry, 1901, p. 66. Type loc.: Córdoba, Argentina, (the designation of "Cordova, Vera Cruz, Mexico" by Pfr. was a mistake). Distr.: Sierras of N. Córdoba.

C. (*S.*) *c. stelzneri* (Doering). *Clessinia stelzneri* Doer., 1875, p. 250; *O.* (*S.*) *c. s.* Parodiz, 1939, p. 732. Type loc.: Serrezuela, Córdoba.

C. (*S.*) *c. striata* (Parodiz). *O.* (*S.*) *c. s.* Par., 1939, p. 733. Type loc.: Sierras of northern Córdoba.

C. (*S.*) *nattkemperi* Parodiz, 1944, p. 1, fig. 1. Type loc.: Pomancillo, near Catamarca, city.

Pilsbrylia paradoxa Hylton Scott, 1952, p. 6, lam. 1, fig. 2. Type loc.: Las Capillas, Jujuy.

Odontostomus odontostomus jorgensenianus Holmberg. *O.* (*Macrodontes*) *j.* Hol., 1912, p. 15, figs. 11–13; *M. o. j.* Parodiz, 1942, p. 338, pl. 3, fig. 24. Type loc.: Bompland, Misiones. Distr.: Misiones; Paraguay.

Pleurodontidae

Solaropsis heliaca minor (Orbigny). *Helix h. m.* Orb., 1837, p. 244; *H.* (*S.*) *h.* Pilsbry, 1889, p. 185. Type loc.: Surroundings of Laguna Ibera, N. Corrientes. Distr.: Corrientes, Misiones, Chaco, Formosa; Paraguay; E. Bolivia.

Helminthoglyptidae

Epiphragmophora trenquelleonis (Grateloup). *Helix t.* Grat. in Pfeiffer, 1851, p. 13; *E. t.* Pilsbry, 1888, p. 82. Type loc.: Córdoba. Distr.: Córdoba, San Luis, Stgo. del Estero, La Rioja, Catamarca, Salta.

E. t. hidalgonis (Doering). *Helix* (*Eurycampta*) *h.* Doer., Doer., 1875, p. 5. Type loc.: Sierra Chica, Córdoba (probably near Córdoba city).

E. t. rhathymos (Holmberg). *Helix* (*Eurycampta*) *r.* Hol., 1912, p. 20 [= *E. monographa* Doering; not *H. monographa* Burmeister which is the typical *trenquelleonis*]. Type loc.: El Desmonte, Catamarca. Distr.: Catamarca, Córdoba, Salta.

E. puntana (Holmberg). *Helix* (*Cochlea-Eurycampta*) *p.* Hol., 1912, p. 9. Type loc.: Cerro Volcán, San Luis. Distr.: San Luis, Córdoba, La Rioja.

E. birabeni Parodiz, 1955, p. 93, fig. 1. Type loc.: Quebrada de la Hoyada, Catamarca.

E. hieronymi Doering, 1875, p. 447. Type loc.: Quebrada del Tala, Catamarca. Distr.: Catamarca, Córdoba, San Luis, La Rioja (= *Aglaja yocotulana* Doer., 1875, p. 446).

E. villavilensis Parodiz, 1955, p. 94 fig. 1. Type loc.: Villavil, Depto. Andalgalá, Catamarca.
E. puella Hylton Scott, 1951, p. 253, figs. 1–3. Type loc.: Quebrada de la Cebila, Catamarca.
E. proseni Hylton Scott, 1951, p. 258, fig. 3[3]. Type loc.: Tumbaya, Quebrada de Humahuaca, Jujuy.
E. hemiclausa Hylton Scott, **new name** pro *E. semiclausa* H. Scott, 1951, p. 257, fig. 3[2] [not *Lysinoe semiclausa* Martens, 1869, now in *E.*]. The change of the name is made here by advice of the author of the species; therefore Hylton Scott retains authorship. Type loc.: La Viña, Catamarca.
E. trigrammephora (Orbigny). *Helix t.* Orb., 1835, p. 22; *E. t.* Ancey, 1897, p. 3, 10. Type loc.: Margins of Rio Grande, Bolivia. Distr.: Jujuy, Salta, Tucumán, Santiago del Estero.
E. t. cryptomphala Ancey. *E. c.* Anc., 1897, p. 4. Type loc.: Zone of River San Lorenzo, Jujuy. Distr.: S. Bolivia; Jujuy, Salta.
E. t. monozona Ancey, 1897, p. 3. Type loc.: Mission San Francisco, Upper Pilcomayo, Bolivia. Distr.: Bolivia-Argentina border.
E. tucumanensis (Doering). *Aglaja estella t.* Doer., 1874, p. 445; *E. t.* Pilsbry, 1894, p. 198. Type loc.: San Javier, Tafí, Tucumán. Distr.: W. Tucumán.
E. argentina (Holmberg). *Helix a.* Hol., 1909, p. 91. Type loc.: Tapia, Tucuman. Distr.: Tucumán, Santiago del Estero.
E. saltana Ancey, 1897, p. 9, figs. 6–7. Type loc.: Tala, Salta.

(*To be concluded*)

TYPES OF MOLLUSKS DESCRIBED BY F. C. BAKER PART II, UNIVERSITY OF WISCONSIN [1]

By DOROTHEA S. FRANZEN

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In 1920 the Wisconsin Geological and Natural History Survey induced Dr. Frank C. Baker to study and prepare a report of the fresh water Mollusca of Wisconsin. His studies of that fauna resulted in his describing numerous species and subspecies. Many of those holotypes and paratypes are deposited in the Museum of The Wisconsin Geological and Natural History Survey, University of Wisconsin. Because there has been no

[1] Expenses incurred in travel necessary to prepare this list have been covered by Grant-in-Aid of the Illinois State Academy of Science.

listing of such types, I have prepared the following list. The procedure has been that followed in the preparation of Part I of this series. Dr. Baker used the term type to designate the holotype, therefore, that term is used here and also as a means to conserve space as suggested by the editor.

GASTROPODA

Amnicola greenensis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 113–114, pl. 6, figs. 32, 33; text fig. 47, 13.

Type: 4544. Paratype: 4545; also Univ. of Ill. Z-16222.

Type locality: Off Sherwood Forest Hotel, Green Lake, Green Lake Co., Wis. (F. C. Baker and C. Juday![2]).

Amnicola limosa superiorensis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 101–102, pl. 6, figs. 9–11; pl. 7, figs. 22, 23.

Type: 4529 (female). Paratypes: 4529 (two females); also Univ. of Ill. Z-13375.

Type locality: 1 mi. N. of Bayfield, Bayfield Co., Wis. on shore of Lake Superior (F. C. Baker! July, 1921).

Campeloma brevispirum Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 74–76, pl. 5, figs. 13–18; text fig. 32.

Type: 4573 (female). Paratypes: 4573; also Univ. of Ill. Z-18297.

Type locality: Mouth of small creek, Mirror Lake, Fern Glen, Sauk Co., Wis. (F. C. Baker! 1922).

Cincinnatia emarginata lacustris Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 127–130, pl. 7, figs. 20, 21; text figs. 54, 3, 4; 55, 56.

Type 4531 (male). Paratypes: 4531; also Univ. of Ill. Z-12676.

Type locality: Winnebago Lake, near Oshkosh, Wis. (F. C. Baker! 1920).

Goniobasis livescens barronensis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 186–187, pl. 9, figs. 33–36.

Type: 4722a. Paratypes: 4722b; also Univ. of Ill. Z-13430.

Type locality: One and one-half mi. below bridge W. of Chetek, Red Cedar River, Barron Co., Wis. (F. C. Baker! Aug. 1921).

Goniobasis livescens michiganensis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 183–184, pl. 9, figs. 27–32.

Type: 4520a. Paratypes: 4520b.

Type locality: Lake Michigan shore, E. of Sturgeon Bay, N. of Ship Canal, Door Co., Wis. (F. C. Baker! Aug., 1922).

[2] The collectors.

Helisoma antrosa shellensis Baker, 1927, Naut. 40 (3): 86.
Type: 4627. Paratypes: 4627; also Univ. of Ill. Z-19354; A.N.S.P.[3] 141566.
Type locality: Shell Lake, Washburn Co., Wis. (F. C. Baker!).

Lioplax subcarinata wisconsinensis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 50–52, pl. 3, figs. 1–9.
Type: 437. Paratype: 437.
Type locality: Fox River, Brown Co., Wis. (Geo. Marston!).

Physella bayfieldensis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 442–445, pl. 27, figs. 1–7, text fig. 194.
Type: 4592. Paratypes: 4593; also Univ. of Ill. Z-13398.
Type locality: Pike Creek, near Bayfield, Bayfield Co., Wis. (F. C. Baker!).

Physella chetekensis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 440–442, pl. 27, figs. 8–13, text fig. 193.
Type: 4595. Paratypes: 4596; also Univ. of Ill. Z-16696.
Type locality: Moose Ear Creek, between Taber and Chetek lakes, Barron Co., Wis. (F. C. Baker!).

Physella laphami Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 420–424, pl. 25, figs. 1–5.
Type: 4578a. Paratypes: 4578b.
Type locality: Hancock, Waushara Co., Wis. (D. S. Bullock!).

Physella obrussoides Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 445–447, pl. 27, figs. 25–29, text fig. 195.
Type: 4598. Paratypes: 4599.
Type locality: Winnebago Lake, Hatchery Bay, Oshkosh, Winnebago Co., Wis. (F. C. Baker!).

Stagnicola walkeriana Baker, 1926, Naut. 39 (4): 119–121.
Type: 4695. Paratypes: 4695; also A.N.S.P. 140268; Univ. of Ill. Z-19437.
Type locality: Lake Superior, Madeline Island, near Bayfield, Bayfield Co., Wis. (F. C. Baker!).

Valvata tricarinata mediocarinata Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 17, pl. 1, fig. 7.
Type: 4704. Paratype: Univ. of Ill. Z-12773.
Type locality: Lower Asylum Bay, Lake Winnebago, Wis. (F. C. Baker!).

Valvata winnebagoensis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (1): 475–476, pl. 1, figs. 11–13.
Lectotype (by present designation): 4555a. Syntypes: 4555b.
Type locality: North shore Miller Bay, Winnebago Lake, Wis. (F. C. Baker!).

[3] Academy Natural Science of Philadelphia.

PELECYPODA

Alasmidonta calceolus magnalacustris Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 188–189, pl. 72, figs. 12–16; pl. 69, fig. 3.

Type: 933a (female). Paratype: 933b (immature female); also Univ. of Ill. Z-18056.

Type locality: Sturgeon Bay, Door Co., Wis. (F. C. Baker! Aug., 1922).

Alasmidonta marginata variabilis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 194–196, pl. 69, figs. 4–9.

Lectotype (by present designation): 935a (female). Syntype: 935b (male). Paratypes: 935 c, d, e; also Univ. of Ill. Z-18031. (933b, the other one of two shells designated by Baker as types, is hereby designated as a syntype. The other shells were designated by Baker as paratypes.)

Type locality: Red Cedar River near Chetak, Barron Co., Wis. (F. C. Baker! Aug., 1921).

Anondontoides birgei Baker, 1923, Naut. 36 (4): 123–125.

Type: 930a. Paratypes: 930b, c.

Type locality: West of bridge, Sturgeon Bay, Door Co., Wis. (F. C. Baker! 1922).

Fusconaia undata wagneri Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 64–66, pl. 40, figs. 1–3.

Type: 344b. Paratypes: 344c, d; also Univ. of Ill. Z-14016, Z-14017.

Type locality: Lake Pepin, near Lake City, Minn. (Geo. Wagner!).

Lasmigona costata nuda Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 145–147, pl. 59, figs. 3–6, text fig. 224.

Type: 900 (male). Paratypes: 901, 902, 903, 904.

Type locality: Red Cedar River, W. of Chetek, Barron Co., Wis. (F. C. Baker! 1921).

Lasmigona costata pepinensis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 144–145, pl. 59, figs. 1, 2.

Type: 357. Paratype: 358.

Type locality: Lake Pepin, Lake City, Wis. (George Wagner!).

Lampsilis gracilis lacustris Baker, 1922, Naut. 35 (4), 131–132.

Type: 964a. Paratypes: 964b, c, d, e; also Univ. of Ill. Z-12433.

Type locality: Lake Butte des Morts, off Plummer's Point, Wis. (F. C. Baker!).

Lampsilis siliquoidea chadwicki Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 279–281, pl. 91, figs. 5–8.

Lectotype (by present designation): 4413a (male). Syntype: 4413b (female). Paratypes: Univ. of Ill. Z-22076. (4413b, the other one of two shells designated by Baker as types, is hereby

designated as a syntype. The other shells were designated by Baker as paratypes.)

Type locality: Doemel Point, Winnebago Lake, near Oshkosh, Wis. (F. C. Baker! 1920).

Lampsilis siliquoidea pepinensis Baker, 1927, Amer. Midl. Nat. 10, p. 223.

Lectotype (by present designation): 355p (female). Syntype: 355e (male).

Paratypes: Univ. of Ill. Z-22075. (355e, the other one of two shells designated by Baker as types, is hereby designated as a syntype.)

Type locality: Lake Pepin, near Lake City, Minn. (Geo. Wagner! 1904).

Lampsilis ventricosa perglobosa Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 285–286, pl. 93, figs. 1–4.

Type: 354a (male). Paratypes: 354b, c, d, e, g, 255.

Type locality: Lake Pepin, near Lake City, Minn. (Geo. Wagner! 1904).

Lampsilis ventricosa winnebagoensis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 291–293, pl. 94, figs. 1–4.

Type: 4423a (male). Paratype: 4423b (female); also Univ. of Ill. Z-12244a, b.

Type locality: Winnebago Lake, near Oshkosh, Wis. (F. C. Baker! 1920).

Quadrula quadrula bullocki Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 87–88, pl. 46, figs. 1–3.

Type: 163. Paratypes: 166, 167.

Type locality: Fox River near De Pere, Wis. (Geo. Marston!).

Sphaerium flavum foxense Baker, 1928, Bull. Wis. Geo. Nat. Hist. Survey 70 (2): 344–345, pl. 97, figs. 27–29.

Type: 4452. Paratypes: 4452.

Type locality: Lake Butte des Morts near Plummer's Point, Winnebago Co., Wis.

Sphaerium solidulum winnebagoense Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 324–325, pl. 97, figs. 4, 5, text fig. 252.

Type: 4435. Paratype: 4435.

Type locality: Lake Butte des Morts, Fox River Channel, Wis.

Strophitus rugosus pepinensis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 204–205, pl. 74, fig. 8.

Type: 362f.

Type locality: Lake Pepin, near Lake City, Minn. (Geo. Wagner!).

Strophitus rugosus winnebagoensis Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 205–207, pl. 74, figs. 1–6.

Type: 943a. Paratype: 943b; also Univ. of Ill. Z-12292.

Type locality: Long Point Island, Lake Winnebago, Wis. (F. C. Baker!).

Truncilla truncata lacustris Baker, 1928, Bull. Wis. Geol. Nat. Hist. Survey 70 (2): 227–228, pl. 78, figs. 1, 2.

Type: 958. Paratype: 959.

Type locality: Long Point Is., Lake Winnebago, Wis. (F. C. Baker! 1920).

Utterbackia imbecillis fusca Baker, 1927, Amer. Midl. Nat. 10: 222.

Type: 927a. Paratypes: 927b.

Type locality: Sturgeon Bay, Door Co., Wis.

GUY L. WILKINS: AN APPRECIATION

By JOSEPH EWAN

Guy Lawrence Wilkins, conchologist, artist, bibliophile, was little known personally to Americans because he did not visit the New World. For those of us who in recent years have visited the British Museum (Natural History) he will be long and affectionately remembered. I went to England in 1954, not as a conchologist, but as a botanist in search of letters, notebooks, and archive materials bearing on the history of natural history. I was introduced to Mr. Wilkins at the 'Canteen,' the social institution of the Museum where morning coffee, lunches, and teas are served to the staff and the public. Our British friends waggishly remark of this as one more break through of the Americanization process since the last war. The staff and visitors drop in for tea, a smoke, a chat, to discuss, to plan, to dissect, and for a few, to swap secondhand booksellers' catalogues. It was perhaps in this last connection that I first 'found' Mr. Wilkins. To emend the motto on the library's facade, "books constrain none," except the bookcollector! Variorum editions, states, and half morocco are collector's language, and o.p. are his middle initials. And Guy Wilkins was an avid collector of natural history titles, and of malacological books in particular. He loved fine books in fine bindings, and owned many.

"I have had a few more books which are getting increasingly expensive and hard to get," he wrote me last July. "The reprint of Linne's 12th ed. Syst. Nat. (3 vols.) is the latest acquisi-

tion, very desirable but will have to be rebound, I fear. The British Museum (Nat. Hist.) Catalogue (8 vols.) fills a corner of my small room but very welcome—I managed to get a set just before they ran out of stock and put the price up for what is left. Another nice little thing was the history of the Orkneys (Wallace, 1700) with a good list of the plants also shells. It is in excellent condition (neatly repaired) but cost me £2. Ah me! Why am I so tempted by these ancient things? My best treasure recently was a priced copy of the Portland Catalogue (1786) complete with a portrait of the Duchess, most unusual to get that and the annotations were by Francillon, the goldsmith and entomologist.''

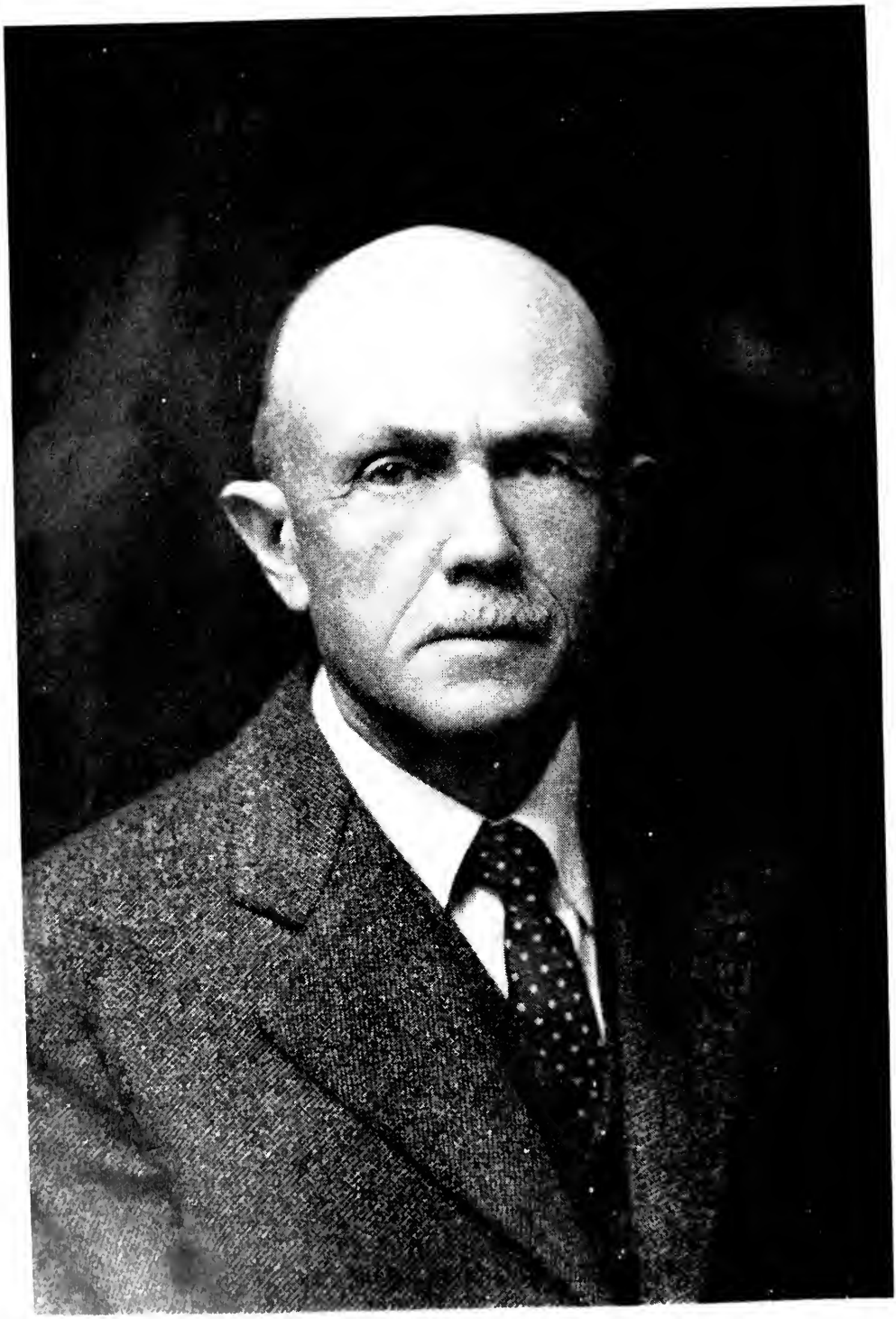
Wilkins knew the London libraries intimately, and made extensive use of books and their marginalia, increment of past owners, in the preparation of his bibliographic papers. He possessed a detailed knowledge of explorers and expeditions. He was an effective worker, modest and imaginative. To his coworkers at the Museum, he was friendly and good-humoured. To those who came to the Museum with shells to name, he was warm and sympathetic.

Born November 5, 1905, at Stoke, Lewington, London, Mr. Wilkins started his working life as a commercial artist, and joined the British Museum in 1949. His skills acquired during his years as a commercial artist carried over to his professional career, and it is likely that the confining habits and close long hours of the drawing board impaired his health. He entered the hospital December, 1956, with granular eruptive tuberculosis and died March 6th, in his fifty-second year. He had recently modelled an exquisite series of marine invertebrates for a Scottish museum using newer techniques and colored by hand.

Best known to the conchologist are his historical studies on the Sir Hans Sloane (1953) and Sir Joseph Banks (1955) shell collections at the British Museum, published in the recently inaugurated *Bulletin* of the Museum's *Historical Series*. His earlier paper on Sloan's shells in the *Journal of Conchology* (1952), and his latest paper, ''Notes on the 'Historia Conchyliorum' of Martin Lister (1683–1712),'' with a portrait, published in the *Journal of the Society for the Bibliography of Natural History* (1957) will continue to be consulted. A third historical *Bulletin* on the shell collection of Rev. Clayton Mor-

daunt Cracherode, 1730–1799, trustee of the British Museum, and antiquarian, is in press. For each of the historical studies already published he sketched a portrait as a cover medallion. Wilkins' attention to handwriting and to the interpretation of symbols (e.g. "N. H." for New Holland, or present New South Wales, when it appears on an occasional shell) will enhance the value of his work for future students.

For me it shall be Guy Wilkins among his books, both of us listening to Alice, his charming wife, play the harpsichord, in their hearthside on Hampstead Heath—a precious memory.



Wm G Fargo

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DREDGING FOR DEEP WATER SHELLS IN SOUTHERN FLORIDA

By PAUL L. and THOMAS L. McGINTY

A growing interest in deep-sea shells, particularly in Florida, has encouraged the writers to record a few observations and notes concerning results obtained after five years of operation, and some 2000 dredging stations from aboard the cabin-cruiser "Triton." *

These explorations were made by Arthur R. Thompson, together with the authors, from a 31 foot motor-vessel equipped with power winch holding 5000 feet of steel cable, and a swinging davit with block and tackle for bringing in the heavy dredges and trawls. Considerable dredging was done along the lower Florida east coast from Jupiter southward to the Miami region, and from various points along the Keys as far west as the Dry Tortugas. Greatest concentration was made at three points, namely: Palm Beach, representing the lower mainland; Sombrero Key, the middle Keys; and Key West, the lower Keys; all at depths ranging from 10 to more than 150 fathoms. Because of a marked dissimilarity between conditions along the Keys and off the lower east coast, both as to shell life and type of bottom, we thought best to comment upon each region separately.

Dredging Off the Palm Beach Area

Between Miami and Palm Beach, where the Gulf Stream makes its closest approach to the mainland, the 100 fathom line runs only about 4 miles off shore, then gradually turns outward in progression up the coast. With this factor in mind, most of our dredgings were made between the Palm Beach Inlet southward to a point beyond Delray Beach, approximately 25 miles,

* See Nautilus, Oct. 1951, pages 37–43.

and perhaps half that distance northward into the Jupiter area. Deep water close to shore provided a reasonable means of retreat in the event of sudden violent squalls, and permitted much saving of time in reaching and returning from the deeper dredging stations. It also enabled prominent shore bearings to remain visible, even in deep water, so that carefully taken compass bearings with subsequent triangulation upon marine charts made possible determination of depth and position with a considerable degree of accuracy. The latter, of vital importance in supplying accurate scientific habitat data for each dredge haul, also provided means for returning to the same area should the dredge contain exceptional material. As every experienced fisherman knows of certain "holes" where the fishing is usually good, so will the dredger, through experience, learn of certain areas where the shell life is more abundant, or upon which the rarer, more desirable, species may appear. In the process, one also learns to avoid certain types of bottom which, for reasons not fully known, may contain an abundance of long dead shells, but be practically devoid of life at the moment.

Progressing sea-ward from the beach the yellowish rather coarse sand (low in coral content since sizable corals are rare throughout the area, but largely composed of silica and finely broken shell) continued more or less unchanged until the reef was attained in approximately 15 fathoms, perhaps a mile off shore. This scattered rocky reef, rather poorly defined in depth and continuity, may be entirely lacking in some areas, but elsewhere continue outward to 40 fathoms or more. To the dredger, little of importance appeared, save littoral forms, until a depth of 20 to 40 fathoms over a "live" portion of this reef was approached where a most interesting and extremely variable molluscan life seemed to occur. With luck, from such a station, an incredible assortment of sea-life might be brought up in the dredge, ranging from many types of sea-weed to sponges of weird shape, from gorgonians to strangely shaped crabs and lovely brittle-stars, all brilliantly colored and seeming to cover the spectrum in the wildest sort of array. Even the mollusks appeared to follow the pattern, with orange, yellow and red far commoner than might be expected. A rather spiny form of *Turbo castaneus,* beautifully shaded with various hues of rose, and the lovely and rare *Conus juliae,* in red, were typical ex-

amples of the colorful shells which might be taken, on occasion, from this reef. Here also lived the vari-colored *Pecten benedicti, Mitra hendersoni* and *M. moisei,* the rare *Primovula carnea* and several recently described species of *Calliostoma.* Oddly, *Scaphella junonia,* not too uncommon along the west coast of Florida, proved to be extremely rare, although it did live upon this reef. An interesting race of small but apparently adult *Xenophora conchyliophora* also was noted, the shells profusely covering themselves by attaching small irregularly shaped stones, but strangely never attaining the larger size of specimens found in shallower water. From sand pockets between scattered portions of the reef came delicate *Pecten chazaliei* (*tereinus*), together with *Corbula disparilis,* a weirdly shaped little bivalve resembling nothing so much as a miniature box with tight fitting lid. Also brought up were a number of species which appear to be new northern records for the east coast of Florida, namely: *Casmaria atlantica, Turbo canaliculatus, Tenagodus squamatus* and *Latirus infundibulum.*

Of course, after handling tons of this reef material, the reader must appreciate that here, as elsewhere in this paper, space permits mentioning but a few of the species which were actually found. The reef, unfortunately, is a most difficult territory to work, and great care must be used to avoid loss of dredge and cable should the equipment become snagged in the rocks below. This was particularly so because, with the Gulf Stream nearby, there was generally a rather strong current flowing northward. Frequently the dredge would surface so heavily filled with reddish rocks and material to be sorted that a davit was almost essential for hoisting the load into the boat. Because of many irritants to the hands, such as sponge spicules, urchin spines, stinging corals and hydroids, plus various types of anemones, heavy canvas gloves were used while handling any large quantity of this material.

Toward the outer edge of this rocky reef, in about 40 to 50 fathoms, the bottom contained more broken shell together with smaller detached rocks or rubble, gradually changing from sand to mud. The curious little *Ancistrosyrinx radiata,* resembling a tiny oriental pagoda, lived in this softer bottom, as did *Fusinus eucosminus* and *Terebra floridana.*

Moving outward to a range of 50 to 60 fathoms over isolated

rubble patches in quite muddy bottom, one might hope to bring up a specimen of *Mitra antillensis,* perhaps the largest and rarest of the West Indian miters. *Conus stimpsoni,* a pretty yellow species might be taken at this depth; also *Fusinus timessus* and *Antillophos beaui,* both being new northern east coast records. Generally speaking however, unless some rocky rubble was present, dredging in this soft grey mud proved somewhat disappointing, for at times the dredge would surface almost empty save for a few chunks of burned material resembling clinkers, a possible residue from ancient coal-burning ships which at one time used this still well traveled south-bound steamer lane.

At an average depth of 75 fathoms, the desirable areas of broken shell and rubble became even scarcer, never the less certain patches harbored an amazing array of extremely choice shells, but unfortunately no great abundance. Among the prizes taken were: *Pecten phrygium* and *glyptus; Liomesus stimpsoni; Cuspidaria rostrata,* the largest east coast form of this peculiar bivalve; *Xenophora longleyi,* an interesting deeper water carrier-shell which freely but insecurely attaches stones and broken shells while young, later losing most of them to become almost "nude" at maturity; *Murex beaui,* largely young, but one unique colony of beautiful yellow-brown adults was discovered; *Conus mcgintyi* (formerly *mazei*), a lovely slender cone, very rare, its radula highly transparent and extremely small, the species lacking operculum; and *Mitra fluviimaris,* an attractive and rare white miter recently named to honor the Gulf Stream. Species collected which appear to establish new northern records for the east coast include *Xenophora caribaeum, Conus villepini, Cymatium occidentale* and *rehderi, Murex beaui* and *Bursa corrugata;* all found between 70 and 80 fathoms in muddy bottom containing some rubble.

Further off shore, in soft mud at 80 to 90 fathoms, a lovely volute, *Aurinia georgiana,* was obtained. At times these shells came up in the dredge with one or more specimens of a pale and strangely unattractive deep-sea anemone firmly attached to cover most of the upper portion of the shell. Seemingly hard pressed for points of attachment, these creatures chose with equal facility any bits of stone, clinkers or other debris which might be exposed along the bottom. Volutes living in this soft mud tended to produce a heavy dark epidermis as protection from

the etching acids of these unwelcome visitors, while those from bottom with a higher sand content, free from anemones, usually had a thin and transparent periostracum. Anatomical observations indicated that the male of *Aurinia georgiana* is considerably more slender and smaller than the female. At the same depth, in patches of slightly firmer bottom, we were thrilled to locate a few colonies of *Calliostoma psyche,* an exquisite cream colored shell spotted with rose, and having that peculiarly lovely iridescence found on only a few deep-water shells.

Mud, at 105 fathoms, afforded optimum conditions for still another volute, *Clenchina robusta.* This species seemed to be a special attraction for deep-sea anemones, for we noted instances where these creatures had almost closed the shell aperture to cause severe distortion of the mollusk's growth. As in *C. georgiana,* these volutes tended to form a heavy rough protective periostracum in badly infested areas, but even so, severe erosion could be detected on some living specimens brought to the surface. Fortunately, at a few localities we found the anemones less abundant, and the shells, with a thinner epidermis, came up in perfect condition.

Attempts to dredge at 150 fathoms or more were somewhat disappointing. Very rarely a specimen of the striped volute, *Clenchina gouldiana,* or an even rarer related form (always very small, cream colored without bands or spots) might appear in the dredge or trawl. Generally speaking however, this soft mud off the Palm Beach area, devoid of rocks, offered little reward with the exception of a few weird deep-sea crustaceans and star-fish plus some small to microscopic shell material which, because of its depth, proved of considerable interest.

Dredging Off The Florida Keys

Unlike the lower east coast mainland, an outer coral and rock reef runs more or less parallel and perhaps 5 miles to the seaward of the low westward curving chain of islands known as the Florida Keys. Extending for many miles, it forms a most serious danger to ships and has long been marked by a series of tall lighthouses strategically located along its length. This reef, submerged for the greater portion, may be thought of as replacing the beach off the mainland, and outward distances for the dredger are most conveniently measured by using it as a

starting point. Between the reef and the string of Keys lies a long narrow body of water called the Hawk Channel, its depth of but a few fathoms affording good passage for yachts and smaller vessels only. Looking seaward from the reef, the 100 fathom line extends slightly further off shore than along the mainland, approximately 5 miles, so the total run from one of the Keys to attain this depth becomes 10 miles instead of the 4 miles noted off the Palm Beach coast. Besides a considerable loss of time, this additional mileage creates somewhat more of a weather hazard since the deeper dredging must all be done well beyond sight of land, and sudden storms in these open Gulf Stream waters become most unpleasant for small boats. Regular checks upon the weather, both by radio and personal observation, are certainly well advised. Unfortunately the exact location of position becomes increasingly more difficult at the greater depths, since visual bearings become available only within range of one of the important lighthouses. Luckily these ranges are considerable, however, since some of the lights are designed to remain visible up to 18 miles at sea.

To the conchologist, perhaps the most interesting factor concerning dredging in this region lies in the presence of an extensive more or less flat rocky area known as Pourtales Plateau. Actually, patches of whitish sand and grey mud would seem to indicate that its surface, at least, is not composed entirely of exposed rock, and while usually considered to begin at about 90 fathoms and extend outward for a considerable distance, its exact contour would appear to vary somewhat since we detected its presence in isolated areas as shallow as 65 to 70 fathoms, off both Sombrero Key and Key West. As might be expected, the presence of rocks in the deeper water affords an environment so contrasting with the soft bottom off the Palm Beach area, at a similar depth, that a number of species of mollusks are confined to one of these areas alone. Inside the rocky plateau, a much larger proportion of species proved common to both regions, with depth ranges of most species being almost identical. This Pourtales Plateau, while certainly most interesting to work, should hardly be thought of as a grab-bag for the eager dredger however, for material may be obtained only with considerable difficulty. The rocky terrain is extremely hard on dredges, with trawls being practically out of the question, and while we found the Gulf Stream current somewhat less than that usually experi-

enced off Palm Beach, it was sufficient, at times, to cause our cable to twang like a plucked banjo string. For some reason ancient dead shells far outnumbered living ones, but whether this indicates a decline of life upon the plateau or is a natural process we hesitate to speculate, although this preponderance of dead material was far less evident in our dredgings off the east coast.

In order that our report of dredging off the Keys may be consistent and follow the pattern already established in our discussion of findings off Palm Beach, let us now return to shallow water inshore and gradually work outward towards deeper water and the Pourtales Plateau. First we might say that dredging in the shallow water of the Hawk Channel, with its eelgrass and numerous bars and patches of heavy coral growth, proved none too productive and we believe other methods of collecting serve better for working this area.

A short distance outside the reef which separates Hawk Channel from the open sea the bottom gradually became a soft sticky white marl supporting vast beds of eelgrass and occasional isolated patches of rubble. On these limited areas of harder bottom, the molluscan life seemed more abundant, and from about 20 to 40 fathoms, over such a station, specimens of the attractive *Conus sozoni* were obtained. *Sconsia striata* also was taken from this depth but proved to be quite rare, apparently preferring an area further westward in the Gulf of Mexico where it is somewhat more abundant.

A depth of 40 fathoms, over rubble bottom when it could be located, appeared to be a favorable habitat for a rather wide range of interesting and somewhat uncommon species. From here we brought up fine living specimens of *Antigona strigillina*, a lovely white bivalve slightly over an inch in diameter and rather a rare shell in collections. Also found were *Chama lactuca,* the delicately fragile *Pecten chazaliei* (*tereinus*), and *Aequipecten lineolaris,* the latter a rarity and apparently new northern record for this species. Among the gastropods represented were the greatly elongated *Torcula exoleta,* its near white shell almost perfectly matching the bottom color, and an extremely lovely little rock-shell known as *Murex tryoni.* Another collector's treasure, *Murex cabriti,* was taken occasionally, with a small colony of unusually attractive orange colored specimens

luckily discovered in the vicinity of Sombrero Key. Other discoveries included *Conus austini,* apparently a new northern record, and *Fusinus timessus* and *F. cucosmius,* the latter shell seeming to suggest deep water and rarity, and almost exclusively confined to areas of heavy rubble or broken rocks.

From a depth of 40 to 50 fathoms the pretty orange-yellow *Conus stimpsoni* made an appearance, together with the curiously distorted *Distorsio mcgintyi,* while at 60 fathoms *Pecten phrygium* was present. Strangely, from one isolated rubble reef not far from Sombrero Key we dredged a lovely large yellow specimen of this rare Pecten, while a second pass over the same territory brought up a smaller specimen almost orange in color. Previously we had never seen this species except in its normal coloration of mottled rose and are at a loss to explain such an unusual variation, but it serves admirably to demonstrate the value of accurately determined position and the resulting ability to return as close as possible to an exact area of unusual interest.

Apparently a great rarity in the volute family, *Aurinia schmitti* was taken in mud at depths from 60 to 80 fathoms, but unfortunately in very limited numbers and seldom in perfect condition. As is of interest to note, these shells do not always have the heavy glazing which was thought to be characteristic of the species. Possibly due to differing bottom conditions, we found a few specimens which were quite clean and free from any glazing whatever. Perhaps one of our greatest treasures, a perfect ¾ inch adult of the extremely rare *Haliotis pourtalesi,* came from a rocky reef in only 65 fathoms off Sand Key, near Key West. Another prize, taken in 70 fathoms off Key West, was a damaged but reasonably fresh specimen of *Pleurotomaria quoyana,* apparently the first record of this extremely rare deep-sea "slit shell" having been taken in waters bordering the United States. After rather extensive explorations in the Key West area, we finally succeeded in locating a colony of the rare *Murex nuttingi* living on a limited portion of rubble reef at a depth of 75 fathoms. At approximately the same depth, but more widely distributed, *Bartschia significans,* a rarity appearing in few collections, made an occasional appearance in our dredge hauls. Also at 75 fathoms we were fortunately able to bring up a few specimens of the exquisitely lovely giant deep-sea Epitonium, *Sthenorytis pernobilis,* its lacy white contrasting

strikingly with a large jet black operculum. Our finest specimen, 42 mm. long, still living and with operculum intact, came up in the dredge in perfect condition, and was so conspicuous in appearance that its presence was detected even before the dredge was brought on board. Certainly of all the thrills we have enjoyed in dredging for shells, this must come very near the top of the list. Another great thrill was presented when we brought up a lovely specimen of *Murex beaui* complete with "fronds and frills," from off Sombrero Key in 75 fathoms. Although most collectors visualize *beaui* as always possessing the overly developed varices of the often figured unique specimen belonging to the National Museum, this is hardly so. At all localities from which we took *beaui,* and we took a respectable series from a number of areas, we found the "wide fronded" variety to be extremely rare. Although there is a greater tendency towards emphasis of the fronding in young specimens, we took but one adult which possessed this characteristic, and it came up in a dredge haul containing another specimen which entirely lacked this peculiarity. As a result of our observations, we feel strongly convinced that the wide varix is far from being a specific character and should not be treated as such.

Conus villepini, a strikingly marked rare white cone, somewhat elongated and irregularly blotched with brown, was rather closely confined to depths from 75 to 80 fathoms, while two attractive rock-living volutes, *Clenchina dohrni* and *Clenchina florida,* ranged from about 75 to 100 fathoms along the Pourtales Plateau. As is of interest to note, neither of these volutes was found in the Palm Beach area, perhaps due to scarcity of rocks in deeper water off the east coast. Likewise, *Aurinia georgiana,* found in soft mud off Palm Beach, failed to appear in the Keys area, although a possible counterpart, *Aurinia schmitti,* might be considered to replace it in the softer bottom off the Keys.

Aurinia dubia, originally described and figured by Broderip in 1827 from a shell without locality, continued to remain a puzzle. His figure, showing a large bulbous protoconch and two weak plications on the columella, it is not quite like any volute yet seen by the authors from Gulf of Mexico or Florida waters. The early date of publication rather suggests that the original specimen might have been taken in a fish-trap from one of the Lesser Antilles, but until the original type specimen is eventually

found and examined it would seem that the exact identity of *dubia* must continue to remain an interesting mystery.

In white sand, at about 90 to 100 fathoms, *Microgaza rotella* was taken on occasion, providing the smaller mesh dredges were used, for this species, in its attractive golden iridescence, does not attain large size.

Bursa tenuisculpta, although rare, was taken living at 115 fathoms and appeared to be confined to the deeper water along the Pourtales Plateau. The deep-water carrier shells, *Xenophora caribaeum* and *X. longleyi,* had a much wider depth range, specimens having been taken as shallow as 70 fathoms and extending out to the greatest depths which we attained.

In deep water, from sandy areas between the rocks, a wide variety of interesting pelagic species were taken, including that transparent jewel, *Cavolina tridentata,* largest of the deep-water flying snails, and the curious *Herse columnella,* resembling nothing so much as an extremely miniature milk-bottle.

In addition to mollusks, other interesting things appeared in our dredges. From one reef off Sombrero Key, in 100 fathoms or more, we brought up pieces of a strangely beautiful and most delicate coral quite unlike anything we had seen, while from the same reef a large pale whitish sponge was obtained, replete with villainous sharp spicules which made it most difficult to handle. One trawl came up so packed with small brittle-stars that the load could not be brought on board until a part of the contents had been dumped, and long spined urchins also made frequent appearances in loads from the deeper water, one species, vividly colored in red and yellow, actually being quite attractive. From a 70 fathom reef, off Key West, a large and perfect basket-star, species unknown to us, made a rather surprising appearance.

Because of space limitations, no attempt has been made to mention all shells obtained, but rather an effort has been made to name those species which we feel to be of greatest interest to collectors, together with depths and types of bottom upon which they were found. Although there were exceptions which tended to range over a considerable area, surprisingly most species were quite closely restricted to the depths as given above. Although the "Triton" lacked a modern electronic depth finder and we were obliged to obtain this data by other methods, we were gratified to learn, upon a number of dredging cruises with our friend the

late Todd L. Moise, where the writers had the great pleasure of serving as invited guests and guides aboard his luxuriously equipped motor-sailer *Escape,* that our measurements agreed almost to the fathom with those indicated by an elaborate electronic device.

In conclusion, certainly no discussion of dredging in the Keys area would be complete without some mention of the limitations imposed so frequently by weather. Although the region affords delightful cruising for small boats and yachts, the open waters of the Gulf Stream rapidly become quite choppy in anything more than a gentle to moderate wind. Unfortunately, dredging from a small boat is not only extremely difficult, but hazardous as well, unless the seas are reasonably calm. Our practice of organizing cruises to the Keys to last something over a month, usually in June or July, when light winds might reasonably be anticipated, worked out quite well, but even so, we vividly recall one period of a full ten days during which it was too rough to attempt a single haul with the dredge. The pleasures and thrills of deep-sea dredging far outweigh the disappointments however, so once the material is brought home and mounted in the collection, perhaps the many difficulties encountered serve some useful purpose by causing us to appreciate even more those delightful treasures from so far beneath the sea.

NOTES ON LAND SNAILS OF GENERA SOLAROPSIS AND NENIA

By HENRY A. PILSBRY

In the course of determining specimens of *Solaropsis* from Colombia, I had occasion to look over the species of Guiana. Finding nomenclatural irregularities, I was led to investigate the history of several species and to regulate their nomenclature.

Solaropsis cicatricata Beck.

Helix pellis serpentis Chemnitz, 1795, Syst. Conch. Cab. 11: 268, pl. 208, figs. 2046, 2047.—Ferussac, 1822, Tableau Syst. Limaçons p. 39.—Pfeiffer, 1848, Monogr. Hel. Viv. 1: 371.—Pilsbry, 1890, Man. Conch. 5: 178. [Not of Gmelin, 1791.]

S.[*olaropsis*] *pellis serpentis* [var.] b, *cicatricata* Beck, 1837. Index Molluscorum etc., p. 27.

Helix constrictor Hupé, 1853, Rev. et Mag. de Zool. (2 ser.), 5: p. 298.

This snail, characterized by the presence of two deep pits on the base, has long been known as *Helix* or *Solaropsis pellisserpentis* Chemnitz, 1795. Chemnitz's nomenclature was not consistently Linnean and is not now admitted, but having been accepted by Férussac and Dr. L. Pfeiffer this name passed into general use. Chemnitz had used the same name in 1786 for what is now regarded as another species, and this early use was the basis of *Helix pellisserpentis* Gmelin, 1791. Beck in 1837 recognized that two forms were involved, and introduced a varietal name, *cicatricata,* for Chemnitz's snail of 1795. A few years later H. Hupé saw that two species had passed under the same name and he named the pitted one *Helix constrictor.* Subsequent authors have followed Pfeiffer's incorrect usage.

This species is variable in size, diameter 41 to 53 mm. in ANSP. specimens, but I have seen little variation in the development of the deep pits at the periphery and base, though their position varies from directly opposite the aperture to a place somewhat more anterior.

Dr. F. Haas (Archiv für Molluskenkunde 78: 152) has given Brazilian localities for this species and the next, under their Pfeifferian names. The type locality in Guiana was fully described by Chemnitz.

Solaropsis undata (Solander).

Limax serpens Martyn, [1786?], Universal Conchologist 3, pl. 120.[1]

Helix undata Solander, 1786, Catalogue of the Portland Museum p. 177, no. 3802 [in part, referring to Lister, pl. 76, but exclusive of reference to Favanne].

Helix pellis serpentis Gmelin, 1791, Syst. Nat. p. 3620 [based chiefly upon Chemnitz, Conchylien Cabinet 9, figs. 1095, 1096].

Planorbis pellis-anguinea Röding, 1798, Museum Boltenianum, p. 72, no. 930 [based upon Chemnitz, Conchylien Cabinet 9, pl. 125, figs. 1095, 1096].

Martyn's nomenclature is not strictly Linnean so that his name is not valid as of 1786, and apparently must give way to *Helix undata* Solander, 1786.

[1] *Solarium serpens* Spix, 1827, is a different Brazilian *Solaropsis.*

Helix colubrina Perry, 1811 (Conchology pl. 15, fig. 4) was possibly a *Solaropsis undata,* but the figure is so preposterously bad that no certain identification is possible.

Solaropsis pellis-boae Hupé (Revue de Zoologie, 1853, p. 299), is a large species apparently closely similar to *S. undata* (Sol.), but I have not seen it. The locality, Mission de Sarayacu, Peru, is a hamlet in the state of Loreto, in the Rio Ucayali valley near the 75th meridian at about 6°58′ S. lat.

S. undata (Sol.) has the subsutural and peripheral spot bands as in *S. cicatricata,* and dense, fine granulation, also as in that species; but the last whorl is regular, without pits. A specimen measures: alt. 35 mm.; diameter 54 mm., 5½ whorls. Figures were given in Man. Conch. 5, pl. 58, figs. 38, 39, 40.

Solaropsis anomala, **new species.** Pl. 3, Figs. 1, 1a, 1b.

The rather solid shell is like *S. undata* in general figure having a dome-shaped spire and angular periphery, but it differs by having a modified last whorl, which on the side opposite the aperture is swollen below the suture, and in the peripheral region it is impressed and concave (fig. 1a). The base is broadly concave and coarsely striate radially around the umbilicus. The first 2½ whorls are smooth, the following whorls are minutely, densely granulose on the upper surface, and the last 1½ whorls have some coarse striae along lines of growth. The color pattern is like that of *S. cicatricata* and *S. undata.* On a whitish ground there is below the suture a broad band of crescentic to angular reddish brown spots alternating with white ones; at the periphery there is a band, half as wide, of more or less angular smaller spots. The white peristome is reflected throughout, and is dilated half over the umbilicus.

Height 32 mm., diameter 51 mm.; width of umbilicus behind lip 3.5 mm.; fully 6 whorls.

Guiana, exact locality unknown. Type 85147 ANSP., received from the Philadelphia Commercial Museum in 1903.

Besides *S. cicatricata* there are two other described species of *Solaropsis* having an indentation of the last whorl: *S. monolacca* (Pfr.) and *S. vipera* (Pfr.). *S. monolacca,* from Surinam, differs from our species in color pattern. It is described and figured as "braungelb, mit vielen rothbraunen, kaum welligen, Striemen gezeichnet," and without the subsutural and peripheral

spot bands of *S. anomda* and others of the *cicatricata* group. The right lip margin is said to be "schmal ausgebreitet," not well reflexed as in our species. A comparison of the descriptions and figures shows various other differences.

S. vipera (Pfr.), described from a specimen from Brazil in the Cuming collection, is a smaller (37 mm. diameter) species with the typical *cicatricata* color pattern and only a quite small sulcus above the peripheral angle. The base is banded and less concave than in *S. anomala.*

A specimen before me, no. 202991 ANSP. agrees well with the account of *S. vipera* except for its larger size, 50.4 mm. diameter, and by having fewer basal spiral lines of dark dots. It is labelled "Brazil," but is from an old collection, origin not traceable.

Dr. Vernhout (1914, p. 7) listed under "*S. pellisserpentis*" a "specimen collected by Mr. Voltz . . . which has the peculiar pits of the left side but faintly indicated." I doubt whether this specimen is really referable to *S. cicatricata,* which has deep pits very constant in a large number seen in various collections. Dr. Vernhout's shell may possibly be the snail described above as *S. anomala.*

Solaropsis undata browni, **new subspecies.**

The color pattern and minute surface sculpture are as in *S. cicatricata* and *S. undata,* but the shape is far more depressed than *S. undata* and the periphery is much more strongly though bluntly angular. It does not have the conspicuous pits of *S. cicatricata.* Height 29 mm., diameter 54.6 mm.; width of umbilicus behind lip 4 mm.; 5⅔ whorls.

This race is known by the type, 1446 ANSP., a specimen from the A. D. Brown collection labelled "Peru." It was figured as a depressed form of "*S. serpens* Martyn" in the Manual of Conchology 5, pl. 59, figs. 50, 51, 52.

Various forms of the *S. gibboni* complex are equally depressed, but they do not have the minute granulation of this subspecies and others of its group.

Solaropsis gibboni (Pfeiffer) Pl. 3, Figs. 2, 3.

A rather distinct form of this species was found in Colombia at Monteredondo, kilom. 73 on the road from Bogotá to Vil-

lavicencio, collected by F. Medem. Figures of an adult, faded specimen (fig. 2) and a young one taken alive (fig. 3) show the characters, solidity, shape and color pattern of this local form of the variable and widely distributed *S. gibboni.* Three specimens measure:

Height 31.5 mm., diameter 53.3 mm.
Height 28 mm., diameter 55 mm.
Height 27 mm., diameter 49.5 mm.

NENIA (ANDINIA) BARCROFTI, **new species.** Pl. 3, Figs. 4, 4a, 4b.

The cylindric shell tapers in the upper half to a truncate summit closed by a strongly convex plug. Color white throughout or faint brown with a brown line at the suture. The whorls are only slightly convex, the last almost straight sided, shortly free in front. Sculpture of irregularly waved and frequently anastomosing riblets which have a slightly retractive axial direction. In adult shells the ventral side becomes worn smooth. On the latter part of the last whorl the riblets are strong and more regular, are often brown, and vary in number individually, as in figs. 4 and 4b.

The aperture is broadly ovate, narrowed at the upper left extremity, white within. The peristome is white, thin and broadly expanded. The superior lamella is marginal, high and thin, concave on the left side, continuous with the very short but high and arcuate spiral lamella; a short low branch at their junction. The inferior lamella is strong, convex. The subcolumellar lamella is deeply immersed and rather strongly developed within. The principal plica is short, lateral and dorsal, and is visible externally as a brown line. The lamella is weak and short, curving anteriorly from near the inner end of the principal plica.

The clausilium tapers distally to a blunt point on the columellar side of the oblique end, and posteriorly passes gradually into its filament.

Length 35.5 mm., diameter 7.3 mm.; 6 whorls remaining.
Length 34.5 mm., diameter 7.5 mm.; 5½ whorls remaining.

Colombia: Monteredondo, kilom. 73, road from Bogotá to Villavicencio, Type and two paratypes no. 203475 ANSP.

This fine *Nenia* is named for Mr. Frederick J. Barcroft. Through his planning, introductions and material assistance during several years, considerable additions have been made to our series of South American mollusks.

Nenia karsteniana (Dohrn) and *N. magistra* (Sowerby) are large species from near Bogotá, both resembling *N. barcrofti* in being truncate and with the peristome expanded, but in both of them the sculpture is less coarse and irregular and it is far more oblique. In *N. barcrofti* the riblets are coarser and more interrupted, and they run nearly parallel to the axis of the shell. The short principal plica, visible externally through the shell, is unlike the *karsteniana* group.

PRUNUM ROSCIDUM IN NEW JERSEY

By R. TUCKER ABBOTT

Pilsbry Chair of Malacology

Mrs. Clara Burke and other members of the Philadelphia Shell Club have been finding in New Jersey living examples of an attractive marginellid which superficially resembles *Prunum guttatum* Dillwyn. Closer investigation indicates that these specimens are *Prunum roscidum* (Redfield), a species which Conrad, Dall and others have erroneously synonymized under the Miocene species, *Prunum limatulum* Conrad. Below, we give a brief account of *P. roscidum* (see pl. 4 figs. 4, 4a).

Prunum roscidum (Redfield).

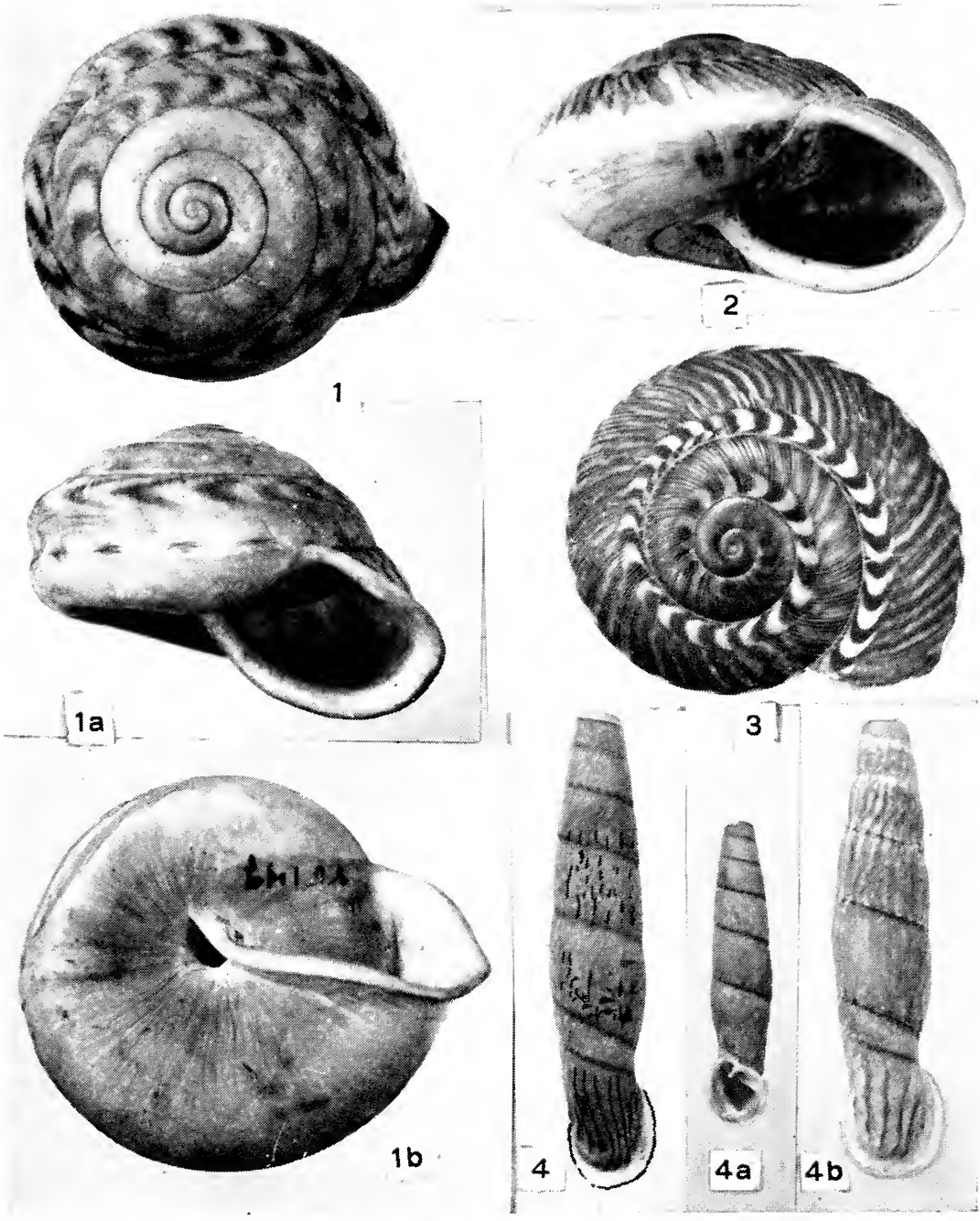
Marginella roscida Redfield 1860, Proc. Acad. Nat. Sci. Phila., vol. 12, p. 174 (Coast of South Carolina); 1868, Conrad (in part), Amer. Jour. Conch., vol. 4, p. 67; 1873, Tryon, Amer. Marine Conch., fig. 90.

Marginella limatula Conrad, Dall 1890, Trans. Wagner Free Inst. Sci., vol. 3, pt. 1, p. 49.

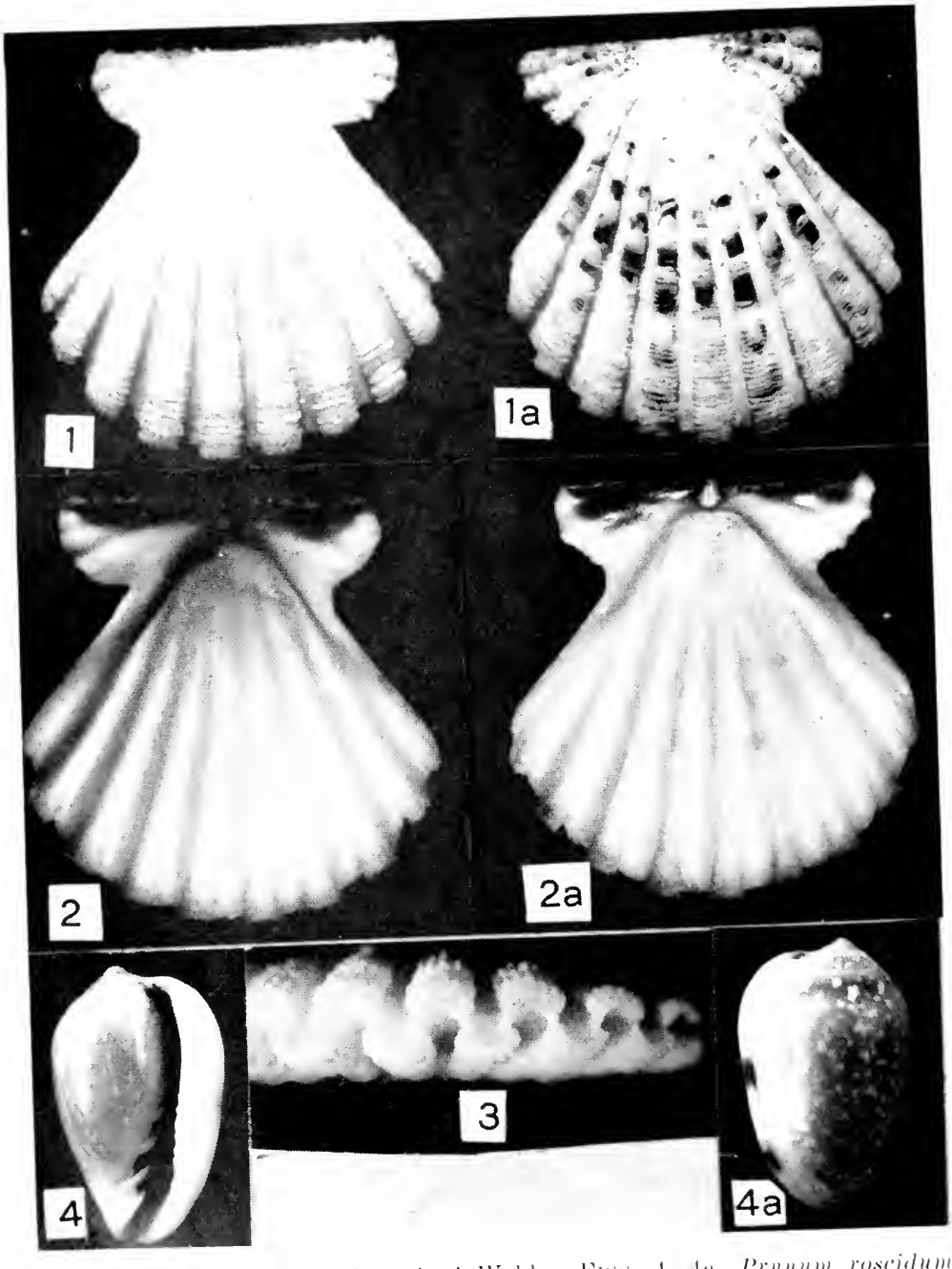
Marginella culima Dall 1893, Trans. Wagner Free Inst. Sci., vol. 3, pt. 2, p. 225 (Pliocene of Shell Creek and the Caloosahatchie beds).

Marginella beali McGinty 1940, Nautilus, vol. 54, p. 63, pl. 3, figs. 10, 11 (Florida).

Adults 13 to 16 mm. in length, glossy, pale pinkish gray with numerous, small, irregular, opaque-white dots which rarely are coalesced below the suture to form short, irregular, axial streaks.



FIGS. 1, 1a, 1b, *Solaropsis anomala*, 3 views of type. 2, *Solaropsis gibboni* Pfr., var., partially faded adult. 3, apical views of immature specimen taken alive. 4, 4a, 4b, *Nenia barcrofti*, type and paratype, figs. 4 and 4b somewhat enlarged.



FIGS. 1–3, *Pecten raduła griggi* Webb. FIGS. 4, 4a, *Prunum roscidum* (Redfield) from North Wildwood, N. J.

Outer lip thickened, white, finely denticulate on its inner edge, and bearing along the rim of the varix four reddish brown spots —a small one at the very top, a broad one at the center, another broad one ¾ the way down, and a small one at the very base of the shell. Upper area of the parietal wall may bear a swollen, white callus. Columellar teeth white, the upper two short and almost at right angle to the axis of the shell, the lowest two teeth very much stronger and more slanting. Spire short.

Range: Delaware to off east Florida. Records: Delaware: 23 fms., 2 mi. north of Cape Henlopen, Delaware Bay (H. G. Richards, leg. 1929). New Jersey: low tide line, among broken shells, North Wildwood (Clare Burke, leg. 1954–56). South Carolina: (cotypes A.N.S.P. no. 29086, Redfield Collection). Florida (form *beali*): 80 fms. off Palm Beach (T. L. McGinty, leg., 1940); 27 fms., off Miami (T. L. Moise, leg. 1954).

Prunum guttatum Dillwyn, a southern Florida and West Indian species, differs in having five varical color spots, two of which are at the base of the shell on each side of the siphonal canal. The lower two columellar teeth are shorter and weaker than the two above; the spire is much lower and the body whorl more gently rounded. *P. borealis* Verrill 1884, found in deep water from Massachusetts to Virginia, lacks the white spottings, has a high, pointed spire, and has very weak, if not absent, denticulations on the inner side of the outer lip. *P. beali* McGinty is a smaller (8 to 12 mm. in length), rosier form or possibly subspecies of *roscidum* from off eastern Florida, where whittish specimens also occur. The fossil *P. limatulum* Conrad from Virginia appears to be more like Verrill's *borealis,* and has a higher spire and proportionately broader aspect in the upper part of the body whorl.

NEW FORM OF PECTEN

By J. H. WEBB

Pecten (Comptopallium) radula griggi, **new form.** Pl. 4, figs. 1 to 3.

Shell triangularly ovate, equilateral and equivalve. Posterior and anterior margins perfectly straight from the umbones to the outer margin and both drop off peculiarly at right angles leaving the edges flat. Holotype 50.8 mm. in height and 50.5 mm. in

length. All paratypes similar in proportions but vary in size from 31 mm. high to 50.8 mm. Left valve very flat and peculiarly compressed at the umbone. Right valve convex. Byssal notch small with three denticles on lower margin. Shell white with left valve maculated with brown and black. Right valve white. Both valves yellow at the umbones. Hinge line straight and stained with coffee-brown on interior. Auricles very large and equal. Auricles on both valves are radially ribbed with three main ribs which are squamate. Ribs number nine or ten and are rounded with the tops of each, on both valves, covered with crowded scales or fimbriations about half the length of rib starting at the outer margin. Sides of ribs and bottoms of interstices are smooth. Both ribs and interstices rounded and of practically the same size.

Holotype and several paratypes were taken at Escape Pass near Cape Leveque in N. W. Australia from tidewater to six fathoms. Holotype in The Academy of Natural Sciences of Philadelphia, No. 225038.

The specimens examined were taken in shallow water at low tide. Although *Murex, Cypraea, Conus* and *Mitra* were also taken the only other *Pecten* taken near the locality was *P.* (*Comptopallium*) *radula* Linné. *P. radula* is narrow and elongate with ten to fourteen rounded broad ribs with radial ribbing covering them and fine concentric lines crossing them, giving the shell a granular appearance. It has no scales or fimbriations and the left valve is slightly convex.

Recently some shells taken at the Palau Islands have many of the characteristics of this new variant. However the Palau I. shells have a slight curve in the posterior and anterior margins, the left valve is not as flat and the scales or fimbriations are not as pronounced. These slight differences may be entirely due to local genetic or ecologic variations.

The author wishes to acknowledge and thank Dr. Harold Rehder of the Nat. Museum in Washington, Dr. Tucker Abbott of the Academy of Nat. Sciences of Philadelphia and Dr. Leo G. Hertlein of the Cal. Academy of Sciences in San Francisco for their help in identifying this shell.

THE RANGE OF THE SEA SCALLOP

By J. A. Posgay

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The range of the sea scallop, *Placopecten magellanicus* (Gmelin), has been variously reported to be from Labrador to New Jersey (Pratt, 1935; Miner, 1950), Newfoundland to New Jersey (Morris, 1947), and Labrador to Cape Hatteras (Abbott, 1955). A search of the literature and major museum collections has been made in an attempt to clear up this confusion among the most generally available manuals. From the evidence gathered, the limits seem to be from the north shore of the Gulf of St. Lawrence to Cape Hatteras.

Since the sea scallop is an important commercial mollusk, the United States and Canada maintain records of the location and extent of their sea scallop fisheries. These records show that sea scallop beds of sufficient extent and density to support a fishery occur from Port au Port Bay, Newfoundland (Latitude 48° 30′ N) to the Virginia Capes (Latitude 36° 50′ N). The animal probably occurs both north and south of the limits of the fishery.

The uttermost limit of the range of any sedentary marine animal is usually a vague and shifting line. A specific locality may be unsuitable for survival in most years, but in occasional years the environmental stresses may be reduced to the point where some fraction of the hardier members of a population can survive and grow. Therefore, the fringes of the range can be expected to produce only a thin population in occasional years.

Whiteaves (1901), after investigating the records of every major expedition which had collected in Eastern Canada, said that the most northern locality in which the sea scallop has been dredged was Caribou Island, Province of Quebec. His reference is Packard (1867). Caribou Island (Lat. 51° 25′ N, Long. 57° 39′ W) is well inside the Gulf of St. Lawrence. No more northerly record has been found in the literature which has accumulated since Whiteaves' time.

The only evidence that I have found to support the idea that the sea scallop occurs off Labrador is one shell (No. 27271) in the mollusk collection of the United States National Museum.

It is labeled "Caribou Island, Labrador" and cataloged as having been received from Stimpson in 1875 along with a great many other shells. There is no mention of the collector. The most probable inference is that these shells were either from Stimpson's private specimen collection or the results of some dredging expedition.

Going backward in time, the first expeditions which might have collected the shell are those of A. S. Packard in 1860 and 1864. He dredged from Little Mecatina Island, in the Gulf of St. Lawrence, through the Straits of Belle Isle and along the Atlantic coast of Labrador as far north as Hopedale. His dredging locations are only given verbally and the sea scallop is mentioned as being found off Caribou Island. Whiteaves correctly locates this in Quebec. Packard, however, calls his paper "A View of the Invertebrate Fauna of Labrador." He also acknowledges that he is: "indebted to . . ., Dr. William Stimpson, . . . for valuable aid in identifying the species mentioned below." Stimpson probably was given his choice of the duplicates, labeled the sea scallop shell "Caribou Island, Labrador" and placed it in his private collection. Later, he presented part or all of his collection, including the sea scallop shell with the faulty label, to the United States National Museum.

Dredging records for the area in which the southern limit of the range might be expected to fall are scarce. Chesnut (1951), however, says that fishermen report taking sea scallops in their nets occasionally while trawling off Cape Hatteras. This is about as far south as they would be expected to occur. As has been shown experimentally (Posgay, 1953), juvenile sea scallops cannot survive exposure to water temperatures above 23° C; mature specimens are killed by water over 20° C.

The average 20° C. bottom isotherm, at its most northerly position, leaves the shore at Cape Hatteras and sweeps gently northward until it is parallel to the bottom contours at about the 100 fathom curve. Probably no sea scallops would be found south of Cape Hatteras or in deep water off the North Carolina coast.

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PROPOSED REVISION OF HALIOTIS RUBER

By Robert R. Talmadge

In the course of a systematic and comparative study of the marine family *Haliotidae,* some interesting information came to light that may be of interest to malacologists. The literature covering the species, that was once known as *Haliotis naevosa* Martyn, 1784, was a bit confusing. There were several names and descriptions covering either closely allied species, or races of a species that varied from locality to locality. The writer, after an intensive study of this group, feels that a single species is represented, but that it may be divided into three geographical races. This proposed revision is based upon the following information.

The approach to the problem was the same method utilized by ornithologists in their monographic works, a comparison of populations of a species. Ino, 1951, had utilized this method on his work with the *discus-kamtschatkana* problem. Talmadge, 1956, had followed this method in the discussion of the *Haliotis varia.* Others had found this method satisfactory in working with land mollusks, and it is gradually being accepted as a basic method of taxonomy. By this kind of comparisons, the various age stages, ecological populations, and pathological specimens are better understood, and evaluated.

Specimens were obtained in as large quantities as possible, with accurate locality data. Various private, university, and museum collections were utilized as well as the writer's personal collection. Each collecting station was plotted on a large scale map, with pertinent data as to average temperatures, currents, and the basic geology. Soft parts were obtained and studied in conjunction with the shells. Research libraries were used in order to obtain the original descriptions and illustrations. After all the data were assembled and compared, there appeared to be a natural sequence of distribution and a gradual merging of one shell type into another with similar animal parts. This is one of the best methods in working with the haliotids; as has been found in separation of the species, the soft parts are quite distinct.

Apparently in the southern part of Australia, a warm temperate region (Macphearson), or the Flindersian of Hedley contained a shell that was rather elongate, high spired, with strong lamellae. This sort of shell merged into a more ovate, lower spired population with low rounded lamellae as one entered the cool temperate (Macphearson) or Peronian (Hedley). This kind of shell in turn gradually became nearly circular with a depressed spire, no lamellae, and a distinct groove below the siphonal angle as tropical waters were reached from around the Capricorn Islands or the Solandrian Province. With this gradual merging of shell features, the animal parts remained the same. Juvenile shells were identical up to around 20 mm. major diameter and could not be separated. A search of literature indicated that all of these races were already named, but due to the similarities, there appeared to be some confusion as to the status. The following names are presented for consideration.

Haliotis ruber ruber Leach.

H. naevosa Martyn, 1784, Universal Conchologist, t. 34.

H. ruber Leach, 1814, Zool. Misc., p. 54, f. 23.

This is the ovate, thin, shell, with the medium spire and low rounded lamellae. The range covers New South Wales, Southern Queensland, and Eastern Victoria. Martyn in his description gave the locality as New South Wales, but Leach referred only to Nova Hollandia. If Leach's figured specimen was typical, the range of the type locality would be from around Brisbane, Queensland south to the northern portion of Victoria. If the

figured specimen was not typical, the range could be extended north to the Capricorn Islands and south to around Melbourne, Victoria.

Specimens from around Melbourne in the south are not typical in comparison with the more northern specimens, but seem to be intermediate with the South Australian race. By the same token, Capricorn Island specimens are mixed as to populations.

HALIOTIS RUBER IMPROBULA Iredale

H. naevosa improbulum Iredale, 1924. Proc. Linn. Soc. of N. S. W., p. 222.

H. improbula, Cotton 1943, Trans. Royal Soc. of S. A., pl. XXIII.

This race of *H. ruber* is rather elongate, thick, high spired, and has coarse lamellae crossing the shell. The animal parts are the same as specimens from New South Wales and Victoria.

Iredale gave the type locality as Port Fairy, Western Victoria. Population series from that locality westward indicate that the Victoria station is just within the range of this subspecies. The exact western limits of the range are unknown to the writer, but a small series from Cape Esperence indicate that the race ranges to that general locality.

HALIOTIS RUBER CLATHRATA Reeve

H. clathrata, Reeve, 1846, Conch. Icon., Vol. III, f. 72.

In the tropical waters north of Australia, there is a small, nearly circular, depressed race of *H. ruber,* that has a depressed spire, a groove below the siphonal angle and lacks the cross lamellae in adult shells. Reeve gave Bohol, in the Philippine Islands as his type locality. Many authors have referred *clathrata* to *H. ruber* as a juvenile. As mentioned earlier, juvenile specimens can not be separated in their early stages. Specimens from Northern Queensland seem to fall into this race, as do specimens from Thursday Island, northern New Caledonia, Indonesia, and Malaya. In some lots examined, muscle scars were present in specimens not over forty millimeters in diameter. The fact that muscle scars were present and that no large specimens have been found in this tropical area as far as known, indicates that this northern race is also much smaller than the *ruber* s.s. further south. In a population series from the Capri-

corn Islands, the small round race is indicated, but not until Townsville, Queensland is reached does the race become separable enough to warrant a subspecific name.

The writer wishes at this time to express his appreciation to the various private collectors, museums, and universities in Australia, Indonesia, Malaya, and the United States for furnishing material and field information pertaining to this study. Thanks are also given to Stanford University and to the California Academy of Sciences for the use of their research libraries. In case others may have pertinent data, my address is: Willow Creek, California.

ELLIPTIO COMPLANATUS ROANOKENSIS IN THE NEUSE RIVER

By WALDEMAR M. WALTER and RICHARD A. PARKER

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In 1950 and 1951 the Neuse River Basin in North Carolina was studied to determine the mollusks present and their distribution (Walter, 1956). Among those collected were 32 shells of *Elliptio complanatus roanokensis* (Lea, 1836).

Empty shells of *E. complanatus roanokensis* were taken from six Neuse River stations, one in the Coastal Plain, five in the Fall Zone. Three of the latter group of stations yielded live specimens. Prior to their collection from the bedrock of the river bottom, they were seen lying on their sides in fast-flowing waters from two to five feet deep. At least 100 live specimens were readily available, but most were left, to conserve what appeared to be a locally distributed, small population. At one of the three stations supporting live *E. complanatus roanokensis,* about four feet of fast, turbid water prevented visual determination of their attitude before removal. However, the shells were acquired here by lightly scraping the even, firm bottom with a scraper net. Since almost nothing but shells was brought up, there can be little doubt that here, too, the big mussels were lying on their sides.

Athearn (1954) reports this form from packed sand and gravel in fairly rapid current, but says nothing of mussel position relative to substrate; since he describes the substrate as

packed, a partly buried position seems unlikely. If the usual position of *E. complanatus roanokensis* in the Neuse River is also characteristic of other drainages, then this naiad occupies a distinctive habitat. Other Neuse Basin species were found in the usually described position of freshwater mussels, i.e., partly embedded in the bottom with the posterior exposed.

The dorsal muscle scars of *E. complanatus roanokensis,* as noted by Simpson (1914), form a row extending backwards through the beak cavity from about the posterior edge of the pseudocardinal tooth, whereas the dorsal muscle scars of Neuse Basin *E. complanatus* occupy only a small depression.

In addition to the differing habitat and arrangement of the dorsal muscle scars, there is a conchometric difference, the

Table I

A Summary of Some Components Used in the Multiple Regression Analyses

Group	D (mm.)	L (mm.)	H (mm.)	Regression D.L b	D.L r	D.H b	D.H r	H.L b	H.L r
E. complanatus roanokensis				0.272	0.927	0.480	0.926	0.555	0.983
N: 32									
Mean	34.6	138.0	71.1						
Range	13–42	56–165	28–87						
E. complanatus				0.353	0.951	0.629	0.971	0.562	0.979
N: 117									
Mean	23.9	71.1	39.9						
Range	3–46	9–118	5–68						

reality of which was tested as follows. The greatest diameter, height and length of 117 *E. complanatus,* and 32 *E. complanatus roanokensis* shells were measured to the nearest millimeter. Multiple regression analyses of these data gave an objective comparison of the two groups. Excellent simple correlations (r) exist among the various dimensions, and there is good agreement between the estimated slopes (b) of the bivariate regressions (Table I) and the ratios (D/H, D/L, H/L) of the appropriate mean values.

Diameter was chosen arbitrarily as the dependent variable. Since some error was inevitable in measuring height and length, the analytical method used here is inexact; however, the reliability of the results obtained seems sufficient to validate the con-

clusion reached. The equations arrived at for *E. complanatus* (1) and *E. complanatus roanokensis* (2) are:

$$(1)\ \hat{D} = -1.3 + 0.005L + 0.621H$$
$$(2)\ \hat{D} = -1.3 + 0.147L + 0.219H$$

An analysis of the errors of estimate from a common regression plane and from the two individual regression planes shows there is a highly significant difference between the two shell forms (Table II), thus substantiating the previously noted differences.

The data so far presented appear adequate to permit restoration of the specific rank given the form *roanokensis* by Isaac Lea.

TABLE II

ANALYSIS OF THE ERRORS OF ESTIMATE FROM A COMMON REGRESSION AND INDIVIDUAL SUBSPECIES REGRESSIONS

Source of Variation	d.f.	Sum of Squares	Mean Square
Deviations from a common regression (0.1027)(12221)	146	1255	
Deviations from individual subspecies regressions (0.1450)(2010) + (0.0728)(7325)	143	824	5.76
Difference between a common regression and subspecies regressions	3	431	143.7

$$F = \frac{143.7}{5.76} = 24.9$$

$$F_{3,\ 143\ (.99)} = 3.9$$

However, such a move would be of dubious validity, if for no other reason than the small number of *E. complanatus roanokensis* shells studied. A second reason for feeling so is that six intergrades had the shell shape and proportions of *E. complanatus,* but had the dorsal muscle scars of *E. complanatus roanokensis.* Finally, seven dead shells were taken from a pile of dried mud on the base of a midstream bridge support in the lower Neuse, four of which were *E. complanatus*, three, *E. complanatus roanokensis.*

The latter three specimens were noteworthy in two ways. First, they were among the smallest encountered, the range of diameter being 13–21 mm., of height, 28–46 mm., and of length, 56–93 mm. Second, these were the only *E. complanatus roano-*

kensis shells seen, alive or dead, partly buried in such a way as to make it appear they might have been living there before exposure and killing by drouth. Also possibly, of course, the entire situation at the bridge was an artifact of flood, of animals, or other agency. The existence of these three and of two others less than 100 mm. long argues against the possibility that the large ones, of which most were 145–155 mm. long, are a gerontic variant of *E. complanatus.*

A question raised by the "bridge shells" is that of the habitat occupied by the smaller, younger ones. Where do they occur? The question is implicit in the fact that the only living specimens found reclining in strong currents were large adults, although two empty shells less than 100 mm. long were found in such a place.

As Ortmann (1919) and Athearn (1954) have concluded, *E. complanatus roanokensis* may prove to be but a variety of *E. complanatus* when critically studied over its whole range. But, the population in the Neuse River, as presently known, is of subspecific rank.

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CATALOGUE OF THE LAND MOLLUSCA OF ARGENTINA

By J. J. Parodiz

(Concluded from July number)

Streptaxidae

Streptaxis regius Lobbecke, 1881, p. 49. Type loc.: "Brazil." Distr.: S. Brazil; Misiones, (probably N. Corrientes).

S. apertus depressus Martens, 1868, p. 180. Type loc.?. Distr.: S. Brazil; Misiones, Corrientes, Entre Rios, Martín Garcia Island; Uruguay.

Scolodontidae

Scolodonta semperi (Doering). *Streptaxis* (*Scolodonta*) *s.* Doer., 1875, p. 438. Type loc.: "shores of Parana." Distr.: Corrientes, Entre Rios, Buenos Aires, Córdoba, Catamarca, La Rioja, Jujuy.

Happia hylephila (Orbigny). *Helix h.* Orb., 1835, p. 7. Type loc.: Forests between Santa Cruz and Chiquitos, Bolivia.

H. h. ochtephila (Orbigny). *Helix o.*, Orb., 1835, p. 6; *Helix h. o.* Orb., 1837, p. 253. Type Loc.: Feliciano, Entre Rios.

H. skiaphila (Orbigny). *Helix s.* Orb., 1835, p. 5; *Happia s.* H. Scott, 1948, p. 257. Type loc.: Cochabamba, Bolivia. Distr.: Salta, Jujuy.

Drepanostomella ammoniformis (Orbigny). *Helix a.* Orb., 1835, p. 5; *Ammonoceras a.* Doering, 1875, p. 149. Type loc.: Yungas, Bolivia. Distr.: S. Bolivia; Tucumán; some specimens from Paraguay, identified as *ammoniformis,* are very close to *D. banghuasi* (Thiele) and *Happia iheringi* Pilsbry.

D. circumscripta Hylton Scott, 1948, p. 262, fig. 10. Type loc.: Urundel, Salta.

D. tucma Hylton Scott, 1948, p. 264, fig. 11. Type loc.: Yerba Buena, near Tucumán city.

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THE TWENTY-THIRD ANNUAL MEETING OF THE AMERICAN MALACOLOGICAL UNION

July 19–22, 1957

When each annual meeting of the A.M.U. becomes history, one is tempted to describe it as "best ever." Without dealing in superlatives, the 1957 meeting at Yale University was well planned, well attended and well conducted. Only the 1956 meeting bettered the registration of one hundred and eleven, and the quality of the scientific papers was outstanding.

Mr. Percy A. Morris of the Peabody Museum was the official host, aided by the Connecticut Shell Club. Visitors were housed in freshmen dormitories on the old campus and made good use of the facilities, not the least of which were the benches beneath the ancient elms. The spirit of earlier students seemed to linger about the stately old college; indeed, the room in Connecticut Hall set aside as A.M.U. headquarters reputedly was the bedroom of Nathan Hale. Malacologists too have left their mark at Yale University; here Benjamin Silliman compiled his Journal which ran to 255 volumes and here Charles Montague Cooke studied under Addison E. Verrill. The shell collection which they began is now cared for by Percy Morris who has brought it up to date and adds to it as the occasion affords.

President Ruth D. Turner conducted the four-day meeting; three of the four days were given over to scientific papers. Some of them were in the form of symposiums; one on medical malacology was led by Dr. Edward H. Michelson, another which reported on research work in a U. S. Fisheries Laboratory was conducted by the Director of the laboratory, Dr. Victor L. Loosanoff. The third and largest on the subject of the distribution of New World mollusca and conducted by Dr. Thomas E. Pulley occupied an entire afternoon. Limited time curtailed most of these interesting papers and no discussion was possible. In all probability they will be compiled and published by the A.M.U. at a future date.

Kodachrome slides furnished by members and recalling previous meetings were shown out-of-doors on a balmy evening, and on another occasion reports of the activities of member clubs were made by members who happened to be present. The annual dinner was highlighted by a brief talk by Dr. Henry A. Pilsbry and by an illustrated accounting by Mr. George F. Kline of "Fielding for the Pros."

At the annual business meeting, it was announced that A.M.U. membership now is 598, an all-time high. Miss Ruth E. Coats, secretary of the Pacific Division, was present, reported a most successful meeting of that group at Santa Barbara in early June. The new officers of the A.M.U. Pac. Div. are: chairman, Albert R. Mead; vice-chairman, John E. Fitch; secretary-treasurer, Ruth E. Coats.

The following were elected to serve as officers for 1957–58: president, Aurele LaRocque; vice-president, R. Tucker Abbott;

2nd vice-president, Albert R. Mead; secretary-treasurer, Margaret S. Teskey; publications editor, George M. Moore; councillors-at-large, Emery P. Chace, Ralph W. Dexter, Percy A. Morris, Katherine v. w. Palmer.

A field trip to the U. S. Fisheries Laboratory at Milford, Connecticut, occupied all the final day. Dr. Victor Loosanoff proved an able host and his guests were given the opportunity to inspect his busy laboratory together with many special exhibits, then were taken to sea aboard the two laboratory boats and given an exhibition of dredging on several types of bottom. The very enjoyable day was a fitting end to the 1957 meeting of the American Malacological Union. An invitation to meet in September, 1958 at the University of Michigan at Ann Arbor has been accepted.—Margaret C. Teskey, *Secretary.*

WILLIAM GILBERT FARGO

1867–1957

As already noticed in the pages of The Nautilus (vol. 70, no. 4, p. 140), Mr. William Gilbert Fargo passed away at his winter home at Pass-a-Grille beach, Florida, on Feb. 2nd, 1957, at the advanced age of 89. A civil engineer by profession, Mr. Fargo had maintained a life-long interest in geology and natural history, especially in ornithology, and in his later years turning to the study of mollusks, both recent and fossil.

Mr. Fargo was born in the city of Jackson, Michigan, on December 6, 1867, the only son of William H. and Nellie (Gilbert) Fargo. After two years of high school where he studied some mathematics, physics and chemistry, Mr. Fargo, now 18 years of age, obtained his first employment in an engineer and survey office as draftsman and field assistant. Here he learned to run a Dumpy level and transit. Shortly afterwards, he opened his own office doing land and drainage surveying and at 22 years of age he was elected county surveyor and custodian of records, some of which dated back to 1823–25, and in 1895 published a detailed property map of the city based on original surveys. Together with practical experience gained in the field, he completed his engineering education by home study and cor-

respondence courses. He now commenced the surveys of several river basins in Michigan for the purpose of locating sites for hydroelectric dams, the first of these leading to the construction of the "Trowbridge Dam" on the Kalamazoo river above Allegan. In 1913, together with four other associates, he founded the Fargo Engineering company, its main offices located in Jackson. While Mr. Fargo remained active in the company, that is through 1925, 61 hydroelectric stations had been designed and constructed partly or wholly under their supervision located in 29 states of the union, and 5 others in Canada and elsewhere. The company also designed and erected 9 major steam plants as well as many miles of high tension transmission lines. The Fargo company was also a pioneer in the design of many new types of dam and spillway construction which since have become current practice. Of the many plants erected during this period, all are still in full operation without any serious failures having occurred, an accomplishment in engineering design and construction of which the Fargo company can be justifiably proud.

From an early date, Mr. Fargo had been a serious and observant student of nature which was no doubt fostered and strengthened by his contacts with the great out-of-doors, as he ran his surveys or pushed his canoe up and down the many water-ways of Michigan in the search for power-plant sites. In 1925, Mr. Fargo, then at the age of 55 years, retired from active participation in company operations in order the better to devote his attention to natural history studies. He now began to spend longer periods at his winter home at Pass-a-Grille on Boca Ciega Bay near the entrance to Tampa Bay. Besides geology, mineralogy and botany, birds had also been a major interest since his boyhood and he now plunged into their study and the collecting of scientific skins with increased vigor. Mr. Fargo's accomplishments in ornithology are too extensive to be recorded here. At the time of his arrival in Florida in the early 1920ths, Pass-a-Grille was a part of a vast expanse of sandy beaches which stretched northward to Indian Rocks and beyond. As reported by Mr. Frederick Gaige, formerly of the University of Michigan, who often accompanied Fargo on his bird trips, here was a large area of salt grass marshland, the habitat of the seaside and sharp tailed sparrows as well as a patch of mangrove which harbored a fine colony of the yellow crowned night heron. Here also, Mr.

Fargo collected the first specimens of the grooved bill ani to be recorded from Florida. Outside of Florida, Mr. Fargo collected in upper Michigan and made several lengthy canoe trips in Canada between 1921 and 1928, covering principally the region between the Great Lakes and James Bay. In addition to his own collecting, he also financed several major expeditions to Texas, Mexico and the southwest under the auspices of the Museum of Zoology of the University of Michigan, principally for the purpose of bird study. An expedition to Panama, and two to the Great Bend region and the Chisos Mountains of Texas were especially fruitful. He also purchased the L. Whitney Watkins collection consisting principally of Michigan bird skins as well as providing the funds for the purchase of thousands of bird skins from Paraguay, Guatemala, Mexico, Canada and elsewhere, which all were presented to the Museum of Zoology at the University of Michigan. In 1927, the regents of the University appointed him to the position of Honorary Curator of Birds, a title which was changed in 1943 at his request to that of Honorary Curator of Paleozoology in the Museum of Paleontology and Zoology. He was a member of the Wilson Ornithological Club and of the American Ornithological Union besides several others. He accumulated a very large library on American birds which he donated finally to the Jackson County Audubon Society. For a space of 30 years or more, he was a close friend of the late Dr. Josselyn Van Tyne, curator of birds at the Museum of Zoology of the University of Michigan, also of Mr. Frederick Gaige, formerly Director of the same institution. He was instrumental in having set aside a bird refuge, "the Palmer Bird Haven," a 53 acre tract on Sandstone creek near the city of Jackson, Michigan.

As he spent so much of his time at Pass-a-Grille on the west coast of Florida where shells are common, it was but natural that Mr. Fargo would become interested in conchology. Also according to information furnished by Mr. Gaige, his interest in shells may also have been further stimulated by his aquaintance with Joe Lee, a retired British soldier who had a small shack on Long Key and who helped to eke out his meager pension through the sale of marine curios to tourists and visitors. On many a trip, they traversed the beach together for shells, especially after a heavy blow, or collected at low tide at night with

a gasoline lantern. In 1938, the locality for Pliocene or Caloosahatchee shells was discovered by Mr. A. P. Cales in the northern suburbs of Saint Petersburg which thenceforth was to receive much of Mr. Fargo's intensive method of research. In 1940, Mr. Charles R. Locklin of Saint Petersburg and Pontiac, Michigan, joined in this work, several tons of marl was dug up, washed, screened and picked over, resulting in the assembling of a very large collection of finely preserved fossil shells, particularly rich in the smaller, less known species. In addition, Mr. Locklin expanded his collecting activities to other Caloosahatchee localities so that in the working up of the Saint Petersburg fauna, good material from the type area of the formation would also be available for direct comparison. Although Fargo and Locklin had already made preliminary identification of much of the Saint Petersburg collections, the entire lot with the exception of the Turridae was submitted to the Academy of Natural Sciences of Philadelphia for further study and a final writeup which culminated in the publication of a special volume entitled "The Pliocene of Southern Florida" and issued as Number 8 of the Monographic Series under the joint authorship of Olsson, Harbison, Fargo and Pilsbry. In the course of the Saint Petersburg collecting, Mr. Fargo had become interested in the Turridae which partly through the special method of careful screening and picking proved to be excessively abundant in both species and individuals. This family of difficult shells was worked up by Mr. Fargo and was published as a separate chapter of the monograph, the group consisting of about 87 species, of which 37 forms were described as new along with 4 new genera. Cost of publication and other expenses connected with the Saint Petersburg monograph were paid by a grant from Mr. Fargo. Since it was realized that expanding real-estate development would in the course of a few years cover the site of the fossil beds, Mr. Fargo and Mr. Locklin promoted and finally succeeded in having this interesting area set aside as a park of about 26 acres so that properly qualified workers could still be able to come here and collect.

Mr. Fargo was a self-made man in the best sense, who, having achieved success in a competitive and technical field, continued to live simply and without pretension. He was a modest and highly sensitive person, retiring and self effacing to an unusual

degree, interested in art and music, and in all those things which contribute towards true progress. He never married. He loved children and they sought him out and trusted him. At an early date, he began to organize study groups for young people which he continued to lead until well into his eighties. He helped many young men to secure their higher education in various branches of science and even in art. Fargo had a high sense of civic responsibility and he gave unstintingly of his time to the city in many hours of hard and often thankless work to serve on various commissions, all without compensation, until forced to retire by failing health. He served his city for many years as chairman of a planning and zoning board and in the promoting of the necessary laws through the state legislature. In the total, he had contributed, over the years, a large sum of money to the advancement of science, partly in the financing of various collecting expeditions, donations and grants to various museums, or for publication needs, for the most part given anonymously. In the passing of Mr. Fargo, the natural sciences have lost a true friend, a man whose greatest joy was to render service to his community and to the advancement of his chosen fields of study. —Axel A. Olsson, June 15, 1957.

NOTES AND NEWS

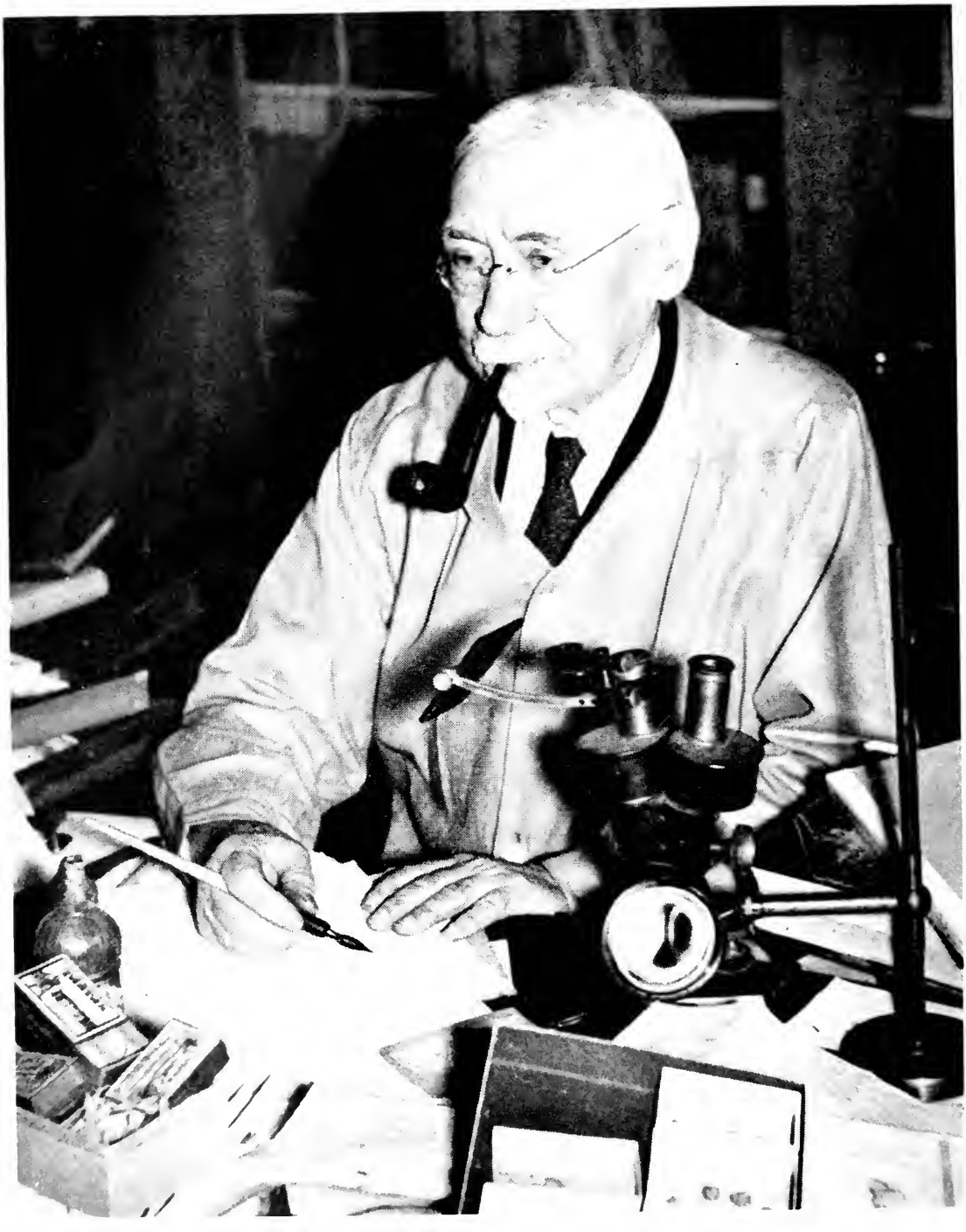
Dates of Nautilus.—Vol. 70, no. 1, pp 1–36, pl. 1, was mailed Aug. 13, 1956. No. 2, pp. 37–72, pls. 2–5, Nov. 12, 1956. No. 3, pp. 73–108, pls. 6 & 7, Feb. 11, 1957. No. 4, pp. 109–144, i–vii, pl. 8, April 29, 1957.—H. B. B.

In memoriam, William H. Weeks, 1870–1957. On April 29, Mr. William H. Weeks died of heart trouble. He was 87 years old. Mr. Weeks had a large hardware store in Brooklyn until illness compelled him to retire. He lived on Willoughby Avenue. In his earlier days he was a musician, and came from a musical family. He built up a large collection of shells, mainly from original collectors and from missionaries in all parts of the world, spending a small fortune for shells. Two shells were named in his honor, "*Helix*" *alauda weeksiana* Blanes and *Papuina weeksiana* M. Smith. Mr. Weeks was a kindly person who radiated enthusiasm and was always ready to help beginners, and freely gave them of his duplicates. His collection

is being broken up and sold to collectors. He is survived by a son H. Wellington Weeks, a musician.—Fred Tobleman.

Gulella bicolor (Hutton) in Florida.—In September 1956 Mr. Harold Feinberg of the New York Shell Club found a single mature, live specimen of this oriental snail about one block south of Coconut Grove Park, Coconut Grove, South Miami, Florida. It is quite different from any snails taken in the east and very closely resembles the excellent figure in Dr. Henry van der Schalie's *The Land and Fresh Water Mollusks of Puerto Rico* (Mus. Zool., U. of Mich., Mis. Pub. 70, 1948, pl. 5, fig. 11a, 11b). This species has heretofore not been recorded from Florida, though there is a record from Charleston, South Carolina (ib., p. 69). It is not mentioned in Pilsbry's *Land Mollusca of North America,* nor does it appear in any of the faunal lists from Florida. Unfortunately no debris was taken from the place where the snail was found and hence no immature specimens were collected. This species may be presumed to be a very recent importation, but, like most molluscan vagrants, can be expected to make its stay here permanent. It is widely but sparsely distributed in many islands of the West Indies and was recently reported from Havana. At various times it appeared in the genera *Ennea, Pupa, Huttonella,* and *Diaphora.* Morris K. Jacobson.

Viviparus contectoides in Wisconsin.—According to Baker's monograph on the Gastropoda of Wisconsin, published in 1928, I find a note that the only record up to that time of *Viviparus contectoides* in Wisconsin was a single shell found at Milwaukee, and of doubtful origin. A few days ago a grandson of mine (Robert Chipley), vacationing on the Chain o'Lakes in Wanpaca county, brought me a dozen or so living specimens collected on the shore of Knight Lake, a small lake at the upper end of the chain. He tells me that the mollusk was present in large numbers both living and dead.—Robert G. Washburn.



HENRY A. PILSBRY
1862–1957

THE PILSBRY NAUTILUS

Vol. 71 JANUARY, 1958 No. 3

HENRY AUGUSTUS PILSBRY

1862–1957

Henry A. Pilsbry was born December 7,[1] 1862, on a farm near Iowa City, in Johnson County, Iowa. He was the fourth child of Dexter R. and Elizabeth (Anderson) Pilsbry, both of English ancestry. He was married October 20, 1890, to Adeline Bullock Avery, whom he lost November 13, 1924. On September 6, 1957, he suffered a heart attack at the Philadelphia Academy of Natural Sciences, and was taken to Jefferson Hospital, where he appeared to recover. October 11, with his doctor's consent, he left for his winter home in Lantana, Florida, but had another seizure there on the 22nd, and passed away in his sleep October 26. He was buried on the 30th, beside his wife, in the churchyard of St. Asaph's which is on Conshohoken Road, between City Line and St. Asaph's Road, in Bala (a suburb of Philadelphia) where he resided during his married life. The Pilsbrys are survived by two daughters, Elizabeth and Grace (Mrs. Frederick J. Barcroft).

Harry, which was his Iowa nickname, was educated in the public schools of Iowa City and at the nearby University of Iowa, from which he graduated in 1882 (B.Sc.). He was interested in animals from an early age, and soon was making collections of them. At college, this interest developed into a desire for knowledge in paleontology and zoölogy, especially in class work with Professors Samuel Calvin and Thomas H. Macbride, and on field trips, which he felt privileged to share. He first collected land and fresh water shells at this time, along with his friend, Bohumil Shimek (1861–1937; N.50:140)[2] who

[1] He gave Dec. 8 to "Who's who in America" but changed it to Dec. 7 (Amer. men of sci.) because, as he told us: "My sister heard the clock strike midnight just after I was born."

[2] Throughout this number, the NAUTILUS is abbreviated to N. and the Proceedings of the Academy of Natural Sciences of Philadelphia to P., except in his "Scientific contributions:" Naut. & Proc. ANSP.

became a leading authority on loess and its fossils. At first, neither had any idea that books had been written about their insignificant snails and mussels, although they had used texts on geology and paleontology. But, through Prof. Calvin, DeKay's "Natural History of New York" and Binney and Bland's "Land and fresh-water shells of North America" were obtained, and a new world of knowledge was disclosed.

After Harry's family left for Florida, several years were spent in various capacities, including that of reporter, with newspaper and publishing firms at Iowa City and Davenport, Iowa, but all his spare time and evenings were devoted to the collection and study of mollusks. During this period, he met Dr. R. Ellsworth Call (1856–1917) at the Davenport Academy of Sciences, and first published (1886, 2)[3] his remarkable skill at drawing.

He went to New York City as a proof reader (at which he had great skill) in the summer of 1887. But soon he received an invitation from George W. Tryon, Jr. (1838–1888; P.1888: 399, with portrait) and visited Philadelphia on Thanksgiving Day. On December 1st, 6 days before his 25th birthday, Harry was installed as Tryon's assistant at the Academy of Natural Sciences, probably on the Jessup Fund.[4] Apparently he might have received up to twenty dollars a month until he became a member (P.1892:505) about 12 weeks later (P.1888:83). Tryon had died quite suddenly on February 5th, 1888, but bequeathed enough to continue his work.

Henry A. Pilsbry succeeded Tryon as Conservator of the Conchological Section (P.1888:447) and as Editor of the "Manual of Conchology" (P:405–406). For some years afterwards, the expenses of the Manual and most of young Pilsbry's livelihood came from the sale of this and other publications. Necessity partially explained his production of 8 parts (2 full volumes) in 1889, 1890 and 1892, and 6 in 1891 (the year after his marriage), 1893 and 1895. He wrote out the text longhand, made many of the plates on lithographic stone, which meant that he drew them as mirror images, and showed the tints for the colored and fine editions, which were hand painted (as piece

[3] Reference to his "Scientific contributions" (1940, 1); see article on later page.

[4] As Dr. Pilsbry told John Dyas Parker.

work) by Philadelphia ladies[5] in their homes. He also began the NAUTILUS in 1889 (see "The Pilsbry Nautilus").

Frank C. Baker (1867–1942; N.56:33, 97–99 & 98–pl.) assisted him in curatorial work during 1889 (P:434) and 1890 (P:483), and Mrs. Pilsbry in 1891 (P:499). The American Association of Conchologists was organized to assist the Section in 1890 (P:482; N.3:140–143) but this promising society apparently broke down during the "hard times" around 1893 (N.7:83; 10:94). Charles W. Johnson (1863–1932; N.46:37, 73–pl. & 129), who became Pilsbry's partner in the NAUTILUS in 1890, John H. Campbell (1847–1897; N.10:116), its president, and John Ford (1827–1910; N.23:121–pl. & 126) also were members. Sherwood R. Roberts (1845–1928; N.42:37–pl. & 60), who was one of the founders (1866) of the Section, continued as Treasurer of it and the Manual until his death. Henry was to outlive all these friends and colleagues of his youth, and sadly to write or edit their obituaries.

Even with this curatorial help, young Pilsbry undoubtedly worked long days and into the night in order to accomplish so much, and one wonders that he did not exhaust all his energies in the details of compilation and administrative work. Nevertheless, he must have been thinking inductively all the while, because he finished, at the age of 32 (1895, 3), his "Guide to the study of helices," the most brilliantly original, iconoclastic book that ever has been written about land snails. Of course, their nomenclature (this was 8 years before the type species "rule") and their systematics (with additions of new data) have changed much since then, but this volume pointed the way to all good, subsequent studies. And in the same year, he completed his new classification of the chitons (1895, 2) and published his treatise on Japanese marines (1895, 18) collected by Frederick Stearns (1832–1907; N.21:83), in addition to 24 shorter contributions.

Promptly afterward, April 2, 1895 (P:211), he was elected a Curator[6] of the Academy (one of four) and made Professor

[5] For many years, these included Mrs. Pilsbry's sister, Mary Elizabeth Avery.—Elizabeth Pilsbry (in letter).

[6] Like George Tryon was from 1869 to July 18, 1876 (P:143). Pilsbry replaced Dr. W. S. W. Ruschenberger (1807–1895; N.9:31) who, as Director of the Conchological Section during the interim, had headed the list of

of Malacology (P:563 & 586), which meant he gave evening lectures; and was given Edward G. Vanatta (1876–1939; N. 52:139)[7] for "student" on the Jessup Fund (P:577). The Academy building (1876) was completed in 1894 (P:467) and opened to the public in 1896 (P:577; P.1901:711–pl. A). Dr. Pilsbry became Curator of Mollusca in 1901 (P:771). The Department of Mollusks was established in 1903, with him, at 40, as its Special Curator (N.17, no. 1, front cover; P.1904:847), and with Miss Winchester as the artist of the Manual (vol. 16:311). It became the "Department of Invertebrate Zoology (exclusive of Insects)" in 1919 (P:316).

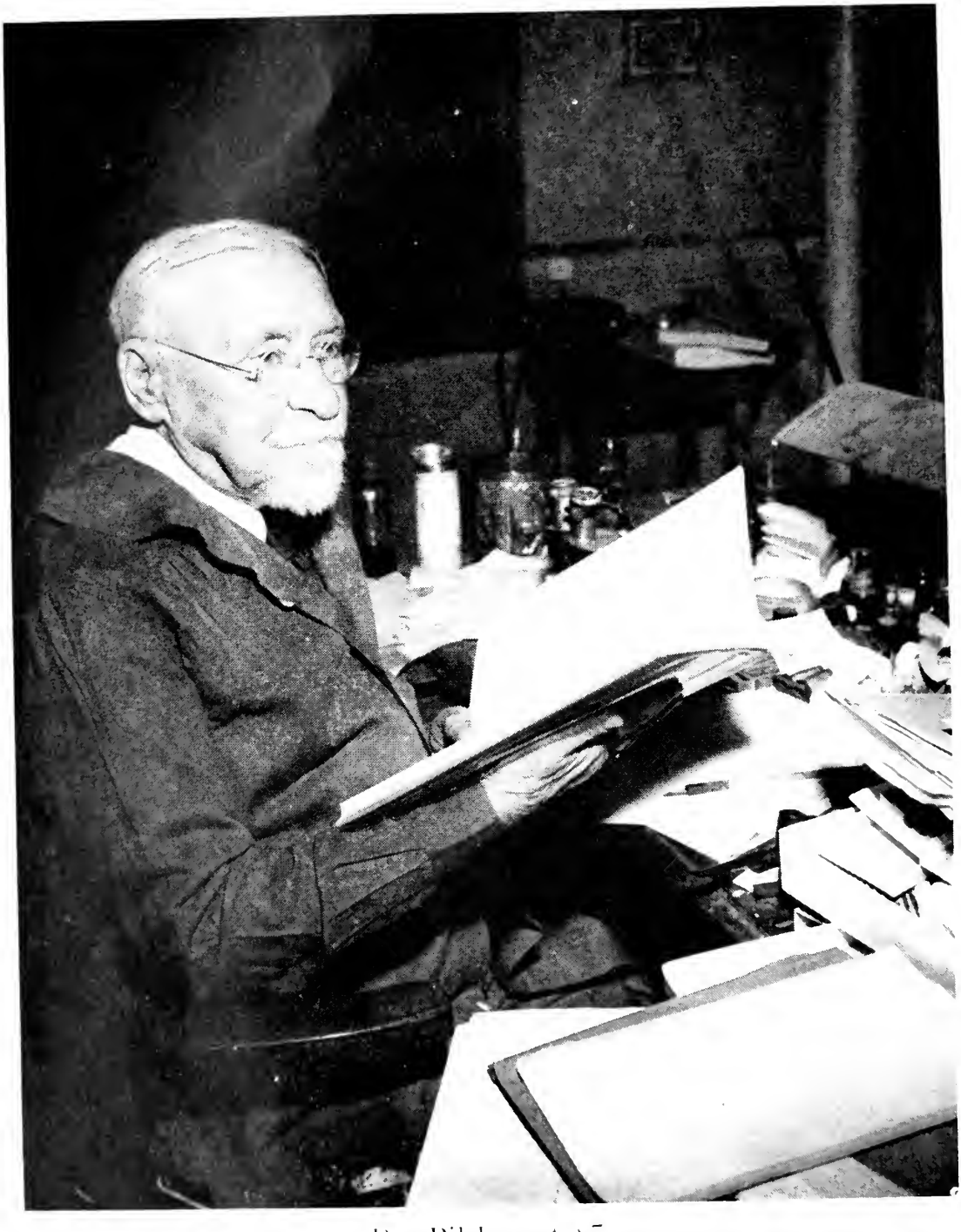
In his room (Plate 6) at the top floor of the Academy, he was untiring in his mental exertion. Impatient for results, he seldomed bothered with complicated techniques, although he was an expert draftsman. In 1920, when Dr. Pilsbry was 57, his only compound microscope was so ancient that Dr. Cooke, Vanatta and I could see little through its clouded lenses. He did not use a dissecting binocular until considerably later. Habitually, his large desk (Pl.7)[8] was piled high with opened reference books, manuscripts, bottles of preserved animals, trays of shells, and the stone ash-receptacle for his warm pipes. But his memory was so good in his prime that he could pull out any one of them almost immediately, although this was one of the few abilities he lost as he grew older. He never was happy in his work unless he had everything within arm's reach, and nearly would explode if anybody "disordered" what looked like a clutter. When busy, his powers of concentration were exceptional; one soon learned that about 10 minutes was enough conversation; after that, between puffs, he might answer "Yes" or "No" but he really was not listening.

its officers (with the Conservator last) until 1891. Dr. Benjamin Sharp (1858–1915) also was "Director," at least from 1896 (P:582) through 1899 (P:543).

[7] Birth date May 2, 1876, from his certificate of death (Jan. 19). His birthplace was given as Pa. and his father's name as George V., by his wife, Emma Greenwood V. He was still Assistant Curator at the Academy ["of Fine Arts" (sic)]. Unfortunately, he left no descendants, for he was a fine and able man.

[8] He was admiring, at 87, a presentation copy from the Emperor of Japan. A story, perhaps mythical, claimed that the first question asked General MacArthur was: "How is Dr. Pilsbry."

Dr. Pilsbry in his prime
Between 1900 and 1910.



Dr. Pilsbry at 87

(Photo by *Philadelphia Inquirer*)

Primarily interested in research, his collecting instinct was so highly developed that at times he seemed almost a little miserly. He was not interested especially in the exchange of shells, but was extremely successful when he freely traded his brains and prestige for additions to the Academy collections. Particularly noteworthy, as regards inland mollusks, were his joint papers on those from: Japan and adjacent regions with Yoichiro Hirase (1859–1925; N.39:67). Central and southwestern United States with James H. Ferriss (1849–1926; N.40:1 & 1–pl.). Mexico and middle America with Anson A. Hinkley (1857–1920; N. 34:55 & 37–pl.) and Herbert N. Lowe (1880–1936; N.50:28, 64). Jamaica and other West Indies with Dr. Amos P. Brown (1864–1917). Pacific islands with Dr. Charles Montague Cooke, Jr. (1874–1948; N.63:33). Africa with Dr. Joseph C. Bequaert. As will be noted, he outlived most of his best friends and students.

Although modest in his relations with others, he was completely self-confident in his research; he knew that his inductive reasoning and his taxonomic intuition were better than most. Perhaps for this reason, his worst papers (and actions) were those printed in haste when he learned that another was studying the same or similar material (e.g., 1934, 12). At least during his prime, he would not put his name on a scientific paper about mollusks unless he did most of the work and all the editing. For example, Dr. Cooke, whom Pilsbry always considered the finest gentleman he ever had known, used to be fond of stating, with high modesty, that he never saw the manuscripts of some of their joint papers on Pacific pupilloids, although of course "Montague" contributed, all sorted into species and genera, most of the material. Except in his youth, about the only paper on snails of which Pilsbry was the junior author was that (1902, 24) with Bryant Walker (1856–1936; N.50:28, 59 & 37–pl.).

One of the best characteristics of Dr. Pilsbry was his ready agreement, and in fact delight in alterations of his earlier classifications, if these were based on discoveries of new data. He was well aware that the natural content of taxonomic groups must change, or at least develop when more was learned about them. In his prime, he was conservative about the artificial sizes of taxons (species, genera, etc.), but became relatively less critical of "splitting" during his last decade. On the other hand,

although he readily brought his own names up to date, he was irked by nomenclatural changes, usually due to alteration of the "rules" during his long lifetime. Very rarely, when "in a Puckish mood," did he wield his prestige to establish dubious cognomens; thus he argued against the use of *Mesomphix* instead of *Haplotrema,* but contrarily replaced *Planorbina guadaloupensis* by (*Biomphalaria*) *Australorbis glabrata* (1934, 7). And, he positively was pained by the exposure of occasional real errors, such as those caused by faulty optics (inadequate microscopes or, when he grew oldest, his own tired eyes). Because his feelings would have been hurt, although he would have published a correction immediately, no one ever told him that figures 274G (1946, 11) and 413C (1948, 0) were actually one drawing, which only represented the *Succinea.*

In the field, on his "vacations" from mental strain, Henry became the traditional U.S. farm boy, who never disdained, and in fact enjoyed hard physical labor. Chasing snails may seem like a sedentary occupation to some, but not to him who has tramped for miles, forced his way through jungles (with or without malaria), climbed arid mountains in the blazing sun, and handled tons of talus, in order to search out living animals [9] in their hidden habitats.

When 23 years old, his first long trip (1937, 13) was to New Braunfels, Texas, before September, 1886 (see Conch. Ex. 1:3rd p. of no. 3), probably by the way of New Orleans (1886, 3). He especially liked to reminisce about the 1899 expedition to the Great Smokies (N.14:49) with George H. Clapp (1858–1949; N.62:143), Ferriss, H. E. Sargent and Walker. He also collected with Ferriss on memorable trips from the Ozarks to Texas in 1903 (P:813; N.16:143) and in the southwestern mountains (Arizona and/or New Mexico and Texas) in 1906 (N.20:84; 21:134), in 1910 (N.24:84) also with Lorenzo E. Daniels (1852–1918, N.32:99, 108–pl.) and in 1913 (N.29:60). He visited Cuba in 1904 (P:845; N.26:125), in 1928 with Dr. d'Alté Welch (1929, 2), in 1938 with the A. M. U. (N.52:66–72) and briefly at other times. Good collecting with "Montague" in the Hawaiian Islands was enjoyed in 1913 (P:702; N.26:108), in 1923

[9] Always important, but especially so in the West Indies, where locality records based on "crab" shells are almost worthless.

on the trip to Australia (N.37:36) and in 1933 (N.47:76). During the excursion to Australia, he worked in Queensland and on the Great Barrier Reef (1925, 1).

He reached his 67th birthday on a cruise of the "Mary Pinchot" with the Hon. Gifford Pinchot (1865–1946), and visited Grand Cayman, Swan, Old Providence and St. Andrews Islands in the Caribbean (1930, 6), Panama (1930, 12) and Cocos, Galapagos and Marquesas islands in the Pacific, during 1929–1930 (N.42:143; 43:37). With Dr. Francis W. Pennell (1886–1952), he collected extensively through northwestern Mexico, where he was very ill with malaria at 70, in 1934 (N.48:33) and 1935 (N.49:34). They worked especially from Nuevo Leon and San Luis Potosí to the Pacific.

Between the ages of 31 and almost 95, he went to Florida many times: in 1894 (P:473) with Charles W. Johnson, in 1899 (P:543), in 1904 (P:845), and during almost every winter from 1936 (N.50:141) to 1957. He spent many happy months (Pl. 7) on trips from his winter home in Lantana, where he collected especially with Paul P. McGinty (1877–1956; N.70:105), Paul L. and "Tom," except when he was visiting the Barcrofts. Of course, these visits meant that he was "chasing" snails: in Guatemala during 1945–1946 (N.59:105) and 1956–1957, in the Peruvian mountains in 1948 (N.61:144) with Axel A. Olsson, and around Argentina in 1949–1950 (N.63:108). On shorter "vacations," he also collected, by bicycle and auto, in Pennsylvania, Maryland and New Jersey, in New York, especially on Lake Champlain, and briefly in many other states. Again, he outlived so many of his favored companions!

Throughout his life, Henry Pilsbry's most outstanding scientific contributions were his researches on land snails, and he was known internationally as the pre-eminent authority on Pulmonata. At the age of 10 or 11 (1937, 13), his first mollusk was naturally the geophile *Pupoides,* and his first paper (1882) was on Iowan inland species. His companions in Philadelphia, when he was 27, recognized that his field was "Land and Fresh Water Shells generally" (N.3:142). In the "Manual of conchology," series 2, he revised most of the shell-bearing groups, beginning with July 1, 1888 (2), when he started on the helicoids (vols. 4, p. 120 to 9, and parts of 13 & 14), which always remained his

favorites.[10] After the Academy had absorbed the Manual, it ceased abruptly with the pupilloids (vols. 21–28) on Nov. 7, 1935 (9), when after all he was only 72. He did omit the Enidae and the Clausiliidae, because he thought his European material insufficient, the limacoids and other groups in Tryon's volumes 1 and 2, and the Heterurethra. Also, often with the help of Vanatta, he worked on many slugs, and always was searching for genera with reduced shells in every family (1900, 12). From the times of his "A descriptive classified catalogue of American land snails" (1897, 13), which he began at 34, he always was looking forward to, and accumulating data and notes for his culminating work on "Land Mollusca of North America (North of Mexico)" (1939, 11 & 1946, 11), which he finished 51 years later, at the age of 85.

However, he was almost equally at home in any group of mollusks; but he accented the living ones, and seldom went back beyond the more recognizable fossils since the Cretaceous (see other appreciations in this number). In addition to all this, he became the leading authority, since Charles Darwin, on the Cirripedia or barnacles, and between the ages of 28 (1890, 29) and 90 (1953, 7) published at least 25 papers on this crustacean group. Also when 28, under the seniority of William H. Dall (1845–1927, N.29:1–pl.; N.41:1), he contributed a little about brachiopods (1891, 13 & 16); and even invaded the echinoderms when he was 51 (1914, 2). Above all, he was a zoölogist of wide ranging knowledge and continuous curiosity.

He always was interested in zoögeography, remained for much of his life a staunch advocate of "land bridges" (1900, 39, et al.), but later did recognize also the sporadic effects of adventitious dispersal. He never did think much of Wegener's revival of "continental float" nor of Simroth's "wandering of the poles." Like many taxonomists, he was weak in ecology. But, he was much concerned with behavior, especially locomotion, and this affected thoroughly, but perhaps too enthusiastically, his classifications.

Edward G. Vanatta worked with him for over 40 years, until bedridden by atrophic arthritis in 1937. Although often they seemed almost antagonistic in their personal relations, Vanatta

[10] Perhaps this was partly why he preferred the descending order of taxonomic groups, and always put the helices at the top.

and Pilsbry were nearly perfect complements of each other. Vanatta was a veritable storehouse of technical knowledge, perhaps the better dissector, and the more patient teacher. Vanatta was the one who examined and took notes on the weekly Academy displays of new books and periodicals, classified them and tied the pieces of paper in bits of string and then fetched the packages when Pilsbry started on a new problem, and who also sorted out and brought up the recent publications of most interest. Somewhat phlegmatic in temperament, Vanatta always bore, with somewhat exasperating calm, the fiery, but brief outbursts of Pilsbry's tempers. When Pilsbry was studying any particular group, he knew more about its species than anyone ever had, but Vanatta was the man to go to when you wanted a fairly close, quick identification of any shell whatsoever. The "Professor" added to the collections, but his "Student" kept them. Vanatta contributed greatly to Pilsbry's greatness, and the master missed his helper pitifully all those later years, and often seemed lost (as were things) without him.

Helen Winchester (Mrs. John E. Gapp) was Dr. Pilsbry's principal artist (P.1912:558) from 1903 to around 1950, and illustrated with superb skill, mainly in dry-point "wash," many volumes of the Manual and of his other papers. She learned with him how to use a color spray, and made the exquisite plates for the quarto monograph on New York inland mollusks, which was finished in 1925 (N.39:30) after 7 years of work, but which perhaps was their greatest disappointment, because the State Museum [11] failed to publish it. Such fine reproductions of iridescent, unione nacre never have been printed. A few of the anatomic figures were included in his "Land Mollusca of North America," but those on fresh water species anticipated studies which have appeared since that time, by himself and others.

For at least two decades after 1913 (P:703), Caroline Ziegler assisted along with Vanatta, who was succeeded by Richard A. McLean, Mrs. Charles R. Locklin (daughter of Mrs. May O. McGowan, at whose home in Morton, Pennsylvania, Dr. Pilsbry lived during his last summers) and John Dyas Parker. J. Elizabeth Letson (Mrs. Bryan; 1874–1919; N.32:142) apparently helped voluntarily in curatorial work around 1897 (P:547) as

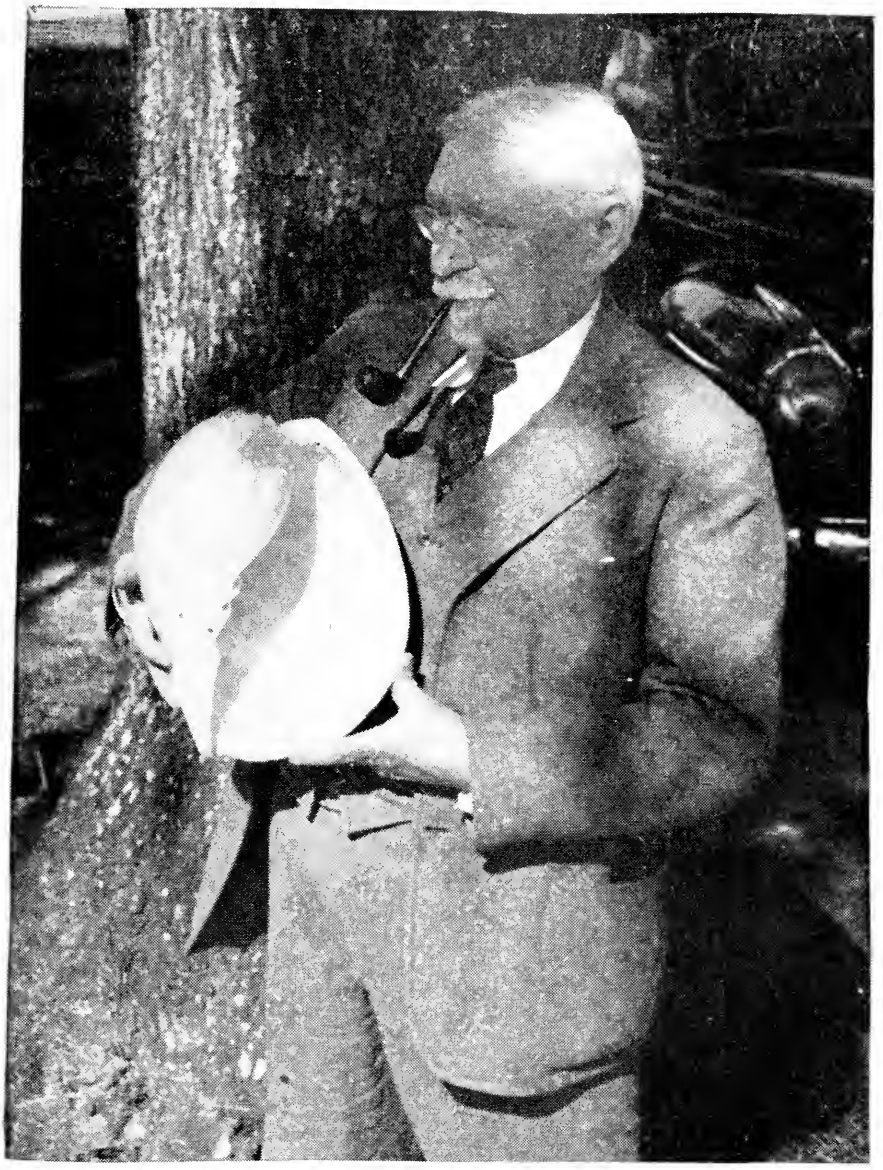
[11] On his last visit, Dr. John M. Clarke (1857–1925; N.39:28), who sponsored it, remarked: "You know, Dr. Pilsbry, this book can't be published in Heaven."—H. W. Gapp, in letter.

did Mrs. Lincoln W. Riddle, Charles B. Wurtz and others in later years.

Degrees of doctor of science were conferred on Henry A. Pilsbry by the University of Iowa in 1899 (when he was 36), by the University of Pennsylvania in 1940, and by Temple University in 1941. Dr. Pilsbry received the Joseph Leidy Memorial Award (and Medal) in March, 1928 (Science 67:311). He was Consulting Malacologist of the Bernice P. Bishop Museum in Honolulu, and Lecturer in Zoölogy at the University of Pennsylvania. After 1906, he was Foreign Corresponding Member of the Academia de Ciencias de Madrid, from 1918, Honorary Foreign Correspondent of the Zoölogical Survey of India and, after 1919, Corresponding Member of the Zoölogical Society of London. He was an Honorary Member of the Conchological Society of Great Britain and Ireland, the Birmingham Natural History and Philosophical Society, the Société Royale zoologique de Belgique, the Senckenbergische naturforschende Gesellschaft, the California Academy of Sciences (1932), the Sociedad de historia natural "Felipe Poey," the Sociedad Malacológica "Carlos de la Torre" and the Sociedad Geológica del Peru. He also was a Fellow (1921) of the American Academy of Arts and Sciences (Boston), and a member of the Malacological Society of London, Sigma Xi (Univ. Pa., 1922), the American Society of Naturalists and the American Association for Advancement of Science.

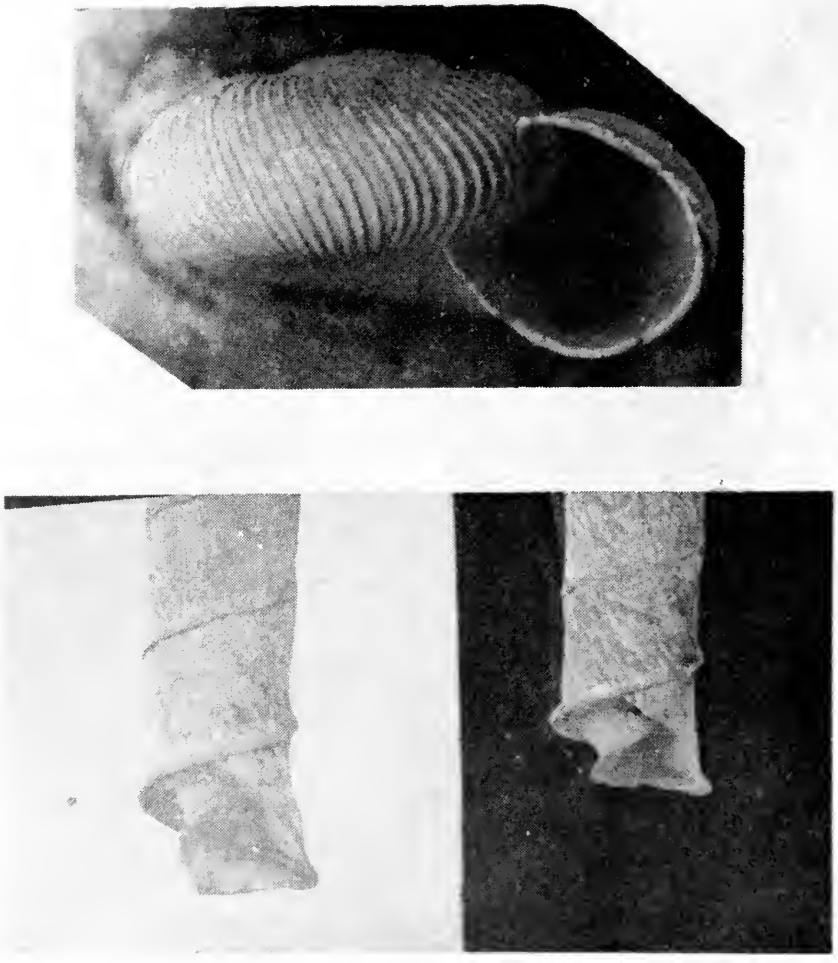
Dr. Henry A. Pilsbry (at 44) was the first president of the American Conchological Society (N.21:94) in 1907, and attended a "Washington meeting" at which another organization was considered in 1914 (N.31:37–pl., which shows him at 51). On April 30, 1931, he became first president of the American Malacological Union (N.45:1 & 1–pl., at 68) and attended most of its meetings including the 23rd (July, 1957) as a council member and Honorary President (1936, N.50:36). September 22, 1955, he was elected Honorary Life President at the first meeting of the Philadelphia Shell Club (Proc. do. 1:15); may it long flourish under the able leadership of Dr. R. Tucker Abbott, of the Henry A. Pilsbry Chair of Malacology (1955, N.68:104).

As he grew older, and lonelier, Dr. Pilsbry became more humanly lovable, was willing to spend time in chatting, and mellowed decidedly in his contacts with others. He very much enjoyed his birthday parties, given during his fifteen last De-



H. A. Pilsbry

Winter Park, Fla. Jan. 1942.



Upper fig., an endodontid. Lower 2 figs., *Rhodea barcrofti* Pilsbry; type at left.

cembers by Anne Harbison and Jeanne S. Schwengel. Also, he spent relatively more time on marine shells, perhaps partly as a relief from his two volumes (really 4) on "Land Mollusca of North America" (1939–1948) but probably more because he always recognized the popular trend. He did grow deafer and perhaps his memories of recent happenings did become a little weaker, although this last was worst just after his bout with malaria, twenty-five years ago, and from which he recovered with remarkable resilience. Physically he slowed down but, as late as 1949 (at 86), he remarked: "Burrington, I must be getting a little older; when at high altitudes in the Andes, a climb of more than a thousand feet at a time got me out of breath!" In any case, his enthusiasm and research drive never were impaired; he corrected proof (1957, 7) in the hospital after his next-to-last blood clot, and critically discussed another manuscript (see p. 116), on which he was working.

Thus, Dr. Pilsbry outlived all his generation of conchologists and companions. For at least half a century, his was the dominating inspiration in the field of malacology, primarily in Pulmonata, but his effect was great on most groups of mollusks.

Compilations are out of date before they are published, but the increments of new data and ideas are eternal. And so, Henry Pilsbry is not dead! He still is alive in the memories of his youngest friends and colleagues, and will live on forever in his ramifying influence throughout the world. Although none of us can hope to equal his contributions, we all together may try to fill in some of the gaps he has left.—H. B. B.

A COLOMBIAN SPECIES OF THE GENUS RHODEA

By H. A. PILSBRY

Rhodea H. & A. Adams is a rather remarkable genus of few species, confined to Ecuador and Colombia. The etymology of the name was not given by its authors, and remains dubious. It is probably a senseless made-up term, since the Greek words suggested by the spelling do not seem pertinent.

RHODEA BARCROFTI **new species.** Pl. 8, lower figs.

The shell is dextral, cylindric, the apical fourth tapering to a rather obtuse summit. The tapering whorls are moderately convex; the last five whorls are flat, the last whorl with a pro-

jecting peripheral keel, concave above it and deeply concave at the base. Sculpture of close, strongly oblique, straight, fine striae, remaining distinct on the last few whorls only.

The aperture is strongly oblique, subtriangular, the basal margin straight, outer margin curved slightly forward, inner margin formed of a strong spiral callous ridge, truncate at the columellar base and spirally ascending the axis within, coiling around a small but distinct central cavity which viewed from the base forms a sort of false umbilicus.

Length 25 mm., diameter in middle 4 mm.; 10½ whorls. Type.
Length 22 mm., diameter in middle 3.7 mm.

Colombia; Monteredondo, kilom. 73 on the road from Bogotá to Villavicencio at 1700 meters elevation. Type and another figured specimen No. 211335 ANSP.

By its cylindric shape and prominent keel, this snail appears related to *R. wallisiana* Dohrn, described from the "upper Magdalena region" without more definite locality; but that species differs by its sinistral coil and larger size (length 34 to 36 mm., diameter in middle 5 to 6 mm.).

The smaller specimen shown in the right hand photograph differs by having one whorl more than the type. It came in a different lot, probably from a different locality.

It is named for Mr. Frederick J. Barcroft, of the American Embassy, in Bogotá at that time, who obtained it from the Colombian collector F. Medem.

DR. PILSBRY AND FRESH-WATER MOLLUSCA

Dr. H. A. Pilsbry published continuously for 75 years. Although his major comprehensive works were in the field of land snails, he had an early interest in the fresh-water Mollusca that never was lost. He collected and wrote about these animals from the very beginning of his career. His first publication was a privately printed leaflet published in Iowa City (1882). In the introduction to this, Pilsbry expressed a desire to exchange for mollusks, and particularly for land and fresh-water shells. In the "Conchologist's Exchange," while in Davenport, he carried an exchange advertisement requesting fresh-water shells specifically.

A perceptive analytical mind coupled with lucid expressiveness was always characteristic of the immense volume of work

published by Pilsbry. He was a master of incisive description. His appreciation of the historic development of malacology, and his interest in geography and its influences, were always reflected in his studies.

A critical awareness of the dictum of constancy in specific characters, and a keen appreciation of the variability found in many species, is readily apparent in Pilsbry's publications. Perhaps no genus of fresh-water snails contains species more difficult of apprehension than does *Physa*. Pilsbry, of course, realized this, and his perceptiveness of the fundamental reasons underlying these difficulties was expressed more than sixty years ago. In a paper on Mexican Mollusca (1891, 24), he discussed the environmental influence on these plastic snails. The absence of varices correlated with the slighter seasonal changes and the absence of periodicity in growth is brought forth in this work. Of particular interest is his discussion of the dilation of the body whorl. He said (p. 324), "I would suggest that the form in these cases is correlated with an increase in the capacity of the air sack or lung, which occupies that part of the shell. . . . It is not unlikely the result of a more continuous or prolonged subaquatic residence." This phenomenon appears to have been "discovered" about once a decade since then.

The same article contains an excellent example of his ability to review bluntly a piece of work he considered inadequate. Of C. F. Ancey's monograph on *Pyrgulopsis,* Pilsbry (p. 329) said, "This paper shows in a high degree the futility of writing about things an author knows nothing about." However, Pilsbry also had a flair for finding the facile expression that could so pleasantly temper his criticisms. This is evident, for example, in a later work of his on Mexican mollusks (1904, 2) where, in speaking of *Physa osculans patzcuarensis,* he calls attention to Strebel's earlier description of the form, and comments (p.778), "He used a preoccupied name which laid in ambush in a dense thicket of text."

The most satisfying works to the taxonomist are those comprehensive works that consider all the known species of a phylogenetic group or of a geographic area. This kind of study also provides the most useful tool for those who are applying the facts of that science in other fields of biology. Pilsbry was especially able at such presentations, and a review of his bibliography re-

veals how productive he was of these very useful treatises as regards the fresh-water mollusks.

The largest treatise Pilsbry published on fresh-water mollusks was co-authored with Dr. Joseph Bequaert. The work was a monograph on the aquatic mollusks of the Belgian Congo (1927, 15) and was the companion volume to his land mollusk volume of that region. This is a masterful treatment that reflects the thoughtful research and congenial cooperation so characteristic of Pilsbry.

The methodology of Pilsbry in the study of the Mollusca has been appreciated by every scientific worker in the field. This appreciation is recognized by statements such as that made by F. C. Baker in the preface to his 1945 monograph on the Planorbidae, "... the terrestrial pulmonates ... have been brought to a high state of precise classification from the anatomical studies of Dr. Henry A. Pilsbry. ..." The fundamental value of this anatomical approach to classification and its application by other scientists is reflected in Baker's further statement, "The study of the internal organization of the family Planorbidae has shown that, as in the case of the land snails, the anatomy gives the only true key to a natural classification." Surely Pilsbry must be credited with establishing the foundations for the modern classification of both the land and fresh-water gastropods. F. C. Baker recognized the value of Pilsbry's contribution nearly fifty years ago when he dedicated his 1911 monograph on the Lymnaeidae to Pilsbry in grateful recognition of his "helpful advice."

The pressure of constant researches, often conducted concurrently on unrelated materials, necessarily resulted in occasional lapses. Pilsbry was always the first to correct his mistakes or apologize for a hasty act. For example, S. N. Rhoads published on the shells from the vicinity of Miami (N.13:43–48, 1899). Pilsbry made all the identifications for this paper, including (p.48) an MS name, *Physa heterostropha peninsulae*. This, of course, was a *nomen nudum* as used. In a later number (1899, 31), Pilsbry calls attention to this MS name, and points out that the specimens were actually *Physa cubensis* Pfr. And again, in a note on Unionidae and Mutelidae (1893, 12), he corrects an error in a paper previously published by Ihering in the NAUTILUS. At the same time, he appended a footnote apology:

"The Editor fears that these errors may have been due to his own hasty proof-reading, rather than to defects in the original MS."

Pilsbry one time wrote (1917, 1), "Rafinesque has the reputation of having been a misunderstood and neglected genius. It is lucky that we had few such geniuses. One or two others would have practically scrapped the nomenclature of our fresh-water shells." This pithy comment was a prelude to a discussion of certain of Rafinesque's genera of fresh-water shells.

But Rafinesque was the cause of one of the soundest policies for taxonomists; though it is rarely practised. This came about through the efforts of two outstanding workers in the field of fresh-water mollusks: Dr. Arnold E. Ortmann (1863–1927; N. 40:109) and Bryant Walker. These gentlemen were long-time correspondents and colleagues of Pilsbry. Both were deeply interested in the Unionidae, and, at one time, undertook to stabilize the nomenclature of this family (1922, 5a). The most controversial facet of their problem was the many species Rafinesque so inadequately described. Their introduction included this statement, "At the inception of the work it was agreed by the authors that their conclusions should be submitted to Dr. H. A. Pilsbry for his criticism and that in all cases where they were unable to agree his decision should be final and accepted by the authors." No statement can better demonstrate Pilsbry's stature in the field of fresh-water mollusks. In effect, this paper contains the unanimous opinion of three men who sat as a court to resolve objectively some troublesome problems. Dr. W. J. Clench (N.43:69–70, 1929) discussed the value of such a policy and reflected the opinion of every objective worker in his commendation of it. With this cooperative example before us the time well may come when other problems of limited extent will be resolved by similar joint action of a few competent authorities.

But now the greatest authority will no longer participate. —Charles B. Wurtz.

DR. H. A. PILSBRY IN MARINE MALACOLOGY

Malacology may be divided into several fields, that of the marines being the most colorful, and with the greatest diversity

in size and shape. Dr. Pilsbry's interest in shells, land and fresh water, began early in his youth, in Iowa, with collecting whenever and wherever he found the time. With his characteristic curiosity and thoroughness, he became more and more interested as his collecting progressed. Desiring to know more about his findings, he spent as much time as possible on his shells.

In 1887, George W. Tryon, Jr., Conservator of the Conchological Section at the Academy of Natural Sciences of Philadelphia, noting the interest of young Pilsbry, invited him to the Academy, and suggested that he give up his newspaper work and devote his time to the field in which he showed such interest and promise. A few days before Pilsbry's 25th birthday, he accepted Tryon's offer and became a member of the Academy staff. When Tryon died, about two months later, Pilsbry fell heir to his position as Conservator.

Previously Henry Pilsbry's whole interest had been in land and fresh water shells, but since his predecessor already had completed nine volumes of the Manual of Conchology, Marine Series, and about 160 pages of volume 10, he felt that he should complete the work, and with thoroughness and extreme interest began his first studies on marine malacology with the "Monographs of the Turbinidae and Trochidae." His inscription on volume 10 (1888, 3) of my copy reads, without further comment: "This volume contains my first work in systematic malacology. H. A. Pilsbry." But, the inscription on volume 11 (1889, 1) reads: "This is the first complete volume I wrote. I spent at least a year of my lost youth over it, and was very proud of what I had done. Alas! when I learned enough to see its faults, my pride evaporated.—H. A. Pilsbry."

Such modesty and humility in the man were astonishing. With no previous experience, by March, 1890, when only 27, he had amassed a volume of 519 pages and 67 pages of illustrations, which was comparable to the best works by scientists of vastly more experience and knowledge of the subject; and, in many ways, his was much more thoroughly and competently done. In the next four years, he completed four more volumes of the Manual, and in four more years finished the last two volumes, which ended, on his 36th birthday, the 17 volumes of the Manual of Conchology, Marine Series, the *bible* of professionals and amateurs.

In 1900, in recognition of his intense interest and colossal accomplishments in the fields of malacology, he was given the well-deserved degree of Doctor of Science by the State University of Iowa. From then on, his work was constant; and his publications of untold value to the collector and student, both in the field of marine mollusks and other subjects malacological. For those who knew him, his going is a great loss, though future years will be filled with pleasant and enjoyable memories. Those who never knew him personally have our deepest sympathy. —JEANNE S. SCHWENGEL.

PILSBRY ON FOSSIL AND MARINE MOLLUSCA

Dr. Pilsbry's broad interest in mollusks, like that of Dall, led him naturally to the study of Tertiary forms, generally in collaboration with other authors; thus he carried on the tradition set by other members of the Academy, such as Say, Conrad and Gabb.

For many years, the occurrence of beautifully preserved, Tertiary fossils in the Caribbean region had become known through the work of European authors, who regarded the age of these fossiliferous formations as Miocene, correlated them directly with the European section. The age assignment of these Caribbean horizons had been changed to Oligocene by Dall, the principal Tertiary authority in America at that time. Pilsbry followed Dall in this assignment although later studies have reaffirmed their true Miocene age.

Pilsbry's first papers on Caribbean paleontology began with two articles on the Panama Canal Zone with Amos P. Brown (1911, 8 & 1913, 1). These fossils had been collected by Brown from dumps and fills resulting from the excavations for the Gatun locks. They listed about 136 species of which nearly half were described as new, the entire fauna being well illustrated. The close relationship and age of the Isthmian fauna with that of Bowden, Jamaica and Santo Domingo were noted. They also called attention to the frequency of many characteristically Panamic (Pacific) genera (*Cymia, Malea, Tesseracme,* etc.) in the Antillean-Isthmian Miocene, now all absent or very rare in the curiously impoverished, littoral Antillean fauna of the

present time. These two papers have remained the principal contributions to the paleontology of the Gatun Miocene, although some additions have been made to its fauna since.

Along with these studies on the Canal Zone, Pilsbry, together with C. W. Johnson, had for some time been engaged in a revision of the collection of Miocene mollusks from Santo Domingo, which had been obtained by William M. Gabb during geological investigations in the years 1869–71. Gabb, following the earlier paleontologists, assigned these deposits to the Miocene. Whether through the loss or the lack of field labels, no locality records existed for any part of this great collection, although practically all now is known to have come from the north side of the island, or from beds exposed in the gorges of the upper Rio Yaque del Norte, or from its tributary streams, such as the Mao, Gurabo and Cana to the west. Gabb had done some preliminary work on the material, and described many new species, none of which had been figured, but his publications showed much evidence of haste. In revisional studies, Pilsbry and Johnson differentiated many additional new species, and described these in a preliminary paper (1917, 10). After Johnson's transfer to Boston, the final studies devolved upon Pilsbry alone. In his final paper (1922, 1), much more detailed and fully illustrated, Gabb's types were figured and their dimensions accurately stated for the first time, besides the new species described in 1917. Pilsbry's work on these Santo Domingan fossils is a major contribution to Antillean geology, and because of its and the stratigraphic results of the Maury expedition in 1917, the Miocene of northern Santo Domingo may be selected as the type for the whole of the Antillean region. Two smaller papers on this region were that in collaboration with B. Sharp on the Scaphopoda from Jamaica and Costa Rica (1911, 4) and another with Brown on Miocene fossils from Colombia and Haiti (1917, 4).

Two important papers formed Pilsbry's main contribution to fossil fresh-water mollusks. The first dealt with material from the Pliocene beds of the Kettleman Hills and neighboring oil fields in California (1935, 2). Pilsbry's chief incentive in his studies was its intrinsic interest as representing the largest Pliocene fresh-water molluscan fauna yet found on the Pacific slope. Largely made up of Amnicolidae, it consisted of about 23 species or subspecies belonging to 7 genera, of which 2 are

extinct. This fossil assemblage differed conspicuously from the living fauna of middle California by the lack of Lymnaeidae, Ancylidae and the larger Planorbidae, old but living groups which are widespread in America today. He concluded that these Pliocene beds had been laid down in a lake of considerable size because the development of so rich a molluscan population would be unlikely in a small one.

Oil geologists, exploring along the valley of the Rio Magdalena in Colombia, had come across fresh-water fossils at several places, but paid comparatively little attention to them at first. Eventually these fossils were recognized as occurring only at certain, fixed stratigraphic horizons, which could be used as key beds to map and unravel complex geologic structure and as marker horizons in drilling operations. Attention to the collecting of these fossils increased, and an assemblage of the more important species made by A. A. Olsson became the subject of a special paper by Pilsbry and him (1935, 4), which also contained an account of the stratigraphy by O. C. Wheeler. The fresh-water fossils came from three horizons. The oldest, named the Los Corros zone, was characterized by several large *Potamides* and a new genus (*Diplocyma*) which is nearest to forms from the Upper Eocene of Peru. These potamidids were associated with corbiculids (*Sogamosa*), suggestive of an estuarine or brackish environment, probably of Upper Eocene age. The two overlying horizons, named the Mugrosa and La Cira zones and considered Oligocene, contain a very different fauna, characterized by river melanids (such as *Hemisinus* of very modern aspect), *Potamopyrgus,* small naiades (*Triplodon* and *Diplodon*), *Mytilopsis, Ostomya* and small corbulids. The La Cira zone is the most extensively distributed elsewhere. Because of its importance, this paper and Wheeler's were translated into Spanish and republished (1941, 3a).

In 1944 (7) Pilsbry wrote a short paper on molluscan fossils from the Rio Pachitea in eastern Peru, which contained two lots: one (marine) from the Cretaceous and the other (non-marine) from the Tertiary. The Tertiary ones include some of the genera (but different species) of the La Cira zone, and the striking resemblance of the two faunas undoubtedly indicates that they are about equivalent in age. This contribution also was translated (1947, 3a).

In his later years, Pilsbry wrote several important papers on marine fossils, of both mollusks and barnacles. One (1941, 2), prepared in collaboration with Olsson, described a Pliocene mollusk fauna from Ecuador; it consisted of 237 species, of which 54% belong to forms still living. An unexpected member was a large *Cypraea,* of the *C. henekeni* group, characteristic of the Antillean Miocene and its first record from the Pacific slope and at such a high horizon.

Pilsbry's final work in paleontology was his report on the vitrinellids and fresh-water mollusks contained in the Fargo-Locklin collection from the Pliocene of St. Petersburg, Florida. His account of these fossils constituted the two final chapters (1953, 8) in the memoir on the Pliocene of southern Florida published in the monograph series of the Academy.

In addition to the fossil mollusks, Pilsbry contributed many papers on the fossil Cirripedia, his largest work (1953, 11) dealt with some Cretaceous and Tertiary forms from Peru and Ecuador and was prepared in collaboration with Olsson. The Cretaceous forms were scalpellids and represent 7 species distributed amongst 2 genera. The Tertiary ones were balanids from the Oligocene and Miocene. The balanid barnacles are often common in our later Tertiary rocks, but usually indeterminable unless the opercular valves are found attached to the cup or in close association with the separated valves.

Among living mollusks, outside the Pulmonata, Pilsbry worked most extensively on marine gastropods and chitons, and much less on bivalves. When he took over the "Manual," his predecessor Tryon had completed 9½ volumes of the marine series, which included the cephalopods. Tryon's extremely conservative views on their systematics aimed toward a reduction of the described species, which he deemed excessive, and so his volumes bear the impress of "lumping" and are useful mainly for their wealth of illustrations copied from the older iconographs. Pilsbry, in contrast, worked directly with the shells, studied the anatomy and radula when necessary, and hence was able to judge relationships more clearly. Although Pilsbry knew the literature intimately, he never was a name changer, for this end alone, but a research scientist, primarily interested in the animals themselves; and his work derived its lasting qualities largely from this distinction. Systems of classification and ideas of

nomenclature may change, but the fundamental basic data worked out by Pilsbry remain.

In 1891 (19) began the important volume devoted to the limpets or Docoglossa and, as noted in its introduction, the material studied included the collection of the U. S. National Museum as well as that of the Academy. From 1892 to 1895 (2), volumes 14 (1893, 11) and 15, on the Amphineura or chitons, appeared. Pilsbry raised the Amphineura to class rank in the mollusk phylum. He divided them into Polyplacophora, or chitons, and Aplacophora (solenogasters), which may not be mollusks. He subdivided the chitons proper into superfamilies, which he named Eoplacophora, Mesoplacophora, and Teleoplacophora. In the Eoplacophora, the rare Paleozoic forms belong to one family, Gryptochitonidae Pilsbry (1900, 18). Numerous Lepidopleuridae occurred in the Tertiary, and a form close to *Lepidopleurus* has been found in the Triassic of Germany (1901, 16). The Mesoplacophora are recent. The Teleoplacophora are the most advanced chitons. Pilsbry's work on the Amphineura will remain a classic and, although his classification has been modified somewhat by a few later students, its essentials remain largely unchanged.

The Scaphopoda and Aplacophora brought to completion the first series of the "Manual" about 20 years after its commencement. As in the chitons, Pilsbry's ideas on classification evolved during the course of study and were not presented fully until the end (1898, 28). A thorough review and illustration of all the living species of scaphopods then known were given, and a catalogue of fossil species was prepared with B. Sharp.

Outside of the "Manual," Pilsbry contributed numerous papers on marine mollusks from many parts of the world. Several on marine Japanese shells were written with Y. Hirase, for whom he named a lovely *Pleurotomaria*. In 1932 (12), Pilsbry and Lowe published their paper on west Mexican and Panamic shells, one of the most important contributions to this fauna ever produced, with its fine illustrations and detailed descriptions of many species, of which 121 were described as new.

In his later years, Pilsbry became interested in the vitrinellids and other small shells often placed with them. The true vitrinellids appear to be taenioglossate and allied to the rissoids, but other similar forms are rhipidiglossate, and several families of

distinct origin and lineage may be involved. Since *Vitrinella* C. B. Adams (1850) became the basis for Katherine Bush's (1897) Vitrinellidae, Pilsbry's first step was to obtain a loan of the Adams collection. Excellent drawings of Jamaican (1946, 1) and Panamic species were made by Helen Winchester, and eventually published. In close collaboration with Thomas P. McGinty, the Florida forms received attention first (1945, 7 to 1950, 2). The Pacific species also were studied and, in collaboration with Olsson, two fairly large papers on Panamic-Pacific species were published (1945, 12 & 1952, 5). This last fauna appeared much richer than the Caribbean, and comprised 137 known species.

The preceding review gives but a very incomplete picture of the vast amount of work accomplished by Pilsbry on marine mollusks, the hours of unremitting toil, careful identifications, searches of literature, etc. Few malacologists have done so much; none have done better.—Axel A. Olsson.

HENRY PILSBRY, ZOÖLOGIST AND MAN

In Pilsbry, the man and the zoölogist became so completely enmeshed and consolidated through the years that any attempted separation would do both violence. The same attributes that made him a great zoölogist made him an excellent man. Among them were: 1) a mind both plastic and retentive ("wax to receive and marble to retain"); 2) great capacity for industry and concentration; 3) skilled hands and clear eyes, as shown by his delicate dissections and finished, accurate drawings; and 4) complete honesty in thought and speech. Other qualities, belonging more to the man but not denied the zoölogist, were: good fellowship and cooperativeness, a soft and even voice, a good sense of humor and a love of adventure.

He was born potentially a zoölogist, but this remained nascent while the child on the Iowa farm absorbed the ways of Nature among the birds, bees and butterflies. He might have become an ornithologist or entomologist, but there were molluscan shells weathered or chipped from the Devonian rocks, and snails and mussels in the Iowa River to be gathered and treasured. He himself tells how at the age of 11, he first saw the little snail

Pupoides on an apple tree and wondered how it got there. This was the real beginning of his interest; the zoölogist in him fully awakened, and he wondered about snails and their distribution throughout his long and busy life.

When he came to the Academy in 1887, it was still in what H. F. Osborn called its Golden Age, with Leidy, Cope, Ryder, Heilprin and others still active, and for its sole purpose the encouragement and advancement of the natural sciences wherever they occurred. The Academy was poor but highly respected and productive.

In this favorable environment and with practically full control of his time, Pilsbry soon sprang into extraordinary productivity, and so continued till his death. The bulk of his prodigious output was original matter, based on exacting laboratory and field work.

Pilsbry's work was largely systematic, but it was far more than the simple descriptions of new species and genera. His early acceptance of evolution and his knowledge of paleontologic succession led to the construction of phylogenies that also fitted the facts of comparative anatomy. Knowing that the ecologic conditions, under which certain kinds of mollusks live, were similar to those that furnished the raw materials for the production of fossil oils, enabled him, by identifying the fossil shells in their rock cores, to guide the exploratory drilling of oil geologists. On the other hand, he helped health officers to solve their problems, because living fresh-water snails are the hosts of intermediate stages of parasites of man (especially trematodes) and domestic animals.

In the mechanics of systematics, his descriptions were well founded on external and internal, anatomical characters, and his nomenclature on exhaustive study of the literature and a reasonable set of rules. He disliked both the extreme "splitting" of genera and the pleas of nomenclatural lawyers who seek stability in new laws.

In the laboratory, Pilsbry's industry and powers of concentration were best displayed. He worked late, often on Sundays and holidays, and at night took his work home. His clean dissections were made with scalpel and needle under a lens; never with a mechanical micro-dissector. He was a constant smoker in the face of a "No Smoking" sign in his own office. When

another was present, he could dissect, smoke and converse at the same time, but if a visitor stayed too long, the conversation slowed and became monosyllabic, and there was one shell collector (J.) in particular who made long and frequent visits. One day when I entered his room, he seemed very glum. To my "What's the matter, Pilsbry?" he replied: "Oh, this Academy never has any luck. J. was just in here telling me how he was in Florida and in stepping over a log almost trod on a big water moccasin. And the thing never bit him!"

He was even happier in the field and, besides short walks for recreation, took "vacations" whenever possible to more distant countries, usually with other shell collectors. One of these was with Gifford and Mrs. Pinchot in their yacht. About this one, Pinchot telegraphed, on the occasion of Pilsbry's 85th birthday celebration: "He was one of the best outdoor men and best companions anyone ever traveled with."

He was thorough and resourceful in finding his desiderata, whether they were under logs, buried in the humus of the forest floor, up a tree, or in clefts of the rock of a cliff. During World War II, when parts of our Atlantic coast were under military occupation as a precaution against submarine landings, Pilsbry was wintering with his daughter in Lantana, Florida. He wished to collect along the shore but was forbidden. So he induced his son-in-law, who was the Mayor, to appoint him a policeman and, with badge and commission, he was free to arrest the shells that illegally had rolled up the beach on the incoming tides.

He was fond of camping and one of his innovations, designed to keep his boots pliable and waterproof, was to pour hot bacon fat inside instead of outside. This surely was an effective lubricant to prevent foot blisters.

His intimate knowledge of the distribution of living snails and their fossil forebears enabled him to postulate past migrations between North and South America via West Indian land connections. Also he showed that the snails of our Pacific states came from Asia by the same Bering Isthmus route as did our aboriginal men and large mammals.

On matters of Academy policy and administration, Pilsbry always stood quietly but firmly for the interests of scientific

research and advancement. As an example, when the proposal first was made to establish a central office to handle all clerical, accounting and similar functions, which previously had been done by each individual or department, he strongly opposed it. But after the Council had adopted and put it into action, he saw that it saved the curators and other researchers much time. He then wrote me a letter, explained that he had thought that it was a plan to put the scientific departments under office control, but now saw otherwise. Scanning the increasing centralization during the passing years, one questions whether Pilsbry's first position may not have been the better—whether freedom was not being sacrificed to efficiency.

Pilsbry's home life was simple and happy. So far as I know, he had no hobbies, except his garden. He was not interested in athletics, politics or art. Occasionally, he enjoyed the theater and was fond of reading the biographies of great men.—J. Percy Moore.[1]

DR. HENRY A. PILSBRY IN FLORIDA

Dr. Henry A. Pilsbry's brilliant pen, unbelievably productive for exactly 75 years, brought forth a vast source of material of particular interest to students of Florida conchology. Although his many contributions covered land, marine, fresh water and fossil shells, his greatest interest was always centered in the land mollusks. The colorful tree snails of the genus *Liguus,* confined in Florida to the extreme lower mainland and the Keys, became particular favorites after his review of this group in the "Manual of Conchology," published in 1899 (35). Feeling that much remained to be learned about the distribution of these beautiful shells, he personally visited Florida in 1903 and made additional collections to further his studies. Again, in 1907, he visited Florida, and together with Dr. Charles T. Simpson made what later proved to be a most memorable field trip to the lower Florida Keys. With Big Pine Key as a base, a search for tree snails was made from Bahia Honda to Key West. The results of these findings were published in his excellent work "A study of

[1] Research Fellow in Pilsbry's "Department of Mollusks, and other invertebrates."—H.B.B.

the variation and zoogeography of *Liguus* in Florida'' (1912, 14). This outstanding contribution, together with its superb colored plates, added greatly to the knowledge of these lovely shells. Later he incorporated the work of many *Liguus* enthusiasts and much exploration into one volume to produce the most complete and finest work yet done on the genus. This appeared in 1946 in his ''Land Mollusca of North America,'' a monumental work of tremendous importance which stands today as a fitting memorial to his great diligence and true genius.

In addition to his outstanding work in the field of land Mollusca, Dr. Pilsbry made many important contributions to all other branches of conchology. Many sea shells were monographed in his work on the marine portion of the ''Manual,'' volumes 11 through 17, which appeared from 1889 to 1898. His studies of the Amphineura (chitons), which appeared in volumes 14 and 15, are classics and a joy to anyone who has ever used them. He personally considered these volumes to represent some of his finest work. Numerous papers pertaining to fresh water mollusks appeared in the NAUTILUS and other publications, and in later years he became much interested in the Pliocene fauna of central Florida, at which time he made frequent field trips to the vicinity of Clewiston and Ortona Locks where large collections were made for the Academy.

Early in 1937, Dr. Pilsbry secured a cottage in Lantana, Florida, and each succeeding winter visit to his Florida home brought the Doctor new friends, plus a host of notables in the conchological world who found their way to his door. Frequent visitors were Dr. Maxwell Smith, Dr. B. R. Bales, Dr. Carlos de la Torre, Dr. Jeanne Schwengel, Axel A. Olsson, Jay A. Weber, and the writer with his family. These winters, at home with his daughters Elizabeth and Grace, who acted as gracious and able hostesses to assist in entertaining his many friends, were certainly most happy ones for the Doctor. Never one to remain idle, much valuable conchological work was accomplished during this period. Numerous field trips were made, often with his daughters assisting in the collecting, so that much important material was added to the Academy collection. He visited Cuba for collecting with his old friend Don Carlos, and made several trips to St. Petersburg, on the west coast of Florida, to visit Mr. and Mrs. Charles R. Locklin, William G. Fargo, Walter F.

Webb, Mr. and Mrs. Dan Steger, and many other conchologists in that area. A number of papers concerning Florida marine shells appeared at this time, among them the "Vitrinellidae of Florida," in which the writer had the privilege and pleasure of participation. This was followed by Dr. Pilsbry's excellent work on the fossil *Vitrinellidae* (1953, 8). During the same year another important paper entitled "Materials for a revision of east coast and Floridan volutes," by Pilsbry and Olsson (1953, 6) made its appearance. The discovery of anatomical material, brought up by deep sea dredging and formerly unavailable to students, permitted a revised generic classification of these little known Florida shells.

During his later years, Dr. Pilsbry spent at least a portion of his time away from his Florida winter home in order that he might visit his daughter Grace and her husband, Frederick J. Barcroft, who, as a U. S. Foreign Service Officer, was established at various posts, including Peru, Argentina and Guatemala. During these visits to our neighboring countries to the south Dr. Pilsbry made many new friends, particularly in the field of the sciences, and did much to spread a feeling of general good will. Frequent collecting trips were arranged by Mr. Barcroft, and the Doctor, assisted by Elizabeth and the Barcrofts, again made valuable additions to the Academy collection.

Although Dr. Pilsbry had an unusually long life, one is amazed at the vast amount of work he accomplished. Active to the end, always a prodigious worker, he continued to spend at least a portion of each year at his desk in the Academy doing the work he so greatly enjoyed. His regard and deep loyalty for his beloved Academy always came first, but surely not far behind was his love for the NAUTILUS which he served as editor so faithfully for so many years. His guiding hand will be missed sorely.

Dedication to his work, and joy in its pursuit seemed to grace him with a youthfulness that belied his years. His quick wit, the happy twinkle in his eye, and the smooth rosy complexion which so became him seemed to undergo no change from 70 onward. Even at the advanced age of 90, he made a dredging trip into the Gulf Stream in search of deep sea specimens. Puffing ardently upon his pipe, which incidentally was never long extinguished, one of the last things he told the writer concerned his regret that illness had prevented completion of all

work planned for 1957, but none the less his hopes were high for a more active and productive year ahead.

Possessed of an inexhaustible fund of knowledge embracing a multitude of subjects, he was always a delightful person to be with, and those of us privileged to have known Dr. Pilsbry will always remember his kindly manner and genial disposition which invariably made friends at first meeting.

His many friends will be pleased to know that during his final brief illness in Florida both of his daughters were constantly at his side offering love and every comfort, and were most solicitous in arranging for the best possible medical attention at all times.—Thomas L. McGinty.

DR. PILSBRY AS A DRAFTSMAN

As artist at the Academy of Natural Sciences for a number of years, I have had the great privilege of illustrating some of Dr. Pilsbry's many writings. He was always most kind and encouraging during the years of my association with him, especially when I was timidly starting out on a career as an artist. So, I am glad to have this opportunity of expressing my appreciation of his technical as well as artistic ability.

As is probably well known, Dr. Pilsbry made numerous drawings himself, especially for the Nautilus, because he was not allowed to take the artist's time. He also did more than one plate of colored figures for other publications, which he seemed to enjoy doing, and took great satisfaction in their accomplishment. We used India ink "wash" for half tones.

He had the advantage over other artists in that he knew at first glance the salient points he wished to bring out in any illustration. While I was still at the Academy, he began to assemble all his drawings; there must have been hundreds of them.—Helen Winchester Gapp.

FROM THE PILSBRY CHAIR OF MALACOLOGY

As I join others in their praise of Dr. Henry A. Pilsbry's outstanding scientific accomplishments and express my own per-

sonal loss of a kindly mentor, I would like to record Dr. Pilsbry's contributions to the development of the Department of Mollusks at the Academy. No man can serve at the helm of a museum department for 69 years without profoundly influencing the growth of its collections and the makings of its success.

Pilsbry was 25 years old, and had been at the Academy for only three months, when he was made Conservator of the mollusk collection on February 28, 1888. Consider the conditions and circumstances at that time. The eminent George W. Tryon, Jr., Conservator, founder and "spark plug" of the Conchological Section, had suddenly died at the age of 50. The well-known and financially successful "Manual of Conchology" was in its 10th volume; the Section was highly organized with a half-dozen well-to-do officers, over a hundred subscribing members, and several committees of volunteer workers; it was conceded that the collection contained more species and specimens than any other in the Western Hemisphere.

This was the bright side of the picture, and to a young and inexperienced man of less ability than Pilsbry's, this would have been an over-powering responsibility and a frightening reputation to uphold. To the new Conservator, the bleak side was even more evident. The growing collection was becoming seriously overcrowded. It was almost entirely uncatalogued and was housed in ill-suited exhibit cases on the galleries surrounding the library hall of the Academy. The officers of the Section were pressing for an immediate continuation of the "Manual," and had arranged that most of Pilsbry's salary would consist of 50 percent of the profits from its sale. Most of the men supporting the section were a full generation older than Pilsbry and had, for years, been led by Tryon's dynamic and persuasive personality. Although sympathetic men like S. Raymond Roberts, the treasurer of the Section and the Academy, and John Campbell, an amateur conchologist, put justified faith in the talented new man, it was natural that some of Tryon's friends, contacts and activities would fade from the scene. Tryon's dynasty was coming to an end. The Pilsbry era was being born.

Pilsbry plunged himself into his new job with fervor. The next volume of the Manual met its deadline. After a year, he joined forces with Averell, a local shell dealer, and revived the "Conchologist's Exchange" into the successful and productive

journal, the NAUTILUS. In addition to taking care of the collection, he gave formal lectures on mollusks to members of the Academy. From his accounts in the annual reports, evidently the physical condition of the collection continually worried Pilsbry. His almost full-time preoccupation with publishing research merely aggravated the situation.

Pilsbry was motivated by two impelling desires which are ingrained in all good museum men and which overshadowed all other considerations: production of publications and acquisition of new material. His field work, correspondence, personal alliances and development of projects were all bent in these two directions. Almost yearly, he added to his annual reports a note that "the great number of species and types contained in the collection of the Academy imposes a large amount of correspondence upon the Conservator, and no little time is consumed in the comparison of specimens for correspondents. This labor is amply repaid, however, by the large mass of new material which it secures us, and which could be obtained by no other means." From the start, Pilsbry was quick to profit from the generous fund left by Tryon for the purchase of shells. Valuable new material was obtained from Fulton and Sowerby, Morelet, Moellendorff, J. C. Cox, Henry Suter and others.

By 1900, Pilsbry, at the age of 38, had proved himself to be far superior as a research man than Tryon. The mountain was now coming to Mohammed. Hirase, Ferriss, A. P. Brown, Frederick Stearns and others were bearing gifts of priceless material in return for junior authorship with a leader in the field. While the venerable William H. Dall in Washington was cutting a wide swath in marine mollusks, Pilsbry was concentrating on a vacant niche that was dear to his heart, the land mollusks. As the years passed, the Academy's collection swelled with Pilsbry's types in new land, fresh-water and marine species. Editorship of the NAUTILUS afforded an opportunity for many unique acquisitions. His several expeditions further increased the collection upon which he could compose his research tunes. During his tenure as Curator, the collection was increased by nearly 130,000 lots or trays, about 4000 of which were primary types.

By the time Dr. Pilsbry was in his late eighties, and even though he was still very active, both physically and mentally, he and his close friends began to consider the problem of a successor. An old problem common to most museums of natural history threatened the future of the Department. As the cost of living rises, even doubles, over the years, allotted budgets and salaries change very little. Dr. Pilsbry was aware of the dim prospects.

His friends rallied to the cause. What better way to pay tribute to the master and assure the continued success of the Department than by creating and financing a research chair in his name? In October 1954, a small fund was established for the formation of the Henry A. Pilsbry Chair of Malacology. The initial boost came from Mr. Alfred J. Ostheimer, 3rd, of Whitford, Pa. and Miss Anne Harbison of Philadelphia. Other friends and admirers joined in supporting the fund, and within two years about two dozen contributors had brought the amount up to half of the $200,000 goal. Although the fund is still far short of its goal, the fact that the position was filled was a great satisfaction to Dr. Pilsbry. Many of the irksome details of departmental administration and "fund-grubbing" were lifted from his shoulders, thus permitting him uninterrupted time for his research.

It is sometimes difficult for an elderly emperor to slacken the reins of control, but Dr. Pilsbry guided the new man with patience, understanding and grace. Although some of the inevitable innovations must not always have secretly pleased him, he never once expressed disapproval. He knew that the same problems that faced him as a young man were again being tackled by a new generation. He left for Florida in October, 1957, with plans for another winter of quiet research, content in the knowledge that the museum "home fires" were still burning cheerfully in his absence. Once again, the wheel of time turned its full revolution on another generation. The Pilsbry era was coming to a close, but leaving one of the most striking and glorious chapters in the history of the Department of Mollusks at the Academy.—R. Tucker Abbott, Academy of Natural Sciences of Philadelphia.

SCIENTIFIC CONTRIBUTIONS MADE FROM 1940 TO 1957

By HENRY A. PILSBRY

In 1940, the American Malacological Union published a chronologic list of the "Scientific contributions" of H. A. Pilsbry, up to and including 1939. This was not a complete bibliography, but purposely omitted most obituaries, editorials without pertinent scientific content and all reviews (except the very few with new names), whether initialed or unsigned. If the custom of the "Zoölogical Record" had been followed, the unsigned publications in the NAUTILUS would have been ascribed to the editors, as for example: [H. A. Pilsbry & C. W. Johnson]. Recently, a random count of these omissions was made in two volumes, 17 and 18. Of the editorials and obituaries, mainly unsigned, 15 were found, of the reviews, mainly initialed, 30. If one multiplies this by 34 (half 68 volumes), one arrives at an estimated total of 1530, which may mean that more than half the notes in the NAUTILUS, which probably were composed by Pilsbry, at least as senior author, were omitted. Since he was a reporter when young, signed the yearly reports of his section and department (Proc. ANSP.) and although he wrote nothing for "Biological Abstracts," an estimate between 3000 and 4000 possibly might cover the number of published articles that flowed from his facile pen. (Numbers do depend on who counts them.)

Number 1 of the 1940 publications is included partly because the biography on pages one to three was written out by Dr. Pilsbry, and his phraseology largely was retained, although of course all the encomiums and some of the data were interpolated by the A. M. U. editors. Also the list of publications was based on one he had for his own use, several years before, so that the plan of omissions was based on his judgment, except where the A. M. U. editors were less severe. For example, he omitted all excerpts from another man's publications, like those in 1900, no. 18.

The following pages, which attempt to bring his "Scientific contributions" up to date, do include signed and unsigned [P&B.] obituaries and death notices and also initialed editorials in the NAUTILUS, but omit brief remarks in "Notes and News."

1903

—— [*Polygyra palliata-obstricta. Lithasia obovata biconica.*] Ann. Rept. Dept. Geol. Nat. Res. Indiana (1902) 27:581–584, 604–605, fig. 23. [In Blatchley & Daniels.]

1914

Ante 1. Jan. 28. [Doryssas of the lower Amazon valley.] Proc. ANSP. 65:648–651, pl. 24. [In Fred Baker.][1]

1939

4–5. July 10. South American land and freshwater mollusks, X.—Species of Colombia and Ecuador. Not. Nat. ANSP. 19:1–6, figs. 1–12.

13. ——. Freshwater Mollusca and Crustacea from near El Molino, Bolivia. John Hopkins Univ. Studies Geol. 13:69–72, pl. 9.

1940

1. After no. 2. Scientific contributions made from 1882 to 1939. By Henry A. Pilsbry, Sc.D. Arranged and published by the Amer. Malac. Union. 63 pp.
2. Apr. 29. Two new Mexican species of *Humboldtiana.* Naut. 53:140–141.
3. July 23. *Megalomastoma* (*Farcimen*) *miranda,* a new Cuban cyclophorid snail. Naut. 54:34.

3a. Aug. 1. [1939, 11, part 2.] Monogr. ANSP. 3, vol. 1(2): 575–994, i-ix, figs. 378–580.

4. Sept. 18. Land shells from Huánuco, Peru. Not. Nat. ANSP. 56:1–5, figs. 1 & 2.
5. Nov. 2. A new race of *Cancellaria* from Florida. Naut. 54:54, pl. 3, figs. 1 & 2.
6. Nov. 2. The Beal collection. Naut. 54:73. [See 1941, 1a.]
7. Nov. 2. [Ida S. Oldroyd. P&B.] Naut. 54:73.

1941

1. Feb. 4. Henry C. Higgins. [P&B.] Naut. 54:106.

1a. May 5. [1940, 6, continued.] Naut. 54:140–141.

2. Sept. 9. A Pliocene fauna from western Ecuador. By H. A. P. and Axel A. Olsson. Proc. ANSP. 93:1–79, 2 figs., pls. 1–19.
3. Oct. 24. New names for subdivisions of *Gonglyostoma.* Naut. 55:70.

3a. "Aug. to Dec." Moluscos Tertiarios de agua dulce en el valle de Magdalena. By H. A. P. and Axel A. Olsson. Rev. Acad. Colomb. Cienc. 4(15, 16):410–417. [See 1935, 4.]

[1] Called to my attention by Dr. Harald Rehder, but I forget who sent me the preceding one.—H.B.B.

1942

1. Jan. 12. A new form of *Urocoptis scobinata* Torre & Ramsden. Naut. 55:104–105.
2. Jan. 12. *Liocentrum.* Naut. 55:105.
3. May 7. Ida Shepard Oldroyd. [P&B.] Naut. 55:140–141.
4. July 23. Land Mollusca of the Cayman Islands collected by the Oxford University Biological Expedition 1938. Naut. 56:1–9, pl. 1, figs. 1–15.
5. July 23. Frank Collins Baker. [P&B.] Naut. 56:33.
6. Oct. 14. Description of a helicoid snail from Madagascar. Naut. 56:48–49.
7. Oct. 14. *Helicodiscus* in the West Indies. Naut. 56:55–57, figs. 1.
8. Oct. 14. Dr. Charles Davies Sherborn. [P&B.] Naut. 56:67.
9. Oct. 14. J. W. Jones. [P&B.] Naut. 56:67–68.
10. Oct. 14. Hugh C. Fulton. [P&B.] Naut. 56:68.
11. Oct. 14. Names proposed as new in Morse's Terrestrial Pulmonifera of Maine. Naut. 56:69–70.

1943

1. Jan. —. Cirripedia. In: "Marine invertebrate faunas of the buried beaches near Nome, Alaska." Jour. Paleont. 17:94–95, pl. 15, figs. 8 & 9.
2. Feb. 15. New marine mollusks from the west coast. By H. A. P. and Axel Olsson. Naut. 56:78–81, pl. 8, figs. 1–7.
3. Feb. 15. Dr. William A. Bryan. [P&B.] Naut. 56:103.
4. July 23. *Ensis minor megistus* n. subsp., a west Florida razor clam. By. H. A. P. and T. L. McGinty. Naut. 57:33–34, pl. 6, figs. 11–13.
5. July 23. Note on *Cerion striatellum* ("Fér." Guérin). Naut. 57:34–35.
6. Oct. 30. Floridian species of *Rimula.* Naut. 57:37–40, pl. 7, figs. 1–3.
7. Oct. 30. *Typhis fordi,* a new Bahaman muricid mollusk. Naut. 57:40, pl. 7, fig. 4.
8. Oct. 30. Olaf O. Nylander. [P&B.] Naut. 57:66.
9. Oct. 30. The type of *Euamnicola* Crosse and Fischer. Naut. 57:68–69.

1944

1. Feb. 9. A west American *Julia.* By H. A. P. and A. A. Olsson. Naut. 57:86–87, pl. 9, figs. 10 & 11.
2. Feb 9. New Peruvian land mollusks. Naut. 57:87–88, pl. 9, figs. 4 & 5.

2a. Feb. 9. [*Plekocheilus mcgintyi* Pilsbry.] Naut. 57:pl. 9, fig. 6.

3. Feb. 9. A Venezuelan species of *Fossula.* By H. A. P. and A. A. Olsson. Naut. 57:89, pl. 10.
4. May 15. Peruvian land Mollusca—II. Naut. 57:118–127, pl. 11, figs. 1–20.
5. May 15. Frank Harvey Eno. [P&B.] Naut. 57:141.
6. May 15. Hemphill's catalogue. Naut. 57:144.
7. Aug. 11. Molluscan fossils from the Rio Pachitea and vicinity in eastern Peru. Proc. ANSP. 96:137–153, figs. 1–3, pls. 9–11.
8. Aug. 17. West American field slugs (*Deroceras*). Naut. 58:15–16.
9. Aug. 17. Peruvian land Mollusca—III. Naut. 58:28–30, pl. 1, figs. 7–9, 11.
10. Aug. 17. *Helix minima.* Naut. 58:31.
11. Nov. 24. Hawaiian species of *Odostomia.* Naut. 58:64–65, pl. 2, figs. 3–6. [See 1945, 3a & 4a.]
12. Nov. 24. Snails from Taylor County, Texas. Naut. 58:69.

1945

1. Jan. 23. Barnacles. In "Geology of Lau" by Ladd & Hoffmeister. Bull. Bishop Mus. 181:371–372.
2. Feb. 19. Peruvian land Mollusca—IV: Clausiliidae. Naut. 58:79–84, pl. 3, figs. 1–10.
3. Feb. 19. Norman W. Lermond. [P&B.] Naut. 58:102–105.

3a. Feb. 19. *Odostomia monaulax.* Naut. 58:106. [See 1944, 11.]

4. June 20. *Stenacme floridana,* an American member of the Amphibolacea. Naut. 58:112–116, pl. 5, figs. 1–12.

4a. June 20. [*Odostomia hiloensis.*] Naut. 58:pl. 6, f. 5. [See 1944, 11.]

5. June 20. *Hodopoeus,* a fossil astray. By H. A. P. and T. D. A. Cockerell. Naut. 58:116–117, pl. 6, figs. 1 & 2.
6. June 20. *Tellina panamanensis.* Naut. 58:145.
7. Sept. 6. Cyclostrematidae and Vitrinellidae of Florida—I. By H. A. P. and Thomas L. McGinty. Naut. 59:1–13, pl. 1, figs. 1–8, pl. 2, figs. 1–10.
8. Sept. 6. Foreword. Naut. 59:29–30.
9. Dec. 27. "Cyclostrematidae" and Vitrinellidae of Florida, II. By H. A. P. and Thomas L. McGinty. Naut. 59:52–59, pl. 6, figs. 1–6, 8–11.
10. Dec. 27. New Floridian marine mollusks. Naut. 59:59–60, fig. 1, pl. 6, fig. 7.
11. Dec. 27. *Otesia* H. & A. Adams versus *Vitrinula* "Gray" Carpenter. Naut. 59:66–67.
12. Dec. 27. Vitrinellidae and similar gastropods of the Panamic Province. Part I. By H. A. P. and Axel A. Olsson. Proc. ANSP. 97:249–278, pls. 22–30.

1946

1. Jan. 18. The type specimens of C. B. Adam's Jamaican species of *Vitrinella*. Not. Nat. ANSP. no. 162:1–5, figs. 1–6.
2. Feb. 9. "Cyclostrematidae" and Vitrinellidae of Florida, part III. By H. A. P. and Thomas L. McGinty. Naut. 59:77–83, pl. 8, figs. 1–6.
3. Feb. 9. Two misunderstood Sphaeriidae. Naut. 59:83–87, figs. 1.
4. Feb. 9. The name *Mesopteryx*. By H. A. P. and A. A. Olsson. Naut. 59:105.
5. Feb. 9. The subgeneric name *Tomopeas*. Naut. 59:105.
6. Feb. 25. Notes on the anatomy of Australian and Galapagos Bulimulidae (Mollusca, Pulmonata). Not. Nat. ANSP. 168:1–4, figs. 1–4.
7. Aug. 30. *Condylocardia* in Florida and middle America. By H. A. P. and Axel A. Olsson. Naut. 60:6–7, pl. 1, figs. 9 & 10.
8. Aug. 30. Another Pacific species of *Episcynia*. By H. A. P. and Axel A. Olsson. Naut. 60:11–12, pl. 1, figs. 6–8.
9. Aug. 30. Vitrinellidae of Florida, part 4. By H. A. P. and T. L. McGinty. Naut. 60:12–18, pl. 2, figs. 1–6.
10. Aug. 30. Note on *Vitrinella* (*Tomura*) *bicaudata*. By H. A. P. & McGinty. Naut. 60:36.
11. Dec. 6. Land Mollusca of North America (North of Mexico), vol. 2. Monogr. ANSP. 3, vol. 2(1):i-vi, 1–520, figs. 1–281, frontispiece. [Continued in 1948, 0.]
12. Dec. 18. Sinistral *Liguus fasciatus* in Florida. Naut. 60:72.

1947

1. Mar. 11. On the anatomy and the systematic place of the land-mollusk genus *Janulus*. Naut. 60:94–97, pl. 7, figs. 1–5.
2. Mar. 11. Dr. Blenn R. Bales. [P&B.] Naut. 60:101–102.
3. July 14. Type of *Pseudantalis*. Naut. 61:31.

3a. ——. Moluscos fósiles del Rio Pachitea y sus alrededores en la región oriental del Peru. Bol. Mus. Hist. Nat. "J. Prado" 10 (1946, quarters 1 & 2):32–57, pls. I–III. [See 1944, 7.]

1948

0. Mar. 19. [1946–11, part 2.] Monogr. ANSP. 3:i-xlvii, 521–1113, figs. 282–585.
1. Nov. 4. Inland Mollusca of northern Mexico—I. The genera *Humboldtiana, Sonorella, Oreohelix,* and *Ashmunella*. Proc. ANSP. 100:185–203, figs. 1–6, pls. 12–14.

1949

1. Jan. 26. Review of Peruvian species of *Temesa* (Mollusca, Clausiliidae). Not. Nat. ANSP. 214:1–8, figs. 1–10.
2. Feb. 9. The landsnail genus *Xenothauma* and other carinate Bulimulidae in Peru. By H. A. P. and Axel A. Olsson. Not. Nat. ANSP. 215:1–14, figs. 1–19.
3. Mar. 18. New species of *Isomeria* and *Helicina*. Naut. 62:99–101, pl. 6, figs. 3 & 4.
4. Mar. 18. *Drillia roseobasis* and *Pleurotoma albicostata* (Sowerby). Naut. 62:103–104.
5. June 8, *Dissentoma*, the embyonic stage of *Cymatium martinianum* (Orb.). Naut. 62:142.
6. June 8. To subscribers. H. A. P. and H. B. B. Naut. 62:145.
7. July 3. *Balanus* in the Oligocene of northern Peru and western Ecuador. By H. A. P. and Axel A. Olsson. Soc. Geol. Peru, Vol. Jubilar, 25th Anivers., pt. 2(16):1–6, pl. 1.
8. Sept. 19. New marine mollusks of Florida and the Bahamas. By H. A. P. and T. L. McGinty. Naut. 63:9–15, pl. 1, figs. 1–7; 63(2):pl. 3, fig. 8.

8a. Sept. 19. [New Cerithiidae from Florida.] Naut. 63:pl. 1, figs. 11 & 12. [See no. 13.]

9. Sept. 19. A West Indian *Hydatina*. Naut. 63:15–17, pl. 1, figs. 8–10.
10. Sept. 19. Two overlooked synonyms. Naut. 63:36.
11. Oct. 14. Peruvian land mollusks of the genus *Nenia* (Clausiliidae). Not. Nat. ANSP. 214:1–8, figs. 1–10.
12. Nov. 1. Land mollusks of Cayman Brac. Naut. 63:37–48, fig. 1, pl. 3, figs. 1–7, pl. 4, figs. 1–10.

12a. Nov. 1. [*Neopetraeus cremnobates* Pilsbry, ——, n. sp.] Naut. 63:pl. 3, fig. 9.

13. Nov. 1. New Cerithiidae from Florida. Naut. 63:65–66. [See no. 8a.]
14. Nov. 1. The mollusk fauna of glasshouses in the Netherlands. Naut. 63:71.

1950

1. Feb. 13. Fresh water mollusks from Colombia and Guatemala. Naut. 63:82–85, pl. 5, figs. 1 & 2.
2. Feb. 13. Vitrinellidae of Florida: part 5. By H. A. P. and T. L. McGinty. Naut. 63:85–87, pl. 5, figs. 6 & 7.
3. Apr. 4. Carlos de la Torre. [P&B.] Naut. 63:143.
4. July 5. Daniel L. Emery. [P&B.] Naut. 64:36.
5. July 5. Review of *Anticlimax*, with new Tertiary species (Gastropoda, Vitrinellidae). By H. A. P. and Axel A. Olsson. Bull. Amer. Paleont. 33(135):1–14, pls. 1–4.
6. Oct. 27. New fountain snails from Florida. Naut. 64:37–39, pl. 3, figs. 1–7.

7. Oct. 27. *Pseudosubulina,* a genus new to the United States. Naut. 64:55–56.
8. Oct. 27. Notes on land snails of Texas. Naut. 64:55–58, pl. 4, figs. 1 & 2.
9. Oct. 27. The genotype of *Plotia* "Bolten" Roeding. Naut. 64:68.
10. Oct. 27. *Helisoma anceps* (Menke), 1830. Naut. 64:68, pl. 4, fig. 44.
11. Oct. 27. The name *Hemisinus* (*Longiverena*) *avus.* Naut. 64:69.

11a. Oct. 27. [1951, 1, figs.] Naut. 64:pl. 4, figs. 3, 5 & 10.

1951

1. Feb. 15. Land snails from the Guadalupe Range, Texas. By H. A. P. and E. P. Cheatum. Naut. 64:87–90; 64(2): pl. 4, figs. 3, 5 & 10.
2. Apr. 4. The Lepyriidae, a new family of fresh-water snails (Gastropoda: Rissoacea). By H. A. P. and Axel Olsson. Not. Nat. ANSP. 233:1–5, figs. 1–7.
3. May 7. A new Caribbean mollusk. By H. A. P. and A. A. Olsson. Naut. 64:109–110, pl. 9, figs. 7 & 8.
4. May 7. New species of *Amnicola* and *Streptostyla.* Naut. 64:119–120, pl. 9, fig. 1–3.

4a. May 7. [1951, 5, figs.] Naut. 64:pl. 9, figs. 4–6.

5. Aug. 27. Notes on some Brazilian Planorbidae. Naut. 65:3–6 [See 4a.]
6. Aug. 27. *Antalis* "Herrmannsen." Naut. 65:33–34.

6a. Aug. 27. [*Caecum biminicola.*] Naut. 65:pl. 1, fig. 13. [See no. 10.]

7. Oct. 17. *Aplysia badistes,* a peculiar Floridan sea-hare. Not. Nat. ANSP. 240:1–6, figs. 1–9.
8. Nov. 9. A peculiar genus of Vitrinellidae. By H. A. P. and A. A. Olsson. Naut. 65:43, pl. 3, figs. 2.
9. Nov. 9. Harold R. Robertson. [P&B.] Naut. 65:68.
10. Nov. 9. *Caecum biminicola,* new species. Naut. 65:69. [See 6a.]
11. Dec. 18. Tertiary and Cretaceous Cirripedia from northwestern South America. By H. A. P. and Axel A. Olsson. Proc. ANSP. 103:197–210, pls. 8–11.

1952

1. Feb. 25. A South African species of *Fauxulus.* Naut. 65:102–103.
2. Feb. 25. The genotype of *Microceramus.* Naut. 65:107.
3. May 22. The generic name *Pseudotrochus.* Naut. 65:137–139.
4. July 25. Notes on *Nesta* (*Laevinesta*) *atlantica,* a Floridan fissurellid mollusk. By H. A. P. and Thomas L. McGinty. Naut. 66:1–3, fig. 1.

5. Sept. 10. Vitrinellidae of the Panamic province: II. By H. A. P. and Axel A. Olsson. Proc. ANSP. 104:35–88, pls. 2–13.
6. Nov. 17. *Littoridina tenuipes* (Couper). Naut. 66:50–54, figs. 1 & 2.
7. Nov. 17. A *Holospira* new to the United States. Naut. 66:69–70. [See 1953, 1a.]

1953

1. Feb. 2. *Fastigiella carinata* Reeve, a little-known mollusk. Naut. 66:77–78, pl. 6, figs. 2 & 3.

1a. Feb. 2. [1952, 7, fig.] Naut. 66:pl. 6, fig. 1. [See 1952, 7.]

2. Feb. 2. A Colombian *Pomacea* of the *Effusa* group. By H. A. P. and Axel A. Olsson. Naut. 66:98–99, pl. 6, figs. 6.
3. Feb. 2. L. A. Burry. [P&B.] Naut. 66:105.
4. Feb. 2. Notice to subscribers. By H. A. P. and H. B. B. Naut. 66:108.
5. June 8. The eighth annual shell show [St. Petersburg]. Naut. 66:142.
6. July 24. Materials for a revision of east coast and Floridan volutes. By H. A. P. and Axel A. Olsson. Naut. 67:1–13, figs. 1–4, pl. 1, figs. 1–6, pl. 2, figs. 1–5, pl. 3, figs. 1 & 2.
7. Aug. 5. Notes on Floridan barnacles (Cirripedia). Proc. ANSP. 105:13–28, figs. 1–5, pls. 1 & 2.
8. Nov. 6. The Vitrinellidae. Fresh-water mollusks. Monogr. ANSP. 8(IIIa & IIIb):411–447, 2 figs., pls. 49–56, 64–65.
9. Nov. 11. *Magnipelta,* a new genus of Arionidae from Idaho. Naut. 67:37–38, pl. 5, figs. 1–3.
10. Nov. 11. Land mollusks from Nuevo Leon, Mexico. Naut. 67:46–47, figs. 1 & 2, pl. 5, fig. 6.
11. Nov. 11. The case of *Paludina multilineata* Say. Naut. 67:58–61.
12. Dec. 9. Inland Mollusca of northern Mexico. II. Urocoptidae, Pupillidae, Strobilopsidae, Valloniidae and Cionellidae. Proc. ANSP. 105:133–167, fig. 1, pls. 3–10.

1954

1. Feb. 18. Some Californian and Mexican mollusks. Naut. 67:81–82, fig. 2, pl. 8, figs. 1 & 4.
2. May 17. The St. Petersburg Shell Show. Naut. 67:138.
3. July 24. A long forgotten shell, *Delphinula laxa* Say. Naut. 68:10–11, fig. 1.
4. July 24. *Holospira riograndensis.* Naut. 68:34.
5. Sept. 7. Systems of the Volutidae. By H. A. P. and Axel A. Olsson. Bull. Amer. Paleont. 35(152):1–36, pls. 1–4.
6. Nov. 19. The Idaho-Montana slug *Magnipelta* (Arionidae). By H. A. P. and Royal Bruce Brunson. Not. Nat. ANSP. 262:1–6, figs. 1–11.

7. Nov. 29. Miocene land shell fossils from the Dominican Republic. Not. Nat. ANSP. 266:1–4, figs. 1–4.

1955

1. Feb. 11. Calvin Goodrich. [P&B.] Naut. 68:104.
2. Nov. 5. Another Floridan *Conus*. Naut. 69:47–48, pl. 3, figs. 10 & 11.

1956

1. Feb. 11. A new *Bostryx* from Peru. Naut. 69:92–93, pl. 5, figs. 4 & 5.
2. Feb. 11. Beach drift Polygyridae from southern Texas. By H. A. P. and Leslie Hubricht. Naut. 69:93–96, pl. 5, figs. 1–3.
3. May 10. A gastropod domiciliary in sea urchin spines. Naut. 69:109–110, pl. 6, figs. 4–9.
4. June 22. Inland Mollusca of northern Mexico. III. Polygyridae and Potadominae. Proc. ANSP. 108:19–40, figs. 1–4, pls. 2–4.

1957

1. Feb. 11. Paul P. McGinty. [P&B.] Naut. 70:105–106.
2. Feb. 11. *Thaumastus conspicuus*. Naut. 70:107.
3. Feb. 11. Notice to subscribers. By H. A. P. and H. B. B. Naut. 70(3):iii.
4. April 29.William G. Fargo. [P&B.] Naut. 70:140.
5. April 29. Guy L. Wilkins. [P&B.] Naut. 70:141.
6. April 29. Wrong address. By H. A. P. & H. B. B. Naut. 70:141.
7. Nov. 4. Notes on land snails of genera *Solaropsis* and *Nenia*. Naut. 71:47–52, pl. 3, figs. 1–4.

1958

1. ——. A Colombian species of the genus *Rhodea*. Naut. 71:83, pl. 9, lower 2 figs.
2. ——. Type of *Paludestrina*. By H. A. P. & H. B. B. Naut. 71(3):116.

THE PILSBRY NAUTILUS

When only 26 years of age, Henry A. Pilsbry began the NAUTILUS on May 5, 1889, with volume 3, because it succeeded (N.3:1) the "Conchologist's Exchange," after a year's lapse. At first, it was a monthly [1] at $1.00 a year for 144 pages plus covers and plates. His one year's association with William D.

[1] Rarely double numbers (so marked) were issued and vol. 23 had only 11, although with the full number of pages.

Averell (1853–1928; N.42:33) as its business manager (see latter's "Prospectus") was none too happy and, at the end of one volume (N.4:1), Averell was replaced by another Philadelphian, at the Wagner Free Institute of Science: Charles W. Johnson, who was not quite a year younger than Pilsbry, and who became junior editor and manager. Undoubtedly young Johnson (N.4:vii of index) and probably Pilsbry expected some cash profit from their partnership. Since Americans traditionally have regarded basic (not immediately practical) scientific studies as luxuries rather than necessities, such hopes crashed abruptly during the "hard times" around 1893 (N. 7:25). During the next 4 years, they often feared that they could not carry the deficits (N.9:97; N.10:97) out of their moderate earnings, until support was guaranteed by Bryant Walker and others (N.11:12).

When Johnson (at 40) went to the Boston Society of Natural History, the NAUTILUS was issued at Boston (N.17:1) from volume 17 (May, 1903) until his death (N.46:37) at 68,[2] 4 days before the mailing of the July number by his Boston colleagues. Throughout the 42 years of the Pilsbry-Johnson partnership (and afterwards), the publication was carried on as a "labor of love" by two busy scientists, without salaries, endowments or dividends, except a small one in the early 1900s, which may have recompensed them in part for their earlier losses.

In 1914, with volume 28 (N.27:144) the annual price was advanced to $1.50; 3 years later (N.30:144), subscriptions became $2.00, and the NAUTILUS changed to a quarterly (36 text pp. per no.) with the first (July, 1917) number of volume 31. During the older World War, most foreign subscribers were lost, and some financial difficulties followed (N.34:36; 36:72; 38:108). Because of postal laws, the title pages and indexes of volumes 43 to 45 were added as the last 4 pages of their April numbers; previously, from volumes 3 to 42, they had been stapled separately.

Dr. Pilsbry (then 69) thought that both editors should be in the same city; so my association, as junior editor and manager, began with the October, 1932, number (p. 37) and Phila-

[2] Coincidentally, Dr. Pilsbry died on the 94th anniversary of his partner's birth.

delphia again became the post office of issue. Beginning with vol. 46, the removal of title pages and indexes was made easier by their inclusion in the middle of each April number (except those for vols. 54 & 55, which were stapled in vol. 55, no. 1, and vol. 56, no. 2, respectively). The present practice of volume, number, month and year at the tops of opposing pages began with vol. 48, no. 1. The dates for each volume have been included under "Notes and News," usually in the next July number, since vol. 46, no. 2 (N.48:69). Earlier dates are in "Scientific contributions" (1940, 1).

After the 1929 "depression," many subscribers again deserted, and rather severe deficits once more became the rule. During the last World War, almost all foreign subscriptions stopped, but this largely was counterbalanced by increases in U. S. subscribers, when money became easier. But another difficulty appeared. Partly because of paper rationing during the war, but mainly on account of renewed and retroactive subscriptions, the reserve stocks of vols. 52 to 58 rapidly diminished. Apparently a similar expansion came 10 years after 1893, since the stocks of vols. 17 to 24 are quite exhausted. Let future managers beware, because a sale of back numbers often has abolished a bad deficit!

Due to inflation, the subscription price necessarily has been raised three times in eight years: to $2.50 with vol. 63 (N. 62:145), to $3.00 with vol. 67 (N.66:108) and to $3.50 with vol. 71 (N.70, no. 3, p. iii). Because of the lapse of 6 months between each increase in printing costs near the first of a year and the beginning of the next volume with a July number, minor deficits also bothered, especially in 1949 and 1953, but the NAUTILUS again is making debits and credits meet.

When an estimate was made a few years ago, almost half of the subscribers were amateur hobbyists, whose subscriptions do tend to rise and fall with the times, and we always have tried to include some papers in each number for them. But, the backbone of the NAUTILUS, that kept it going when money became scarce, apparently always has been the more continuous subscriptions of institutions and of professional zoölogists and/or malacologists. For this reason, if for no other, the scientific standards, established by Dr. Pilsbry during his 68 years as senior editor, must and shall be maintained.

At least twice during September and October, 1957, Dr. Pilsbry implored me to make sure that the NAUTILUS would continue, and solemnly was promised that it would. The present plans are that Dr. Charles B. Wurtz, Consulting Biologists, 610 Commercial Trust Building, Philadelphia 2, and Dr. R. Tucker Abbott (Pilsbry Chair of Malacology), Academy of Natural Sciences, 19th and the Parkway, Philadelphia 3, will join the staff as junior editors with the understanding that, if at any future time either should cease to be a resident of the Philadelphia area, this would be considered as a tendered resignation.

Dr. Abbott will edit especially papers on marine mollusks. Dr. Wurtz will continue to superintend the mailing of back numbers, take over the actual mailing of each issue, and become editor for fresh water mollusks and ecology. Bernadine B. Baker (Mrs. Horace B. B.), 11 Chelten Road, Havertown, Pa., as manager, will keep the books and receive renewals, new subscriptions and orders for back numbers. Since the Bakers and the NAUTILUS can afford but one bank account, checks may be made out as usual.

Manuscripts, for publication in the Pilsbry NAUTILUS, should be sent to the senior editor, as customarily stated on page ii (inside of back cover). He has on file all those at the ANSP. or acknowledged by him. Publication of these may be a bit slow for a while, since enough are on hand for two future numbers, but this rarely has continued to be the case for long.

Two general indexes have been issued by others. The "Index to the Nautilus, vols. 3 to 34, 1889–1921 and to its predecessor [3] the Conchologist's Exchange, vol. 1, 2, 1886–1888," was compiled by John Brooks Henderson, Jr. (Frontispiece; died 1923) assisted by Marguerite Woodward, and edited by William H. Dall. It was published in 1927 by George H. Clapp and Bryant Walker. About 1933, its two owners generously presented the remaining copies to the NAUTILUS and these still furnish some support. The "Index to the Nautilus, volumes 35 to 60, 1921–1947," was compiled by Aurèle LaRocque, assisted by Geneva Smithe and Harold W. Harry; it was published in 1951, and is sold by the University of Michigan Press.—H. BURRINGTON BAKER.

[3] It ceased publication a year before the NAUTILUS began.

NOTES AND NEWS

Type of Paludestrina.—*Paludestrina* Orbigny, 1839 or 1840, Voy. Amer. Merid. (Moll.), p. 381, evidently was proposed to replace *Hydrobia* Hartmann, 1821, type *Helix acuta* Müller, 1774, Verm. II, p. 100. Although the word "substitute" was not used, *Paludestrina* at least included *Hydrobia*. Apparently the first valid type selection was made by Bourguignat, 1887, Etud. petit. Paludinidées, p. 10, who designated *H. acuta* = *P. a.* Dr. von Ihering's subsequent and invalid type selection, 1895, Nachrbl. Deutsch. Malak. Ges. 27:128 (Cf. N.10:119), was useless, as our old South American friend (1850–1930) and correspondent must have realized before 1910 (N.24:15). Equally unnecessary was Parodiz's attempt, 1955, Neotrópica 1:95–96, to replace *Potamolithus,* 1896, by *Paludestrina,* which last remains what Orbigny intended it to be: an objective synonym of *Hydrobia.* "*Requiescant in pace*" for another 60 years!—H. A. P. and H. B. B.[4]

Collecting in Peru and Argentina.—A collecting trip was always my father's greatest pleasure and recreation. A great outdoors man, he was comfortable in any circumstances and equal to all situations. In Peru, we with others made long trips over much wildly beautiful country, besides short ones around Lima. All were successful; he always knew where the shells were.

Dr. Jorge A. Broggi took us on many delightful collecting trips, especially a five day one to Paracas and Pisco in southern Peru, over the deserts. Axel Olsson took us on a fine camping trip from Talara to Zorritos and Tumbes in northern Peru. In 1948, Dr. Pennell joined us in one to the mountains east of Trujillo and another to Cajamarca, from where we went to Celendin and down into the canyon of the Marañón. Other trips took us to Tingo María, Cusco, Chimbote and up the canyon of the Santa River, and Machupicchu. We crossed the continental divide five times; my father was not affected by the altitude.

He was not affected by the heat either. In 1950 on the pampas of Argentina, he enjoyed the oven birds and burrowing

[4] Written by me, but based on my last discussion with him.—H. B. B.

owls, oblivious to 110 degrees. We again were visiting Grace and Fred, whose home was near Rio de La Plata, in which he collected at low tide. Together we collected up the coast of Uruguay to the Brazilian border, and also at the falls of Iguazú, near the Paraguay border. Father also enjoyed the warm hospitality of Dr. Biraben and his wife, Dr. Hylton Scott.

Good trips in Guatemala were planned for 1957–8, but my father's heart attack suggested a switch to a quiet winter in Florida, which was cut short by his untimely death. Of Father, at nearly 95, one truly may say: "He died young."—Elizabeth Pilsbry.

Resolutions.—We have learned with great sorrow of the death of our distinguished Honorary Life President, Doctor Henry Augustus Pilsbry, Curator of Mollusks at the Academy of Natural Sciences. In grateful tribute to his memory, we recognize, as the world of science already has recognized, the conspicuous abilities displayed by him in the fields of Mollusca and Cirripedia, but still more fully we appreciate the fact that, as a contributor of a vast amount of basic research, he stood without a peer. His judgment and scientific conclusions will guide many generations to come. His leadership and helping hand kept alive the greatness of the Academy and served as an inspiration in the founding of this Club. We mourn his loss not only on account of these attainments, but also as a man of broad sympathies, cheerful character and tender heart. Our sincere sympathies are extended to the members of his bereaved family, with a token copy of these resolutions.—Philadelphia Shell Club.

THE NAUTILUS

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REDISCOVERY OF A RARE CARIBBEAN *CONUS*

By R. TUCKER ABBOTT
Pilsbry Chair of Malacology

Mrs. Mildred R. Barnes sent me three specimens of a rare and hitherto misunderstood species of *Conus,* that she collected in July 1956 on the beach just east of Boca Mahos, Aruba Island, Netherlands Antilles. They are *Conus armillatus* C. B. Adams, previously reported only from Jamaica and the Virgin Islands, and a species formerly relegated to the synonymy of other species of *Conus.*

In 1942, Clench (Johnsonia, vol. 1, no. 6, p. 3) considered it to be a young specimen of *C. regius* Gmelin. In 1950, Clench and Turner (Occ. Papers on Moll., Harvard, vol. 1, no. 15, p. 258, pl. 31, fig. 10) repeated this opinion. They figured the supposed holotype, although that shell, according to the magnification given in the explanation of plates, is almost twice the size of that from which Adams made his description. I believe Adams probably had several shells, but only one badly worn specimen (possibly a young shell of *regius*) remained in his collection when Clench and Turner chose the holotype. In 1875, Weinkauff (Syst. Conchyl. Cab., vol. 4, pt. 2, p. 392) considered *armillatus* a synonym of *C. proteus* Hwass = *C. spurius* Hwass on the basis of a probably misidentified specimen in Dunker's collection. In 1864, Krebs (The West Indian Marine Shells, p. 3), suggested, in error I believe, that this species was *C. mindanus* Hwass from the Philippines.

Below is given a full description, which has so many important features mentioned by Adams that I have little hesitation in assuming that these specimens from Mrs. Barnes are *C. armillatus.*

Shell 13 to 17 mm. in length, solid, and ovate-conic. Whorls 7, rounded at the shoulder, slightly convex on the sides, and flattish at the base. Whorls in spire convex. Ground color milk-white, overlaid with irregular dark-brown mottlings which may consist of squarish or oblong splotches at times becoming axially con-

fluent. Color of spire white with narrow, zigzag axial bars of black-brown. Interior of aperture purple-brown with a revolving, narrow white band just below the middle. Base of shell, inside and out, a pale lavender or brownish lavender. Nuclear whorls whitish tan. Spiral sculpture on the spire consists of about 6 fine, raised threads; on the body whorl there are about 20 very narrow, raised, whitish threads bearing a series of tiny rounded beads; towards the base the threads become more grossly pustulous, but on the fasciole they are obsolete. The scar caused by the posterior siphonal filament, located on the parietal wall at the top of the aperture, is deep and channel-like. Length and width of 3 specimens, respectively, are: 16.5 × 9.4; 15.3 × 8.5; and 13.0 × 7.5 mm.

Comparative remarks: C. armillatus is recognized by its lavender base, and non-coronate spire. *C. armillatus* resembles *C. jaspideus* Gmelin in size and shape, but has fine spiral threads on the top of the whorls in the spire and has a lavender base. It differs from *regius* in not having a coronate spire. Superficially, the color and shape of this cone suggests a darkly colored, immature specimen of *Columbella mercatoria* (L).

Mrs. Barnes also obtained at Aruba one of the smallest specimens of *Strombus gallus* L. on record (an adult 70 mm. in length), and two cones which appear to be *Conus sennottorum* Rehder and Abbott, 1951.

ELLOBIID AND OTHER ECOLOGY IN FLORIDA

By J. P. E. MORRISON

In the course of a two weeks' visit to the Miami region in November 1955, a special search was made for the species of salt-marsh snails (Ellobiidae) living there and on the Florida Keys. This search proved so successful that the ecological observations are offered here in the belief that at least some of this data may be new to others also. They should be helpful in collecting the species more readily, as well as in understanding these species and their biology. Knowledge of the habitats is necessary even to find some of the smaller forms which live only under rocks along some of the Florida shorelines.

At Matheson Hammock Park, the small black *Batillaria minima* (Gmelin) was abundant in countless numbers everywhere on the coralline rocks along the shore. *Nassarius vibex* (Say) was

found in one to three feet of water in the sandy bottom at the swimming beach. A walk (barefooted, and carrying a small grandson on one arm) on the coralline gravel surface of the rock jetty that surrounds and protects this swimming beach was somewhat painful. Search here under some rotting coconut husks in the drift piled along the high tide line on the outer side of the jetty yielded a few live specimens of *Pira monile* (Bruguière) as a reward. Also, there were a few *Tectarius muricatus* (Linné) in the crevices of the coralline rocks just a little above the high tide line.

Travelling southward a mile or so to Snapper Creek, by outboard motor boat, we went a mile up the creek to get into the landward part of the Mangrove swamps. A small inlet cut into the swamp on the north side of Snapper Creek was barren of shells, but at a distance of 25 feet or so from this inlet, the expected *Melampus* population was found. These *Melampus coffeus* (Linné) were quite active, crawling all over the mud of the swamp, in the shade of the mangroves, when the tide was low. More than 200 were picked up in just a few minutes. Care taken to completely sample the population by collecting every specimen in a limited area, including all the small shells, paid off. When these shells were studied later, it was discovered that *Detracia clarki* Morrison is living here in small numbers with *M. coffeus*. The 15 specimens of *clarki* collected here looked just like the small *M. coffeus* when they were all mud-coated and crawling on the mud surface together.

A check of the mangrove swamp just behind the sand barrier at the mouth of Snapper Creek revealed *Melampus* thriving here also. In this part of the swamp, only 4 specimens of *Melampus bidentatus* Say and 6 specimens of *Detracia clarki* were picked up with more than 200 of *Melampus coffeus* in a short time. Under the logs and other drift at the high tide line on the Biscayne Bay side of the sand beach barrier were found a couple of mature specimens of *Detracia bullaoides* (Montagu), in company with numerous *Truncatella pulchella* Pfeiffer and *T. caribaeensis* Reeve.

On the return from a sight-seeing trip to Key West, a stop was made for swimming at Bahia Honda Key. While the family, including the grandsons, went swimming at the beach on the north

side of Bahia Honda, I struggled a few yards into the mangrove swamp just east of the parking lot, and fought off mosquitoes and blackflies for about a half hour. *Melampus* were not too abundant here, but were seen sparingly on the mud, or on the lower parts of the mangroves. Only one large *Melampus coffeus* was found living here. A mixture of *M. bidentatus* (41 specimens) and of *Detracia clarki* (26 specimens) made up the rest of this sample. Before the tide came in too far, a dozen and a half of the tiny *Cerithidea costata* (DaCosta) were seen crawling on the mud and the fallen mangrove leaves. They were not abundant here, perhaps only one or two every square yard, in this landward margin of the mangroves. The incoming tide also prevented the discovery of the exact habitat in which the brackish-water clam *Pseudocyrena maritima* (Orbigny) lives in this swamp. Only a couple of recently dead, empty shells of the *Pseudocyrena* were collected.

On the north side of the small boat channel at the northeast corner of the parking lot, the shore is open, rocky, with a few small mangrove saplings beginning to take hold. Under the small rocks (coralline limestone) just below the high tide line, live three minute species of Ellobiids, along with the tiny golden snail *Syncera*. On the under side of these rocks, the tiny specks of dark reddish brown color proved to be *Pedipes ovalis* (C. B. Adams), and *Syncera modesta* (H. C. Lea); those of paler color were mostly *Laemodonta cubensis* (Pfeiffer), with two specimens of *Marinula succinea* (Pfeiffer). One fine specimen of *Siphonaria alternata* (Say) was found on one of the rocks here also.

A three-day stay on Plantation Key was especially valuable in allowing time to look for some of the less obvious species. The north side of the Key, just east of the Plantation Harbor Yacht Club pier, is a secondary habitat, rather than a completely natural one. It has been filled, with a shore line stabilized by a low concrete wall in part, and with the edge of the fill elsewhere protected by a line of coralline rocks. At the high tide line, under the rocks, drift materials, and around the roots of the grasses along this margin, there is a very definite zonation of certain species. On this particular shore, the zonations of habitat are very narrow, and the species overlap in their occurrence somewhat, but still there is a rather definite picture of the

zonation, if careful attention is paid to look for it. *Detracia bullaoides* (Montagu), *Melampus coffeus, M. bidentatus,* and *Pira monile* (Bruguière) are all to be found under these rocks, with the *Detracia* furthest away from the water. The *Pira monile* are closest to the water line in this habitat.

One low spot on this northern shore of Plantation Key apparently represents a trace of the former typical mangrove swamp conditions. Here were found 4 *Detracia bullaoides* of large size; 1 specimen of *D. clarki;* 10 *Melampus coffeus;* 28 *M. bidentatus* [of the small dwarf form erroneously figured by Binney, Dall, and others as *Detracia floridana* (Pfeiffer) for many years]; and 1 empty shell of *Pseudocyrena maritima* (Orbigny). A couple of shells of *Cerithidea scalariformis* (Say) were drifted on this north shore, but they were not living in this particular area.

The truncatellas are exceedingly abundant here. All three Florida species are living on this shore, in slightly different habitat zones. Closest to the water, where they are probably immersed at every normal high tide, *Truncatella scalaris clathrus* Lowe is common on the sand under the rocks. A little further, that is just a few inches up the shore, *T. caribaeensis* Reeve and *T. pulchella* Pfeiffer appear. The *caribaeensis* are less common, and burrow more deeply in the sand under logs or stones, when they are inactive in the daytime, than do *pulchella.* The *T. pulchella* population also extends further landward into a higher and drier habitat. *T. pulchella* lives here by the myriads. The maximum concentration of individuals of *T. pulchella* Pfeiffer in this place was estimated to exceed 1,000 to the square foot.

On the under side of these rocks just a little below the normal high tide line, there are tiny ellobiids to be found. Sitting or lying in the sun is pleasant, but searching every rock, and picking off the tiny snails with spring-steel forceps requires a sharp eye and a patient, steady hand. *Pedipes ovalis* C. B. Adams (252 specimens), *P. mirabilis* (Mühlfeld) (2 specimens), and *Laemodonta cubensis* (Pfeiffer) (2 immature specimens) were taken here in a couple of hours, along with a few young mussels of the genera *Crenella* and *Brachidontes,* which were attached to the under surface of these rocks by their byssal threads.

A little to the east along this north shore, a small colony of *Siphonaria alternata* (Say) was discovered in the splash zone (intertidal) near the high tide line on eroding limestone rock of the natural shoreline. Although it was a simple matter to collect 100 small specimens with the point of a knife blade, this colony was apparently restricted to about twenty feet of shore line.

The other Florida species *Siphonaria* (*Patellopsis*) *pectinata* (Linné) was found in great abundance on the creosoted wooden jetties along the Golden Beach (188th Street of Miami Beach). A number were brought home alive, in spite of undergoing some rough treatment over a period of about seven days. The night after they were placed in a salt-water aquarium maintained by friends, Mr. and Mrs. William Foster of Falls Church, Virginia, they laid gelatinous egg strings, crowded with hundreds of tiny eggs, on the glass and on other shells. Subsequent check of these egg masses, and recovery of the (dead) empty larval shells later, proves that this species has a pelagic larval stage in its life history, as Thorson (Danish Sci. Investigations in Iran, part II, pp. 225-227: 1940) has reported for the species *Siphonaria sipho* Sowerby, from the Persian Gulf. The larval shells of *pectinata* resemble figure 30 F on p. 224 of Thorson's paper. Does *Siphonaria alternata* (Say) have a pelagic stage, or does the young individual crawl out of the egg mass, as Thorson (loc. cit., pp. 227-229) has reported for *S. kurracheensis* Reeve? Otherwise, why are the colonies of *alternata* apparently so localized or restricted? In ecology, the two Florida species of *Siphonaria* exactly parallel the two species studied by Thorson in the Persian Gulf. *S. alternata* is found in the splash zone near high tide line, and normally remains out of water for hours at every tide interval. In direct contrast, the *Siphonaria pectinata* live closer to low water mark, always wet in their natural surroundings, and lay numerous eggs in soft, gelatinous strings. Their larvae pass through a pelagic stage after hatching.

The south or oceanic shore of Plantation Key was visited once. This slow shore had apparently been partly cleared at one time by burning off the mangroves or other trees. Only a few *Tectarius muricatus* (Linné) and *Littorina angulifera* (Lamarck) were to be found here on the stumps drifted up on the beach.

Nearby, on and under boards, and a low shrubby plant mat, *Melampus* were abundant on the lowest, most swampy part of this shore line. *Melampus coffeus* (18) and *M. bidentatus* (156) were here in about a 1 to 8.6 ratio. Both these species were extremely active, about 5:00 p.m. just at dusk, after a rain, as the tide was coming in. Empty shells of *Ellobium pellucens* (Menke) were seen in the drift, but no living ones were discovered before darkness and the mosquitoes necessitated a retreat from this south shore.

Stops were made at several places on the way back to Washington, to look for *Melampus* and *Detracia*. The edge of the U. S. No. 1 highway embankment along a tributary of the Halifax River, 2 miles south of Allandale, Volusia County, Florida, yielded a few *Melampus coffeus* and *M. bidentatus*. Nearby, under oyster shells, etc., on a fill, at the extreme high tide level in this estuary, *Truncatella pulchella* Pfeiffer was found in moderate abundance. How much further north along the east coast of Florida, does *M. coffeus* live? A look at the map indicates that it probably should be living naturally at least as far as the north end of the Halifax River estuary system, that is about 15 miles north of the city of Daytona Beach. It is interesting to note that this Volusia County record on the east coast is just about five miles south of the latitude of the northernmost record of *M. coffeus* known to me from the west coast of Florida. That is, Hemphill's record from the Cedar Keys.

To the northward, at inlets along the road on St. Simon's Island, Georgia; and south of Murrell's Inlet, South Carolina; and south of Myrtle Beach, South Carolina, along route No. 17, the facies or aspect of the population of *Melampus bidentatus* Say is changed. The *M. bidentatus* in these marshes north of Florida appear more uniform; the shells of any one population seem much less variable both in size and color, than is the case in the populations seen from the Florida Keys. In this group, as in some others known, there possibly are more generations of *Melampus* per calendar year unit in the subtropical climate of Florida in which *M. coffeus* lives, than there are to the northward in Chesapeake Bay, for example. With the same rate of variation per generation, we might thus explain the

much greater observed variation of shells to be found in the southern Florida populations. This change in the populations of *M. bidentatus* seems to coincide with the geographic zone in which *M. coffeus* drops out of the picture, and the common Chesapeake Bay littorinid *Melaraphe irrorata* (Say) shows up in the marshes alongside *bidentatus*.

It will be interesting for collections to be made to determine whether *Melampus coffeus* is ecologically restricted to the range of the white mangrove, *Rhizophora mangle,* which is known from Brevard County, southward, or to the range of the black mangrove, *Avicennia nitida,* which is known from St. Johns and Levy counties, southward; as well as spots in Mississippi and Texas.

At present writing, no specimens of *Melampus coffeus* are known to me from the United States shores of the Gulf of Mexico, westward of the Cedar Keys, Florida. All such records in the literature that I have been able to trace, particularly those from Texas, refer to *M. bidentatus* which has been misidentified.

The distinction of *Melampus coffeus* from *M. bidentatus* and from *Pira monile* is easily made, because the sculpture of the shell above the shoulder of the body-whorl is different in each case. *M. bidentatus* possesses spiral incised lines on this part of the shell (if not all the way up and down the body-whorl).

M. coffeus has no such spiral incised lines on the spire or the upper part of the body-whorl. *Pira monile,* on the other hand, shows a single spiral row of epidermal setae, or pit-scars after loss of the setae, in the middle of each whorl on the spire.

ADDITIONS TO TEXAS MARINE MOLLUSCA

By DONALD R. MOORE
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The marine mollusks of Texas probably have been studied less than those of almost any other coastal region of the United States. The opaque waters, the repetitious stretches of sandy beach and the dearth of pretty collector's items probably have had much to do with this lack of interest. However, some 450 species have been listed by various authors up to the present

time. In 1952, a resumé of all marine species reported from Texas waters was published by T. E. Pulley. This paper is of great value because it brings all records together in a systematic list, and is a great time saver for any worker on Texas mollusks.

The species have notes on their occurrence from Pulley's own observations, or else prior authorities are listed. Pulley also corrected a number of errors of previous workers.

While at the Institute of Marine Science at Port Aransas, Texas, I collected and observed mollusks in the vicinity of the station. Unusually clear water in the summer of 1955 gave me a chance to dive around the jetties and to observe the living animals. Some of these species were not listed by Pulley, and little information was available on others.

All the species discussed in this paper were collected in the vicinity of Port Aransas. Most were collected by myself, but a few were collected by other workers at the Institute of Marine Science. This marine station is located on the southern shore of Aransas Pass, a jettied inlet between the Gulf of Mexico and Aransas Bay. The pass is an important ship channel, and is maintained at a depth of over 30 feet. Near the Institute, the bottom slopes down to a depth of about twenty feet within approximately 150 feet from the jetty. The bottom consists of sand, and, where the engineers had dumped them, piles of limestone rocks. One such pile, just east of the laboratory dock, proved to be a prolific collecting ground.

Most of these rocks had many small holes over the surface, and in each could be seen a velvet brown siphon. Small rocks taken ashore and cracked open were found to be riddled with a rock boring bivalve, *Lithophaga bisulcata* (Orbigny). Pulley found this species in oyster shells in Aransas Bay where they must have been very small and few in number. In the rocks at Aransas Pass, however, they were quite large and extremely numerous. Many specimens were close to 40 mm. in length, and the largest measured 42 mm. Their burrows, 60 to 70 mm. deep, were considerably larger in diameter deep within the rock than at the surface. As a result, an apparently solid rock when dropped on the concrete jetty cap would easily shatter. Probably underwater limestone structures would not last long in these waters.

Members of the family Arcidae are usually rendered inconspicuous by dull colors and a rough epidermis. The three species found in Aransas Pass were no exception to this rule. The largest and most common was *Arca umbonata* Lamarck. Pulley states that fresh dead valves of this species have been found in this locality, but as far as I know, no one has reported living specimens from inshore waters before. *Barbatia domingensis* (Lamarck), cited as *Arca reticulata* Gmelin, was reported by Pulley from the coral banks 50 to 100 miles offshore. This species is smaller than *A. umbonata,* and was much less common. Living specimens were found in the same general area as the preceding species. A single live specimen of *Barbatia candida* (Helbling) made a new record for the Texas coast. All these species are attached to rocks by a byssus.

Two species of Chamidae were found living cemented to rocks. Only one *Pseudochama radians* (Lamarck) was collected, but it was a large, fully adult specimen indicating favorable conditions for a considerable length of time. The other species, *Chama congregata* Conrad, was found to be more numerous, but still rare. Neither genus has been reported from Texas before.

A more common bivalve was *Isogonum alata* (Gmelin). Rather small live specimens were collected from rocks along the edge of the jetty.

Among the gastropods, *Cantharus tinctus* (Conrad) was to be found everywhere, living on rocks and pilings. This species was reported by Whitten *et al* in 1950. Before that, Dall and Strecker had both listed it as occurring in Texas. However, Pulley said it does not live in Texas.

A live specimen of *Drupa didyma* Schwengel was something of a surprise. This species was described in 1943 from the east coast of Florida, and this is the first record from the Texas coast.

Another uncommon species was *Monilispira leucocyma* (Dall). One dead and two live specimens were collected from the rock pile just east of the laboratory dock.

Fasciolaria distans Lamarck has been reported by Pulley as living offshore in 15 to 30 fathoms. During the month of July, 1955, this species was fairly common. Most specimens were found under rocks, but one was found crawling. A larger species of

the same genus, *Fasciolaria (Pleuroploca) gigantea* Kiener, was not as common. However, I found four live specimens one day. They were not very large, 200 mm. to 250 mm., and were probably immature. Eggcases of this species commonly wash up on the beach at Mustang Island during the summer months.

The sand bottom along the jetties was also examined. A small venerid clam, *Chione grus* (Holmes), was taken alive. This species was reported by Ladd, 1951, but not by Pulley. A live *Mangelia cerina* (Kurtz and Stimpson) was also found. *Cerithium floridanum* Mörch and *Nassarius ambiguus* (Pultney) were represented by worn, dead specimens. Perhaps these last two species were weathered out of Pleistocene deposits.

The presence of an oceanic pelagic pteropod in the Pass was discovered in an odd way. The slender glasslike shells of *Creseis acicula* Rang pierced my hand in numerous places while I was changing strainers on the underwater intake pipe below the laboratory dock. These animals had been drawn into the strainer, and had been caught with the sharp pointed apical end protruding. The weather for some time preceding had been calm, the water clear, and Gulf water quite probably had moved in almost to the beach. However, the pteropod invasion must have been of short duration, for ideal conditions do not last long on the Texas coast.

Among beach drift specimens collected by C. E. Dawson and Henry Hildebrand, several were of more than ordinary interest. *Epitonium novangliae* (Couthouy) is reported from Texas by Clench and Turner in Johnsonia, 1952, but it is not on Pulley's list. Several specimens were found.

A gastropod, *Odostomia seminuda* (C. B. Adams), was the smallest specimen identified from beach drift. *Odostomia engonia* Bush was scarcely larger. This last species has not been reported from the Gulf before.

Several small bivalves were found imbedded in the tunic of a tunicate washed up on the beach by March winds. All specimens were of *Modiolaria lateralis* (Say), a mollusk often found associated with tunicates. Very small specimens were found, a few days later, attached to blocks of tar which had washed ashore. This species has not been reported from Texas before.

It is impossible to say when the rock living species came into

the Pass, or where they came from. They probably lacked a proper substratum before the Pass was jettied. Those species with planktonic larvae probably moved in shortly after a hard substrate was provided. Species hatching out as bottom crawlers, such as *Cantharus tinctus,* would have to immigrate by mechanical means (on ship bottoms, etc.), and would take longer to settle. Whitten, in 1947, found only one specimen of *C. tinctus;* I found this species to be quite common in 1955. Although our collecting methods were admittedly different, this species possibly had just begun to establish itself, and was quite rare when Whitten made his survey.

Most specimens mentioned above are in the collection of the Gulf Coast Research Laboratory.

The following species are discussed in this paper:[1]

Cerithium floridanum (D, R). Not reported before.
Epitonium novangliae (D, R). Not listed by Pulley; reported in Johnsonia.
Odostomia engonia (D, R). Not reported before.
Odostomia seminuda (D, R). Not reported before.
Sistrum didymum (A, R). Not reported before.
Fasciolaria distans (A, R). Reported by Pulley as living offshore in 15 to 30 fathoms.
Fasciolaria gigantea (A, R). Live specimens not reported before.
Nassarius ambiguus (D, R). Not reported before.
Cantharus tinctus (A, C). Reported before, but Pulley states that it does not live in Texas.
Mangelia cerina (A, R). Pulley lists it as reported by Singley.
Monilispira leucocyma (A, R). Not reported before.
Creseis acicula (A, R). Reported before. Pulley states that it is a pelagic species that probably lives offshore.
Arca umbonata (A, C). Fresh dead shells reported by Pulley.
Barbatia candida (A, R). Not reported before.
Barbatia domingensis (A, R). Reported by Pulley from 50 to 100 miles offshore.
Lithophaga bisulcata (A, C). Reported by Pulley from oyster shell.
Modiolaria lateralis (A, R). Not reported before.
Isogonum alata (A, R). Not reported before.
Chama congregata (A, R). Not reported before.
Pseudochama radians (A, R). Not reported before.
Chione grus (A, R). Reported by Ladd, but not by Pulley.
Dentalium eboreum (D, R). Not reported before.

[1] A, alive. C, common. D, dead. R, rare.

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STUDIES ON MOLLUSK POPULATIONS: IIIa[1]

BY R. STOHLER
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Dall (1871, p. 130) described a variety of *Chlorostoma brunneum* (Philippi) and gave it the name *fluctuatum*. The whorls of this new variety were said to be "marked with oblique, prominent, rounded, short riblets." No type was designated nor was a type locality mentioned.

Almost 50 years later, Dall (1919) described a new variety of *Ch. brunneum,* but named it *fluctuosum*. Monterey, California, is given as the type locality and the type lot is U. S. National Museum Cat. No. 60055. The sculpture is described as "well-marked obliquely protractive ribs to the number of 18 or 20 on the last whorl, reaching from the suture nearly to the periphery." Dall further states that the variety is less elevated than the typical specimens and that the suture is more depressed. Neither of the two descriptions is accompanied by figures.

The variant of the common brown turban shell of the Pacific coast may be found, in varying proportions, in almost any population of this species. Several careful collections were made by this writer in different California localities by picking up every snail that, through foam-sprayed bifocal glasses, appeared to be a *Tegula brunnea;* shells inhabited by hermit crabs were, however, immediately discarded. In each case, before leaving the collecting area, each animal was carefully examined and an accurate count was made; the typical specimens were returned to tide pools and all individuals showing the variation to any extent, were retained and later preserved.

In the accompanying table are given the numbers and percentages thus found. The percentages are calculated to indicate

[1] An abstract of this paper has been published (1955).

how many variants were obtained in each hundred specimens collected.

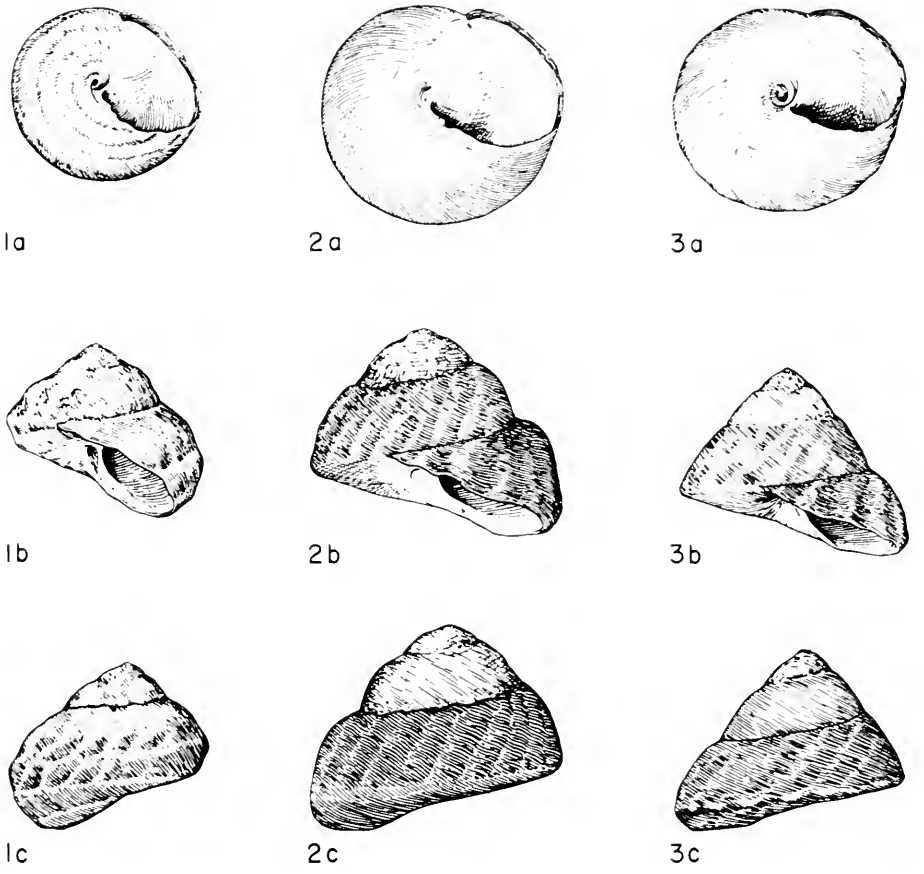
Lat. North	Locality & County	Total No.	No. of var. (%)
38°48′	Havens Neck, Mendocino	77	7 (9.09)
38°34′	Salt Point, Sonoma	79	15 (18.99)
37°12′	Pigeon Point, San Mateo	548	48 (8.76)
36°32½′	Mission Point, Monterey	74	3 (4.05)
36°27½′	Point Soberanes, "	70	20 (28.57)

The two last localities deserve, perhaps, special attention: the populations collected are nearly identical in size but the number of the variants reach here the extremes of the entire series; yet the two localities are only a few miles apart and the general features of the environment are, as far as is apparent, identical, which seems to rule out ecological factors.

Another point, which cannot be shown in any table, needs special mention, namely the fact that in any group of the variant (such as that obtained at Salt Point or Point Soberanes, but particularly the larger group from Pigeon Point) there is to be observed almost every possible intermediate form between the typical smooth *brunnea* and the extreme variant form. This alone would suffice, as pointed out in an earlier paper of this series (Stohler, 1950), to relegate the variety *fluctuosa* (Dall) to the synonymy of *Tegula brunnea* (Philippi).

However, if specimens exhibiting the sculpture described by Dall are compared with typical specimens of *Tegula aureotincta* (Forbes) a striking similarity between the two becomes apparent (cf. figs. 1 and 2). This similarity has convinced the writer that we are dealing with a case of parallel evolution. Presumably, closely related species have a great number of genes in common, whatever the concept of the gene may be; in fact, it might be stated that the more closely related two species are, the greater number of like genes they possess. In parallel evolution, corresponding genes in different species undergo similar mutation trends and the consequent end results would be that the species are more similar to each other than before.

In the genus *Tegula,* several series of shell characters may be regarded as the expression of such parallel evolutionary trends; among them might be considered the presence—or absence, whichever did not occur first—of an open umbilicus, and, of course, the sculpture of the shell. In *T. aureotincta* the char-



1, a-c, *Tegula aureocincta* (Forbes). Palos Verdes Point, Los Angeles County, June 23, 1948. 2, a-c, *T. brunnea* (Philippi). Pigeon Point, San Mateo County, April 29, 1955. 3, a-c, *T. pulligo* (Martyn). Salt Point, Sonoma County, May 24, 1955. All ×1.

Erratum: On pl. 10 and p. 131, change *Tegula pulligo* (Martyn) to *T. pulligo* (Gmelin).—R. Stohler.

acter, described by Dall as a variety in *T. brunnea,* is typical for the species. In *T. brunnea,* on the other hand, it seems to be a mutation that may or may not eventually replace the smooth shell form; in other California species, as far as is known at present, this character is extremely rare or lacking entirely.

The idea that the *"fluctuosa"* character is what may be called a parallel-evolutionary trait receives support from the fact that at the time the group at Salt Point was collected, there were picked up actually a total of 81 *"T. brunnea"* animals; but during examination at the shore, as described above, there were found among these two *T. pulligo* (Martyn) one of which also exhibits the same *"fluctuosa"* character (see fig. 3).

It is considered that the phenomenon of parallel evolution, as discussed here, adds to the validity of placing the "varietal" names *fluctuatum* Dall and *fluctuosa* Dall into the synonymy of *Tegula brunnea* (Philippi).

The shells figured in plate 10 were collected by the writer and are preserved in the collection of the Department of Zoölogy, University of California, in Berkeley. The drawings were made by Mrs. Emily Reid, staff artist.

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MARINE SHELLS OF ILLINOIS INDIAN SITES

By PAUL W. PARMALEE

Sixteen years have elapsed since a summary of marine shells found in Indian sites in Illinois has been presented (Baker, 1911). During these intervening years, archaeologists have uncovered additional quantities of shells which have not only added to the list of species identified but also to the knowledge of the different Indian cultures and the importance that mollusks played in their daily lives. Probably Dr. Frank C. Baker, former Director, Museum of Natural History, University of

Illinois, Urbana, did more in the manner of identifying specimens, interpreting data and stimulating interest in this aspect of conchology than any other individual in Illinois.

All Indian sites in Illinois are, or were located along some body of water and, as evidenced by the quantities of freshwater mussel remains found in midden deposits and village refuse heaps, these mollusks provided an abundant source of food that was normally available, easily obtainable and unlimited. As an indicator of agricultural activity, the values of some of the larger and heavier species (e.g., blue-point, *Amblema peruviana;* washboard, *Megalonaias gigantea)* were drilled and evidently used as hoes, these often being encountered in Hopewell (500 B.C.-1200 A.D.) and Middle Mississippi (1200-1550 A.D.) village sites. Crushed mussel shell was used as temper material in making pottery (primarily Middle Mississippi culture), and often valves were cut and fashioned into pendants, spoons, dishes (?), rattles and various other ornaments and utensils (Cole and Deuel, 1937; Deuel, 1952, et al.). Freshwater snails, especially *Anculosa* sp., were often used as beads.

Marine mollusks occasionally are found in association with Archaic sites (8000-2000 B.C.?) and somewhat more abundantly in Hopewell, but not until the apparent establishment of efficient trade routes or collecting parties by the Middle Mississippi culture do they appear in any quantity. Apparently the marine species were especially prized by prehistoric groups occupying the midwest region and from these shells they manufactured a variety of spoons, pendants, dippers and beads of numerous types. Without exception, the greatest quantity and number of species found in any site in Illinois thus far have been at Cahokia, an extensive Middle Mississippi site in the East St. Louis area (Madison and St. Clair counties) bordering the Mississippi River.

The single most comprehensive work on Cahokia was done by Moorehead (1929) and included an appendix section by F. C. Baker, which also appeared separately (Baker, 1923). Numerous illustrations and descriptions of both freshwater and marine species appeared in the works of Moorehead (1929), Titterington (1938), and Baker (1941). From September through December, 1956, Mr. Gregory Perino, Thomas Gilcrease Foun-

dation, Tulsa, Oklahoma, excavated approximately one acre of the Cahokia village. All bone and shell was given to the author for identification and analysis; the quantity and variety of species encountered serve as a basis for this report.

Acknowledgments: I would like to express my gratitude to Mr. Gregory Perino and the Thomas Gilcrease Foundation, Tulsa, for their kindness in giving me the faunal material from Cahokia as well as permission to use the data. I am especially grateful to Dr. Henry van der Schalie, Museum of Zoölogy, University of Michigan, Ann Arbor, and to Dr. Joseph P. E. Morrison, Division of Mollusks, U. S. National Museum, Washington, for their kindness in identifying certain specimens. Common and scientific names have been taken from "American Seashells" by R. Tucker Abbott.

RANGIA CUNEATA (Gray) Common *Rangia*

Baker (1941) refers to three valves of this species that were found in the James Ramey Mound (Cahokia). An additional four specimens were recovered in the village midden debris at Cahokia during the 1956 excavations by Mr. Perino. Apparently marine clams were not particularly favored judging from their scarcity at sites in comparison with the quantity of gastropods.

DINOCARDIUM sp. Cockle

A small section of a cockle was found by Mr. Perino at Cahokia. Specific identification is impossible but considering thickness and the scalloped margin, it was a portion of a large valve, quite possibly a species of *Dinocardium*. A similar margin fragment was found by George and Ethel Schoenbeck at the Steuben Site (Hopewell), Marshall County.

MACROCALLISTA NIMBOSA (Solander) Sunray venus

The left valve of an adult specimen was encountered in a refuse pit near Cahokia Mound No. 34 by Mr. Perino. Although this species normally possesses a glossy-smooth shell, the polished appearance of the shell, faint scratch lines and apparent smoothing of the posterior margin point to the fact that it had been worked and possibly used as a spoon or other utensil. None of the valves of *R. cuneata* showed signs of having been worked and their use by the Indian is open to question.

STROMBUS PUGILIS Linné West Indian fighting conch
STROMBUS ALATUS Gmelin Florida fighting conch

A single, unbroken large specimen and a fragment of the upper whorls of another, "apparently worked for an ear or nose ornament," were found in the James Ramey Mound (Cahokia) and listed as *Strombus pugilis alatus* Gmelin by Baker (1941). Six additional specimens, *S. alatus,* were found during the 1956 excavations, four in a single large refuse pit that also contained 190 individuals of *Busycon perversum.* One still exhibited portions of the brownish epidermis. This conch is rare in Illinois sites and apparently was little used for specific purposes, with one exception as noted above.

LITTORINA IRRORATA (Say) Marsh periwinkle

There is one record of a single specimen that was found in the James Ramey Mound at Cahokia (Baker, 1923). Quite possibly this small snail, common in the brackish water marshes of northern Florida, was accidently (or incidentally) collected by the Indian and transported inland. Apparently this periwinkle was not preferred, as was the case of *Marginella* for beads, since it is an abundant and easily obtainable mollusk.

PHALIUM GRANULATUM (Born) Scotch bonnet

A section of the outer lip of this species was found in a refuse pit in the Cahokia village by Mr. Perino. This shell fragment is evidently the first record of *P. granulatum* from Illinois Indian sites and, as apparently is the case with other forms represented by only one or a very few specimens, probably was collected incidentally to the preferred species.

CASSIS MADAGASCARIENSIS Lamark Emperor helmet

As Baker (1929) pointed out, "Two large and characteristic species of Mollusca occur in the Hopewell group that are absent from the Cahokia group, *Cassis madagascariensis,* and *Cypraea exanthema.* This may indicate a different trade route, perhaps with different tribes, because these shells would appeal to the aboriginal mind on account of their size and striking appearance as well as attractive colors, . . ." The emperor helmet has been recorded (Baker, 1941) from Calhoun County (two specimens in the Mus. Nat. Hist., Univ. of Ill., Urbana); fragments were

found in the Ogden Mound of the Liverpool group near Lewistown, Fulton County and a single shell was removed from Mound No. 1 of the Montezuma Group in Pike County.

A complete *Cassis* shell vessel was found with a Hopewell burial near Oakford, Menard County, about 1932 by a local farmer. Although the shell was later sold to a private buyer, the Illinois State Museum first obtained photographs of the specimen. The most recent record is that of a shell removed from a Hopewell mound (Bedford Mound No. 9) near Bedford, Pike County, during the 1955 summer excavations by Mr. Perino for the Thomas Gilcrease Foundation.

MUREX POMUM Gmelin Apple *Murex*

Baker (1941) refers to a specimen which was found with a burial in a Hopewell mound (Rose Mound, No. 13) in Schuyler County. The shell was apparently in poor condition but a drilled hole near the anterior canal indicated that it had been used as a pendant or ornament.

THAIS HAEMASTOMA FLORIDANA (Conrad) Florida rock shell

A single, partially broken, large specimen was recovered during Mr. Perino's work at Cahokia in 1956. Apparently this common Florida species had not been found previously in other mounds or village sites in Illinois and of what use, if any, it may have been to the Indian is questionable since the shell bore no signs of having been worked.

BUSYCON PERVERSUM (Linné) Perverse whelk

The perverse whelk is, without exception, the most abundant large marine gastropod recovered from Illinois Indian sites thus far, and it has been found in association with all three major cultural groups (Archaic, Hopewell, Middle Mississippi). This shell evidently was prized highly, judging by the quantity that has been found and the variety of uses to which it has been put. In the case of the Hopewell Indian (Deuel, 1952; et al.), the shell dippers, made by removing the central axis or columella, were buried in mounds with the dead. Possibly because they were more difficult to obtain since there were fewer or less well-established trade routes, the earlier Hopewell prized these whelks even more than the later Mississippi people. Rarely if

ever are complete, or even fragments, of marine shells found in midden debris and refuse pits in Hopewell villages, while remains of them are often abundant in Middle Mississippi village areas (e.g., Cahokia).

No site in Illinois has yielded such a tremendous number of *B. perversum* as has Cahokia. Although dippers were made from this species by Middle Mississippi people, they were probably sought more for their use in the manufacture of ornaments, beads and other objects. At Cahokia disk beads, cut from the whorls, were abundant as well as sections of the axis that had been drilled lengthwise. Complete small and medium-sized shells were drilled and evidently worn as pendants, as were numerous pieces that had been cut into a variety of shapes and sizes. Mr. Perino recovered nearly 300 identifiable specimens of *B. perversum* during his 1956 excavations at Cahokia and a large number of sections and fragments that are probably assignable to this species.

Busycon carica (Gmelin) Knobbed whelk

Baker (1941) points out that the shell illustrated in Moorehead (1929), plate XXXIV, fig. 2, "appears more like a reversed *carica* than a specimen of *perversum*." Because of alteration by working and/or the fragmentary state of many shells, it would be difficult to distinguish *B. carica*. A few specimens have been identified from Cahokia (Moorehead, 1929, plate XXIV, fig. 16) but apparently it never was collected in any quantity.

Busycon canaliculatum (Linné) Channeled whelk

One small (3 inch) shell was removed from a refuse pit during the excavations at Cahokia in October, 1956. It had not been recorded previously from Indian sites in the state and, again, may have been collected incidental to preferred species. The absence of such generally common species may be explained on the basis of local collection points, i.e., possibly the Indians located areas where preferred species (such as *B. perversum*) were abundant and although a variety of other species occurred in the area and were collected, they were not taken in significant numbers.

BUSYCON SPIRATUM (Lamarck) Pear whelk

Eight adult specimens of this rather delicate and thin-shelled whelk were encountered in the village midden debris at Cahokia by Mr. Perino. None of these shells showed signs of having been worked or used, although the single specimen removed from the James Ramey Mound had been drilled and apparently used as a pendant (Baker, 1941).

FASCIOLARIA TULIPA (Linné) True tulip

A single, somewhat weathered specimen of a relatively large individual was recovered from a refuse pit by Mr. Perino near Cahokia Mound No. 34. Because of its only partially complete condition specific determination is difficult, but the shell compared most closely with *F. tulipa*. There is no evidence as to its use by the Indian.

FASCIOLARIA HUNTERIA (Perry) Banded tulip

Baker (1941) refers to a single shell of this common western Florida snail (*F. distans* Lamarck) occurring in the James Ramey Mound at Cahokia. Apparently no additional specimens have been recovered in the ensuing years since 1922.

PLEUROPLOCA GIGANTEA (Kiener) Florida horse conch

A young specimen, portions of a moderately sized individual, a whorl section from an adult shell and a section of columella of an animal approximately 15-18 inches in length were found in the midden deposit at Cahokia by Mr. Perino. A portion of the axis of this large marine snail was encountered in the James Ramey Mound (Baker, 1941). None of these remains bore evidence of having been utilized as pendants, utensils or other artifacts.

PRUNUM APICINUM (Menke) Common Atlantic marginella

Although Mr. Perino encountered only one shell of this species during his four months of excavation, they have been found in considerable numbers at Cahokia (Baker, 1941), late Woodland sites in Jersey County (Illinois State Museum collection: specimens donated by Dr. P. F. Titterington, St. Louis) and elsewhere. This small snail was used primarily for making beads, the side of the shell being ground until the body cavity

was exposed; this and the natural opening served for threading the beads. Several thousand specimens, forming a large blanket which covered a burial, was found in Powell Mound No. 1 at Cahokia. Beads made from this species were encountered with burials at the Dickson Mound Cemetery (Middle Mississippi), Fulton County.

OLIVA SAYANA Ravenel Lettered olive

Numerous specimens were encountered in Powell Mound No. 2 and a single individual in the James Ramey Mound (Baker, 1941). The spire had been removed from the Ramey Mound specimen, possibly for use as a pendant, but those from the Powell Mound showed no evidence of having been utilized. A single set of approximately 134 "Olivella" beads (*O. sayana*) were found with a burial at the Dickson Mound Cemetery, Fulton County.

OLIVELLA JASPIDEA (Gmelin) Jasper dwarf olive

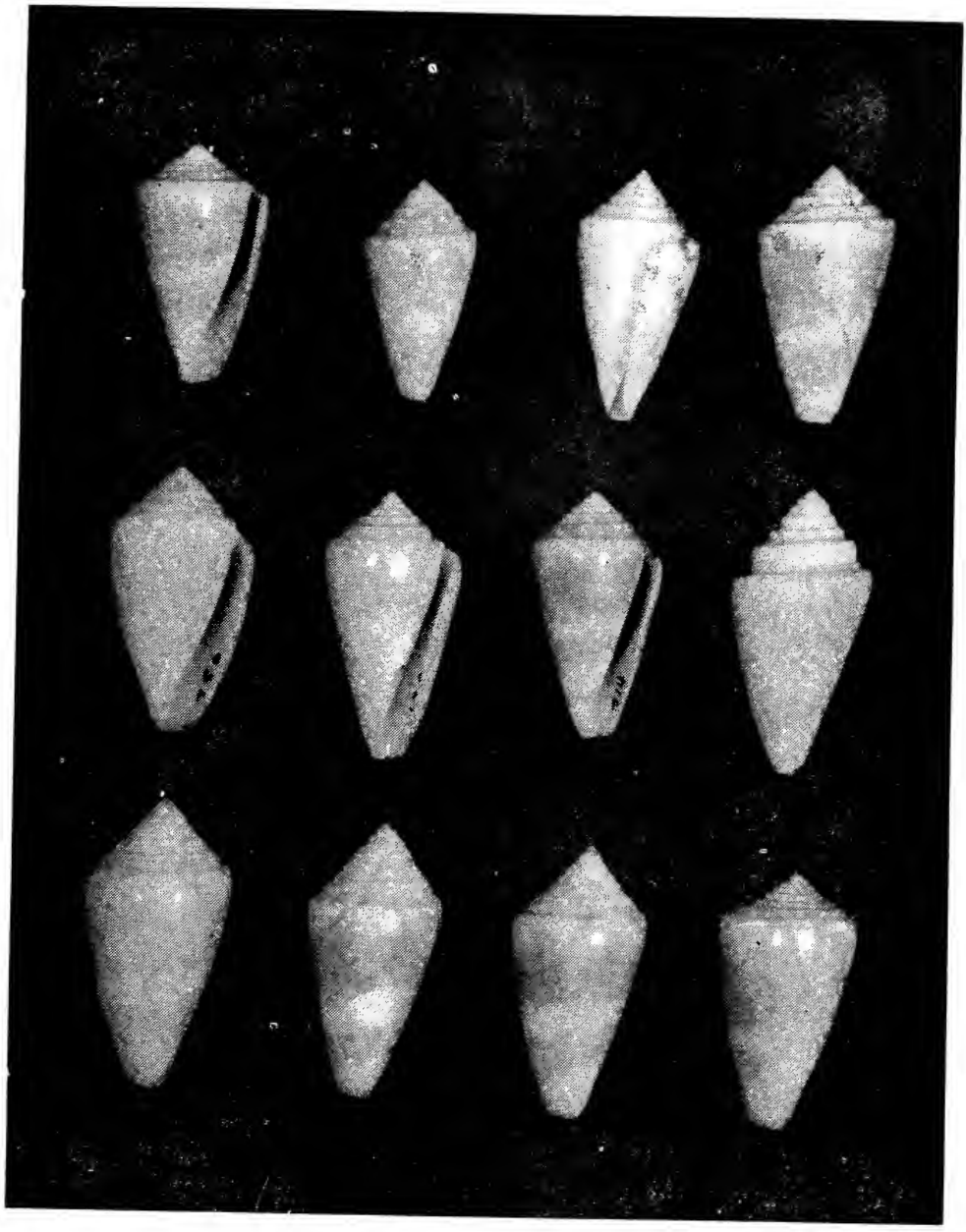
Approximately 85 specimens of this small snail from southeastern Florida were found in the Morton Mound (F°14, Middle Mississippi) in Fulton County (Cole and Deuel, 1937). The apex had been perforated and the shells apparently strung as beads. Titterington (1935, pl. 8, fig. c) found 33 shell beads with a burial uncovered in a western Jersey County mound.

CANCELLARIA RETICULATA (Linné) Common nutmeg

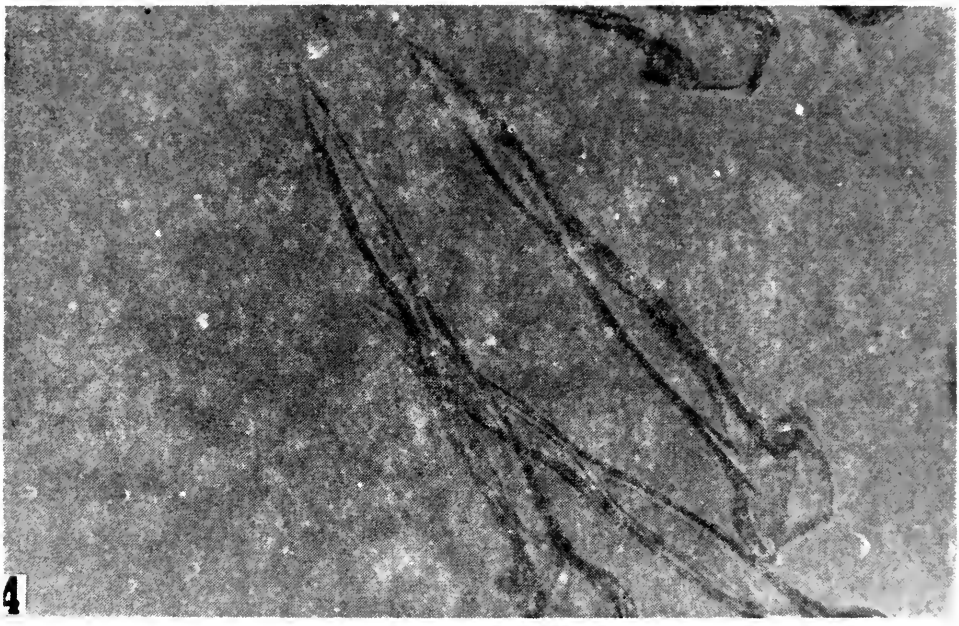
A central axis from this common Florida snail was found in Powell Mound No. 2 at Cahokia. Baker (1941) states that "It was cut so as to show to advantage the spiral plaits or ridges on the columella and its use was doubtless as an ornament, possibly as a pendant for a necklace of Marginellas."

SUMMARY

Marine mollusks, especially the gastropods, were highly favored by the prehistoric Indians of Illinois and they were used in the manufacture of dippers, spoons, drills, beads, pendants and other ornaments and utensils. Although marine shells have been encountered in Archaic sites, and somewhat more commonly in the later Hopewell Culture (primarily *Busycon perversum* dippers), the greatest number and variety of species



Conus bermudensis, shells



Conus bermudensis, radula

have been found in Middle Mississippi sites.

During the last four months of 1956, Mr. Gregory Perino, Thomas Gilcrease Foundation, Tulsa, excavated nearly one acre of the Cahokia village in Madison County, Illinois. From the tremendous quantity of bone and shell removed, approximately 325 specimens of marine mollusks were identified and 6 of the 11 species determined from this sample had not been previously reported from sites in Illinois. The forms new to Illinois sites are: *Dinocardium* sp., *Macrocallista nimbosa, Phalium granulatum, Thais haemastoma floridana, Busycon canaliculatum* and *Fasciolaria tulipa.*

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REPORT ON CONUS BERMUDENSIS CLENCH

By T. R. A. NIELSEN

Dr. Clench in Johnsonia (Vol. 1, No. 6, pp. 34-35) described a new species of cone from Bermuda, however I feel that the following report will add greatly to the available information on this interesting shell. This report is based on my findings over a three year period of diving, collecting and study, during which time I have collected about three hundred specimens both living and dead.

So far as is known, *Conus bermudensis* (pl. 11) occurs only in Bermudan waters and has been found living in water up to thirty-five feet in depth (deeper waters have not yet been explored due to difficult dredging conditions) and is to be found only in harbor waters and not in the open sea. The specimens upon which this report is based were collected by the author

in the following areas: Grace Island, Spanish Point, Hawkins Island, north side of Long Island and Two Rock Passage.

Conus bermudensis prefers a shell-mud bottom fairly thickly overgrown with long marine grasses and is usually found partly buried so that only part of the shell is visible to the swimming collector.

During the late summer (Aug.) *Conus bermudensis* is often to be found in pairs (sometimes in threes) adhering to each other which may indicate that this is their breeding season. Living specimens of this shell are fairly easy to obtain in a few small areas, but perfect specimens (from a fussy collector's standpoint) are very rare; usually the shells are badly worn.

Two distinct color forms exist; one is pale pink with blotches of darker pink or even brick red, and the other is pale orange with blotches of darker orange or even rusty orange. These two color forms never merge and one can easily differentiate between them. I would like to note here that both color forms can be found in a bed of these shells, indicating perhaps a sexual difference rather than a racial one. The orange color form seems to be much harder to obtain than the pink form. I also wish to note that on two occasions I have taken a pure white specimen, but these were not albinos.

Sculpturing on mature specimens consists of seven to ten incised lines covering the lower third of the shell and often very faintly over the rest of the body whorl, however young shells often display heavy grooving over the entire length of the body whorl and sometimes these grooves were broken to form heavy beading.

The operculum is very small, being only about 1/16th the length of the aperture and is roughly oval in shape. It is very thin and light brown or tan in color.

The perioscutum is thin and opaque and rusty brown in color, but is usually badly worn in mature specimens.

The radular teeth are very tiny, each being about .23 mm. long, and are of the usual barbed, harpoon-like kind found in most of the Conidae (Plate 12, fig. 4, × 300).

Early morning collecting disclosed that *Conus bermudensis* feeds on annelid worms, which the cone finds just under the surface of the mud-shell sea-bed.

The shells in plate 11 range from 35 mm. to 47 mm. in height. From left to right in each row, the figured shells may be described as follows:

Top row: typical, slightly coronate, typical and typical. Middle row: rounded, pure white, typical and a freak. Bottom row: orange, orange, high-spired pink and low-spired pink.

LAND SNAIL DISPERSAL

By H. BURRINGTON BAKER

This will deal largely with generalities. Generalities do exist in taxonomic problems, although generalizations or general laws usually are very dangerous.

The first question to ask is: What is a land snail? The answer is that there is not any such thing. In fact, one might say that no such thing as a land animal exists. For example, you readers, who undoubtedly consider yourselves land inhabitants, actually see under water, hear under water, breathe under water and carry on all your life processes in dilute salt water. You are able to live on land only because you make tanks of yourselves; in other words, you really are perambulating aquaria.

But, as compared to you, the land snails are very inefficient and leaky tanks. None can live actively except in the presence of water or in humidity rather near the dew point. But mollusks do have remarkable powers of aestivation, and, some land snails can exist in a semidormant state during dry periods for at least as long as 5 years. They are able to do this because they have in their shells reserve supplies of $CaCO_3$ (calcite or aragonite) to which they can add, or from which they can subtract relatively large quantities during their growing or adult lifetimes. In order to prevent asphyxiation during dry periods, they dissolve $CaCO_3$, even to the extent of making holes in their shells, in order to buffer the CO_2 (acid) content of their blood. This is correlated with the fact that most desert snails are calcophiles (prefer limestone). The reverse of this is also true; snails can live better than most animals where $CaCO_3$ is superabundant, because they can secrete that excess of lime into their shells.

In this brief consideration of land snail distribution, paired

extremes will be discussed under four headings, as follows:

DISPERSAL		CHANCE		BARRIERS		EVOLUTION
automotive	→	large numbers (laws)	→	ecologic	→	major taxons
adventitious	→	small numbers (luck)	→	zoogeographic	→	speciation

By automotive dispersal, progression of the snails by their own efforts is meant. Although the foot of some snails has muscular waves of contractions which help them to travel, none walks like you do; all snails actually swim with the beating of microscopic hair-like processes, called cilia, on the sole of the foot. Thus a land snail really swims over the land, along a little river of slime, which it secretes as it goes forward, largely from a hole at the head end of its foot. For these reasons, snail species are proverbially slow, but, in the hundreds of thousands of years of their history, they might get anywhere in the world, if some barrier did not stop them.

The other extreme in dispersal is adventitious or accidental carriage by other means, e.g., by birds, by hurricanes, etc. Of course it also includes introduction by man, but this usually is called artificial, as opposed to natural dispersal. Natural adventitious dispersal, of course, takes place very rarely, which means that small numbers are involved. In this connection, you should remember that the land snails of the Pulmonata have a great advantage over most animals, for example, over most operculate land snails, because they are hermaphroditic, that is, each animal has both male and female organs and can fertilize its own eggs. Thus, in such hermaphrodites, the accidental transport of one juvenile individual might start a new colony. On the other hand, in order to establish a species with separate sexes, at least a young male and a female must be introduced simultaneously; in fact, one can prove mathematically that still larger numbers probably would be required. To illustrate this by a hypothetic case, suppose that the chances are a million to one against the arrival of one animal by accidental transport in a given time period—say one year, which would mean one might expect several during the last geologic era. Then the chances would be 2 billion to 1 against the simultaneous but independent arrivals of two animals of opposite sexes—2 million times as great, which would not allow enough time since the beginning of the better known geologic eras in the Cambrian.

This naturally leads up to the difference between large and

small number chance. Of course, automotive dispersal, since it takes place over a broad front or periphery, involves large numbers, while adventitious transport is rare and may be limited to a single individual.

The rather fundamental difference between large and small number chance may be exemplified by throws of a die—one of the pair of cubes used in "craps" or backgammon. As you know, each die has 6 sides with numbers of spots from 1 to 6. If you throw a die many times, you can predict with mathematic accuracy that 1/6 of the throws will result in one spots (e.g., 6000 throws means 1000 ± 31.6). On the other hand, if you throw a die only once, no one can prophesy that you will get an ace. In fact, mathematically speaking, the same is true of 4 throws, because 4 throws are not significantly different from none. Even 9 throws would only reach the borderline of careful mathematic significance. Small number chance is luck, pure and simple.

Thus, although automotive dispersal may be defined in terms of general laws, this is not true of adventitious transport. The accidental arrival of one species and the absence of another may be a matter of sheer luck. Thus, in any one case, even though my hypothetic hermaphrodite geophile had an advantage of 2 million to one, an operculate snail, with separate sexes, just might happen to be 2 million times as lucky, and be the one to get transported.

In time, dispersal means that each species would occur everywhere unless it be stopped by barriers, which also have two extremes, which I am calling ecologic and zoögeographic. Since the distinction between these two is a matter of semantics, I must define my terms. As used here, an ecologic barrier is one that involves only one gradient, in some climatic, physiographic or biologic factor, or complex of factors; it is readily crossed by ecesis, e.g., by slight gradual adaptation to changed conditions during automotive dispersal. On the other hand, I mean by a zoögeographic barrier one that involves two opposing gradients, the crossing of which almost always requires sporadic adventitious transport. Before proceeding, let me emphasize that the difference between them is not a matter of distance. As defined here, either may include thousands of miles, or, in some cases of land snails, distances of much less than a mile.

An example, of a large scale climatic gradient which provides ecologic barriers, would be shown by a map which is one of a series which I based on the records of the U. S. Weather Bureau. So far as I am aware, no similar maps ever have been published. It represents the distribution in the U. S. of one aspect of temperature: The length of the growing season. Each of the 13 color zones represents a difference of 30 days,—from less than a month between killing frosts on the summits of the Rockies to more than 360 days (practically without frost) in the Florida keys and along the coast near San Diego. Although they represent actual barriers to migration, the lines between these color zones, as you know, are arbitrary; actually the map should show a gradual gradient of color from north (or high altitudes) to sea level in the south. Also, since the data mapped are means over many years, they do not represent the conditions of any extreme year. This means any zone may be much farther north in a hot year and more to the south in a cold one. These conditions assist ecesis, in adaptation to cooler or warmer temperatures. Of course, since the spread of a species by ecesis takes place over a broad front by automotive dispersal, it involves large numbers and general laws.

For examples of zoögeographic barriers on a large scale, I have two other maps; one represents mean annual rainfall, and the other the seasons in which precipitation exceeds 2 inches a month. In each, there are three zones, which run roughly from north to south and at right angles to the temperature zones, and in which the precipitation is high and sufficient throughout the year. These zones are in eastern U. S., the Rocky Mts., and along the Pacific coast. These three humid zones are separated by two regions of lower rainfall, which involve two opposing gradients of decrease and increase. Thus a land snail of humid eastern U. S., in order to reach the Rockies, would have to adapt itself down a gradient of decreasing wetness, and then reverse ecesis and climb up one of increasing humidity. Animals almost never cross such opposing gradients by automotive dispersal and ecesis. Adventitious transport is the method necessary and this involves small numbers, perhaps only single individuals, and sheer luck. For land snails, the double gradients into the prairies and steppes of middle U. S. have formed a zoögeographic barrier which has

prevented automotive dispersal more effectually than has the Pacific Ocean.

A fourth map represents an attempt to combine the formulae given, but never plotted, by C. Hart Merriam (1898) with data on seasonal rainfall corrected for temperature in the north. It shows the temperature zones and also shows (more accurately because of this correction) the humid and dry areas.

These dry zones form the boundaries of W. G. Binney's (1878) and Pilsbry's (1948) major regions of North America. Of course, such maps of regions represent generalities rather than general laws, because their boundaries should not be lines but 2 broad zones of opposing gradients, and also because they only apply to southern snails which are not tolerant to cold. Both arid zones pinch out north of the U. S. and represent no zoögeographic barriers to cold-resistant snails. Such species as *Retinella electrina, R. binneyana* and *Zonitoides arboreus* extend across the continent, as do the genera *Vitrina, Striatura* and *Discus.* But a southern snail, in order to get around at the north would need to cross double gradients of temperature.

One is apt to think of oceans as the only zoögeographic barriers to land animals. Of course, these also involve two opposing gradients: down from land to water and up from sea water to land. As you know, 3 major groups of mammals, the seals, sea cows, and whales, have slid down the single gradient from land to ocean and become adapted in various degrees to marine life. But no mammal ever has crossed by automotive dispersal and ecesis; these marine mammals have produced no terrestrial derivatives.

For concrete cases of zoögeographic barriers, with the sporadicity and pure luck of adventitious transport, I shall cite two examples. One of these does involve 2 or 3 thousand miles of open ocean, but the other deals with a distance of about half a mile. Both are fundamentally similar.

The first case is that of 5 Hawaiian genera of limacoids from the Nearctic (N.A.) or Holarctic: *Vitrina, Striatura, Retinella, Euconulus* and *Godwinia.* In my study (1941) of Pacific limacoids, the hypothesis was advanced that they probably were carried by migrating birds. In any case, they evidently arrived by adventitious transport for 2 reasons: 1) Their differences in dif-

ferentiation, that indicate they arrived at widely divergent times. 2) The luck that these 5 were the only arrivals.

In regard to the first, these differences may be shown as follows:

Vitrina. Apparently no specific differences between *V. tenella* from Hawaii and *V. alaskana* from western N.A.; incidentally the Hawaiian name is prior. Probably *Vitrina* is the latest immigrant.

Striatura. At least 2 endemic Hawaiian species.

Retinella. Hawaiian species 3, which form a poorly marked, typical section of the subgenus *Nesovitrea,* to which our *R. electrina* belongs.

Euconulus. Hawaiian species belong to the very distinct subgenus *Nesoconulus.*

Godwinia. A genus limited to Hawaii with 2 subgenera, although it is most closely related to the Mexican *Patulopsis* (in our genus *Mesomphix*). Possibly *Godwinia* has been longest in Hawaii.

To take up the second reason: Since only 5 genera arrived, and perhaps only 5 animals, this is evidently a case of small number chance. As for the proof, why did these 5 taxons reach Hawaii, while such genera of small snails as *Hawaiia, Zonitoides, Pristiloma* and *Discus* did not? The first 2 certainly can live in Hawaii since they have been introduced by man. In this connection, *Vitrina* would appear to be the luckiest of them all, since it can only live at high altitudes in Hawaii, and the migratory birds are mainly shore species. Evidently the arrivals of all 5 genera were simple luck.

My other case involves calcophile snails on limestone and sandstone around the Cumberland escarpment of eastern Tennessee and northern Alabama. These out-crops are separated from each other by zoögeographic barriers, which exhibit 2 opposing gradients: from limestone to less calcareous soils in the valleys and back up to rock on the next outcrop. The most startling example I have seen consisted of 2 limestone outcrops around the cave-sources of Battle Creek, near Dove, Tennessee. These were separated by only about half a mile of valley. The more eastern one was visited in the summer of 1928 and 2 new species were described: *Paravitrea variabilis* (1929) and *Pilsbryna castanea* (1931). The former species was found on 3 other outcrops, mainly of sandstone, but was absent from similar intervening ones. The latter was found at only one other place. On

return in the spring of 1929, I also visited the western source. To my great surprise, both these species were absent from this nearby outcrop, but were replaced by large numbers of the northern *Paravitrea multidentata,* which I had not seen the previous summer anywhere, and by *Zonitoides lateumbilicatus,* for which I had made a special but futile search and had collected a limestone outcrop within a few hundred yards of the type and only other locality, near Gurley, Alabama, over 30 miles away. This evidently exhibits the same kind of sporadic adventitious transport, and population by mere luck as does the Hawaiian example. To use Mayr's misleading term, these calcophile snails on the two outcrops are allopatric in the same sense as are the species of Hawaii and North America. Of course, one must realize that what is allopatric for calcophile zonitids would be sympatric for birds (or even non-calcophile snails) ; a bird could fly or even walk a half a mile in a few minutes. Again, Mayr's terms represent generalities, not general laws.

For brevity, little will be discussed about the last pair of my extremes, under evolution. Speciation, because of the flow of genes throughout any continuous range of a species, practically requires isolation by zoögeographic barriers, and may involve luck. This fundamental generality was pointed out about a century ago by Alfred Russell Wallace, the great zoögeographer. Incidentally, his contemporary, Charles Darwin, although he called his classic book, "Origin of Species," largely neglected this, and his discussions mainly apply to the evolution of major taxons, such as genera, families, orders, etc. The evolution of these does not require zoögeographic isolation, and may follow general laws, because fertile crosses between major taxons of higher animals do not occur.

In fact, as best provable in the mammals, the only land animals with sufficient paleontologic evidence, the evolution of major taxons, especially families, orders, and higher groups, largely has taken place on big continuous land masses, such as continents. The opposite was very evident in the limacoids of the Pacific Islands. Species and sections were very numerous because of the isolation between the isles. But, all except those derived from adjacent continents, probably by adventitious transport, belong to one primitive subfamily, the Microcystinae, and in the Philo-

nesiae even the 4 genera I recognized are poorly differentiated, as Hugh Watson reasonably objected. In this connection, one must remember that, although the distances between the Pacific Islands are greater than on any continent, even Eurasia, their total land area is not much bigger than West Virginia.

In conclusion, let me repeat my introduction: Generalities do exist in taxonomic problems, but generalizations or general laws usually are very dangerous. In other words: Don't blindly accept anyone's hypotheses, not even mine!

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STATUS OF NEWCOMB'S ACHATINELLID NAMES

By ARTHUR HADDLETON CLARKE, JR.[1]

The Wesley Newcomb Collection of mollusks at Cornell University contains types of most of the 126 species described by that author. During the course of isolating these specimens and gathering material for a biographical resumé of Newcomb and an annotated list of his species, certain facts came to light which bear on the authorship and dates of 58 specific and "varietal" names in the Achatinellidae attributed to Newcomb. At first inspection, these facts might be interpreted to mean that these names should date from an earlier paper by L. Pfeiffer, but such is not the case. It is desirable to clarify this issue now in a separate publication to avoid confusion in the forthcoming report.

According to Waterhouse, pp. 113 to 160 of the Proc. Zool. Soc. London, *21* (1853) were published on November 14, 1854 (see *ibid., 107*: 71-84, 1937). This section contains a paper by

[1] The author is indebted to the trustees of the Teagle Foundations for support of the curatorial work on the Newcomb Collection of mollusks on which this report is partly based and to Drs. C. O. Berg, W. Storrs Cole, and J. C. Francelmont of Cornell University and Dr. W. J. Clench of the Museum of Comparative Zoology for helpful advice and criticism.

Wesley Newcomb on *Achatinella*. Of the 79 new species and one variety described, 21 species had already been described by Newcomb in Ann. N. Y. Lyceum of Nat. His., *6:* 18-30 (May, 1853). Until now, all names proposed in these publications have been accepted as originating with Newcomb on the dates here given.

In June, 1854, 5 months before the accepted date of the Newcomb publication in the Proceedings, the main body of a paper by Dr. L. Pfeiffer appeared in Malakozool. Blaetter, 1854 (pp. 112-145). The final two paragraphs of the paper (containing no descriptions) appeared in August, 1854. These dates are given on the signatures which were apparently issued separately. The conclusion that the Pfeiffer paper preceded the Newcomb paper in the Proceedings is substantiated by the fact that Pfeiffer's paper was reviewed in the September, 1854 issue of Zeits. für die gesammten Naturw. (p. 252).

In this paper, Pfeiffer (1) described in his own words 50 species and varieties later described as new by Newcomb in the Proceedings (loc. cit.), (2) quoted verbatim Newcomb's descriptions (loc. cit.) of 8 additional species, (3) used Newcomb's names for these 58 species and varieties, and (4) cited Newcomb as original author in each case, giving page, plate, and figure references to the Newcomb paper. These page references differ in all cases from the pagination in the Proceedings, but correspond in all cases to the pagination of two separate copies of the Newcomb paper (not issued in the volume of the Proceedings) formerly in Newcomb's personal library and now in the main library at Cornell University (Catalog numbers 9612 D53, D54). There is no difference in plate and figure numbering between the Proceedings and the separate copies of the Newcomb paper, so Pfeiffer's plate and figure references are correct for both.

In a footnote on page 115 (Malak. Blatt., *1*), Pfeiffer states: "In den Proceedings ist die Insel immer Mani genannt; nach des Vf. eigner Handschrift lese ich Maui, . . ." From a letter from Pfeiffer to Cuming, we know that Pfeiffer had seen Newcomb's manuscript and most of his type specimens, but the above quotation proves that Pfeiffer had also seen a printed copy of Newcomb's paper. The agreement of Pfeiffer's page references with the pagination of the separate Newcomb publication indicates that this is what Pfeiffer had before him.

From the evidence presented, apparently the Newcomb paper was issued separately and before the paper by Pfeiffer. In order to decide whether the 58 names involved are to date from this paper by Newcomb or from Pfeiffer, it must be determined whether the descriptions by Newcomb should date from the separate issue or from the Proceedings.

At the Paris 1948 meeting of The International Commission on Zoological Nomenclature (see Bull. Zool. Nomen., *4*: 167, ¶53, May 25, 1950) it was reaffirmed that a recommendation should be submitted to the Congress to include in the régles words to the effect that the date of a new name shall not be the date of issue of preprints, reprints, or separates but shall carry the date of the volume in which it is included. The words preprints, reprints, and separates may be interpreted to mean copies of a work which are printed from the same type as the comparable portion of the volume, i.e., separate impressions or "all the same press-prints" (Opinion 59). This may be contrasted with a separate edition, which is not merely a separate impression but contains definite changes in type, arrangement, or orthography.

A comparison of the two issues of the Newcomb paper reveals several significant differences. The separate issue contains a full title page with the date 1854. The Proceedings issue has no separate title page and no stated publication date. The text of the separate issue begins at the top of page 3 and ends near the center of the lower half of page 31, occupying parts of 29 pages. The text of the Proceedings issue begins near the bottom of page 128 and ends near the center of the lower half of page 157, occupying parts of 30 pages. Under the description of *Achatinella cestus*, the words "A fine skull . . ." in the separate issue were replaced with "A fine shell . . ." in the Proceedings. In the separate issue the words *tristis* (p. 8, line 28), *porphyrea* (p. 8, line 45), *multilineata* (p. 14, line 12) and *mustelina* (p. 14, line 13) have been replaced in the Proceedings with the words *A. tristis* (p. 134, line 21), *A. porphyrea* (p. 134, line 36), *A. multilineata* (p. 140, line 12), and *A. mustelina* (p. 140, line 13). The colored plates of the two issues show constant differences also, and in general the plates in the Proceedings appear to be more carefully done.

Additional differences could be cited, but it is clear from the preceding that the separate issue of the Newcomb paper qualifies as a first edition and not as a preprint, reprint, or separate. The decision of the international commission therefore does not apply to the present situation, and the names must continue to be ascribed to Newcomb. The date of this first edition cannot be definitely established, but it is before June 1854, and probably in that year.

The trivial terms of *"Achatinella"* thus affected are: *acuta, affinis, albolabris, ampla, aplustre, assimilis, baldwinii, biplicata, buddii, casta, cestus, concinna, crassa, crassilabrum, curta, cylindrica, decipiens, elegans, emmersonnii, flavescens, fulgens, fumosa, germana, gigantea, glabra, grisea, hybrida, intermedia, johnsoni, mastersi, melanostoma, moesta, multilineata, nivosa, obscura, ornata, physa, porcellana, porphyrea, pupoidea, recta, redfieldi, reticulata, rubiginosa, rugosa, rutila, sanguinea, semicarinata, solitaria, sordida, soror, subvirens, swifti, terebra, turgida, variabilis, venulata,* and *vitrea.*

NOTES AND NEWS

Monterey Mollusca, corrections, ii—In our discussion of "Mollusks and Brachiopods of Monterey Bay and Vicinity" (Proc. Calif. Acad. Sci., 4th Ser., vol. *26*, no. 8, Dec. 15, 1948), we named as new *Turbonilla* (*Bartschella*) *bartschi* Smith & Gordon on pages 222-3, plate 3, figure 13, and listed it on page 193. Since this name proved to be preoccupied, we selected a new name, *T.* (*Bartschella*) *bartschiana* Smith & Gordon (see Naut., vol. *62*, no. 3, page 105). Dr. Joshua L. Baily, Jr., kindly informs us that this second name is also invalidated by *Turbonilla* (*Chemnitzia*) *bartschiana* Brown & Pilsbry (Proc. Acad. Nat. Sci. Philadelphia, vol. *64*, Dec. 1912, pp. 509-10, figs. 4a-6). This being the situation, we accept Dr. Baily's suggestion and hereby rename the species *T.* (*Bartschella*) *pauli,* **new name,** It still is known only from the type specimen.

On page 207 of the same paper on Monterey mollusca, *Ischnochiton* (*Lepidozona*) *golischi* Berry is listed and its range discussed. This is an erroneous use of the name, which should be corrected to *I.* (*L.*) *gallina* Berry. *I. golischi* is a species so far

reported only from deep water off the southern California coast.—Allyn G. Smith and Mackenzle Gordon, Jr.

Trip to south Chile.—I am leaving by planes for southern Chile, on Nov. 25th, where I will collect botanical specimens of all classes for the University of California botanical gardens at Berkeley. This work will be mostly in the rain forests of Antarctic beech in the Cordillera Pelada, south of Temuco, and across the Andes in Tucuman province of Argentina. Needless to say, I will not pass up any shells or fossils. It will be a one man expedition and I expect to return by May 1st.—W. J. Eyerdam.

Meioceras lermondi as food for Penaeus duorarum?—Examinations of the stomach contents of the brown-spotted shrimp, *Penaeus duorarum* Burkenroad, from the Tampa Bay area, have shown the presence of *Meioceras lermondi* (Dall) quite frequently. One stomach contained 32 opercula, a mass of crushed shell parts, and six complete specimens of *M. lermondi* (Dall). This suggests that this tiny mollusk serves as a source of food for young shrimp.—Bonnie Eldred. Fla. State Board of Conservation Marine Lab., St. Petersburg, Florida.

PUBLICATIONS RECEIVED

Zoogeography: the geographical distribution of animals. By Philip J. Darlington, Jr.. 1957. 675 + xi pp., 1 pl., 80 text-figs. John Wiley & Sons. $15.00—In the classic manner, the author interprets "animals" to mean higher vertebrates, and "zoögeography" as limited to inland (land and fresh water) evidence. Keeping these two limitations in mind, his readable book seems a very valuable contribution, and emphasizes wisely the need for zoögeography as a different science from ecology. And, since the mammals are the only land animals about which paleontologic knowledge even approaches sufficiency, his discussions also should be of great interest to students of inland mollusks, especially on continents. In regard to islands, which naturally are treated more briefly, Darlington accepts the importance of adventitious dispersal, without land connections. For example,

the Antilles are included among the "fringing archipelagos," with the statement that "different kinds of vertebrates are represented in the West Indies in proportion to their probable powers of crossing water." But the contributions from South America are so important (at least in land snails) that one doubts "if most of them have come from the west by way of Cuba or (less often) Jamaica." Since we snail-chasers are also human, the last chapter on man will interest everybody.—H. B. B.

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