THE

NAUTILUS

A QUARTERLY JOURNAL
DEVOTED TO THE INTERESTS
OF CONCHOLOGISTS

VOL. 54
JULY, 1940 to APRIL, 1941

EDITORS AND PUBLISHERS

HENRY A. PILSBRY
Curator of the Department of Mollusks and Marine Invertebrates,
Academy of Natural Sciences

H. BURRINGTON BAKER
Professor of Zoology, University of Pennsylvania
PHILADELPHIA, PA.

THE SCIENCE PRESS PRINTING COMPANY
LANCASTER, PENNSYLVANIA

CONTENTS

Names of new genera and species in *italics*.

Alabama, ruderal land mollusks 18
Albino, a sinistral 141
Alcadia, subgenera 70, 71
American Malacological Union 35, 146
Apolymetis Salisbury 191
Aquebana (Exsauvitas) pubeseens Pfr. 59
Aquebana velutina Lam. 59
Aquebaninae, H. B. Bkr. 55
Aretic mollusks of eastern Canada 1
Arion circumseriptus Johnst. 69
Aroostook Co., Me., marl deposit 143
Aspella elizabethae McGinty 63
Assiminea, Chinese 119
Austroselenites alticola H. B. B. 135
Austroselenites concolor Fér. 132
Austroselenitinae H. B. B. 134
Beal Collection 73, 140
Bellaspira pentapleura Schwengel 51
Botula fusca 40
Bursa spadicea in Florida 71
Campeloma leptum Mattox 12
Campeloma tannum Mattox 15
Cancellaria (*Bivetopsis*) *moorei pachia* Smith 45
Cancellaria reticulata adelae Pils. 54
Cantharus lugubris C. B. Ad. 47
Cape May shells 126
Cardium corbis Martyn 53
Cave Mollusca 111
Cedar Breaks National Park, Mollusks of 116
Cerithium auricoma Schwengel 72
Chondropoma dentatum Say 32
Civilization and Aquatic Mollusks 6
Cleaning shells with maggots 145

Crassispira plasma Schwengel 49
Drepanotrema hoffmani F. C. Baker 96
Ekadonta Rao 120
Epitonium pilsbryi McGinty 62
Eunaticina oldroydii Dall 132
Fenimorea halidorema Schwengel 50
Fluminicola avernalis Pils. 117
Fluminicola avernalis carinifera Pils. 117
Freshwater Mollusks surviving drought 84
Fusinus hyphalus Smith 43
Gastrochaena 41
Glyphostoma pilsbryi Schwengel 51
Greggiella H. B. B., n. subg. Haplotrema 131
Haldeman's 1840 Supplement 64
Haplotrema coelatum Mazyck 131
Haplotrema transfuga Hemph. 131
Haplotrema voyanum Nc. 132
Haplotrematinae H. B. B. 134
Helisoma clewistonense F. C. Baker 17
Helix pomatia in Wisconsin 145
Helminthoglypta cuyamacensis lowei Bch. 33
Helminthoglypta dupetithouarsi Dh. 122
Helminthoglypta umbilicata Pils. 122
Helminthoglypta nickliniana ramentosa Gld. 141
Hermaphroditic Mytilus 90
Higgins, Henry C. 106
Hjalmarsona H. B. Baker, n. g. 70
Hojeda inaguensis Weinl. 60
Horatia in Texas 34
Humboldtiana fortis Pils. 47
Hyalosagda subaquila Shuttl. 60
Hyaloteuthis pelagicus Bosc. 71
Janthina exigua 73
Janthina janthina L. 75
Land Mollusks, daylight activity 87
Lithophaga 39
Lymnaea contracta Currier 121
Marginella beali McGinty 63

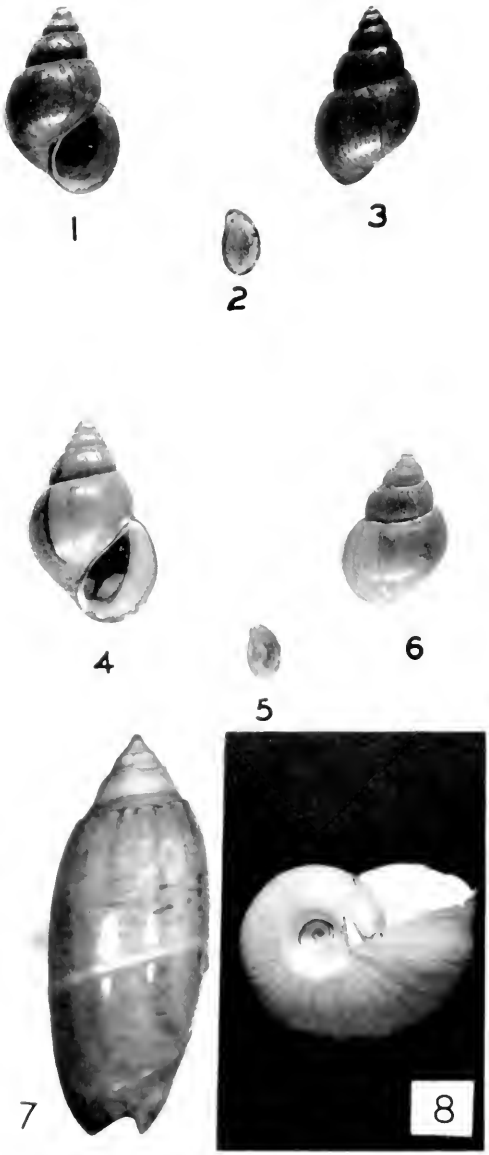
Marginella jaspidea Schwengel 49
McLeania darlingtoni Beq. & Cleh. 55, 57
Megalomastoma mirandum Pils. 34
Menetus cooperi F. C. Baker 97
Mesodon elevatus Say 79
Mesodon thyroidus, copulation of 143
Microphysula ingersolli Bld. 57
Microconus wilhelmi Pfr. 57
Murex anniae Smith 44
Murex ednae Smith 43
Murex (Jaton) gaza Smith 44
Murex recurvirostris citrinus Smith 45
Murex recurvirostris delicatus Smith, n. subsp. 45
Murex recurvirostris nigrescens Sby. 45
Myrsus H. & A. Ads. 191
Mytilus, hermaphroditic 90
Natica (Stigmaulax) sulcata Born. 71
Neptunea "Bolton" Röding, type of 125
Neritina virginea L. in Jamaica 21, 66, 98
Newfoundland mollusks 74
New Hampshire, fresh water shells 52
Odontostomus (Spixia) columellaris Parodiz 94
Odontostomus (Spixia) doellojuradoi Parodiz 93
Odontostomus (Spixia) holmbergi Parodiz 92
Odontostomus (Spixia) minor Parodiz 94
Odontostomus (Spixia) tucumanensis Parodiz 92
Oldroyd, Ida S. 73
Oleacininae H. B. B. 135
Oliva sayana, abnormal 32
Olivella watermani McGinty 64
Oreohelix parawanensis Gregg 95
Pecten caurinus, range of 68
Perpusilla, new subg. 81
Physa, naturally introduced 107
Planorbis declivis Tate 97
Planorbis pertenuis F. C. Baker 97
Planorbis planulatus Cooper 97
Planorbulina 33

Platysuccinea portoricensis Shuttl. 61
Platysuccineinae H. B. Baker 55
Pond Snails during dry periods 128
Primovula (*Pseudosimnia*) *vanhyningi* Smith 46
Quebec, Bay Chaleur, marl deposit 144
Rock Borers 39
Rumina decollata L. 69
Rupellaria typica 40
Sagdidae, Antillean 54
Salasiella, Mexican 80
Stenotrema monodon group 113
Stenotrema monodon Rack. 78
Solarium bisulcatum Orb. 106
Spiraxinae H. B. B. 135
Striatemoda H. B. B., n. gen. 71
Strombus gallus in Florida 71
Tellina guildingi Haml. 71
Tennessee, Snails of Ted Cave 10
Texas, Point Isabel mollusks 20
Thericium stantoni Dall. 72
Torinia bisulcata Orb. 106
Tridacna gigas L. 107
Tropicorbis tatei F. C. Baker 97
Turritelloma n. n. for Turritoma Bch. 143
Utah, Oquirrh and Stansbury Mts. 27
Utah, Zion National Park 30
Viviparus contectoides in Massachusetts 141
Viviparus malleatus Rve. 69
Yunquea densilirata H. B. B. 57
Zion National Park, Mollusks of 30

INDEX OF AUTHORS

Albany, R. L. 73, 125
Alexander, Robert C. 126
Andrews, A. E. 21, 66, 98
Archer, Allan F. 18
Baily, Joshua L., Jr. 32, 69
Baker, Frank C. 17, 96
Baker, Horace B. 70, 80, 130
Bales, B. R. 39
Bartsch, Paul 143
Burch, Tom 46
Clench, Wm. J. 52, 70
Cockerell, T. D. A. 108
Cooke, C. M., Jr. 107
Eyerdam, W. J. 53, 145
Goodrich, Calvin 6, 70, 76, 121, 141
Gregg, Wendell O. 30, 33, 95, 116, 117
Haas, Fritz 33
Hubricht, Leslie 10, 33, 107, 111
Hertlein, L. G. 69
Ingram, William Marcus 84, 87, 136, 143
Johnson, Richard I. 141
Jones, David T. 27
Koestner, E. J. & Schneider, R. A. 47
Marsh, Phil. L. 113
Mattox, N. T. 12
McGinty, Thos. L. 62, 71, 106
Morrison, J. P. E. 64
Nylander, Olaf O. 143, 144
Oughton, John 1
Parodiz, Juan José 92
Perry, Louise M. 32
Pilsbry, H. A. 34, 54, 73, 74, 108
Rehder, Harald A. 71, 72, 141
Robertson, Mrs. Harold R. 35, 145
Rogers, George Floyd 75
Russell, Henry D. 52
Schneider, R. A. 47

Schwengel, Jeanne 49
Smith, Maxwell 43, 44
Stenzel, H. B. 20
Strandine, E. J. 128
Washburn, Robert G. 145
Webb, Glenn R. 69, 122
Wurtz, Charles B. 143
Yen, Teng-Chien, ... 119
Young, R. T. 90



Figs. 1, 2, 3, *Campeloma leptum*. Figs. 4, 5, 6, *Campeloma tannum*; all natural size. Fig. 7, *Oliva sayana*. Fig. 8, *Helisoma cleavistonense*, enlarged.

THE NAUTILUS

Vol. 54 July, 1940 No. 1

A VISIT TO THE ARCTIC OF EASTERN CANADA

BY JOHN OUGHTON

Each year the Hudson's Bay Company sends ships to the eastern Arctic to carry in supplies and relief men and to bring out furs and men on furlough. This past year, all pieces of the cargo bore the number 270, indicating that ships of the old Company have been sailing into Arctic waters for almost two and three-quarters centuries. The chief ship being used as present, the R. M. S. *Nascopie*, is of course especially adapted for northern navigation. To this end, it has a reinforced bottom and prow and such modern navigation gadgets as the gyroscopic compass. In recent years, part of the ship has been leased by the Canadian Government in the interests of the Royal Canadian Mounted Police and the Eastern Arctic Patrol. The latter, under the direction of Major D. L. McKeand, comprises medical men and naturalists.

I left Montreal on July 8, 1939, in the midst of a heat wave. I saw my first iceberg in the Straits of Belle Isle and I, with other greenhorns, wasted photographic film on it. Soon ice was to become an ubiquitous and even tedious part of the environment. But the first berg, small and miserable as it was, had a glory of its own. After turning up the Labrador coast, but keeping well out, a fog set in and held us up for three or four days. During this lull, we saw some harp seals seated on a small pan of ice, floating southwards.

Early on the 17th, we made our first port at Hebron in northern Labrador, where we were met by a boat from the Moravian Mission, which has been established on this coast for more than a century. Their band, which proudly serenaded us, is remembered for two things:

1. The parson's claim that this is the only Eskimo brass band in the world.

2. The unusually high incidence of sour notes. No doubt the cold congeals the juices so essential to the horns.

With my head full of thoughts of *Vitrina* and *Stagnicola vahlii*, I rushed ashore. I found none of the these but after much searching did turn up a few pupillids and slugs. In desperation, I turned to a new love—sea shells. A merry Eskimo family joined forces with me and we obtained a good number of *Littorina saxatile*, *Macoma balthica*, a few *Crenella* (*faba?*), *Mytilus edulis*, a smooth *Astarte*, *Mya truncata*, *Saxicava arctica* and *Margarites helicina*. We filled up a couple of bottles with small fish and gammarids lurking among the *Fucus*. The party was concluded to mutual satisfaction with cigarettes all around.

On the 19th, we dropped in at Port Burwell, formerly well-known to whaling and sealing boats as Cape Chidley. During the brief visit ashore, I could find no land or freshwater shells. Instead, I occupied myself with spiders, amphipods and more *Littorina*. On weighing anchor, a pretty little bivalve, *Serripes grönlandica*, was brought up from 15 fathoms.

We crossed Hudson Strait to Baffin Island, enduring more fog, more ice and more farewell parties. Max Dunbar, planktologist, and I left the ship at Lake Harbour, while she spent three weeks visiting the points on Hudson Straits and Hudson Bay. We were very fortunate in being able to occupy the residence of the Anglican missionary, who had gone out on furlough. Around our house, the Iceland poppy and fireweed made a pretty splash of color. The house overlooked the head of the fiord, which during our first week was choked with ice. The tidal drop of thirty odd feet would strand pans and bergs, which looked very awkward tilted on the shore. Around us, the rugged-bare rocky hills rose and fell in never-ending series.

Sometimes I rambled back over the hills, collecting the abundant spiders, perhaps throwing in the odd beetle or *Collembola* just in case. The land snails, comprising three or four species of pupillids and one species of slug were confined to wet edges of streams and ponds or boggy flats. The ponds and streams themselves were rather barren; some appeared to support no

macroscopic life, while others contained a few sticklebacks, beetles, caddis larvae, and amphipods or fairy shrimps, but no molluses. Marine dredging, especially at the mouth of the fiord some eight or ten miles distant, was more remunerative. In the depths explored, *i.e.*, down to 35 fathoms, brittle stars, amphipoda, prawns and sedentary worms predominated. The molluscan fauna, while perhaps smaller in numbers, was varied. The most abundant types among the bivalves were: *Nuculana* sp. near *minuta* Müll., *Modiolaria laevigata* Gray, *Cardium ciliatum*, *Macoma calcarea?*, *Mya truncata*, *Saxicava arctica* including several of the curious spiny juveniles. The common snails were *Lepeta caeca*, *Puncturella* probably *princeps,*: *Margarites* was not only abundant in individuals but well represented in species with *M. umbilicalis*, *M. helicina*, *M. cinerea*, a small unidentified species and one I take to be *M. grosvenori*, described by Dr. Dall in 1926 from Etah, Greenland. A single species of Pyramidellidae, nameless to me, was abundant. Among those also present were *Velutina laevigata* and *V. lanigera;* Rissoidae, three or four species; *Trichotropis*, a few shells of apparently both boreal species; *Trophon* spp., a small number of these delicately sculptured shells. Of whelks, I obtained only four adults, but juveniles of two or three species were more numerous. *Colus* sp., a single individual 4½″ long, was the largest mollusc captured. There were two or three species at least of *Lora* and its relatives, and a few fragile *Cylichna*.

Arctic dredging was never boring, I found. Iola, the laughing Eskimo who acted as engineer, guide and friend on our forays, always put his harpoon and gun aboard. If we, *i.e.*, he, saw a seal, we gave chase, leaving the bottom organisms to their own devices. Our meals were good hearty ones of ship's biscuit, tea and sardines, taken on the job. Iola always concluded matters by drinking the last drainings of sardine oil. I might mention the item of dredging weights. On the advice of Bill Clench, I provided myself with handsome iron weights at 7c per pound. Early in the work, these elegant pieces disappeared into the Arctic seas. Thereupon, I was forced to cadge bits of bolts, chains, hooks and axles from the 3rd engineer or to beachcomb. My most useful find in this field was a stove grating.

On the shores of the fiord at low tide, large numbers of *Littorina saxatile* could be obtained in company with a small barnacle. In more restricted stations, *Crenella*, *Mya truncata*, *Margarites umbilicalis* and *M. helicina* could also be found at low tide. One day was spent dredging in Soper Lake, which has an inflowing stream of freshwater at one end and a narrow connection with the sea at the other. The surface was quite fresh to the taste, or more accurately, its content was 0.23 Cl. p.p.m., while the bottom water at 9 fathoms was distinctly salty, viz., 10.7 Cl. p.p.m. Large areas of the bottom were covered with a foul black mud devoid of macroscopic life. The bottom fauna in the remaining areas was typically marine: brittle stars, prawns and tubeworms being abundant. Of the molluscs, the smooth *Astarte* mentioned above, a *Macoma* and *Saxicava arctica* were especially conspicuous.

At 4 A.M. on the 15th of August, an excited native rushed into our house to say that the big boat was coming. Again aboard the *Nascopie*, we left Baffin Island, and visited Port Burwell briefly. The tide was quite low, so that I was able to get several specimens of *Margarites helicina*, *Crenella* and *Modiolaria laevigata*, all of which I had missed before.

Our next hop was a long one, taking us the whole length of Baffin Island and past Devon Island to Craig Harbour, on the southern tip of Ellesmere Island. This we finally reached on the 23rd, after much ice and fog and snow. During the hour or two ashore, snow fell much of the time and prevented serious collecting. The dead beach shells were *Buccinum*, *Astarte*, *Saxicava arctica* and *Mya truncata*. The two pteropods, *Limacina helicina* and *Clione limacina* were abundant near the anchored ship, the former being much more numerous. After more fog and more ice, we reached on the 30th Fort Ross, situated on the northern tip of Boothia Peninsula, *i.e.*, approximately 100 miles north of the magnetic pole. Heavy snow ashore made collecting unfruitful; I obtained only a few worn valves, chiefly of the old perennials, *Saxicava*, *Mya* and *Astarte*. Historically, this locality of low hills is of interest as it stands at the eastern entrance of Bellot Strait—the Northwest Passage. Leaving here, we retraced back and around to Arctic Bay in northwest Baffin Island.

On the beach of Arctic Bay there were good windrows of shells containing *Mya*, *Astarte*, *Saxicava* and *Modiolaria*—not an attractive feast perhaps to ye collector satiated by Floridan beaches. Next to Pond Inlet, on the northeastern corner of Baffin Island, which we reached on a fine sunny day. The snow and glacier on the hills of Bylot Island sparkled brightly. A good beach of drift shells provided me with a couple of whelks, *Mytilus edulis* and *Acmaea testudinalis* in addition to the old favorites. There was a great number of pteropods, chiefly *Limacina helicina*, but also a small proportion of *Clione limacina*. They were confined to a band one hundred to two hundred yards wide near the shore. Two residents informed me that only at this time, *i.e.*, early September, did they see the pteropods which then come close to shore. For the rest of the year, these pelagic molluses are elsewhere, presumably in deeper water. By the way, the Eskimo term for *Limacina helicina* is tu-lu-gah-juk, which means "something that looks like a raven"—an appropriate name, as the little creature is quite dark in the water and flaps its wings in a ponderous crow-like fashion.

Continuing down the eastern coast of Baffin, we stopped for a few hours at Clyde River and then on to Pangnirtung, which is situated just a few miles south of the Arctic Circle on Cumberland Sound. The high, snowclad hills, combined with the bright sunshine and cool air, made the three day stop a pleasant one. *Macoma* was very abundant here on muddy tidal flats and *Littorina*, of course, was found on the rocks, while a few specimens of *Mya truncata*, *Crenella*, *Saxicava*, *Acmaea testudinalis* and *Margarites helicina* were also found at shore. The dredge brought up from depths of 10 to 25 fathoms specimens of two Pectens, namely *P. islandicus* and *P. grönlandicus*. The former is bright orange-red, particularly in the young stage, while the latter is vitreous. The other species dredged were much the same as those obtained at Lake Harbour, *Nucula*, *Nuculana* 2 spp., *Lora* spp. and young whelks, bulking largest. But *Daerydium vitreum*, a minute, shining member of the *Mytilidae*, was another new record to me.

We continued our southward course, calling at Hebron enroute to unload the barges and surplus goods, and then southward again

and homeward. In two or three days we saw the twinkling lights of some village shore, and on September 23rd we docked at Halifax.

The best remembered aspects of the trip were the things less tangible than molluscs, although these are good in their place. The bare sweep and the quietness of the hills; the cheerfulness of that sturdy, enterprising people, the Eskimo, as they helped us in our work or gathered around our stove in the evening for warmth and companionship, coffee and cigarettes; and last, and perhaps best of all, the way Jimmy Bell, man of the Hudson's Bay Company, and our other neighbors at Lake Harbour, adopted us into their midst, aided us in our endeavors and entertained us in the hearty hospitality of the north.

CIVILIZATION AND AQUATIC MOLLUSKS

BY CALVIN GOODRICH

Studies of Dr. Victor Sterki (1911) and Dr. Allan Archer (1937) upon the adaptiveness of American molluscs to agricultural, industrial and urban environments were devoted almost wholly to the adjustments made by terrestrial forms, and in fact particulars in regard to aquatic species were entered into only in the case of the introduced *Bythinia tentaculata*. It is proposed here to deal with adaptations among fresh-water mollusks either observed personally or chanced upon in random reading. Since both Sterki and Archer have used the word "civilization" in the titles of their papers I am venturing to echo them, for all that currently doubt is entertained about the existence of that state of affairs.

Lymnaea. The favored habitat of *L. humilis modicella* and *obrussa* in the middle west is mud flats of pasture brooks and ponds. The snails are not adversely affected by the accumulation of silt in their gills and by high summer temperatures. Judging by their numbers they have prospered better than has *L. caperata* which I recall as once associated with them in ditches and now is seldom met with. *L. columella* has been found in southern waters locally described as "hog creeks," appearing there to be the only mollusks. An extremely turbidity and per-

haps some farmyard pollution have been insufficient to bring about their extinction. As long ago as 1854, Dr. J. P. Kirtland reported the occurrence of *L. megasoma* in the Mahoning River at Alliance, Stark Co., Ohio. When a few years ago a collector came to notice at Alliance, I asked him to look for the species. He found it in fair numbers. The locality is in an industrialized area and *megasoma*, which usually is thought of as belonging to unaltered sub-boreal regions, might have been expected to perish in such a place. It has done so in a bay of Lake Huron where it was abundant in 1922, but not found living eleven years later. The marshes it occupied have been made a dumping ground by summer cottagers. Even a slight pollution is enough apparently to destroy *L. stagnalis appressa* of inland lakes of southern Michigan, and it has seemed to me that *L. palustris* has been reduced by the same sort of contamination. On the other hand, *L. reflexa*, large and free of the common ferruginous deposit, has been scooped from the discharge of a city sewer.

Helisoma. The species *H. trivolvis* may be rated as intrinsically adaptive inasmuch as it lives under a variety of conditions even where the natural environments have not been disturbed. It has extended the range of its habitats to water tanks, watering troughs, field drains and like artificialities. Innumerable takings of aquatic materials in the course of studies of fish food that have been examined have almost always contained examples of *H. antrosum* (*H. anceps*), and that probably points also to inherent adaptiveness. A much more intolerant species is *H. campanulatum*, and I am inclined to believe that it is becoming rarer as human occupancy increases.

Physa. The appearance and disappearance of colonies of this genus from one year to another make it difficult to decide whether it can adjust itself successfully to the newer conditions, a point that might, of course, be settled if the generations in any one spot were continuous. *P. integra* has been found in a stream that for a while came under hearty condemnation in municipal reports for carrying more domestic wastes than natural waters. Existence there may, however, have been only temporary. Van Hyning (1904) tells of finding *P. gyrina* so crowded in a spot that the individuals were wedged together into an immovable mass. I

myself found a similarly dense population of the species in a shallow roadside ditch in northern Indiana. The reflection of sun rays made the shells noticeable from a moving car. The favorable conditions to reproduction, whatever they were, were man-made.

Ferrissia. Numbers of *F. tarda* have been seen on stones of a polluted river which for a stretch of miles seemingly contained no other mollusks.

Pulmonates in general. Oil wastes in the lower part of the Detroit River led to the filing of a lawsuit, an outstanding complaint of which was that fishing had been ruined. The respondent caused a survey to be made of the organic life of the area affected. It was learned that domestic sewage associated with the oil increased the nitrates and that these in turn increased vegetation, phytoplankton and surface-living snails, the reaction on fish life being altogether beneficial. While the pulmonates *L. catascopium* and *H. trivolvis* were discovered to be in vast numbers, the bottom-dwellers, operculates and pelecypods, were nowhere found living within the polluted tract.

Valvata. Specimens of *V. tricarinata* were taken with *P. integra* in the extremely polluted stream above mentioned. Richardson (1925) studied the progressive contamination of the Illinois River, which carries the refuse of Chicago. The expansion called Peoria Lake showed a greater destructive action on living organisms than parts below it, and the occupants of this lower section, while still having to adapt themselves to fouled conditions, were spoken of as "cleaner preference species." Among these were *V. tricarinata.*

Bythinia. The introduced *B. tentaculata* (reintroduced in F. C. Baker's belief) has kept so closely to the shores of the Great Lakes during its occupancy of the region as to seem limited in its range of habitats to clean, or fairly clean, waters. Yet within the last two or three years Mr. Charles D. Nelson has been finding it in the polluted Grand River at Grand Rapids, Michigan. This is about forty miles upstream from the river's discharge.

Campeloma. Richardson (1925) dredged *C. subsolidum* in parts of the Illinois which he described as having "bad odor and abundant bubbling."

Pleurocera acuta and *Goniobasis livescens*. Listed by Richardson as "cleaner preference species" of the Illinois River. Inasmuch as these two species were among the aquatic mollusks that early advanced into the glaciated area, indicated by Pleistocene deposits, they may be considered innately adaptive and so are perhaps more resistant to polluted conditions than most other Pleuroceridae. The "winter-kill" in the case of *Goniobasis* may be due to toxins liberated under the ice by decaying algae and a sharp decrease in the amounts of dissolved oxygen as well as to floods or which human agencies can be held responsible. It is difficult in the circumstances to say whether natural conditions or artificial bring about the destruction sometimes to be noted by windrows of shells on beaches in the spring.

Unionidae. Three species of *Lampsilis* and one of *Plagiola* were living in the Illinois River in 1923 in the parts defined by Richardson as favorable for the "cleaner preference species."

Sphaeriidae. Richardson reported that *Musculium transversum* had been enormously prolific in the excessively tainted Peoria Lake. Numbers sometimes ran to 100,000 to the square yard in 1922. Repetition of dredgings disclosed that populations increased from 50 to 2000 fold in the period of two years. Oxygen available for organisms was very low. Carp which had made *Musculium* an important part of their food had been driven out. Below the lake, four species of *Sphaerium* and four of *Pisidium* were found living.

A phase of survival under conditions set up by the new "culture" has an appearance of adaptiveness that is probably deceptive. This may be illustrated by three instances. *Ligumia recta latissima* lives in an upstream part of the Huron River of southern Michigan, *Lampsilis ventricosa* occupies an old millrace of the River Raisin below Tecumseh, Lenawee County, Michigan, and *Goniobasis cahawbensis* and *carinocostata* are in an impounded part of the Little Cahaba River, Jefferson County, Alabama. All specimens taken of the four species were adult, healthy, thick-shelled and without malformation. Yet no young were seen. It is clear that reproduction has stayed, nullified or rendered impossible. A plausible explanation as applying to the mussels is provided by M. M. Ellis (1931). In partially

polluted streams wherein he was seeking breeding stock he found plenty of living Unionidae, but a large percentage of the gravid females thereof were heavily infested with bacteria and infusoria. A result was that ". . . most of the glocidia were either destroyed leaving only the empty shells in the marsupia or were reduced to an enfeebled condition. . . ." It is reasonable to believe that the two species of *Goniobasis* of Alabama were undergoing a similar restraint on propagation.

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THE SNAILS OF TED CAVE, TENNESSEE

BY LESLIE HUBRICHT

Ted Cave is situated on the west bank of Caney Fork River, about five miles east of Smithville, DeKalb Co., Tennessee. It is an ugly cave, without any of the formations which make many so attractive. The floor is littered with slabs of rock fallen from the roof, and over these is deposited a layer of slippery mud acquired when the river rose and flooded the cave. It has nothing to attract the tourist, but to the conchologist and evolutionist it is of great interest.

The mouth of the cave is a large opening on the bluff about twenty-five feet above the river. On the right hand side, a short distance within, is an opening in the floor through which a stream may be seen about twenty feet below. This is Fall Creek, which

enters the cave through a sink-hole, flows for about a quarter mile underground, and emerges on the bank of the river about forty yards down stream. The stream cannot be reached here without a ladder, but farther back the cave forks; a short distance along the right fork and down a steep, clay bank there is a small opening in the right wall through which the stream may be reached.

The winding channel through which the stream flows is about ten feet wide and just high enough for a man to stand erect, if he is not too tall. The stream has a good current, and is from six inches to a foot or more deep and from six to eight feet in width. The bottom is composed of smooth, well-packed gravel or sand, with an occasional large rock dropped from the roof. Because the stream flows for several miles above ground before it enters the cave its temperature fluctuates with the seasons, quite warm in the summer, cold in the winter.

In the riffles the stream-bed is dotted with small snails with light brown shells, smooth or with weak spiral striae, about 4 mm. in diameter and would be about 6 mm. in height if the spires were not eroded away. These have been determined by Mr. Calvin Goodrich as a form of *Lithasia obovata* (Say). In the quieter water, among the leaves and sticks washed in by floods, another and larger snail, *Goniobasis edgariana* Lea, is found. This species has a plicate-striate shell about 5 mm. in diameter and 15 mm. in length (allowing for the eroded spire).

Both of these snails represent intermediate stages in adaptation to a subterranean life. *Goniobasis edgariana* has been modified the least. The colors of the animal appear brighter, due apparently to a reduction of the black pigment. The eyes are black and probably functional. The most marked difference is in the reduced size of the shell, being less than one-half the size of epigean specimens. Like the above species, *Lithasia obovata* has been greatly reduced in size. The animal is white or blue-white with a pink band across the snout and pink tentacles. The pigment has been reduced about 85 per cent. The eyes are pink rather than black and are probably non-functional.

As far as the author was able to ascertain neither species occurs in Fall Creek above the sink or where the stream emerges on the bank of Caney Fork River. Both, however, are inhabitants of the Caney Fork tributaries elsewhere.

TWO NEW SNAILS OF THE GENUS CAMPELOMA FROM ONTARIO

BY N. T. MATTOX
Miami University

The snails herein described were collected in two different localities of southern Ontario, Canada. The specimens of *Campeloma leptum* n. sp., were taken by M. S. Ferguson from a mill pond near St. Thomas, Ontario, representing three collections taken during the summers of 1936 and 1937. The samples of *C. tannum* n. sp. were gathered by J. C. Medcof and J. Oughton from the Speed River near Hespeler, Ontario, in two collections, 1932 and 1937.

For a comparison with the two species here described, the writer has examined specimens of *C. milesii* and *C. decisum*. The specimens of *C. milesii* were collected at Grosse Isle, Michigan, and presented to the writer by Dr. van der Schalie. Approximately 300 specimens of this collection were carefully examined for comparisons. Of those examined all were females, suggesting that this species is also a "female species." Eight specimens of *C. decisum* from the North River, Lexington, Virginia, were loaned by Dr. Paul Bartsch of the U. S. National Museum. All of these animals were also females.

The writer is indebted to Dr. M. S. Ferguson, Dr. J. C. Medcof, Dr. H. van der Schalie, Dr. Paul Bartsch, and Mr. J. Oughton for contributing the specimens used in the present study. He is also appreciative of the generous advice and assistance given him by Mr. Frank C. Baker.

Type specimens will be filed in the U. S. National Museum and paratypes in the Academy of Natural Sciences of Philadelphia.

CAMPELOMA LEPTUM n. sp. Plate 1, figs. 1, 2, 3.

As previously mentioned, these snails were taken from a mill pond near St. Thomas, Ontario, Canada. The total number of individuals in the three samples is approximately 2,000, of which the writer has critically examined about 700. Since no male individuals have been encountered in these examinations, it has been concluded that *C. leptum* is a "female species" like *C.*

rufum. The latter has previously been shown by the writer (1938)[1] to be a "female species," or parthenogenetic. No sinistral shells were encountered in this species.

Shell: Elongate-ovate, subfusiform, very thin; color light olive, through dark green; surface smooth, lines of growth fine; very fine, indistinct, revolving striae which are epidermal; apex narrow and pointed, sutures deeply impressed; spire long and pointed, markedly conical and acute, no erosion; whorls six or more, flatly rounded; sutures very deeply impressed; aperture elongate-ovate, more ovate, rounded below and above, bluish within; peristome sharply acute; columellar wall of aperture covered by a callous appressed to the parietal wall in a nearly straight line; lower part of the inner lip is deflected and erect, and is incompletely imperforate leaving a small chink.

The following measurements represent those of ten individuals taken at random from the collections.

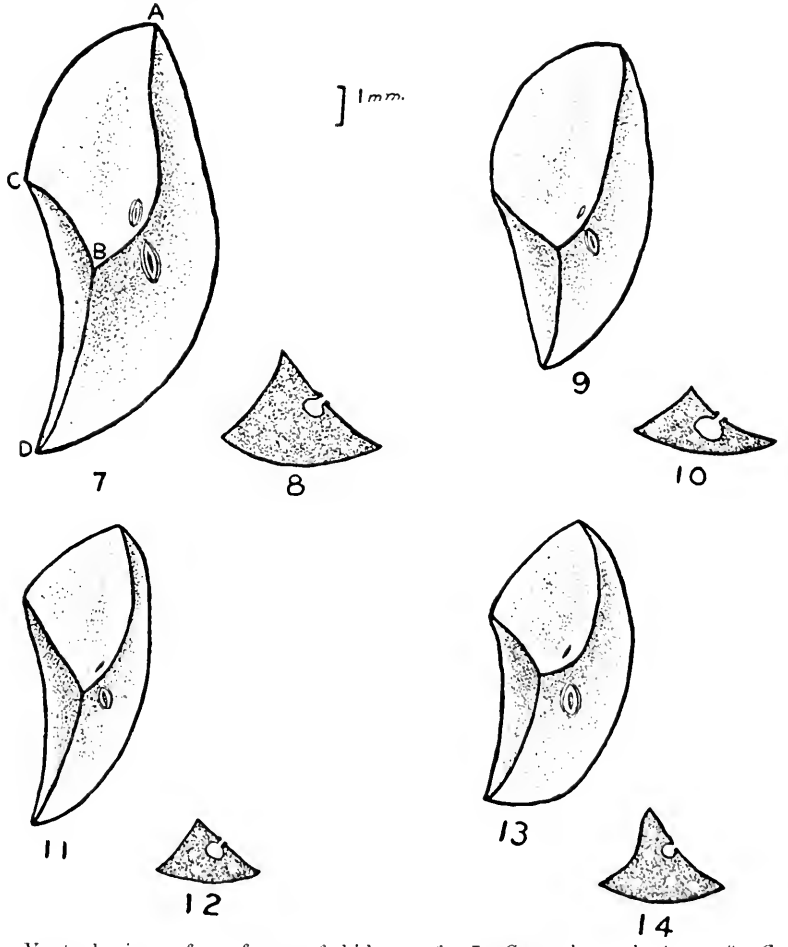
L. 27.8; W. 16.1; Ap. L. 12.5; Ap. W. 9.8 mm.
L. 27.5; W. 15.6; Ap. L. 11.9; Ap. W. 10.0 mm.
L. 27.2; W. 16.0; Ap. L. 12.6; Ap. W. 10.1 mm.
L. 25.8; W. 15.5; Ap. L. 11.8; Ap. W. 9.6 mm.
L. 25.0; W. 14.5; Ap. L. 11.4; Ap. W. 9.0 mm.
L. 24.5; W. 14.6; Ap. L. 11.1; Ap. W. 9.1 mm.
L. 24.4; W. 14.0; Ap. L. 11.2; Ap. W. 9.1 mm.
L. 23.7; W. 14.3; Ap. L. 11.0; Ap. W. 9.1 mm.
L. 22.8; W. 13.9; Ap. L. 10.7; Ap. W. 8.6 mm.
L. 22.7; W. 13.4; Ap. L. 10.6; Ap. W. 8.5 mm.

Operculum: Elongate-ovate, lower margin rounded, apex narrowly rounded, right margin rounded, left margin concave toward the apex, producing an in-curved tip; nucleus situated medially near the columellar, or left margin; markings concentric; the operculum is thin and horny. It fits the aperture snugly when drawn in deeply.

Animal: In living conditions the foot is very light, steel gray, heavily pigmented with orange spots (gives an orange appearance); tentacles dark gray, less pigmented; rostrum lighter pigmented with orange; body gives a light cream appearance, almost white; thin scattering of yellow-orange pigment over lateral surface of mantle, dorsal mantle surface with thin scattering of black pigment; black pigment on digestive gland. Albumen gland cream color; albumen loop (oviduct) yellow in first portion, pink in upper portion; follicles of digestive gland light, olive green, inter-follicular spaces white; ctenidia very long, extending to

[1] Jour. Morph., Vol. 62, No. 2, 243–261.

very near edge of mantle, pink on ventral edge, short side white; osphradium, a high ridge, gray pigmented; vaginal tube pink; rectum light gray.



Ventral view of surfaces of kidney of: 7, *Campeloma leptum*; 9, *C. tannum*; 11, *C. decisum*; 13, *C. milesi*.

Cross section through point "B" of the kidney of: 8, *C. leptum*; 10, *C. tannum*; 12, *C. decisum*; 14, *C. milesi*.

The kidney (Fig. 7) is extremely elongated and narrowed, being horn shaped. As shown by the cross-section (Fig. 8), it is very high ridged. The urinary aperture is long and narrow with well-defined papillae and is located slightly anterior to the

medial apex of the gland (point B). The reno-pericardial aperture is more prominent than in other species. The mantle cavity surface of the gland (B–C–D) is very narrow and elongated. The proportions of the ridge A–B to the ridge B–D are 4 to 5. The same proportions for *decisum* (Fig. 11) are 6 to 5 and for *milesii* (Fig. 13) 4 to 3.

C. leptum closely resembles *C. decisum*, but differs in the extremely thin shell, darker pigment of epidermis, and more elongated shell. The sutures are more deeply impressed, the aperture is more nearly round and the operculum is thinner and has a more pronounced concave left margin. The average width of the shell is 60% of the length, that of *decisum*, 57%; aperture width is 80% of the aperture length, that of *decisum*, 72%; aperture length 45% of length of the shell, *decisum*, 48%; aperture width of the shell width 62%, *decisum* 60%. The extremely elongated kidney is also a character differing from the kidneys of all other species. It is believed by the writer that the shape and proportions of the surfaces of the kidneys and its apertures may be used as specific characters. This has been determined after an examination of the kidneys of nine species of the genus.

CAMPELOMA TANNUM n. sp. Plate 1, figs. 4, 5, 6.

Specimens of this species were collected in the Speed River near Hespeler, Ontario. The writer has critically examined approximately 150 individuals of this species, all of which were normal, dextral females. It has been assumed from this examination that this is also a "female species," as are *C. leptum* and *C. rufum*.

Shell: Ovate-elongate, relatively thin; color a very light brown or tan to a pale green; surface very smooth, lines of growth not prominent, revolving striae absent or nearly so; apex very long and narrow, sutures well impressed, but not deep; spire long, conical, no erosion; whorls generally six, rounded; sutures not deeply impressed; aperture ovate-elongate, more ovate, well-rounded below, slightly channeled, definitely pink within; peristome sharp; columellar wall of aperture with callus tightly appressed to parietal wall, with a brownish edge of a slightly sigmoid shape, completely imperforate.

The following measurements are of specimens taken at random from the collections.

L. 31.9; W. 19.9; Ap. L. 14.2; Ap. W. 12.0 mm.
L. 28.3; W. 16.6; Ap. L. 13.5; Ap. W. 11.3 mm.
L. 23.3; W. 14.5; Ap. L. 11.8; Ap. W. 9.4 mm.
L. 23.2; W. 14.2; Ap. L. 11.6; Ap. W. 9.1 mm.
L. 22.0; W. 13.5; Ap. L. 11.5; Ap. W. 9.0 mm.
L. 22.0; W. 14.0; Ap. L. 11.4; Ap. W. 9.0 mm.
L. 20.3; W. 13.2; Ap. L. 10.2; Ap. W. 8.5 mm.
L. 19.7; W. 12.6; Ap. L. 10.0; Ap. W. 8.2 mm.
L. 19.4; W. 12.8; Ap. L. 10.0; Ap. W. 8.1 mm.
L. 18.3; W. 12.1; Ap. L. 9.6; Ap. W. 7.9 mm.

Operculum: Broadly ovate-elongate; lower margin rounded, apex narrowly rounded, right margin rounded, left margin nearly straight only slightly concave, but not producing a curved apex; nucleus sub-central, near the columellar or left margin; markings concentric; thin and horny.

Animal: The living animal has not been examined. In alcohol specimens, there is an indication of a dark pigmentation over the entire body; tentacles are very dark; darker pigmentation over the digestive gland. Albumen gland light in color, very compactly compressed; albumen loop very long; ctenidia very wide, short side very short; osphradium small, a low ridge not extending very far along the gill; vaginal tube, rectum and urethral aperture well marked.

The kidney (Fig. 9) is very wide and heavy. The posterior surface (A–B–C) is very broad; the mantle cavity surface (B–C–D) is rather short and triangular. The urinary aperture is nearer the medial apex (point B) than in *leptum*. The proportions of the ridge A–B to the ridge B–D are 7 to 4 as against those of 4 to 5 for *leptum*, 6 to 5 for *decisum*, and 4 to 3 for *milesii*.

C. tannum is intermediate between *C. decisum* and *milesii*, not as elongate as *decisum*, *decisum* is more flat-sided, nor as wide or full as *milesii*. The pink color of the aperture opening is very similar to that of *rufum*, however, *tannum* has a much thinner shell and is more elongate than *rufum*. *C. tannum* is similar to the foregoing species, *leptum*, but differs in the epidermal color, inner color of the shell, shape of the operculum, and in not being as narrow as *leptum*. The heavy kidney of this species is similar only to that of *integrum*, which is very different in its much heavier shell to *tannum*. The average width of the shell is 62% of its length, that of *decisum* 57%, *milesii* 66%, *leptum* 60%; aperture width is 81.5% of the aperture length, that of *decisum* 72%, *milesii* 85%; aperture length 49% of the shell length, of

decisum 48%, *milesii* 55%, *leptum* 45%; aperture width is 64% of the shell width, *decisum* 60%, *milesii* 66%, *leptum* 62%.

A NEW HELISOMA FROM THE PLIOCENE OF FLORIDA

BY FRANK C. BAKER

HELISOMA CLEWISTONENSE sp. nov. Pl. 1, fig. 8.

Shell of four whorls, very rapidly increasing in size, the body whorl very capacious; spire very small, depressed below the level of the body whorl, occupying about one-fifth of the diameter of the shell (spire 3 mm., shell 16 mm. diameter); base broad, the umbilical opening small, round, deep; base shows a trifle more than two whorls; sculpture of coarse growth lines, almost thread-like, and on the body whorl near the aperture raised into regular ridges; there are evidences of spiral lines; aperture somewhat auriform, narrowed and angled above, very wide below where the lower lip is effuse and is much in advance of the upper lip, forming a distinct "shelf": the lower lip is roundly curved and bent downward; there is a heavy callus on the columella which merges into the upper and lower lip; at the upper angle of the aperture the type shows two lips, an old one 6.5 mm. back of the last one.

Height 10.5; major diam. 15.5; lesser diam. 11.5; aper. height 9.0; diam. 6.0 mm.

Locality: Clewiston, Florida, in Pliocene strata.

This fossil species differs from any Helisoma observed from Florida. It appears nearest to the Mexican form known as *Helisoma tenue chapalense* Pils. from Lake Chapala, near Guadalajara, Mexico. It differs from that race in its narrower, smaller spire, more capacious body whorl, smaller umbilical area, and in the shape of the aperture. It is also of greater axial height. This species is totally unlike the common group of shells included in the subgenus Seminolina. It is a true Helisoma of the subgenus Pierosoma. A series of this shell is a desideratum to show the range of variation.

Holotype: U. S. Nat. Mus., no. 515222.

LAND MOLLUSCA OF A RUDERAL FIELD COMMUNITY IN NORTH CENTRAL ALABAMA

BY ALLAN F. ARCHER

In connection with ecological work done in the interests of the Department of Conservation of Alabama I had occasion to make observations and collections at Muscoda, Jefferson County, Alabama. This locality is of peculiar interest as illustrating an optimum type of mollusean assemblage in open country.

The locality is a low mountain range of rather submature topography lying within the industrial district of Bessemer and and adjacent to the Birmingham District. In this area the range has been totally deforested, and has remained treeless at least half a century. The timber was cut during the earlier days of iron-ore mining. Today it presents an aspect of open fields with many thickets of shrubs and very young trees. Grassland predominates here, and the thickets are of only minor value to local animal life. There is not a single feature that is suggestive of the former forest cover, although there are similar mountain ranges in north central Alabama that are in forest. The timber of this locality was sacrificed to the necessities of mining, and has not been allowed to stage a comeback. Portions of the slope are scarred with deep pits, and there is a minor amount of gullying. Cattle and rabbits constitute the more conspicuous mammals of the locality.

The local soil is very red and of a clay-sand constituency. It is decomposed from sandstone of the Red Mountain formation. It is fairly rich in lime, in fact so rich that the iron ore mined from the area is self-fluxing. Because of the richness of the soil it is not surprising that a vigorous mollusk fauna should be present, rather in contrast with the few species found in ruderal fields in the Piedmont and Coastal Plain of Alabama. The local association with limestone is not at all surprising when we consider that Muscoda is located in the Appalachian Valley Physiographic Province.

The grassland which covers four-fifths of the ground surface forms a good, consistent, erosion-resistant sod. However, the grasses and ground plants exist in tufts (characteristic of the

warm temperate zone) in contrast with the tough, crowded sod of some open fields in the northern United States. The vegetation is of weedy character and is roughly as follows: Grasses, particularly *Andropogon* and *Panicum*, annual weeds, ferns (rare), *Rhus copallina* (frequent), *Toxicodendron radicans*, *T. toxicodendron*, *Lonicera japonica*, *Vitis rotundifolia*, *Smilax glauca*?, *Platanus occidentalis* (out of place ecologically, but characteristic of fields), *Liquidambar styraciflua*, *Hicoria alba*, *Quercus velutina*, *Pinus echinata* (rare). All the arboreal species exist in scattered thickets, are only a few feet high and about the size of the sumac. Rocks and stones are scattered over the area, but are not utilized as shelter by the snails.

Of interest as indicators of open-land conditions are some of the following spiders recorded from the locality: *Xysticus audax* Hentz, *Theridion differens* Emerton, *Latrodectus mactans* Fabricius, *Leucauge venusta* Walckenaer, *Cyclosa turbinata* Walckenaer, *Neoscona minima* Cambridge.

The following Mollusca were found:

1. *Philomycus carolinianus* Bose. Under rotten wood in grass. 1 specimen.

2. *Deroceras laeve gracile* Rafinesque. Crawling on grass. 1 specimen.

3. *Retinella cryptomphala* form *solida* H. B. Baker. Under leaves on borders of thickets. 2 specimens.

4. *Mesomphix pilsbryi* Clapp. Base down in soil, either under leaves of thickets or in dense grass. 11 specimens.

5. *Polygyra plicata* Say. Under leaves or plant trash close to thickets or in thickets; also at bases of grass tufts. 8 specimens.

6. *Stenotrema stenotrema* "Férussac" Pfeiffer. Commonest in tufts of grass, concentrated in the vicinity of a gully, but scattered thinly elsewhere; also in leaves at border of thickets. 18 specimens.

7. *Mesodon rugeli* Shuttleworth. Between leaf mold and bare soil in thickets, or in grass tufts in open areas. 12 specimens.

8. *Strobilops labyrinthica* Say. In thin leaf trash on lower border of a thicket. 1 specimen.

10. *Succinea avara* Say. Either in grass tufts or in leaf mold in thickets. 5 specimens.

11. *Olygyra orbiculata* Say. Especially common at borders of thickets in leaves. The immatures are quite hirsute. 8 specimens.

None of the species above listed are exceptional, but are quite apt to be found in open country in various parts of the state. The two least likely to be found are the *Philomycus* and the *Strobilops*. Most of the species are rather small and of xerophilous propensities. The only large one in the list is *Mesomphix pilsbryi* which occurs in open country in Alabama and Georgia. It is the commonest *Mesomphix* in the city of Montgomery.

MOLLUSKS FROM POINT ISABEL IN TEXAS

BY H. B. STENZEL

Many malacologists have pointed out that very little is known concerning the distribution of marine mollusks along the coasts of Texas and adjoining Mexico. In order to further our knowledge of the distribution, a list of mollusks from Point Isabel is given below. Point Isabel is in Cameron County, Texas, near the southernmost tip of the State on the shore of the Gulf of Mexico. It lies on the delta of the Rio Grande.

The collection was made by members of the Bureau of Economic Geology. The preservation is very poor because the collection was made on the beach. However, according to Dr. H. A. Pilsbry, it is perfectly adequate to establish distribution. Identifications were made by Mr. William T. Clarke, Jr., and R. A. McLean, of the Academy of Natural Sciences of Philadelphia. The writer wishes to express his thanks to these gentlemen.

Gastropoda

Bulla occidentalis Adams
Polinices duplicata Say
Sinum perspectivum Say
Crepidula fornicata L.
Architectonica granulata Lam.
Littorina irrorata Say
Strombus pugilis alatus Gmel.
Semicassis gibba Gmel.
Murex flavescens Sowb.
Thais floridana Conrad
Busycon perversum L.
Busycon pyrum Dillw.

Pelecypoda

Nuculana acuta Conr.
Arca campechiensis Gmel.
Arca chemnitzi Phil.
Arca transversa Say

Arca umbonata Lam.
Arca occidentalis Phil.
Noetia ponderosa Say
Atrina rigida Dillw.
Atrina serrata Sowb.
Ostrea virginica Gmel.
Spondylus americanus Lam.
Pecten gibbus Lam.
Pecten gibbus amplicostatus Dall.
Anomia simplex d'Orb.
Mytilus recurvus Raf.
Echinochama arcinella L.
Lucina pectinatus Gmel.
Loripinus chrysostoma Phil.
Cardium muricatum L.
Cardium robustum Sol.
Laevicardium serratum L.
Laevicardium mortoni Conr.
Dosinia discus Reeve
Dosinia concentrica Born
Pitar texasiana Dall
Chione cancellata L.
Chione intapurpurea Conr.
Chione latilirata Conr.
Venus campechiensis Gmel.
Petricola pholadiformis Lam.
Tellina tenera Conr.
Tellina tampaensis Conr.
Macoma constricta Brug.
Macoma tageliformis Dall
Semele proficua Pult.
Abra aequalis Say
Donax denticulata L.
Donax variabilis Say
Tagelus gibbus Spengl.
Mactra fragilis Gmel.
Mulinia lateralis corbuloides Desh.
Rangia flexuosa Conr.
Labiosa canaliculata Say
Barnea costata L.

NERITINA VIRGINEA L., IN JAMAICA, B. W. I.

BY E. A. ANDREWS

INTRODUCTION

The present paper seeks to describe localities where the gasteropod *Neritina virginea* L. was collected in 1910 and 1932, and to correlate size and pattern of shell with environment.

Collections were made: in Northern Jamaica in sea water at White House and at Sandy Bay; in saline estuarine waters at Mo Bay in the Brackish Pond and the Lagoon of the mouth of the Montego River; in the fresh waters of a stream at Port Antonio and the Town Creek of Mo Bay and Mount Pleasant stream, as well as the rivers Retirement, Montego, Flint, Great, West Lucea; in Southern Jamaica: Fort Clarence Salt Pond; Rock Port Spring and the rivers Black and Cabaritta.

DESCRIPTIONS OF LOCALITIES

1. *White House Shore, Mo Bay.* Along the north coast are stretches of reef leaving quiet shallow shore waters with fine limy

bottoms with algae and gasteropods. One such is a few miles East of Mo Bay, near the town quarry and stone crusher, with shore fringed with mangrove. In 1910 a few small shells, and in July 1932, locality not changed and many crawling scattered one or two to square foot amidst eel grass but two inches in height. Water clear and quiet, gravity taken five feet from shore 4 inches deep and also 20 feet out and 6 inches deep, the same, with air and water both 30.8° to 31.2° C. On a few large stones were *Nerita versicolor* and *Nerita tesselata*. A half mile farther East many dead shells and fragments midst dead eel grass cast up under mangroves.

2. *Sandy Bay.* Another like region West of Mo Bay back of the village where shore is low and planted with cocoanut, yielded many crawling near the shore in August 1910, along with many inhabited by hermits and many bored by some mollusk. In July 1932 the locality was little changed, conchs and other gasteropods taken by natives to sell to tourists. The snails have a high polish yet are not conspicuous on fine limy bottom with dwarf eel grass and mossy alga, crawling in 2–10 inches clear water exposed to full sunshine from shore out 150 feet to a sand bar, bare at low tide. Some shells and small lime pebbles bore egg capsules. In a half hour with the aid of women and children gathered near quart, but of these 894 proved *Nerita tristis*, resembling larger banded *N. virginea*. A half mile to West the same environment, minus the human element, yielded many scattered again only few to the square foot, in water 2–6 inches 20 feet out and 8 inches 150 feet out, with temperatures from 29.9° to 31.3° when air was 30° to 31.8°.

3. *Great Salt Pond, Fort Clarence.* This large body of saline water near Kingston Harbor is at times open to the sea and had a varying population as collected in 1891, 1910, 1932, and 1936; the main results are indicated in the table and more details published elsewhere ("Ecology"—1940).

4. *Montego River Lagoon.* At the mouth of this river on edge of pasture set with cocoanut the sea had thrown a sand barrier 125 feet wide, forming a lagoon 250 feet long parallel to shore and into it entered a little stream, Little Pye River, near the mouth of which there were great herds of snails on sand, in shal-

low water, gathered by handfuls as 7–8 quarts, end of August 1910.

The sea outside the bar was affected by the two rivers so that its density was read as 1.0034–1.0048. In July 1932 no snails were found; the region was entirely changed; cane fields had extended and the Little Pye had been diverted into Montego farther up, to leave fields free of floods; sand flats and lagoon had disappeared.

5. *Brackish Pond, Mo Bay.* This is a T-shaped pool near the iron hull of an old ship and was evidently an old mouth of the Montego River, 150 feet back of it and sometimes overflowing fresh water into it.

The length of the stem of the T was 325 feet, and its larger arm, toward the town, 300 feet, and the smaller, 200 feet; the width was 50 feet, and the greatest depth, 15 feet.

In 1910, long cut off from the harbor by a sand beach 125 feet wide, the end toward the beach was but a few inches deep and on sand and green algae just below, as well as above the water line, browsed dense herds, so that handfuls were easily collected in June, July, and August.

It then functioned as a trap in which marine organisms were held captive and subject to changes in salinity. Its fauna included twelve sorts of fish: namely, 5 species of Snapper, Jack, Yellow Coat, Gar, Barracuda, *Elop saurus*, Mullet, Darter, and Shad. A dozen sorts of crustacea, blue crab, Zoeas of some crab, white crab, *Cardisoma guahnhumi*, mangrove crab, *Goniopsis cruentata* Latreille, our *Panopeus herbstii* Milne Edwards, small shrimp, *Upogebia affinis*, large *Callianassa*-form *Lepidopthalmus* (then undescribed), Amphipod, *Alpheus*, Stomatopod larva, Ostracods, and Barnacles. Such mollusca as *Mytilus*, thick oyster and nudibranchs, with sea anemone larvae; Ctenophores and yellow sponges along with algae near the bank, and a patch of eel grass.

In July 1932, a canoe entered against a strong wide outflow across the beach and no snails were found in this greatly changed end of the pond; moreover, mangrove and other trees had been cut and shore toward the town used as a dump for rubbish that overflowed into the greater arm of the pond. Near the blind end

of this, snails were browsing, scattered over green slime on tire casings, horns, and parts of cattle skulls, bottles, pots, shoes, etc.

6. *Town Creek, Mo Bay.* In July 1910, water from the large City Spring, in its bricked housing, was used for an adjacent washing shed and the soapy water discharged into the creek. From the spring the Creek ran to the harbor between walls with about a foot of water that floated a rowboat, over bottom with stringy mould or bacterial growths, small fish, and tadpoles. Scattered on the bottom and crowded in shade of cut-out bottom of wall, a quart of snails collected in a few minutes along with some *N. punctulata*, and many *Neritilia succinea*. In July 1932 no snails could be found: the wash house was no longer; men were digging out deep sand from the creek, bearing tufts of alga above and contaminated below, where entering harbor. In the spring were small fish and clear shrimp, while square crabs ran on wall.

7. *Port Antonio.* In 1891, 18 dark shells along with 28 *N. punctulata* were taken on and under stones with algal growths in dark woods at trail crossing of small brook up the hill near reservoir. In 1896 or 1897 Dr. F. S. Conant sent Dr. Metcalf 500 somewhat smaller, 6–9 mm., shells from some stream in Port Antonio, possibly at saline mouth, like those Metcalf took in Great Salt Pond, Ft. Clarence, but with yellow in place of white background.

July 1932: a vain search for any in springs and streams about reservoir and all along East Town River; yet natives aver these fresh water "bossu" come out at night and might be found "tomorrow," and that they are delicious cooked and picked out, but do not go into sea where there is another sort, *Nerita*. Apparently greatly increased population with added cultivation has nearly exterminated these river snails here.

8. *Cabaritta River.* July 1932: abundant upon cement foundations of highway bridge West of Sav la Mar; a handful in a few minutes, at surface and larger two inches down in dense dark algae, exposed to full sun except under bridge. Water drunk by natives, and just below bridge clothes are washed, but boats come up from sea.

9. *Broad River branch of Black River.* July 1932: by rowboat up about mile to first large branch of Black River and collect at a

turn where a central group of waterlily flowers and serrated leaves ("pancakes") and cocoanut leaves stuck down six feet to muddy bottom by fishermen. Snails with egg capsules on these leaves and stems and on *Ruppia maritima* L., from surface down several feet. Strong outward current, water dark coffee-colored, tasted fresh, but natives said was more brackish at high tide, with immature bivalves of *Mytilopsis leucophaeta* Conrad, the alga, *Compsopogon aeruginosus* J. A., living serpulas in tubes and brown and green sponges, identified by Dr. Penny in 1933 as probably *Spongilla*.

Also some distance down river along banks on plants such as water hyacinth, more of these peculiar smooth, dark forms that may be what C. B. Adams found here and called *Neritina tenebricosa*.

10. *West Lucea River*. July 1910: quart and a half in half hour; clear water 6 inches to 2½ feet, scattered over densely shaded, dark gravel bottom and more numerous on floating logs and bamboos, reached by rowboat half mile above main road. Also half mile farther up where road crossed by ford at washing place, many snails on puddingstone rock in water 2 feet depth.

July 1932: both East and West Lucea Rivers swollen muddy flood, but up West Lucea River where road crosses on high bridge at Eton sign post, above and below bridge, waist deep rapid muddy stream, scattered widely on dark pebbles, scarce, but several on few larger stones. Egg capsules on small stones.

11. *Flint River*. August 1910: on and under dark stones of dark bottom, under bridge where main road crosses, also in full sunshine of pasture above bridge, rapid cool water, some in spring on bank.

July 1932: under bridge and 20 feet upstream rapid, clear cold stream 6–18 inches penetrated by sunshine, on white flint and dark stones with more *N. punctulata* and *N. succinea*. Great numbers of egg capsules of all three, especially along depressions, often 20–40 per square inch, but also scattered widely over surfaces of stones.

12. *Mt. Pleasant Stream*. July 1932: rapid clear, little over foot deep, below culvert under main road from S. Nigril to Green Bay, scattered 5–10 to square foot, on small stones with algal

tufts with equally numerous *Neritilia succinea* and fewer *N. punctulata*; many egg capsules of all three.

13. *Montego River.* August 1910: end of rowboat access about mile from mouth, back of Barnett Mill, numerous in rapid stream from mill race and on stone abutment, feeding on microscopic green algae, and in cold spring on bank, also some few on stones of sluice and in river. 2½ quarts.

July 1932: by canoe to back of Mill, on stones in rapid shallow river.

Montego River Bridge. June 1910: on stones under bridge of main road above Mill; ½ quart with few *N. punctulata.*

July 1932: many at and near surface, felt down to 6 inches on stones and masonry under bridge in slime exposed to full sunshine, in rapid turbid stream.

14. *Great River.* June 1910: head of rowboat access, foot of cascade and remnants of dam, on stones and logs, rapid stream, near surface and on wet rocks in depressions where alga abundant and near holes in old sluice, with *N. punctulata.*

Late July: water muddy and rising in freshet; felt for under loose stones, adherent while the more expanded *N. punctulata* fall off into torrent, herds of *Neritilia*, 50–100 under some stones.

Very dense crowd in depression bearing moss and algae, in square foot 64 *N. virginea*, 765 *N. punctulata*, chiefly young of several broods.

July 1932: rowboat mile from mouth to about same locality. Most of the shells so badly encrusted as to distort shape and lime dissolved in acid reveals green algal threads.

Wading waist deep in torrent feel shells several to square foot on stones, rocks and old tree trunks; do not fall off though most are *N. punctulata.* Egg capsules of both abundant on all stones and cocoanut leaves in water. Those of *N. punctulata* less abundant, may be deeper. Very many *Neritilia.*

15. *Redding, or Retirement, River.* July 1910: where fine clear stream rushes across road, supporting water hyacinths, to supply native washerwomen below road, on stones. Many repairing injured shells; correlated with wheel and hoof traffic on road.

July 1932: no shells to be found, though stream still supported

hyacinths, but workmen paving the road to let water flow across without miring autos; stream below partly diverted to a tannery.

Rock Port Spring. 1932: small pool with large outrush of clear fresh water close to brink of salt water of harbor opposite quarry, said to have arisen after earthquake of 1907, with *N. punctulata*, on bottom with stones and algae.

(To be continued)

MOLLUSKS OF THE OQUIRRH AND STANSBURY MOUNTAINS IN UTAH

BY DAVID T. JONES, M.S., PH.D.
Associate Professor of Zoology, University of Utah

This study was undertaken in a region that no malacologist would select for good collecting. The object was to find out what was there, if anything. The results have been quite surprising and informative. The comparatively barren Oquirrh and Stansbury Ranges, immediately south of Great Salt Lake, receive very much less precipitation than the Wasatch Range to the east. The vegetation in most places is scanty and of the desert type, which conditions are very unfavorable for mollusks. The study includes the intervening Tooele and Stockton Valleys, also the eastern slopes of the Oquirrh Range in Jordan Valley.

The author has personally collected in all the localities, but was accompanied by one or more persons on each trip, who were the drivers and who also aided in collecting. These persons were, for each locality (as given by number), as follows: Perry Plummer for localities (1), (6), (13), (15), (16), and (17); Frank F. Daughters for (2), (4), and (5); Thomas A. Hopkins for (3), (14), (20), and (21); Thomas Hopkins and Harden Rowland for (4) second time, (18), (19), and (22); and Calvin A. Richins for (7), (8), (9), (10), (11), and (12). Acknowledgment is made to the Zoölogy Department of the University of Utah for financing both trips in which Thomas Hopkins was driver; also on the same trips to the federal student aid (then F.E.R.A.) for driver's compensation. All collections recorded in this article were made in the spring of 1936.

Localities and stations are as given alphabetically below, the numbers being those used in the preceding paragraph, also in the

systematic list that follows: (1) Bingham, Utah—Bingham Canyon, one-half mile below the town, on a rock slide; (2) Cedar Valley, Utah—a station three miles east of town in drift material along a small creek that arose in the Oquirrh Mts.; (3) Clover, Utah—Fisher's Pass, ten miles west of town, between the Stansbury and Onaqui Mts.; (4) Fairfield, Utah—in or near the town; (5) Fairfield, Utah—Five Mile Pass, five miles west of town, on the top of a wind-swept peak to the south of the pass, under cedars; (6) Garfield, Utah—one mile west of the smelter; (7) Grantsville, Utah—southwest edge of town; (8) Grantsville, Utah—one-half mile east of town; (9) Grantsville, Utah—northwest of town, near the point of the Stansbury Mts., on a salt flat in a pool formed by fresh water seepage; (10) Grantsville, Utah—mouth of South Willow Canyon; (11) Grantsville, Utah—South Willow Canyon, four and one-half miles from mouth; (12) Grantsville, Utah—South Willow Canyon, six miles from mouth; (13) Herriman, Utah—Rose Canyon, seven miles from the mouth, near a damp spring-box; (14) Lake Point, Utah—two miles west of Lake Point; (15) Lark, Utah—at the mouth of Butterfield Canyon, in an area partially denuded by fire and overgrazed by sheep, in underbrush; (16) Lark, Utah—Butterfield Canyon, five miles from the mouth, a woodland habitat; (17) Magna, Utah—in and near the town; (18) Mercur, Utah—between Manning Silver Mine and Mercur; (19) Mercur, Utah—one mile west of the old ghost-town ruins of Mercur, which at the time we collected were adjoined by the Mercur mining camp, mostly of tents; (20) Stockton, Utah—three miles south of town at Rush Lake, the remnant of the lake that once filled the valley; (21) Tooele, Utah—in or near town; and (22) West Mercur, Utah—on the road leading to St. Johns, somewhat west of the ghost-town ruins of West Mercur, under a thicket of scrub oak, along a creek arising in the Ophir region of the Oquirrh Mts.

The species obtained are listed in systematic order below:

Pisidium variabile Prime—Locality (4), two valves.
Vallonia pulchella (Müller)—(17), four living specimens.
Vallonia albula Sterki—(7), two shells; (18), one shell; (4), two juvenile specimens, probably of this species; (22), several living specimens.
Vallonia gracilicosta (Reinh.)—(2), five shells.

Orcohelix strigosa depressa (Cockerell)—(19), several shells, one of which approached "form *gabbiana*"; (11), two shells, one of which was high-spired; (1), eight shells, five of which showed two distinct but narrow color bands. All were low-spired but one. This approximated "form *gabbiana*"; (2), one immature shell; (3), several, high-spired specimens, some of which were alive; (15), a few fragments of shells.

Microphysula ingersolli (Bland)—(16), twenty-three living specimens, some of which were juveniles.

Pupilla blandi Morse—(22), one shell; (19), seven specimens, some living; (21), one, living; (5), five adults and twelve juveniles, many of which were alive; mature shells with dentition.

Vitrina alaskana Dall—(15), two shells; (16), eight, living; (11), seven, living; (12), eight, living; (13), two, living; (10), one shell; (19), several, some alive; (18), one shell; (3), several, living; (21), several, living.

Euconulus fulvus alaskensis Pilsbry—(16), two worn shells; (12), one shell; (11), eleven specimens, a few alive; (7), one immature shell.

Zonitoides arboreus (Say)—(15), two worn shells; (16), sixteen specimens, a few alive; (13), four, alive; (11), four shells.

Deroceras agreste (L.)—(21), two living specimens.

Discus cronkhitei (Newcomb)—(3), several living specimens, the body whorls of many very abruptly descending.

Discus cronkhitei anthonyi (Pilsbry)—(16), three shells; (2), two shells.

Stagnicola palustris nuttalliana (Lea)—(8), many dead shells; (20), one shell; (4) several living juveniles.

Fossaria modicella rustica (Lea)—(14), three living specimens.

Fossaria obrussa (Say)—(4), several living specimens.

Gyraulus vermicularis (Gould)—(20), five living specimens; (4), ten living specimens.

Physa ampullacea Gould—(8), two shells; (4), twenty-six living specimens; (20), four living specimens.

Amnicola limosa (Say)—(21), several, alive, shells encrusted with mud; (21), another set, subfossil; (4), two shells, subfossil.

Paludestrina longinqua (Gould)—(13), one shell; (6), many, alive; (9), many, living; (20), many, living.

MOLLUSCA OF ZION NATIONAL PARK, UTAH

BY WENDELL O. GREGG

A three-months stay in Zion National Park during 1935 gave opportunity for a rather thorough search for the members of its mollusean fauna. I arrived there early in May when conditions are most favorable for finding the minute species of land snails. In my list I have combined the results of this study with what published records I have been able to find. In 1929 Mr. A. M. Woodbury[1] reported fifteen species of mollusca from this park. *Microphysula ingersolli*[2] is reported to have been taken by Dr. Pilsbry. Chamberlin and Berry[3] report *Gastrocopta ashmuni*. In addition to these forms the five previously unreported species which I took there bring the total number of species to twenty-two. Two of the species I found, *Vallonia perspectiva* and *Hawaiia minuscula neomexicana*, have not been reported from Utah. Three other species not previously taken in the park are *Pisidium abditum*, *Vallonia pulchella* and *Lymnaea bulimoides cassi*.

There are some changes in the names previously used. The large snail formerly reported from this locality as *Oreohelix cooperi* proves to be *O. strigosa depressa*.[4] This fact is borne out by the anatomy as well as by the shell characters. The shell previously reported from here as *Pupilla syngenes dextroversa* proves to be *Pupilla blandi*. *Oreohelix haydeni oquirrhensis*[5] is reported as occurring at the Narrows in Zion Canyon. It is the consensus of opinion that this record is also erroneous.

In the following list I have enumerated the principal locations in the park where I have taken specimens.

Pisidium abditum Haldman. Quite plentiful in a small pond in Birch Creek Canyon.

Vallonia pulchella Müller. Under dead leaves near Grotto Camp Ground; three specimens found. Probably introduced.

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[1] NAUTILUS, 43: 54.

[2] Bull. of the University of Utah, vol. 19, no. 4, p. 75.

[3] *Ibid.*, vol. 21, no. 2, p. 4.

[4] Land Mollusca of N. A., vol. 1, part 1, p. 431.

[5] NAUTILUS, 34: 141.

Vallonia gracilicostata Reinhardt. Along Virgin River, foot of Bridge Mt.; Grotto Camp Ground; Saddle Nook, and other localities. Quite common.

Vallonia perspectiva Sterki. Grotto Camp Ground and Saddle Nook. Previously overlooked because of its diminutive size.

Oreohelix strigosa depressa Cockerell. The Grotto, Grotto Camp Ground, the Narrows, Weeping Rock, Saddle Nook, Fairy Land, Birch Creek Canyon, Temple of Sinawava and Wiley's Retreat. Commonly found throughout canyon under dead leaves, old logs and in rock slides. One sinistral specimen was taken at Saddle Nook.

Microphysula ingersolli Bland. Specimens were taken in 1927 by Dr. Pilsbry. Others have failed to find it. It is found commonly in southern Utah at higher altitudes.

Gastrocopta ashmuni Sterki. Reported taken by R. V. Chamberlin and Elmer Berry, Sept. 24, 1930.

Pupoides marginatus Say. Mr. Woodbury reports taking two specimens.

Pupilla blandi Morse. Near Virgin River at foot of Bridge Mountain, Grotto Camp Ground and Temple of Sinawava.

Pupilla syngenes Pilsbry. Found at the Grotto, Grotto Camp Ground, Saddle Nook and along the trail to the Narrows.

Cochlicopa lubrica Müller. Taken at the Grotto, Grotto Camp Ground, Oak Creek Canyon, Saddle Nook, Refrigerator Canyon, Temple of Sinawava and Wiley's Retreat. Very common.

Vitrina alaskana Dall. Along Virgin River at foot of Bridge Mountain, Grotto Camp Ground, the Grotto, Weeping Rock, along train to the Narrows, Saddle Nook, Regrigerator Canyon, Emerald Pool Canyon, Temple of Sinawava and Wiley's Retreat.

Retinella indentata Say. Grotto Camp Ground, Weeping Rock, Saddle Nook, Refrigerator Canyon, Emerald Pool Canyon and Wiley's Retreat.

Euconulus fulvus alaskensis Pilsbry. Refrigerator Canyon, Emerald Pool Canyon, Temple of Sinawava and Birch Creek Canyon.

Zonitoides arborea Say. The Grotto, Grotto Camp Ground, Weeping Rock, Oak Creek Canyon, Saddle Nook, Refrigerator Canyon, Emerald Pool Canyon, Temple of Sinawava, along trail to the Narrows and Wiley's Retreat.

Hawaiia minuscula neomexicana Cockerell and Pilsbry. Two specimens were found by a spring near the entrance to Refrigerator Canyon and one was found at Saddle Nook.

Agriolimax campestris Binney. Along Virgin River at foot of Bridge Mt., the Grotto, Oak Creek Canyon, Grotto Camp Ground, Saddle Nook, Birch Creek Canyon, Refrigerator Canyon and Emerald Pool Canyon.

Discus cronkhitei cronkhitei Newcomb. Grotto Camp Ground, Weeping Rock, Saddle Nook and Wiley's Retreat.

Succinea avara Say. Grotto Camp Ground, Saddle Nook, Emerald Pool Canyon and Birch Creek Canyon.

Lymnaea (*Stagnicola*) *bulimoides cassi* Baker. Small stream, Saddle Nook.

Gyraulus similaris Baker. Pool in Birch Creek Canyon.

Physa (*Petrophysa*) *zionis* Pilsbry. On wet faces of cliffs along the trail to the Narrows. I noted colonies at points approximately 1053, 1058, 1114 and 1544 yards from the Temple of Sinawava. A colony was also located at "Fairy Land" about three-fourths mile south of the Temple of Sinawava. Here many specimens were noted on horizontal surfaces of large flat rocks at the base of the cliff as well as on the perpendicular surface of the cliff. *Physa zionis* is reported from the canyon beyond the end of the trail along the first mile of the Narrows proper.

NOTES AND NEWS

Exact Dates of The Nautilus.—Vol. 53 (1) : pp. 1–36, pls. 1–7, was mailed July 21, 1939; (2) : 37–72, pls. 8–9, Oct. 20, 1939; (3) : 73–108, pls. 10–12, Jan. 28, 1940; (4) : 109–144 (+ viii), pls. 13–14, Apr. 29, 1940.—H.B.B.

Chondropoma dentatum.—I would like to report the occurrence here in Naples, Collier County, Florida, of *Chondropoma dentatum*. The single specimen taken is dead and bleached and its establishment here in the living state is not determined, but the occurrence of even a dead specimen so far north of its usual habitat in the keys I think to be not without interest. It came from under a hedge on the rear side of the Naples Inn lawn, with *Polygyra uvulifera*.—J. L. Baily.

Peculiar Oliva.—An interesting anomaly has been noted in a series of the shells of *Oliva sayana* Ravenel collected about Sanibel-Captiva, Florida. Each individual specimen in this small group is entirely normal in form, color-pattern and high polish, but bears a well-elevated, rounded, cord-like ridge about 2 mm. wide, parallel with the suture and generally at or near the middle of the body whorl. This cord-like girdle shares the polished enamel of the entire shell surface, and, as shown in several juvenile specimens, seems to be a structural anomaly of the shell

and not the result of an accidental circumstance occurring during the period of growth. See Plate 1; Fig. 7.

In a certain limited area where *Oliva sayana* is fairly abundant eleven specimens showing this unusual peculiarity have been taken. If similar specimens have previously been noted or reported, I shall be exceedingly glad to hear of them.—Louise M. Perry.

Anatomy of Helminthoglypta.—In looking through your recent work on land snails I note the illustration and description on page 146 of the "Genitalia of a *Helminthoglypta* of uncertain status." This illustration and description agree in every detail with genitalia of *H. cuyamacensis lowei* from Palomar Mountain which I collected and dissected during 1936. I have never collected typical *cuyamacensis*.—Wendel O. Gregg, M.D., in letter to Ed.

Planorbulina Not a Generic Name in the Mollusca.—Mr. Hugh Watson has recently called my attention to the fact that there is no genus or subgenus *Planorbulina* Jickeli, 1874, as stated by me in a recent publication (Zool. Ser. Field Mus. Nat. Hist., *24*, p. 100, 1939). An examination of the literature shows that this name has been published on three occasions as referring to a mollusk, but that each one represents a slip of memory or of the pen.

Thus von Martens (Biol. Centr.-Amer., Terr. & Fluv. Moll., p. 400, 1899), in writing of *Planorbis edentulus* Clessin, states that "This species is said to belong to the group of *P. armigerus*, *i.e.*, to *Planorbulina*, but to be without internal lamellae." This is plainly a slip for *Planorbula* Haldeman.[1]

In listing the synonyms of *Planorbula* Germain (Rec. Ind. Mus., *21*, p. 179, 1923) includes "1874. *Planorbulina* Jickeli, Fauna der Land- und Süsswasser Mollusk, Nord-Ost-Afrik., Dresden, p. 221 (pour le *Planorbis alexandrinus* Ehrenberg (*Segmentina sousgenre Planorbulina*)." Examination of a copy of Jickeli's work kindly loaned to me by the Museum of Comparative Zoology shows that this is a slip on the part of Germain, since there is no

[1] This use of *Planorbulina* by clerical error was noticed and explained by Pilsbry and Bequaert in 1927,—Aquatic Moll. Belg. Congo, p. 131.—Ed.

mention of any name but *Planorbula* on the page cited, nor does *Planorbulina* appear elsewhere in the work.

My own use of the name *Planorbulina* is due to a slip of memory, since I was convinced that I had verified Germain's reference several years ago when Jickeli's work was available to me. It is apparent that I had not, and I repeated Germain's error quite unintentionally.

The name *Planorbulina* is in any way unavailable for a mollusk. It is applicable only to the Foraminiferan genus so named by Orbigny in 1826.—FRITZ HAAS, Curator of Invertebrate Zoology, Field Museum of Natural History, Chicago.

MEGALOMASTOMA (FARCIMEN) MIRANDA, A NEW CUBAN CYCLOPHORID SNAIL.—The strong, heavy shell is oblong, the sides convex, the conic summit about one-third of the length, the diameter nearly half of the length. Surface dull, pinkish cinnamon (varying in tone). Aperture circular, with a narrow projecting rim and a very wide callous lip, which recedes in the lower half but is level and adnate to the preceding whorl in its upper half, much thickened at the columellar and upper outer portions. Length 35 mm., diameter 15.5 mm.; paratypes 35×16 and 32.7×15.3 mm.; $7\frac{1}{2}$ whorls, or with one or two lost at the apex. All ♀. From top of a mogote north of Mercedes Valley, Miranda, Oriente, Cuba, collected by Pilsbry and Welch, July 21, 1928. Type and paratypes 146743a A.N.S.P. As this fine snail has been somewhat widely scattered under the above name, it is now validated by a description.—H. A. PILSBRY.

A SUBTERRANEAN SNAIL FROM AN ARTESIAN WELL.—At the U. S. fish hatchery at San Marcos, Texas, is an artesian well 188 feet deep from which a most remarkable fauna has been collected. Six species of blind crustaceans, belonging to as many genera, and one species of blind salamander have been described from this well. During May, 1940, the author spent three days collecting at the San Marcos well. A plankton net was tied over one of the openings and examined twice a day. After each twelve-hour period the net usually contained a half dozen crustaceans. On the third day a small snail was found in the net. It was so badly corroded that little was left except the columella

and aperture. Upon close inspection it was found to belong to the genus *Horatia*, a genus which had been collected only twice before in the United States. The first specimens (five dead shells) were collected in 1903 by Pilsbry and Ferriss from drift debris on the bank of the Guadalupe River, above New Braunfels, Texas. The second locality is a subterranean stream in Manitou Cave, near Fort Payne, Alabama, where living specimens in large numbers were collected by the author in 1939.—LESLIE HUBRICHT.

THE TENTH ANNUAL MEETING OF THE AMERICAN MALACOLOGICAL UNION

Returning to the scene of its first meeting, which was on April 30, 1931, the American Malacological Union held its tenth annual convention in the Academy of Natural Sciences in Philadelphia from June 17 to 21, 1940. Here, on Tuesday morning, June 18, Mr. Charles M. B. Cadwalader for the second time extended to this group of Malacologists the hospitality of the institution of which he is president.

The program of scientific papers presided over by Dr. Horace B. Baker, President of the Union, was continued over Tuesday, Wednesday and Thursday, a final business session being held on Thursday afternoon.

As guests of Miss Anne Harbison members were entertained at dinner in the Barclay Hotel Tuesday evening. On this occasion Mr. Norman W. Lermond, Corresponding Secretary of the Union, was presented with a testimonial of appreciation for his labors during the winter of 1930–31 which culminated in the organization of the Union the following spring. This appreciation was in the form of a poem by Dr. Paul Bartsch, handsomely engrossed on parchment in a tooled leather binding and signed by all the members present.

On Wednesday evening Mrs. Frank R. Schwengel's perennial and liberal hospitality was again enjoyed by every one at a cocktail party and buffet dinner in the Orchid Room of the Warwick Hotel.

The Annual Dinner climaxed the social features of the convention. It was held in the Library of the Academy and because this meeting marked its tenth anniversary, a special program

had been arranged to do honor to its first president, Dr. Henry A. Pilsbry. Dr. Paul Bartsch, as toastmaster called on several speakers,[1] each of whom voiced an affectionate appreciation of the labors, in research and writing, the goodfellowship, patience and kindness in the field and laboratory, and the unfailing loyalty and devotion of this eminent leader.

A list of papers presented follows. Most of them were illustrated by lantern slides.

Tuesday Morning:

Drs. Carlos de la Torre and Paul Bartsch: The Cyclophoridae of Cuba.

Dr. P. Bartsch: The Cyclophoridae of the West Indies, exclusive of Cuba.

Drs. P. Bartsch and J. P. E. Morrison: The Cyclophoridae of the mainland of America.

Tuesday Afternoon:

Dr. H. B. Baker: Are snails animals?

Mr. M. S. Briscoe: The growth of the radula in *Goniobasis virginica.*

Dr. F. C. Baker: Report on the progress of the monograph of American Planorbidae.

Wednesday Morning:

Dr. B. R. Bales: The rock dwellers of the Florida Keys.

Dr. Myra Keen: Marine Mollusca common to Japan and west North America.

Miss Bernadine Barker: Travels in Venezuela, Curaçao and Haiti.

Dr. Myra Keen: The muricid genus Typhis, subgenus Talityphis.

Wednesday Afternoon:

Mr. H. F. Wheeler and Dr. Allan F. Archer: Mollusca of Monte Sano, Alabama.

Dr. d'Alté Welch: Achatinellae from Oahu, Hawaii.

Thursday Morning:

Dr. Wm. J. Clench: Where should I collect?

Dr. Harald A. Rehder: On some West Indian Naticidae.

Dr. Henry A. Pilsbry: Distribution of Polygyridae.

Dr. Allan F. Archer: Pine woods as adequate habitat types of land Mollusca.

[1] A detailed list of speakers at the Annual Dinner will be printed in the Annual Report to be issued separately.

Thursday Afternoon:

Dr. J. P. E. Morrison: Population studies on Goniobasis.

Dr. Henry D. Russell: Collecting in Santo Domingo.

In an endeavor to give tangible evidence of its regard and esteem, the American Malacological Union, through its Financial Secretary, Mrs. Harold R. Robertson, informed Dr. Pilsbry of the projected publication by the Union of a bibliography of his published works comprising over one thousand titles. This will be distributed to the membership and will prove an invaluable aid to every serious student of the mollusca. A perusal of the titles alone will serve as a stimulus to investigation since they cover a wide range not only in the field of malacology but in other subjects as well, and demonstrate what is possible for one man to do.

Dr. Pilsbry responded, voicing his appreciation of the sincere affection manifested toward him and of which he had received such overwhelming evidence. On his part this regard was no less deep toward his co-workers and friends in the Union. The concluding feature of the program was the presentation of a red rose to Dr. Pilsbry by Mrs. Frank R. Schwengel, a token of the love of each and all.

Resolutions were adopted expressing appreciation and thanks to President Cadwalader and the members of his staff who contributed so wholeheartedly in making the meeting a success; to the committee of arrangements for formulating a most interesting program; to Miss Anne Harbison and Mrs. Frank R. Schwengel for their delightful hospitality, which made the two evenings devoted thereto outstanding in the history of our organization, and to our retiring president, Dr. Horace B. Baker, for the masterful way in which he has piloted our meeting and for all else that he has done to make the endeavors of the A. M. U. outstanding on this occasion.

On Friday morning at 9 o'clock autos were boarded for a trip to the Morris Arboretum followed by a picnic lunch at 12:30 at Bloomfield Park where the Misses Grace and Elizabeth Pilsbry charmingly performed the duties of hostesses. This was the final event of a week packed with delightful episodes.

The next meeting will be held in the Knox Academy of Arts and Sciences, Thomaston, Maine, in August, 1941.

THE NAUTILUS

Vol. 54 October, 1940 No. 2

THE ROCK DWELLERS OF THE FLORIDA KEYS

BY B. R. BALES, M.D.

To see a shell collector sally forth armed with a hammer and chisels, might seem incongruous, but such equipment is necessary when hunting the various species of bivalve mollusks that spend their entire lives in their self-made sepulchres in the solid coral rock.

During the past two winters spent collecting specimens on the Florida Keys, I have taken ten different species of these "rock dwellers" and have learned a few facts regarding their life histories. To be successful in taking specimens, the collector must first learn by what means their burrows may be located or just what "sign" is evident upon the surface of the rock which will indicate that a mollusk is hidden within.

The sign of *Lithophaga antillarum* is a small oval opening, perhaps a half inch long and one fourth inch in the smaller diameter. The burrow extends backward horizontally; is smooth, straight, and conforms to the shape of the shell.

Lithophaga nigra has the same "sign," but it is smaller. The burrows of both are somewhat larger than the shell, which enables the mollusk to have a certain degree of motion within its cell, though motion is very much restricted. Both of these have very definite preferences regarding location. They are seldom seen where the adjacent ocean bottom consists of sand that is easily stirred up nor in rocks that may be covered by moss or algae. Frequently a long line of rocky shore may contain a colony of Lithophagas in but a small portion, as adjacent portions are apparently unfavorable; thus, they may be found in a space of but a few yards in extent, although the rocks may extend for a mile. Occasionally both may be found in large and movable slabs of

rock, though they prefer the solid rock that forms the coast line of the Keys.

Quite different is the "sign" of *Lithophaga bisulcata.* This is merely a small round hole, and the tip of the shell is often seen just below the opening, although the mollusk retreats out of sight at the slightest disturbance. Bisulcata burrows are usually vertical and although occasional burrows may be horizontal, the vertical position is the usual one. The burrows do not penetrate as deeply into the rock as the other two Lithophagas.

The burrows of most of the "rock dwellers" are usually near the tide line at low tide which facilitates the removal of the shells, but when the burrow entrance is under water, it is located by seeing the mantle of the mollusk at the burrow entrance. This is black in *Lithophaga nigra,* but is brown in *antillarum.*

Botula fusca has a brown mantle similar in color to that of *Lithophaga antillarum,* but this mollusk is more difficult to find; possibly by reason of its rarity or from the fact that it has no regular "sign". The burrow entrance may resemble the oval entrance of *Lithophaga antillarum* or it may be just another small hole in the rock. The shell, also, is more difficult to remove. With the Lithophagas, as soon as enough of the rock has been chipped away to expose the anterior portion of the shell, a firm grasp of the finger tips, with a gentle rotary motion to loosen the byssus, will bring the shell to light. Not so with *Botula fusca;* the rock must be chipped away until the entire shell is exposed, as the swelling at the umbones and the firmer attachment of the byssus makes it impossible to remove it intact otherwise. Several choice specimens were broken before this fact was learned.

Rupellaria typica is usually found just below the surface on the tops of wave washed rocks and by its accessibility is probably the easiest "rock dweller" to remove. Its "sign" consists of two small holes resembling the punctuation mark, colon. These two small holes are in reality the tips of the two siphons which disappear as soon as touched. At low tide, favorable rocks are fairly peppered with them.

Petricola lapicida also is found just below the surface of horizontal rocks and the "sign" is similar to *Rupellaria,* though they seem to be more frequently found in deeper water.

Gastrochaena ovata and *rostrata* present another problem in rock chipping. Unlike the before mentioned rock dwellers which are found but a short distance in the rock from the burrow entrance, these construct a more or less elaborate burrow. The "sign" cannot be mistaken for anything else. Built up at the entrance to the burrow are two pearly cylinders of shell secreted by the mollusk; there is a narrow slit at the point where the cylinders meet. The two siphons of the animal may be seen at the tips of the cylinders when it is undisturbed. The portion of the burrow immediately below the cylinders carries out the double character of the cylinders for a short distance; after that the burrow is cylindrical and smooth for about an inch; then the remainder of the burrow which comprises about four-fifths of its length is corrugated, with distinct and prominent ridges running crosswise. This extends downward to the enlarged smooth bottom chamber where the shell rests. The length of the burrow varies and is dependent upon the age and size of the mollusk and the character and hardness of the rock. The entire burrow is lined with a nacreous or shelly substance which seems to be more heavily applied to the sides of the burrow at the corrugated portion. It has been found that the two pearly cylinders at the opening of the burrow are normally about one-fourth inch in height when free from any corralline or other extraneous marine growth, but when such growths are deposited upon the cylinders, the mollusk adds more to the tops of the cylinders and continues to add to their height as the foreign growth increases. Specimens with coral incrusted cylinders have been found that were fully one inch above the rocky entrance to the burrow.

Unlike the Lithophagas, the Gastrochaenas do not have a straight burrow, but it is more or less tortuous, evidently following the line of least resistance and the collector is never sure just where to expect to find the shell and many are broken. Very frequently, the burrow opening when found is above the water level, but it may range downward until the end is well below the water which makes chipping difficult and hazardous to the integrity of the shell. If care is taken, the mollusk may be taken alive and placed in a vessel of sea water for observation; and it presents, indeed, a curious spectacle. I have seen them placed in a test tube of water and set aside for a period; after the mollusk

has recovered from the shock of removal from its home, it sends out the soft, movable portion of its body. This is light colored and is surmounted by the two dark siphons. In some instances it has extended the full length of the test tube, the body being four or five inches long and with a diameter of at least one half inch—all this from a small shell less than an inch long. It might be interesting to know the reason for the corrugated portion of the burrow and why it is smooth at both ends.

In the study of this interesting group of mollusks, the student is confronted with the problem of just how they form their burrows. No doubt all of them enter some small hole in the rock when they are very small and as growth proceeds, they enlarge it to conform to their ever enlarging bodies, but how this is accomplished, remains to be learned. Several theories have been advanced. Some say that the mollusk secretes some substance that attacks or has a tendency to soften the lime of the rock, enabling the animal to fashion its burrow, but it would seem that any acid that would attack the lime of the rock, would also attack the lime of the shell. Others have contended that the burrow is formed by friction, and that the rock is worn away by the turning of the shell in the burrow. None of the shells show any evidence of such a procedure and many are so fragile that even a small amount of friction, if it did not break the shell outright, would present some evidence of wear on the shell itself. Another theory is that the rock is worn away by the soft parts of the mollusk, working endlessly on the unyielding rock. Taking into consideration that the mouth or opening of the shell points to the opening of the burrow, this would not permit the operation of a radula or other organ of the animal even if it had one, in fashioning its burrow, for the burrow is formed *back* of the shell. The mollusk does not burrow forward into the rock, but backs into it. It is very evident that this class of mollusks offers the opportunity for intensive study relative to the life histories of the various species.

To take them is one of the hardest forms of collecting, and it is attended with many a disappointment, for frequently just as a specimen is about to be secured, an injudicious blow of the hammer fractures the shell. To collect them the student must needs have more than the usual amount of enthusiasm and a strong back.

TWO NEW MARINE MOLLUSCS FROM JAPAN

BY MAXWELL SMITH

MUREX (MUREXSUL) EDNAE n. sp. Pl. 2, Fig. 10.

Nucleus apparently consisting of two whorls (not perfect in holotype); shell consisting of six whorls; anterior canal about one-third length of shell, partially open, gradually bent backward. Outer lip irregularly dentate, the dentations forming shallow grooves extending inside upon wall and corresponding with exterior axial ribs. Parietal wall smooth, callus forming a sharp edge and not spread out upon surface of shell. Each whorl bears nine varices. The penultimate varix is well excavated beneath the entire length; another varix shows triplicate formation, the earliest of the three bearing spines. All of the spines are of open tubular type and are decidedly recurved. They are of varying length and average twelve on each varix, being continuations of the axial ribs. Upon the back of the shell and opposite the anterior canal the spines almost touch those above. Arising from the canal, and from three previous abandoned canals, a single long curved spine is present in each case which is distinctly separated from the adjacent varix. The axial ribs are tinged with chocolate brown color, the same shade extending to the spines. Suture well impressed but regularly interrupted by the varices. Length 50 mm., breadth 26.5 mm. Holotype in the collection of Mrs. Edna G. Gordon to whom the species is dedicated. Drawing by Richard L. Albany.

Locality: deep water off the coast of Japan.

FUSINUS HYPHALUS[1] n. sp. Pl. 2, Fig. 9.

Shell thin, fusiform; nucleus pearly, two whorls; seven and one half subsequent whorls; suture well impressed but its continuity frequently broken by the growth sculpture; primary spiral ribs numerous, with several lesser ribs between each pair; slightly larger spiral rib at periphery forming an indistinct shoulder; growth lines strong, of variable size and forming a reticulate surface; the spire as far as the penultimate whorl covered with low rounded projections extending from suture to suture, about twelve to each whorl; anterior canal comparatively short, open; outer lip thin, slightly reflected, moderately dentate inside. Epidermis persistent, straw-brown in color. Holotype in writer's collection measures: Length 36.5 mm., breadth 12.5 mm., length aperture and anterior canal 20 mm. Drawing by Richard L. Albany.

Locality: 100 fathoms off Tosa, Japan.

[1] Greek, hyphalus, from under the sea.

NEW RECENT AND FOSSIL MOLLUSCS FROM FLORIDA

BY MAXWELL SMITH

MUREX (JATON) GAZA[1] n.sp. Pl. 2, Fig. 3.

Shell of moderate size, whitish, tinged with yellow and flesh color; about five and one-half whorls, body whorl with four reflexed varices, the final one thin and rather sharp, particularly posteriorly where it is more extended. Equidistant between the varices are rounded shorter blunt nodules; surface of final whorl sculptured with unequally spaced somewhat broken incised spiral lines, about seventeen in number below the periphery; surface of final varix, adjacent to aperture, with undulating incised lines and numerous scale-like processes. Aperture elongate-oval, margins white, interior flesh color; interior of outer lip provided with four blunt teeth, the lip slightly crenulate; canal closed except near end. Length 20 mm., breadth 9.5 mm.; aperture length 5.5 mm. Holotype, the only known example, in the writer's collection. Collected by Mrs. L. A. Burry of Pompano, Florida.

This attractive little shell apparently is the Atlantic analogue of the well known Murex festivus Hinds of California. M. gaza differs from that species in the sculpture, smaller size, narrower form and straighter canal.

Locality: Off Key West, Florida (obtained by diving).

MUREX ANNIAE n. sp. Pl. 2, Fig. 1.

Shell of moderate size. Nucleus of 1½ whorls, the portion following the first half rounded and prominent, very similar to M. cabritii nucleus. Anterior canal comparatively short, straight, tip not recurved. Edge of outer lip bearing inside a series of blunt inconspicuous and widely separated denticles; outer lip well denticulated with in addition about seven long low processes upon the adjacent inner wall. There are three varices upon each whorl together with secondary spineless intermediate ribs. Spiral threads of two sizes cover the surface and extend over the varices. Certain of the primary threads form spines on the varices, these spines of fairly uniform size and few in number adjacent to the anterior canal; early whorls of spire presenting a reticulated appearance. The holotype, in the writer's collection, measures: length 33 mm., breadth 20 mm. A fragment exhibiting the aperture agrees perfectly with the holotype. Named in honor of the writer's mother Annie Lum Smith.

[1] Greek, gaza, treasure.


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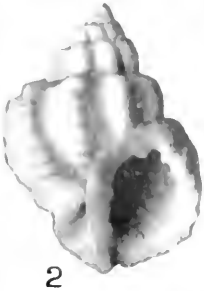
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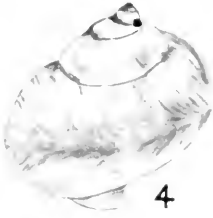
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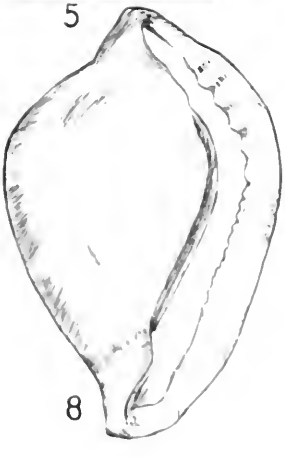
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This remarkable little Murex may be the progenitor of Murex cabritii, now living in the Gulf of Mexico. The nucleus is almost identical with that species. The abbreviated canal of M. anniae, fewer and shorter spines, separate it from the latter species. From M. curvirostris Sowerby it differs in the straighter canal and in possessing fewer and coarser spines upon the varices.

Woodring has shown that Murex messorius Sowerby is a synonym of M. recurvirostris. Sowerby's figure in the Conchological Illustrations certainly does not represent the Florida shell which has long been called messorius. It therefore seems advisable to describe:

MUREX RECURVIROSTRIS DELICATUS n. subsp.

Considerably smaller than the type, more delicately sculptured, fewer spines upon the varices. Length usually about 30 mm. Holotype in the writer's collection, from Lake Worth, Florida.

Locality range: Gulf of Mexico and east coast of Florida.

MUREX RECURVIROSTRIS RUBIDUS F. C. Baker.

The well known red colored form.

Locality: Florida, chiefly in vicinity of Marco.

MUREX RECURVIROSTRIS CITRINUS n. subsp.

Suffused with lemon yellow color which is most conspicuous upon the ribs and varices. Two purple colored spiral bands encircle the final whorl. The parietal wall and canal area are touched with the same purple color. The holotype in the writer's collection measures 28.5 in length. Dredged at moderate depth by Mr. and Mrs. J. W. Donovan.

Locality: Living off Key Largo, Florida.

MUREX RECURVIROSTRIS NIGRESCENS Sowerby.

Placed by Woodring as a synonym of recurvirostris it appears that nigrescens is at least entitled to subspecific rank. The interior of the aperture is extremely dark. Several fine examples were obtained by the writer in the John Calvert collection which was recently brought to America.

Locality: Panama (Atlantic side); east coast of Central America.

CANCELLARIA (BIVETOPSIS) MOOREI PACHIA[2] n. subsp. Pl. 2, Fig. 2.

Guppy described C. moorei in 1866 (see Quart. Jour. Geol. Soc.

[2] Greek, pachia, fat.

London, Vol. 22, p. 289, pl. 17, fig. 7). The plaits upon the columella of paehia are almost equidistant, the shell is broader than the type, while the posterior denticles within the outer lip are more pronounced and placed closer together. The holotype and only example known, in the writer's collection, is 18 mm. long.

Locality: Dike near Belle Glade, Florida (probably Miocene).

PRIMOVULA (PSEUDOSIMNIA) VANHYNINGI n. sp. Pl. 2, fig. 8.

Shell pale olive color; swollen in the center, extremities produced; surface covered with interrupted regularly spaced spiral lines which apparently are absent at the periphery; marginal teeth coarse and widely spaced.

Schilder in 1917 described the subgenus Pseudosimnia to receive two species, P. carnea Poiret (the genotype) from the Mediterranean and P. adriatica Sowerby. No New World examples have heretofore been known. P. vanhyningi is nearest to P. carnea. It differs from that species chiefly in being proportionately broader, more pinched above and below the extremities, in possessing fewer and coarser marginal teeth. The holotype, deposited in the Florida State Museum, Gainsville, measures 11 mm. in length., 7 mm. breadth. (P. carnea example 11 mm. length, 6 mm. breadth.) Named for Dr. T. Van Hyning, curator of the State Museum. The two known specimens were dredged by Frank Lyman in 50 fathoms. Drawing by Richard L. Albany.

Locality: Off Boynton Beach, Florida.

ADDITION TO THE MOLLUSCAN FAUNA OF CALIFORNIA

BY TOM BURCH

During the summers of 1938 and 1939 the writer dredged eight specimens of a small shell from gravel in 25 fathoms off Redondo Beach, California that appear to be identical with specimens of *Cantharus lugubris* C. B. Adams from Mexico and Central America in the Herbert N. Lowe collection at the San Diego Society of Natural Sciences. There is also a single specimen of the same species in the G. Willett collection from Catalina Island. Furthermore, it appears commonly in the Pleistocene deposits near Playa Del Rey, California, where it has been confused with *Fusinus lutcopictus* Dall. The nucleus and other characters are,

however, quite distinct from *Fusinus*. The nuclear whorls are also different from those of the majority of *Cantharus*, being subpyramidal, ornamented by fine rounded papillae, and terminated by a narrow elevated rib. It seems probable that the genus *Cantharus* should be divided into two genera.

This species has never, to the writer's knowledge, been reported living or fossil from California, nor has a figure of it ever been published. Therefore, I take this opportunity to report an extension of range and to present figures of a species heretofore unfigured.

Photographs by courtesy of the Los Angeles Museum; drawing of nuclear whorls by courtesy of Mr. A. Peterson of the Allan Hancock Foundation, The University of Southern California.

Pl. 2, fig. 6. *Cantharus lugubris* C. B. Adams, length 10.2 mm. 25 fathoms off Redondo Beach, California.
Pl. 2, fig. 7. Nuclear whorls of another specimen from Redondo Beach. Length of whorls shown 1 mm.
Pl. 2, fig. 5. *Cantharus lugubris* C. B. Adams, length 15.1 mm. Pleistocene near Playa Del Rey, Calif.

NOTES ON THE SNAIL HUMBOLDTIANA FORTIS PILSBRY

BY E. J. KOESTNER AND RICHARD A. SCHNEIDER

Our observations on the snail *Humboldtiana fortis* Pilsbry, were confined to the vicinity of Cerro Potosí, a 12,500 foot mountain near Galeana, Municipio de Galeana, Nuevo Leon, Mexico. Frequent trips between Galeana and our camp on the peak of Cerro Potosí (5,400 feet to 12,000 feet altitude) gave us opportunity to observe the presence or absence of the snail in the different types of vegetation cover represented. The extreme peak is crowned by an area of rocky alpine meadow, and is fringed by an almost pure stand of scrubby piñon pine (an undescribed species) which forms a timberline zone of varying width. Descending the mountain one finds that the scrub pine zone gives way to an open, grassy forest of *Pinus montezumae* Lindl. var. *hartwegii* Engelm. At lower altitudes mesic oak forest is encountered in ravines and sheltered valleys, while the ridges and dry valleys support a chaparral of varied composition.

The snails were abundant in the alpine meadow and scrub piñon pine zones. A few were found in the upper limits of the pine forest where the scrub piñon pine mixed with it. They were observed only once in the pure pine forest, this being near a spring at an altitude of about 10,500 feet. None were seen in the other vegetation types, or below that altitude. The species seemed to be isolated on the upper portions of this peak although its presence elsewhere under conditions of a similar character is possible.

The snails were apparently associated with the scrub piñon pine and were found to be most abundant around the base of these trees. They climbed up the trunks and occasionally out on the branches. In the alpine zone the snails were found to be abundant about rocky areas and patches of a yellow composite (*Helenium pinetorum* Standl.) where the Mexican vole, *Microtus mexicanus* (Saussure), occurred in colonies. The presence of large numbers of empty shells in such places, the side of which had apparently been broken away by the mouse, seemed to indicate that this mammal fed extensively on *Humboldtiana fortis* it is possible that these mice had something to do with the presence of the snails in such places. Clark's nutcracker (*Nucifraga columbiana* (Wilson)) was observed perched on a lower branch of a scrub pine eating a snail.

The temperatures of that portion of the mountain where the species was observed averaged low (3° C. to 15° C.), the higher temperatures being maintained only during the short periods of actual sunshine. During much of the time the peak was covered by a cloud cap which produced rain or hail nearly every day. The hail was usually gone within a few hours after falling although it occasionally remained on the ground until the next day. Winters on the peak were reported to be severe. At lower altitudes, the country became very dry, and temperatures were high.

The generally cool and damp conditions seemed favorable to the activity of the snails and there was no limited activity period. They were observed to be moving about both during the day and at night. They were usually found under a shrub, small tree, or around some object or group of objects which offered more shelter

than the general terrain, such as an accumulation of limestone rocks or fallen logs. This habit tended to make them somewhat local in distribution. They usually occurred in groups or aggregations and were seldom found far from another individual of their kind.

Mating individuals were observed, in one case on July 5, 1938, but no obviously young or immature specimens were found.

Many snails were noted with rough and irregular parts to their shells due to regeneration of broken shells, indicating that injury must be quite frequent. They were attracted to mouse traps set for small mammals and would spring them frequently enough to be a nuisance. The traps were baited with a mixture of 1 part bacon, 1 part raisins, 2 parts oily peanut butter, with enough rolled oats to make the mixture of putty-like consistency.

The flora of the upper reaches of the peak, those inhabited by *Humboldtiana fortis*, contains a large number of endemics, and many species of the southern Rocky mountains. There is apparently little relationship with the flora of the mountains of southern Mexico.

NEW MOLLUSCA FROM FLORIDA

BY JEANNE S. SCHWENGEL

MARGINELLA JASPIDEA, n. sp. Pl. 3, fig. 12.

The shell is biconic, smooth, highly polished, spire straightly conic, with an obtusely rounded apex. It has five whorls, the outline of body whorl being concave toward the base. The aperture is nearly two-thirds the length of the shell, the lip heavily margined on the outside and irregularly denticulate within. The columella has four distinct folds, the first transverse, with the next three increasingly oblique downward. The color is jasper pink, with a slightly darker band below the suture. The juveniles are a light jasper red, with the protoconch a pure jasper red. Length 11 mm., width 5½ mm. Length of aperture 7 mm., width of aperture 1½ mm.

Dredged off Palm Beach, 66 fms. Type 176454 A.N.S.P.

This lovely little marginella was dredged by Thomas L. McGinty.

CRASSISPIRA PHASMA, n. sp. Pl. 3, fig. 8.

This pure white shell is fusiform, spire thick and elongate, nuclear whorls smooth and rounded. It has nine whorls, those

of the spire moderately convex, the last with concave anal fasciole, and a definite shoulder where the strong, sharp axial ribs begin. These ribs are about one-half as wide as the spaces between them, are retractively curved, and the sixteen on the body whorl are constricted and drawn together near the base. Very fine, weak spiral threads cover the shell from apex to base, with faint incremental lines covering ribs and intercostal spaces. The aperture is over one-third the length of the shell, elongate oblong, with strong, smooth columellar callus, a short anterior channel, the anal sinus deeply cut, with the parietal callus forming a tubercle below the suture. The outer lip arches forward and has a slightly serrate edge. There is a heavy, rounded varix one-quarter of a turn behind the aperture on the body whorl.

Length 28 mm., breadth 11 mm.

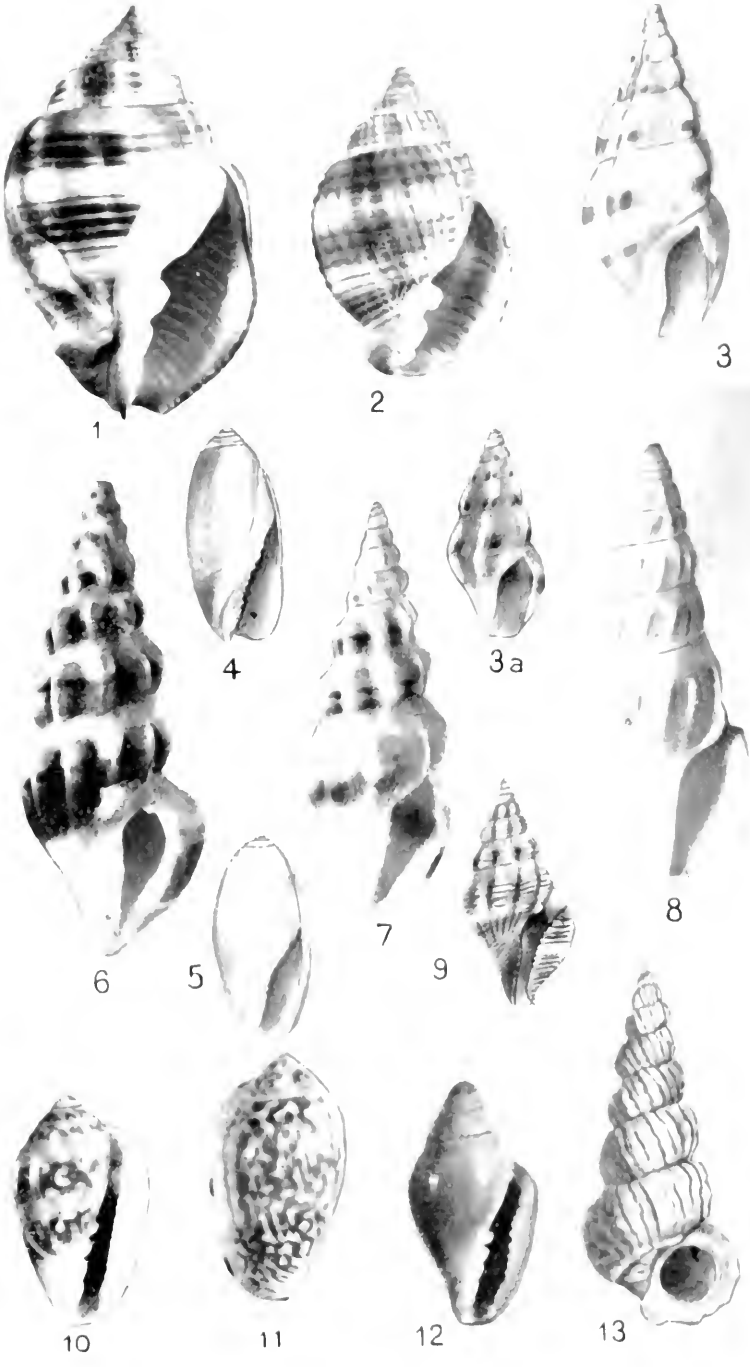
Dredged by the author off Palm Beach, April 1939, in 12 fms. Type 176453 A.N.S.P.

FENIMOREA HALIDOREMA, n. sp. Pl. 3, fig. 6, 7.

This beautifully colored shell is fusiform, with an elongated spire, one and one-half nuclear whorls, which are smooth, convex and opaque white (worn). It has nine whorls, well marked suture, a faintly pinkish-white above the shoulder and at the base, lower half of whorls of the spire and the middle of last whorl marked with a wide cinnamon-rufous band, somewhat faded on the heavy, rounded axial ribs. The band on the body whorl is continuous over the ten axial ribs. In some specimens there is a fainter band of geranium pink fading into white, instead of all white from the dark band to the base. The aperture is about one-third the length of the shell, elongate-oval, the columella white, with strong, reflected callus, a short, shallow anterior canal, the posterior canal deeply incised, with the parietal callus forming a tubercle on the columellar side of the aperture. There is a stronger varix behind the outer lip.

Length 25½ mm., breadth 9½ mm. Type 176452 A.N.S.P.

This shell greatly resembles *Fenimorea jonctae* Bartsch, but does not have the fine sculptural lineations of the latter, being smooth between the ribs. Also it seems to be slightly smaller, with fewer axial ribs. The author dredged this shell off Palm Beach in April, 1939, but had only dead specimens. It was named at that time, but not described until the better shell was dredged by T. L. McGinty in July, 1940, off Palm Beach, in 60 fms.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GLYPHOSTOMA PILSBRYI, n. sp. Pl. 3, fig. 9.

Shell broadly conic with horn-colored tip, the post-nuclear whorls pale chestnut brown, fading as they cross the ribs. The lower half of the base is chestnut brown, with two pure white spiral cords where the axial ribs end. The interior of the aperture is bluish white, with the brown of the outside and the white band showing through. The first one and one-half apical whorls are rounded, the following whorl carinate; the sculpture of the axial ribs and spiral cords beginning at the end of the third whorl, there being about eight spirals on the fourth whorl. In some places there is a minute granulation in the intervals between the spiral cords. There are six post-nuclear whorls, well rounded, marked by exceedingly strong, broad axial ribs, about nine on the last whorl, which flatten out as they pass below the periphery and are divided into two or three riblets, which gather together and form a reticulated area before they disappear near the base of the shell. On the sutural fasciole of the last whorl there are about eight and below that to the base, about thirty-three spiral cords. The aperture is elongate oblong, nearly one-half the length of the shell, strongly channelled both posteriorly and anteriorly. Just behind the outer lip is a strong varix, from which the edge of the lip turns inward. The callus of the inside of the lip over the varix is finely denticulated, also the lower half of the sinuous columellar callus. There is a small tubercle near the anal channel on the columella, which forms a toothlike projection. Length 9½ mm., breadth 4 mm.

Dredged by T. L. McGinty off Palm Beach, about 100 fms. Type 176451 A.N.S.P.

This shell is very like *Glyphostoma elsae* Bartsch, but differs in having fewer axial ribs and many more spiral cords on the body whorl.

BELLASPIRA (?) PENTAPLEURA, n. sp. Pl. 3, figs. 3, 3a.

Shell fusiform; two nuclear whorls, opaque white and rounded, the later whorls are waxy white, with light chestnut spots. There are six whorls, each with five strong axial ribs, narrow and high, separated by much wider, concave intervals. The ribs are continuous from whorl to whorl, a cross-section of the shell forming an exact pentagon with projecting, rounded angles. Spiral sculpture of extremely fine, wavy, incised lines, becoming gradually more distinct and evenly spaced on the body whorl. Faint incremental lines cover the entire shell, becoming quite strong and uneven toward the base. The last whorl has a peripheral and a basal spiral series of squarish, chestnut spots on the crest of each

axial wave, absent in the intervals; the peripheral series continues up the spire, above the suture. Aperture ovate, about two-fifths the length of the shell, anterior canal short, broad and shallow, outer tip thin and simple, a slight pure white callus on the inner lip, thickening at the suture into a weak tubercle below the incised anal canal.

Length 10.1 mm., breadth 3.4 mm.

Several of these beautiful shells were dredged by T. L. McGinty off Palm Beach, in 45 fms. Type 176450 A.N.S.P.

The "*Drillia*" *pentagonalis* Dall, Bull. M. C. Z. 18: 90. 1889, mentioned by Woodring as possibly a Bellaspira, has never been figured or sufficiently described. Its relation to the present form is doubtful.

This species resembles *Bellaspira virginiana* Conrad, as described and figured in Amer. Jour. Conch. Vol. 3, p. 261, pl. 21, fig. 12.

FRESHWATER SHELLS OF NEW HAMPSHIRE

BY WILLIAM J. CLENCH AND HENRY D. RUSSELL

The following is a list of species with localities additional to those published by the above authors in the New Hampshire Biological Survey Reports of the Merrimack and Connecticut Watersheds (report no. 3, pp. 201–206, pl. A and B, text map, 1938, and report no. 4, pp. 222–227, pl. 3–4, 2 text maps, 1938, respectively).

This material was collected the third to the fifth of August, 1940.

As the Connecticut River forms the boundary between New Hampshire and Vermont, such stations made on the Vermont side of the River are considered to be New Hampshire records.

Elliptio complanatus Dillwyn. Records. Grafton Co., Connecticut River, 2 mi. north of Monroe.

Strophitus undulatus (Say). Records. Grafton Co., Connecticut River, 2 mi. north of Monroe.

Anodonta cataracta Say. Records. Grafton Co., Connecticut River, 2 mi. north of Monroe.

Alasmidonta heterodon (Lea). Records. Grafton Co., Connecticut River, 2 mi. north of Monroe.

Alasmidonta undulata Say. Records. Grafton Co., Connecticut River, 2 mi. north of Monroe.

Campeloma decisum (Say). Records. Belknap Co., Pemigewasset River, ½ mi. south southeast of Hill. Grafton Co., Connecticut River, 2 mi. north of Monroe. Orange Co., Vermont. Connecticut River, 5 mi. south of Wells River.

Physa heterostropha Say. Records. Orange Co., Vermont. Connecticut River, 5 mi. south of Wells River.

Helisoma antrosa Conrad. Records. Orange Co., Vermont. Connecticut River, 5 mi. south of Wells River.

SOME MAXIMUM SIZED CARDIUM CORBIS FROM ALASKA

BY WALTER J. EYERDAM

During the course of twelve trips to the coastal regions of Alaska since the year 1917, I collected the following large-sized basket cockles, *Cardium corbis* Martyn, which were selected from many thousands of specimens. Any of these shells in excess of four inches in length are very large for the species.

The numbers used are those in my collection of shells.

No. 9841—*Cardium corbis* Martyn.
Sitkalidah Island, Kodiak group, Alaska.
Length = 4⅜ in.
Length = 110 mm.—Width = 108 mm.—Height = 80 mm.

No. 9842—*Cardium corbis* Martyn.
Cordova, Alaska.
Length = 4⅜ in.
Length = 110 mm.—Width = 112 mm.—Height = 85 mm.

No. 9843—*Cardium corbis* Martyn.
Adak Island, Aleutian islands.
Length = 4½ in.
Length = 115 mm.—Width = 112 mm.—Height = 85 mm.

No. 9844—*Cardium corbis* Martyn
Raspberry Island, Kodiak group, Alaska.
Length = 4⅞ in.
Length = 125 mm.—Width = 120 mm.—Height = 74 mm.

A NEW RACE OF CANCELLARIA FROM FLORIDA

BY H. A. PILSBRY

CANCELLARIA RETICULATA ADELAE, new subspecies. Plate 3, fig. 1.

The shell is similar to *C. reticulata* but differs by the smoother, often somewhat glossy, surface, the axial riblets being obsolete and the spirals very much reduced, nearly flat, on the last whorl, both being developed on the spire as in *C. reticulata*. The last whorl is more swollen below the suture. Apertural folds as in *C. reticulata*, but there is a very heavy, smooth, white, parietal callus projecting well forward at the posterior half of the inner margin, much heavier than usual in *C. reticulata*. The outer lip is somewhat straightened above and below the peripheral convexity, and there is the slight trace of a stromboid notch. Color buff with three wide interrupted, tawny to russet or in places chestnut, bands.

Length 52.3 mm., diameter 32 mm.; 9½ whorls. Type.
Length 41 mm., diameter 24 mm.; 9 whorls.

Little Duck Key, Florida. Type 176085 A.N.S.P., paratypes in the Bales and Koto collections. Others to be placed in U.S.N.M. and M.C.Z. collections. All taken by Dr. B. R. Bales in the seasons of 1939–1940.

This Cancellaria is quite unlike the *C. reticulata* (Pl. 3, fig. 2—Hickory Pass, Florida) of both east and west coasts of Florida, also found at Key West. It is more like the large Caribbean forms, such as those of St. Thomas, Tortola and Antigua, but differs by the obsolescence of sculpture on the last whorl. Those large West Indian forms usually have interstitial spirals between the main spirals of the last whorl or two.

It is named for Miss Adele Koto, one of the keenest collectors of shells of the Keys.

SOME ANTILLEAN SAGDIDAE OR POLYGYRIDAE

BY H. BURRINGTON BAKER

Although primarily a study of Puerto Rican forms, these notes also add details on a Haitian and a Floridan species that have already been discussed briefly. Symbols used on the figures, but not mentioned in the text, are explained in Bull. Bishop Museum

158, page 92. Scales for figures of shells, genitalia and penes indicate 1 mm.; those for radular teeth 10 microns; and those for lines of right half of radular rows 100 microns (0.1 mm.).

Two new subfamilies are proposed in the following key:

POLYGYRIDAE (?).

A. Talon well developed and carrefour mainly exposed; epiphallus poorly differentiated as simple enlargement of vas deferens or as a chamber inside penis; spermatophore (so far as observed) a simple membranous sac: ... Thysanophorinae.

SAGDIDAE (!).

AA. Talon obsolescent and carrefour mostly imbedded in albumen gland; epiphallus well developed, usually with flagellum; spermatophore (so far as seen) with horny walls and often complex. (C) Penial appendix single or absent, without greatly swollen base; lung and kidney medium to long. (B) Spermatheeal sac below aorta; flagella cylindric, short or absent; penial appendix (when present) opening through large papilla into small penis; Puerto Rico to Cuba:

Aquebaninae, **new subfamily**

B(AA). Spermatheeal sac above aorta, with slender duct opening into swollen stalk near terminal attachment of retractor; penial appendix (absent in *Hojeda*) opening through a ring into appendicular branch; principal flagellum large, more or less crescentic and flattened, at least at tip, and with lumen near one side; large species mainly Jamaican: ... Sagdinae.

C(AA). Penis has three appendices, with big, very thick-walled bases; lung and kidney short; shell *Succinea*-like; flagellum extremely long; Puerto Rico (and Lesser Antilles):

Platysuccineinae, **new subfamily**

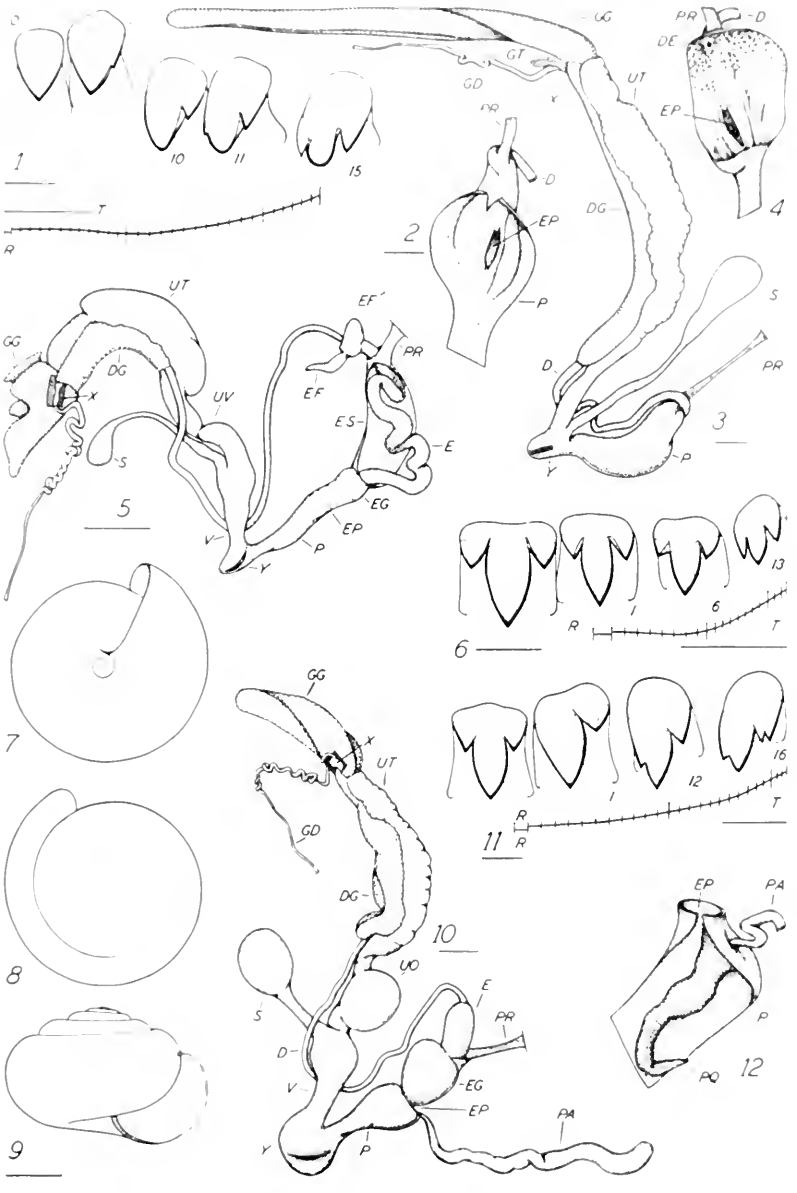
MCLEANIA DARLINGTONI Bequaert and Clench. Pl. 4, figs. 1–4.
1939, Mem. Soc. Cuba. Hist. Nat. 13: 283, pl. 36, f. 4–6.

Shell largely epidermal, thin; keel serrations not hollow. Embryonic whorls around 1.5; first not serrate, rapidly assuming fine, discontinuous, anastomosing, more or less retractive wrinkles, which separate fusiform pits, and fairly coarse, irregular, protractive threadlets. Later whorls with fine, closely spaced, epidermal growth-riblets, which are stronger on serrations, along irregular and anastomosing retractive bands above, and in patches below. Peristome with palatal, basal and columellar sides well

reflected; basal wall thickened internally; parietal region not reflected but curved upward near middle to form a marked, semicircular sinus, and downward more laterally as an indentation, or a weak, tooth-like projection into the aperture.

Animal similar to *Thysanophora palcosa*, 1927, Proc. ANSP. 79: 238, but brownish, with darker bands along edge of sole, broad black ones each side of head and a narrow middorsal one; tentacles light with dark tips. Inconspicuous right and left (anterior) mantle-lappets present. Lung black, with colorless lines, or large areas, over principal veins; almost 5 times length of base or twice kidney, which is very attenuate anteriad, over 3 times length of its base and almost twice pericardial length. Ovotestis consisting of fan-shaped or conical lobes (7 seen laterad) in basal 0.6 of apical liver lobe. Talon (GT, f. 3), which internally is divided into 3 caeca at apex, and most of carrefour (X) exposed although bulb of latter is behind prostate (DG), which is attached to uterus (UT). Albumen gland (GG) extending to above apex of stomach. Spermatheca (S) sometimes containing membranous sac, probably a spermatophore. Vagina (V) almost absent. Penis (P) externally simple, with nerve from cerebral ganglion, but, when opened lateroventrally (f. 4), epiphallic chamber (opened) occupies almost $\frac{3}{4}$ of length; opening of vas (DE) simple; aperture into penis proper (EP) large. When opened dorsally (f. 2), penis proper (opened) overlaps epiphallic opening (EP) almost $\frac{1}{3}$ its length. Pharyngeal retractor almost free; right and left free retractors soon separating; right ommatophoral muscle in penioviducal angle. Salivary glands apparently fused above oesophagus, forming sagittate mass about 1.5 length buccal mass. Jaw solid, with extremely low, rounded thickenings, that barely undulate margins. Radular formula (f. 1): 30 + 1 + 12 + 18; entocone appearing on 11th to 13th tooth; outer 10 may break up ectocone; 144 rows counted.

The dissected specimens come from cloud-zone forest, under decaying wood, in Maricao Forest, on main ridge south of Maricao; also found under dead palm leaves, on ridge west of Adjuntas. Although the radular as well as the shell characters of this species warrant its retention as a genus, *Mcleania* seems fairly close to typical *Thysanophora*, or, at least, to the only section (*Miroconus*) of which the anatomy is known. In its reflected peristome with a tooth-like indentation, as well as its simple genitalia, *Mcleania* also definitely approaches the Polygyridae; in fact, as suggested in the key to subfamilies, the gap between that family and all the Thysanophorinae seems, on the whole, less than



Figs. 1–4, *Melanoria darlingtoni*. Figs. 5–9, *Viviparus georgianus*. Figs. 10–12, *Aquebana pubescens*.

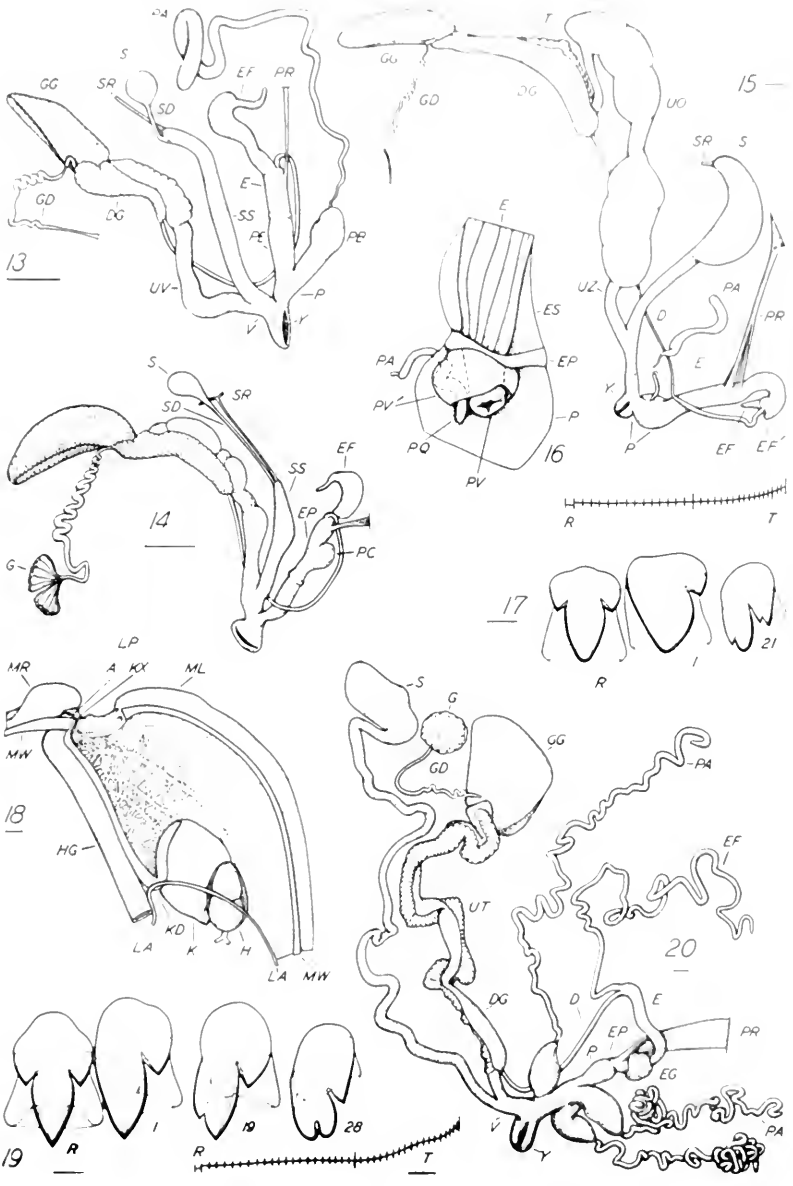


Fig. 13, *Hyalosagda albaqeda*. Fig. 14, *Hagda magnocrassa*. Figs. 15–17, *Aquebuna relativa*. Figs. 18–20, *Platysuccinea portoricensis*.

that between the last and the true Sagdidae. The anatomically known genera of Thysanophorinae, to which *Itzamna* might be tentatively added on the basis of its distribution, are outlined in the following key:

A. Spermathecal sac above aorta; radular marginals with entocones; epiphallus with vestigial flagellum; Mexico and south: *Microconus* (*wilhelmi*).

AA. Spermathecal sac below aorta; flagellum absent. (C) Central and inner laterals of radula with distinct ectocones, but marginals without entocones; albumen gland medium in length; shell without reflected peristome or large carinal serrations. (B) Epiphallus broad, attached on side of penis; shell smoothish; western U. S.: *Microphysula* (*ingersolli*).

B(AA). Epiphallus terminal (*Setidiscus*), vestigial (*Lyroconus*) or inside penis (*s.s.*, like *Meleania*); shell with epidemal outgrowths; mainly tropical: *Thysanophora* (*impura*).

C(AA). Central and inner laterals with or without weak ectoconal notches, but marginals with entocones; albumen gland longer than other female organs; shell with reflected peristome, large carinal serrations and epidermal riblets; western Puerto Rico: *Meleania* (*darlingtoni*).

YUNQUEA DENSELIRATA, new genus and species. Pl. 4, figs. 5–9.

Shell (f. 7–9) depressed turbinate, with evenly rounded and gradually increasing whorls; almost white, dullish but iridescent, and translucent. Embryonic whorls 1.7, soon assuming sharp widely spaced growth-threads, in interspaces between which weaker ones develop and become stronger until subequal. Later whorls above and below with sharply cut but very fine and closely spaced, weakly arcuate growth-threads, of which about 1 in 7 is very slightly stronger; below also with irregular spiral striae, especially in umbilicus. Suture well impressed but with narrow bevel. Aperture crescentic; peristome sharp, about 10° to shell-axis, noticeably arcuate above; parietal callus fairly strong. Umbilicus (measured from overhanging peristome) 8.6 times in maj. diam. Dimensions of type (ANSP. 176681); alt. 2.45 mm., maj. diam. 147 (3.60 mm.) [at 4 wh. 2.91, 4.5 wh. 3.43, 5 wh. 3.8 mm.?], min. diam. 137 (3.36); alt. apert. 67 (1.64), diam. apert. 112 (1.84).

Foot light in color, with head, tail and especially long tentacles darker; tail with rounded tip and obscure dorsal groove. Right and left (anterior) mantle-lappets minute; umbilical lobe fairly prominent. Lung blackish, about 4 times base and almost thrice length of kidney, which is triangular, about twice its base and 2.5

pericardium. Pigment blackest over ovotestis, which consists of fan-shaped lobes (7 seen laterally) and is imbedded in basal 0.6 of apical liver lobe. Carrefour (X, f. 5) imbedded in albumen gland, in which intestine is also impressed. Epiphallus (E) with thin-walled flagellum (EF) and terminal enlargement (EF′); remainder thick-walled, convoluted inside sheath (ES; opened), which is attached throughout by fibers, receives penial retractor (PR) and contains glandular ring (EG) near base (EP); short, domed vergic papilla (outlined) present. Penis (P) enervated from cerebral ganglion. Atrial (Y) opening a vertical slit just behind inferior tentacle. Salivary glands or ducts 1.3 times length of buccal mass. Jaw consisting of 33 narrow fused plaits, which serrate margins; growth-striae very distinct. Radular formula (f. 6): 19 + 1 + 8 + 11; practically all teeth tricuspid, although occasional outer ones divide ectocone; 74 rows counted. Pharyngeal and right and left free retractors almost immediately separating; right ommatophoral muscle in penioviducal angle.

In two weeks, 3 specimens of *Yunquca densclirata* were collected on fallen leaves, along Rio Minas trail from Restaurant El Yunque, below Big Trees trail; altitude about 2500 feet (station ER3). *Yunquca* seems to be a primitive member of the Aquebaninae; it is distinguished from the other genera in the following key:

A. Radular laterals tricuspid; ureteric opening in posterior corner of lung; shell with fine close growth-threadlets; penial appendix absent, but sheathed epiphallus with glandular ring near base; eastern Puerto Rico:
Yunquca (*densclirata*).

AA. Radular laterals lack entocones; ureter complete; shell with epidermal outgrowths. (C) genus *Aquebana;* penial appendix emptying through large papilla into small penis; central and inner laterals have distinct ectocones; flagella very short or absent. (B) epiphallus lacks flagellum or vergic papilla, but has glandular sheath around base; oviparous; shell hirsute; Haiti: subgenus *Exsuavitas* (*pubescens*).

B(AA). Epiphallus has short flagella and vergic papilla, enclosed with appendicular papilla in a membranous hood; probably viviparous; shell scabrous; eastern Puerto Rico:
subgenus *Aquebana* (*velutina*).

C(AA). Penial appendix absent; central and inner laterals with or without weak ectoconal notches; flagellum possibly longer; Cuba: *Suavitas* (*suavitas*).

AQUEBANA (EXSUAVITAS) PUBESCENS (Pfeiffer). Pl. 4, figs. 10–12.

A. (E.) pubescens H. B. B., 1939, Naut. 52: 143.

Animal similar to preceding; light in color with brown spots on tail, which is rather attenuate, pointed posteriad and has weak middorsal groove; tentacles darkish. Lung with sparse brown to black spots, mainly in anterior half; about 5 times base or twice length of kidney, which is less attenuate about 4 times its base or thrice pericardium. Ovotestis with 5 visible lobes, imbedded in basal half apical liver lobe. Most of carrefour (X; f. 10) buried. Free oviduct containing a large, chalk-shelled egg (UO). Epiphallus (E) containing a U-shaped fold below apical entrance of vas (D) and with basal half surrounded by a thick, alveolate sheath (EG). Penial appendix (PA) glandular throughout length; opening through capilla (PQ) which is partly contained in small, thin-walled penis proper (P; opened out in f. 12). Salivary ducts longer. Jaw slightly enlarged at ends; composed of 21 broader plaits, which do not serrate margin. Radular formula (f. 11): 25 + 1 + 11 + 14; entocone appearing on 11th tooth; outer 12 divide ectocone; 105 rows counted.

Although distinct enough for recognition as a separate genus, *Exsuavitas* is evidently closest to *Aquebana*.

AQUEBANA (S.S) VELUTINA (Lamarck). Pl. 5, figs. 15–17.

Helix velutina Lam., 1822, An. s. vert. 6 (2): 86. *Suavitas (A.) velutina* Pilsbry, 1926, Proc. ANSP. 78: 111.

Animal similar to *A. pubescens* but tail less acuminate, sides of foot slightly darker and top of head becoming dark towards either side of middorsal white stripe. Mantle collar orange. Lung with diffuse pigment, darker anteriad; about 7 times base or twice kidney length, which is almost 7 times its base or 5 times pericardium. Ovotestis with 7 alveolate lobes visible in basal $\frac{2}{3}$ of apical liver lobe. Free oviduct or functional uterus (UT, f. 15) containing 6 large eggs. Epiphallus (E) with two short flagella (EF, EF′), internally with 5 narrow pilasters; surrounded by sheath which is free near base (ES; end of E and all penis opened out in f. 16); and opening into small thin-walled penis (P) through vergic papilla (PV), which is surrounded by a membranous hood (PV′). Penial appendix (PA) not glandular in slenderer base; opening through a hard papilla (PQ), which is attached along inside of vergic hood but protrudes briefly. Jaw with 23 plaits and continued by weak cornification of oral roof. Radular formula (f. 17): 31 + 1 + 14 + 17; mesocones bluntish;

entocones may be indicated on 14th tooth but very variable on all; ectocone often divided from 16th out; 128 rows counted.

The dissected animals were found deep under rocks in limestone hills south of Old Loiza.

HYALOSAGDA (MICROSAGDA) SUBAQUILA (Shuttleworth). Pl. 5, fig. 13.

Helix subaquila Sh., 1854, Mitth. Nat. Ges. Bern 1854: 94 [154].

Shell protoconch with obsolescent spirals (approaching *Acrotrochus*) and growth-striae; later whorls with clean rib-striae.

Animal similar to *Aquebana pubescens*, but foot and lung not spotted. Lung almost thrice as long as base or twice kidney, which is almost thrice its base and over twice pericardium. Ovotestis with 10 lobes (7 visible laterally). Penial appendix (PA) entering appendicular branch (PB) of penis through a slightly protruding, annular thickening (as usual in Sagdinae). Jaw much thinner; 23 plaits. Radular formula: 23 + 1 + 9 + 14; entocone appearing on 11th tooth; divisions of marginal ectocones deeper and often more numerous; 93 rows counted.

In the genitalia of *H. epistyliulum*, the type of *Microsagda* (section of *Lacteoluna*), the spermathecal duct (SD), the distance between vas (D) and penial retractor (PR) and the undivided penial base (P) are all longer. The dissected specimens of *H. subaquila* come from the canyon of Rio Grande de Arecibo (station PN1).

HOJEDA INAGUENSIS (Weinland). Pl. 5, fig. 14.

H. B. B., 1936, Naut. 50 (2): 70.

Animal very similar to *Hojeda vanattai* H. B. B., 1924 & 1926, Occ. Papers Mus. Zool. Univ. Mich. 152 & 167: 79 & 13, which has been dissected again. Lung 3 times base or twice kidney length, which is 2.3 base or twice pericardium. Ovotestis with two lobes. Talon obsolete and carrefour buried in both species. Spermatheca with stout stalk (SS), long duct (SD) and retractor (SR) in both. Epiphallar opening into penis (at EP) without distinct vergic papilla. Penis with apical caecum (PC) only in *H. inaguensis*. Radular formula same in both; cusps of central and laterals actually extend to margin of base, as usual; 84 rows counted.

Hojeda has the spermathecal and flagellar characters of the Sagdinae and is quite close to *Microsagda*. From the other thoroughly known genera, which were outlined in 1935, Naut. 48: 135, and to which *Odontosagda* and possibly *Xenodiscula* might be dubiously added, *Hojeda* is separated in the following key:

A. Penis without appendix; shell minute, rib-striate and accumulating dirt more or less evenly: ..... *Hojeda* (*canattai*).
AA. Penis with appendix; shell usually larger, clean or accumulating dirt very unevenly:
Hyalosagda, Proserpinula, Sagda, Zaphysema.

PLATYSUCCINEA PORTORICENSIS (Shuttleworth). Pl. 5, figs. 18–20.
Simpulopsis p. Sh., 1854: 55 (147).

Foot dark in color with chrome markings, so large that it cannot be entirely drawn into shell; tail pointed, with weak middorsal groove obsolete towards tip. Mantle-collar chrome-speckled, with little anterior shell-lap but quite large, tongue-shaped umbilical lobe; right mantle-lappet (MR) fairly large; left one (ML) short and undivided. Lung (f. 13; viewed from inside; only coarser venation shown) darkly pigmented; anus (A) and ureteric opening (KX) near external end of pneumostome (LP). Kidney (K) and pericardium (H; opened) overlapping attachment of diaphragm (LA) and intestine. Ovotestis (G, f. 20) subspherical, consisting of conical lobes of clavate alveoli (not shown), imbedded below and surpassing in volume apical liver lobe. Carrefour without talon and completely imbedded. Spermoviduct folded into haemocoele; eggs spherical, chalk-shelled and 2 mm. in diam. Spermathecal sac (S) above aorta; spermatophore (only broken ones seen) with head triangular in cross-section with all angles slightly produced, and with tail cylindric with wing down one side, which is mainly entire but is serrate for part of its length. Epiphallus (E) with alveolate, annular sheath (EG) near base, which internally shows several, high, thin, fleshy folds; lumen above this like head of spermatophore and in flagellum (EF) like tail; opening (at EP) through domed vergic papilla, about as long as broad. Penis proper (P) enervated from cerebral ganglion, internally with 5 pilasters and receiving 3 appendices (PA), which appear glandular throughout and have greatly enlarged bases, with very thick walls and capillary lumen (like dart sacs). Atrial opening and retractors much as in *Aquebana*. Salivary glands not longer than buccal bulb; ducts half again as long. Jaw as in *A. retutina*, with 21 plaits, but with heavy plate back along roof of mouth. Radular formula (f. 19):

40 + 1 + 21 + 19; entocone beginning on 19th tooth; marginals with mesocone and entocone subequal and spatulate and with ectocone rarely divided; 154 rows counted.

Platysuccinea portoricensis is strictly terrestrial; it occurs rarely, deep under rocks, on the lowlands, but is common, on fallen leaves, in the more humid mountains, especially under ruderal conditions. The dissected specimens come from the same locality as *Yunquea denselirata*. Evidently, *Platysuccinea* Aneey (1881) is an aberrant sagdid and is not related to *Simpulopsis*. On the other hand, the arboreal genus *Gacotis* has also been examined and does belong in the Bulimulidae.

NEW MARINE SHELLS DREDGED OFF PALM BEACH, FLORIDA

BY THOMAS L. McGINTY

For some time the collectors of south-east Florida have been agreeing upon the dredging possibilities present in the deeper water off-shore, but like Mark Twain and the weather, no one did anything about it. That is, until Jeanne S. Schwengel and her friends, Greta Bishop and Mary McIntosh, put theory into practice during the spring of 1939. They continued their work in 1940 with results so gratifying that others were induced to enter the field.

The species following are a part of the McGinty dredging efforts made during the past spring and summer. The resulting number of new forms and records far surpassed our fondest hopes, but needless to say, much work remains to be done before anything approaching a complete record of this fauna can be compiled.

EPITONIUM (CIRSOTREMA) PILSBRY, new species. Pl. 3, fig. 13.

Shell rather slender, dull white; 9½ well rounded whorls, nucleus smooth, of about 1½ whorls; suture deep; surface spirally striate, numerous separated wavy varices becoming strong where a rest period is indicated; aperture almost round, lip expanded; operculum black and horny.

Length 16 mm., width 7 mm. Length 19.2 mm., width 7.1 mm.

The type 176448 A.N.S.P. was dredged on the rocky reef off Palm Beach, Florida, in 75 fathoms.

This new species somewhat resembles *E. cochlea* Sowerby, but easily may be distinguished from that species by its rounded whorls and difference in sculpture. The whorls of *E. cochlea*, which was also present in the dredgings, are well shouldered. So far, this new *Cirsotrema* is known only from off shore stations. Named in honor of Dr. Henry A. Pilsbry.

MARGINELLA BEALI, new species. Pl. 3, figs. 10, 11.

Shell small, polished, apex slightly elongated, about 4½ whorls, suture shallow, aperture narrow and nearly as long as the shell, outer lip thickened, with minute, irregular denticulation. Pillar with four plaits, the lower two being somewhat stronger. Greyish white, with three livid brown bands, the band nearest suture half the width of the lower two bands, which terminate with brown spots at the back of the lip, a smaller brown spot well up on the lip toward the apex. The last three whorls are covered with irregular opaque white flecks.

Length 8.5 mm., width 4.8 mm. Length 12 mm., width 6.8 mm.

The type, 176447 A.N.S.P., was dredged off Lake Worth, Florida, in 84 fathoms. Paratypes in the collection of Dr. J. H. Beal, Cocoa, Fla., in whose honor the species is named.

The new species superficially suggests a very small race of *Marginella guttata* Dillwyn, because of similarity in general color pattern. However, the apex of *M. beali* is more elongated and the early whorls retain the irregular snowy flecks which are glazed over in *M. guttata*. The brown markings which cover the lip of Dillwyn's species are merely suggested on *M. beali*, not being visible from a frontal view. Also, the irregular small teeth upon the lip of the new species do not appear on *M. guttata*.

ASPELLA ELIZABETHAE, n. sp. Vol. 53, Plate 10, fig. 7, Nautilus, January 1940.

Shell elongated, obliquely subfusiform, chalkish white, with five or six varices on each whorl; several narrow grooves on the spire and low spiral cords between varices, about six on the body whorl. Nucleus smooth, opaque, apex acute, convex, suture deeply impressed, aperture elliptical, lip expanded and indented, operculum yellow and corneus, canal short, narrow and recurved.

Length 12 mm., width 5½ mm.

The type, 176449 A.N.S.P., was collected by T. L. McGinty at Middle Sambo Shoals, near Key West, Florida.

Named in honor of Elizabeth Pilsbry.

OLIVELLA WATERMANI, new species. Pl. 3, figs. 4, 5.

Shell solid, whorls about 4, with a short conic spire; suture canaliculate, deep and narrow; columellar area with a strong raised callus, an upper and lower set of columellar plications; lip about four fifths the length of shell, with upper third of aperture closed off by the heavy callus. Color white, with three rather obscure suffused bands of pink, orange or yellow spots on the last whorl.

Length 10.5 mm., width 4.6 mm. Length 9.6 mm., width 4.5 mm.

The type, 176446 A.N.S.P., was dredged off Palm Beach, Florida, in 80 fathoms, marl bottom. Paratypes in the Waterman collection, Palm Beach. Named in honor of Dr. George A. Waterman.

HALDEMAN'S 1840 SUPPLEMENT

BY J. P. E. MORRISON[1]

In the library of the Division of Mollusks of the United States National Museum, there is a copy of S. S. Haldeman's "Supplement to number one of 'A Monograph of the Limniades, or Freshwater Univalve Shells of North America,' . . . Published October, 1840, for gratuitous distribution."

Since Sherborn[2] definitely states that he had not seen this publication, and since neither Schultz, *et al.*,[3] nor Neave[4] correctly date the new genera contained therein, this brief list of corrections and annotations of Molluscan names is presented to supplement the magnificent works of compilation of those authors.

(p. 1)

Melania interrupta is correctly listed on p. 171 of Tryon's Strepomatidae (Smith. Misc. Coll. #253, 1873).

Melania suturalis, Haldeman, Oct. 1840, preoccupies *Melania suturalis*, Philippi (Abb. Conch. 2: 173, 1847).

Melania exilis is correctly treated on p. 279 of Tryon.

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[1] Published by permission of the Secretary of the Smithsonian Institution.

[2] Index Animalium, II, (1801–1850).

[3] Nomen. Animal. gener. et subgener., 1926.

[4] Nomenclator Zoologicus, 1939.

Melania substricta, Haldeman, Oct. 1840, was the name given for the preoccupied *Melania conica* Say. Haldeman's later homonym (Jan. 1844) is stated to be a synonym of *Melania obtusa* Lea (Feb. 1841) on p. 168 of Tryon.

Anculosa Say, used here in *sensu latu;* also in *sensu stricto*, with the four following additional subgenera.

Lithasia, Haldeman, Oct. 1840. Correctly dated by Sherborn, in spite of his statement "mihi non visum."

Paludomus Swainson, no species mentioned, no correction needed.

Hemimitra Swainson, no species mentioned, no correction needed.

Mudalia, Haldeman, Oct. 1840. This is the first description and use of the name.

Anculosa (*Lithasia*) *geniculata*, Haldeman, Oct. 1840, described from E. Tennessee, is the type of *Lithasia*, and correctly dated on p. 13 of Tryon.

(p. 2)

Anculosa (*Mudalia*) *turgida*, described in the Supplement, should be considered the type of *Mudalia*. It is given as a synonym of *Anculosa melanoides* Conrad by Tryon, p. 399. Tryon (p. 388) does not record Haldeman's use of *Paludina* (*Mudalia*) *dissimilis* Say, which combination is merely listed, in the observations.

Limnaea platystoma, is correctly dated on p. 463 of F. C. Baker's Lymnaeid Monograph.

Limnaea expansa, dates from Oct. 1840, as treated by F. C. Baker on p. 301.

Physa microstoma, Haldeman, dates from the Supplement (Oct. 1840), where it was first described.

Physa distorta, Haldeman, dates from Oct. 1840, also.

Planorbula, Haldeman, dates from Oct. 1840, where it was briefly described and stated to be a new name for *Discus* Haldeman, July 1840 (not *Discus* Fitzinger, 1833).

Paludina, Lam., used here in *sensu latu;* also in *sensu stricto*, with the four following additional subgenera.

Lutetia, Haldeman, Oct. 1840, has not been found in any generic list consulted. The original description: "Shell like

Paludina, operculc thick and shelly, just fitting the peritreme," can be easily recognized as the generic character of *Bulimus* alone, among the forms probably known to Haldeman at the time of description. In the absence of any previous fixation, *Helix tentaculata* Linnaeus is hereby designated to genotype of *Lutella,* which is a synonym of *Bulimus* Scopoli, 1777.

Tulotoma, Haldeman, dates from this supplement, Oct. 1840, p. 2.

Nematura, Benson, briefly described with no species mentioned.

(p. 3)

Amnicola Gould & Haldeman, is briefly described, with no species mentioned in Oct. 1840.

NERITINA VIRGINEA IN JAMAICA

(*Continued from page 27*)

BY E. A. ANDREWS

LOCALITIES WHERE OTHER NERITIDAE WERE COLLECTED IN 1910 AND 1932

Neritina punctulata L. Port Antonio stream, 1910; and rivers: Montego at bridge, 1910; Great, 1910 and 1932; Flint 1910 and 1932; Mt. Pleasant, 1932. Town Creek, Mo Bay, 1910; Rio Grande Bridge, 1932; pebbles few miles from mouth of Buff Bay, 1932, Dr. Patterson.

Theodoxus meleagris (Lam.). Concrete slab west side mouth of Town Creek, Mo Bay, 1932; few inches from surface, migrating down with tide toward zone of green and red algae, exposed to full sun, crowded few to square inch, firmly adherent. Water contaminated, 29.6–9° C., air 30° C., density at top, 1.003–1.022, ten inches down, 1.023. Some shells with hermit crabs. Eyes white on black peduncles, tentacles light with black markings, body black blotched with white, sole smoky, operculum white.

Neritilia succinea Recluz. 1910: common in Town Creek, Mo Bay, but none in 1932. Mt. Pleasant stream abundant with egg capsules in 1932. Great River rapids abundant, 1910 and 1932; many on under sides large stones migrate with surprising rapidity

to shade of top when stone turned upside down in air, may be trains of 7–8 in row, like ducks.

Nerita tristis d'Orb. 1932: many at Sandy Bay shoals near shore.

Nerita peloronta L. 1932: spray-wet rocks, S. Nigril Light House with egg capsules, July; 1932: rocks 24 miles East of Kingston, Cays off Kingston Harbor, White House Point, Mo Bay.

Nerita tessellata Gmel. 1932: White House Point, Mo Bay; Cays off Kingston Harbor.

Nerito versicolor Gmel. 1932: White House Point, Mo Bay; Cays off Kingston Harbor; rocks 24 miles East of Kingston.

Nerita alticola Pilsbry. First found in 1910 by Dr. C. B. Wilson in brook from Spanish Dam, Catadupa; July 1932: many on small stones, same rapid brook, with egg capsules. July 1910: Great River near bridge at ford near bridge where road down from Catadupa joins road from Mo Bay to Black River, 20 miles from each, on stones and logs in shade, dozen in few minutes with many Hemisinus lineatus Gray; but in 1932 none to be found, banks cultivated. July 1932: just above Lethe Bridge, Great River, opposite Mrs. Grubb's and below remnants of old dam, scattered 6–12 to square foot, or in small groups and pairs with egg capsules, dozen or more to square inch under stones, firmly adherent, waist deep rushing stream. Stones with microscopic algae turned upside down in air, snails rapidly migrate onto darker face, former top. Many Hemisinus on top of stones. Also *Ampullaria fasciata* Roissy. Also three miles farther up Great River at Shettlewood Bridge same date, under stones abundant in muddy rapid with egg capsules.

July 1932: Sweet River (Bowen's) near highway bridge and 112 milestone from Spanish Town, under stone with capsules in waist deep rushing clear water, many plants. *Hemisinus lineolatus* and *Ampullaria gossei* Reeve.

EXPLANATION OF DATA IN TABLES

Size is expressed by the range from largest to smallest, measured by calipers across shell; by average of the above, or from observation; and as maximum from measurements of greatest

dimension from apex to farthest edge, as ee.; a concept of the bulk of an average shell in each population got by dividing the entire bulk measured in cubic centimeters in a tall graduate by the numbers of shells in that lot, by the percentages of shells of various sizes in each collection, recorded as a, b, c, d, that stuck on iron wire screens of square mesh of 11, 5.5, 4.5, 3.5 mm. sides, while e represents the percentage of (immature) shells that passed through the smallest mesh, 3.5 mm.

By Brilliance is meant the percentage of reflected light from a typical shell as compared with a slide of magnesium oxide taken as 100.

A notion of the relative frequency of the more striking patterns on shells is given in the columns I–V: I being the percentage of shells that are melanic (or black) with at most fine white spots; II, the percentage that are albinic with little color, or nearly lacking in pattern; III, the percentage banded or having spiral lines or groupings of markings; IV, the percentage with large light blotches demarked by dark sinuous or angular lines; and V, the percentage with more pigment reducing the light background to minute spots or areas. All five inter-grade.

To be continued.

NOTES AND NEWS

ADDITION TO THE RANGE OF *Pecten caurinus* GOULD.—In the NAUTILUS, Volume 51, No. 4, 1938, p. 144, I cited the northern range of *Pecten caurinus* as Kayak Island, Alaska, mentioned by Steller and Stejneger. During the course of field work in Alaska in 1938 G. D. Hanna definitely confirmed this northern record and stated that live specimens of the species were taken by fishermen some 60 miles north of this locality, off Channel Island, Orca Inlet, Cordova, Alaska, in 25 fathoms. Live specimens were dredged by G. D. Hanna, August, 1940, 2 miles W by S ¼ W of Fort Bragg Buoy, California, in 47 to 50 fathoms while on board the *N. B. Scofield*, of the State of California Division of Fish and Game. A fragment of a valve was dredged by Dr. Hanna from the same ship in 100 fathoms 17¼ miles, W ½ N from Drakes Bay Buoy, Point Reyes, California. The range of the species as known

at present is from Channel Island, Orca Inlet, Cordova, Alaska, to off Point Reyes, California.—L. G. Hertlein.

Arion circumscriptus in Indianapolis, Indiana.—Two specimens of *Arion circumscriptus* Johnston were collected November 2, 1936, under a stone in the rock-garden at 5348 Ohmer Avenue, Indianapolis, Indiana. The larger specimen was preserved and is no. 176395 A.N.S.P. The species has been found to be common at this locality.

Specimens have also been found at a vacant lot on the northeast corner of Good Avenue and Rawls Avenue; 28 specimens being collected December 3, 1938, at this locality. The 18 preserved specimens are no. 176396 A.N.S.P. collections. The species is also common at this locality, although it has not been found in the three blocks separating this from the other locality. Specimens collected from both colonies this spring seem to indicate that the species is firmly established.

The writer is indebted to Tucker Abbott of Watertown, Massachusetts, for citations to helpful references.—Glenn R. Webb.

Wilmington, N. C., Records.—On visiting Lake Greenfield at Wilmington, N. C., in January of the current year, the following species were taken in beach drift:

Elliptio fisherianus Lea. Said by local residents to be quite plentiful.

Campeloma geniculatum Conrad. "A rather unusually rounded form of the species" (H. A. Pilsbry.).

Succinea campestris Say. Identification uncertain owing to poor condition of shells.

Mesodon thyroidus bucculenta Gould.

Triodopsis hopetounensis Shuttleworth.

Rumina decollata Linné. Dr. H. A. Pilsbry informs me that *Rumina decollata* has not previously been taken so far north.

—Joshua L. Bailey, Jr., March 14, 1940.

Another Record for *Viriparus malleatus* in Massachusetts.—Mr. W. D. Thomas recently (Aug. 11, 1940) collected a series of this species in Whitman's pond, East Weymouth, Massachusetts, and reported that the species was exceedingly abundant. This

would indicate that the introduction may date back several years. It is of considerable importance that these records be published inasmuch as we then gain some idea relative to the time of their introduction and the speed at which they occupy new territory. Though East Weymouth is distant only 15 miles from Muddy River, Boston, the first record for New England, it is the most southerly record so far for the Boston area. These introductions are unquestionably made by man, and very probably indirectly through aquarium supply stores. They are now sufficiently abundant in Muddy River to warrant their collection and sale in the Chinese quarter of Boston.—W. J. Clench.

From Capt. Frederick Marryat, "*A Diary in America, with Remarks on Its Institutions,*" Philadelphia: Carey & Hart, 1839, vol. 1, p. 212. "The shells found in their western rivers are very interesting. I had promised to procure some for Mr. Lea, of Philadelphia, and an old squaw had been despatched to obtain them. She brought me a large quantity, and then squatted down by my side. I was seated on the stone steps before the door, and commenced opening and cleaning them, previous to packing them up. She watched me very attentively for half an hour, and then got up and continued, as she walked away, to chuckle and talk aloud. 'Do you know what the old woman says?' said the old Canadian interpreter to me; 'she says, the man's a fool; he keeps the shells and throws the meat away.' "—Calvin Goodrich.

New Subgenera of Antillean Helicinidae.—**Hjalmarsona,** new subgenus of *Alcadia*, type *A.* (*Idesa*) *hjalmarsoni* (Pfeiffer), from Puerto Rico. Shell smooth and shining, with rapid whorl-increase and large aperture; peristome scarcely reflected and only weakly thickened internally; columella weakly convex and scarcely thickened. Calcareous plate of operculum thin but well developed, granulate externally; columellar margin sigmoid. Differs from other sections of *Idesa* by more rapid whorl-increase and simpler peristome. Probably also includes *A. megastoma* (C. B. A.) and *A. erythrozona* Dean from Jamaica, *A. gonavensis* Weinland and *A. olcosa* (Pfr.) from Hispaniola, and possibly *A. necbiana* (Pfr.) from Cuba.

Striatemoda, new subgenus of *Alcadia* (?), type *A.* (*Emoda?*) *striata* (Lamarck), from Puerto Rico. Shell with marked growth-threads on earlier post-embryonic growth; columella swollen and rather abruptly terminated below; animal often paedogenetoid. Operculum with calcareous plate well developed, although smaller than horny one, and pebbled externally; columellar border almost straight. Differs from *Analcadia* by absence of hairs at any stage of growth and from *Emoda* by weaker calcareous plate of operculum and almost complete absence of spiral sculpture on shell. Probably also includes *A. platychilos* (Mühlfeldt), *A. striatula* (Sowerby), *A. rufa* (Pfr.) and *A. haitensis* (Maltzan).—H. Burrington Baker.

Some Marine Species Hitherto Unreported from Florida.—*Strombus gallus* L., 95 mm. in length, taken in 1938 and 1940 from shallow water in Lake Worth, at Boynton, Florida.

Bursa (*Marsupina*) *spadicea* Mont. Three living specimens were found in Lake Worth, at Boynton, Florida, during 1938. The largest specimen measured 56 mm. in length. Another specimen was dredged off-shore in 30 fathoms.

Tellina guildingi Hanley. Several specimens were taken during 1939 in Lake Worth, at Boynton, Florida. Length 40 mm.

Natica (*Stigmaulax*) *sulcata* Born. A number of rather worn beach specimens have been taken from the beach at Boynton. This past summer Mr. and Mrs. James Donovan have taken living specimens from the sand-bar at Peanut Island, Lake Worth.—Thomas L. McGinty.

Hyaloteuthis pelagicus (Bosc) in the North Pacific.—While on a trip from Dutch Harbor, Alaska, to Honolulu, T. H., in the late summer of 1939, F. E. Lewis, captain and owner of the *M. S. Stranger,* collected three specimens of this interesting and rather rare squid. These cephalopods were taken in approximately Lat. 29° 40′ N., Long. 159° 15′ W., which is about 580 miles due north of Kauai Island, T. H. According to Sasaki (Monog. Dibranchiate Ceph. Japanese Waters, 1929, p. 288), there had been at that time only two specimens recorded from the northern Pacific Ocean, both from the Japanese Islands. Pfeffer

records one specimen from the south Pacific, the scattered other records being from the Atlantic Ocean. The specimens were forwarded to the U. S. National Museum through the kindness of Dr. G. E. MacGinitie of the Kerckhoff Marine Laboratory at Corona del Mar, California.—H. A. Rehder.

Note on *Thericium auricoma* Schwengel and *stantoni* Dall. —In a re-arrangement of certain Cerithiums in the collection of the United States National Museum, initiated by the description of *Cerithium auricoma* Schwengel from Florida, it was found that the group to which the latter species belongs was first characterized by the description of *Cerithium moenensis* Gabb, from the Pliocene of Moin Hill, near Puerto Limon, Costa Rica (Journal Acad. Nat. Sci. Philadelphia, 1881, ser. 2, vol. 8, pt. 4, pp. 360–361, pl. 46, fig. 49). The next species to be described was *Cerithium stantoni* Dall (Nautilus, 1907, vol. 21, pp. 22–23). This was a complex description, based on a specimen from Belize, British Honduras (U.S.N.M. no. 150294) and one from the Florida Keys (U.S.N.M. no. 110469); the color notes were taken from the Central American form, while the measurements were based on the Floridian specimen. The description of *Cerithium auricoma* Schwengel (Nautilus, 1940, vol. 53, p. 109, pl. 12, figs. 8, 8a) from near Key West, Florida, may be considered as restricting the name of Dall's complex species to the British Honduran form. This form differs from the Floridian form in being shorter, more broadly conic, having more numerous and stronger ribs, and in having the ground color of the basal portion of the whorls much darker. Dall considered his Florida specimen to be bleached, but this form is naturally pale in color. It may be noted here that the generic name to be used for this group is *Thericium* Monterosato 1880. The type of Cerithium is *C. adansonii* Bruguière (by virtual tautonymy), which Adanson states to have collected in the mouth of the Gambia River, near Albreda, Gambia, West Africa, undoubtedly a brackish water habitat. This species has apparently not been found again, but from Adanson's figure, is quite different from any of the West Indian forms. This complex of Antillean species may therefore be arranged as follows:

Thericium moenensis moenensis Gabb 1881—Pliocene, Costa Rica.

Thericium moenensis stantoni Dall 1907—Recent, Central America.

Thericium moenensis auricoma Schwengel 1940—Florida Keys.

—H. A. Rehder.

The Beal Collection.—We learn by the *Rollins Record*, June, 1940, that the fine collection of mollusks assembled by Dr. J. H. Beal of Merritt Island and Cocoa, Florida, has been presented to Rollins College. It will be housed in a museum building now in process of erection on the Rollins campus, the gift of Mr. B. L. Maltbie.

Dr. Beal, formerly Professor of Pharmacy at the University of Illinois and the University of Pittsburgh, has devoted much time and money to the accumulation of this museum of Florida and exotic mollusks, which is notable for the quality of the specimens and the large number of genera represented. In the last year he added the great Mosier collection of *Liguus* among other accessions.—H. A. Pilsbry.

A New Character of the Early Stages of the Mollusc *Janthina exigua*.—At Deerfield Beach, Broward Co., Florida, I found 25 specimens of *J. exigua*, all under 1.5 mm. long and containing the soft parts, clinging to the under side of kelp. Their prominent feature was the asymmetrical papillary nucleus set at an angle with the following whorls and composed of two or three whorls, depending on the example. It is of a porcellanous texture in most specimens. This is apparently a hitherto unknown character of this shell. In the examples taken, the nuclei are deflected to either right or left. The shells are very fragile and of a semi-translucent texture. The color is a deep violet. They all have a sharp peripheral angle. No examples with perfect outer lips were taken. Specimens have been deposited in the A.N.S.P., no. 176445, and one is shown in fig. 4 of plate 2.—Richard L. Albany, Lantana, Florida.

We are grieved to announce the death on July 8th of Ida S. Oldroyd. A biographical notice will appear in the January Nautilus.

PUBLICATIONS RECEIVED

WORLD-WIDE SEA SHELLS, by Maxwell Smith. A book for the identification of sea shells from all over the world. A large number of genotypes and of the species likely to be found in collections being figured, with the names, localities and dimensions. Two interesting essays on the names of shells were contributed by Dr. Joshua L. Baily. One new name, *Strombus gigas horridus*, p. 131, is introduced for an abnormal specimen from Lake Worth.—H. A. P.

THE WEST AMERICAN HALIOTIS. By Paul Bartsch (Proc. U. S. Nat. Mus. 89: 49–58, 3 plates). A review of the species and subspecies, the following described as new: *H. sorenseni*, *H. rufescens hattorii*, *H. aulaea*, *H. smithsoni*. The long lost species *H. ponderosa* C. B. Ad., is described and figured from the type. It is thought to be from southern California, and looks much like an old *H. rufescens*.—H. A. P.

GEOGRAPHIC DISTRIBUTION OF THE RECENT MOLLUSCA OF NEWFOUNDLAND. By Stanley Truman Brooks and Betty Watt Brooks. (Ann. Carnegie Mus. 27: 53–77). This is a summary of several years collecting by the authors in Newfoundland. Of 67 species listed, 41.7 per cent are considered circumboreal, 16 of them being forms of European origin, the rest considered to be derived from the North American fauna. Among the European forms may be mentioned *Helix hortensis*, *Limax arborum*, *Arion*, 3 species, *Hygromia striolata*, *Succinea groenlandica*(?), *Vertigo alpestris*, *Discus rotundatus*. It is believed that part of the species survived glaciation of the greater part of the island. An important paper on a fauna hitherto but little known.—H. A. P.

THE NAUTILUS

Vol. 54 January, 1941 No. 3

WRECK OF THE JANTHINA JANTHINA

BY GEORGE FLOYD ROGERS

Asheville, N. C.

Early in February, 1939, we were heading across Tamiami Trail from the West coast of Florida, laden with a precious cargo of many fine specimens gathered on the treasure island, Sanibel.

A delightful afternoon and evening with friends on Miami Beach passed, the next morning, Tuesday, February 7th, 1939, we thought we would take a look at Key Largo. So off we went. Soon we were crossing to the island, turned left on Largo and a short distance up we found, as we had hoped, our little black friend, Thomas Jefferson. His eyes were shining and his white teeth beautiful by contrast, and a grand supply of tree snails, striped and mottled, some yellow, some deep brown and some ox-blood. I relieved him of most of them and he smiled the more.

Turning south in a little while we were at Largo's southern tip. There was an inviting Fisherman's Lodge. A good luncheon was served. In my eagerness to eye the beach, I assigned my mince pie and moved out. My eager impatience and my gastronomic restraint were immediately rewarded. There before my eyes on the beach, a large live *Janthina janthina*[1] lay, purple-bubbling, before me! A little distance away, another, and another and another! Two inlets deep in mud limited my scope of investigation. More than a dozen good specimens were safely "bagged" alive in my handkerchief, knotted at the four corners and several which were "broken hearted" and exhausted by reason of their separation from their native blue, had lately died!

[1] Also known as *Janthina fragilis*, but the Linnaean name *janthina* is now usually used.

A good Venus clam, two nice live cowries and several live discus clams added to my delight and made my day complete.

I noticed the wind. It was strong from the southeast and looked as if it would continue so through the night and be as good or better in the morning. I did my own figuring and had my hopes but said nothing. Back we went to Miami past the "Sausage trees" and other things of great interest and beauty.

Next morning early we were loaded off on our northern trip for Miami Beach. The wind was still strong from the southeast, almost a young storm! I could hardly wait to reach the beach! Were the violets beauties coming in? Had the wind which beached them on lower Largo reached and passed where we were?

At the first opening to the beach I parked my car and my wife, head-on to the sea, so she could keep one eye on her knitting and one on the breakers as they came rolling in. A tip to a naturalist husband: Head your wife in your general direction so that she can look at something else more beautiful and you can maneuver undisturbed, for a time!

My first close-up of the beach was a thrill that beggars description. There before me and riding in on every wave that came were literally hundreds of the dainty purple shells and with them an innumerable number of gorgeous purple Portuguese Men-of-War, their long purple streamers stretching some of them ten feet away from the main float!

The curving line of the incoming tide was marked as far as the eye could discern, a brilliant purple. Purple shells, purple balloons, purple streamers, purple bubbles! Bubbles, bubbles, world without end bubbles. Every little shell had bubbles all its own! It was sad, too. Every little bubble was a part of the last tragic effort—the only effort the little fellow knew how to make to survive, and so lying still on the beach, each one, big ones, middle sized ones, little ones, each one lay there blowing bubbles! I had provided half a dozen Christmas-present handkerchiefs; out they came and were soon knotted into little bags. I piled them in—all sizes, bubbles and all—then began to pick and choose the largest, the deepest purple, the most perfect! Dripping purple at every step I made my way to the car and back again to the beach. The thrill is one never to be forgotten!

The sea gulls were collectors too; they came by dozens and worked away for a living on these precious beauties!

The greatest show I had ever seen was going on. How many millions of these violet gems lay, bubbles up, on the surface of the sea? How far up the beach would they be coming in? We moved on up the beach to the north, stopping every few hundred yards. Back to the beach I would go and the thrill was always repeated! There they were, literally thousands of them—bubbles, bubbles, purple bubbles and so many exquisite purple shells and fondled by and confused with thousands of Men-of-War!

The same marvel of purple necklaces spread on the beach everywhere, with each incoming wave changing and enlarging its beauty! Not till Fort Lauderdale was nearly reached did I finally leave the beach and the great display! How much further north they were, still landing and making that wonderful display of nature's best, I cannot say. I had seen them over a distance of 90 miles! That was enough.

Altogether I secured some 500 perfect specimens of all sizes and could have as easily secured 10,000 more.

How did I get them home? Well, what difference does one more smell make when you already have a car full? A half dozen cigar boxes at the first store in Fort Lauderdale relieved the handkerchiefs. We hung them out in the car to dry. They did, a mottled purple! They never looked the same! Every time a sight could be had of our Christmas 'kerchiefs, a full picture of the beach came back and happiness born of a pleasant recollection, returned.

How to clean them? Well, after several days they are "ripe" enough to respond perfectly to the gentle pressure of a small jet of water. Carefully applied they are perfectly cleaned and not one is injured by the process. The color remains as it does today.

I have read and rejoiced over the thrill of Mr. Charles T. Simpson at Key West in January, 1883 (reported in NAUTILUS, April, 1897), when his good fortune landed him in such a familiar state of bliss. Now it was mine!

ON CERTAIN LAND SHELL LOCALITIES

BY CALVIN GOODRICH

In the recently published Part 2 of Volume I of the "Land Mollusca of North America," Dr. Pilsbry closes the discussion of *Stenotrema monodon* (Rackett) with these words, "As Thunder Bay appears on maps of the time, properly located and under that name, and was on the regular water route of trappers and other travelers to Mackinac Strait and the Sault Ste. Marie, there seems no reason to doubt that the type locality of *Helix monodon* was in what is now Alpena County, Michigan."

Inasmuch as *S. monodon* does occur in Alpena County, Michigan, and that county borders on Lake Huron, serving in Rackett's description to place his Thunder Bay, it is perhaps captious to challenge a locality designation that answers all practical purposes. I have, however, entertained doubts about the matter for a long time and would like to recite them if only to get them aside and forgotten.

In the first place, Rackett headed his article "Description of Some Shells Found in Canada" and in the text says that these shells were taken "by Edmund Sheppard, Esq., of the Royal Artillery, in Canada, in the year 1818." He wrote in 1822, or possibly 1821. By that time the demarkation of Michigan from Canada was thirty-eight years old by treaty and twenty-five by evacuation. The War of 1812 was over. Mackinac had been returned to the United States after recapture and white residents of Michigan were beginning to think of their territory as something else than a source of furs. It seems to me unlikely that a member of the British army would be traveling up the west side of Lake Huron, going as he would be to Sault Ste. Marie in Ontario and not to Mackinac, and more unlikely that he would be making a landing on the American shore. If the error in the use of the word "Canada" is wholly Rackett's, it is understandable as reflecting the nineteenth century Englishman's notorious confusion of North American geography. So, it would not do to stress "Canada" as thus employed as deciding the argument.

Rackett described the site as "a little above Thunder Bay, where the beach is formed entirely of shells." In that day of

slow traveling, "a little above Thunder Bay" could have been no great distance, surely not to exceed forty miles. The shore for forty miles above Thunder Bay of Michigan consists of rocky headlands, boulder strewn "flats" sometimes flecked with reedy pools, sometimes entirely under water; a few, narrow sand beaches. Wave action is strong. The shallows are scanty hems to the land, shelving off quickly into deep water. Except Lymnaeidae in small colonies here and there and battered Unionidae looking as though they had been swept in from a distance, I have seen few mollusks on that coast. The conditions are not favorable ones for large molluscan populations and hence not favorable for forming beaches "entirely of shells."

Across the lake in Georgian Bay, which is Canadian, is a Thunder Bay. It is small, shallow and within an area of exposed limestone. The bay, moreover, and the shore above and below it are in the shelter of the Christian Islands, the whole forming a sound the greatest depth of which, as shown on the hydrographic chart, is twenty-six feet. I have not seen this area, but have visited Nottawasauga Bay, the broad southern loop of Georgian Bay. Some of its beaches are as thickly covered over with shells as the western arc of Lake Erie. Now this Thunder Bay lies between the entrances to two portages or cut-offs to Lake Ontario. These were used for at least a decade after the War of 1812. On one of the "carries," guards were maintained over military stores into the 1820's. The streams making up the cut-offs could accommodate only canoes and small boats. Only such craft could be handled at the portages. Once in the lake, they had to keep near shore for safety's sake. At night and in storm, when headwinds held up transport or when food was to be cooked, crews and passengers had to make landings. They would be the ones to observe a "beach formed entirely of shells" rather than travelers on the open lake, for whom there were sailing vessels well before 1770.

Among Michigan localities for *Mesodon elevatus*, Dr. Pilsbry lists Grand Rapids and Ann Arbor (fossil only), quoting, I gather, from Walker. Both these localities are in error, in every likelihood. No specimens with such data are in the Walker Collection, that of the Kent Scientific Institute of Grand Rapids and

that of the Museum of Zoology of the University of Michigan. The one citation was seemingly an acceptance on faith of a distribution census sheet that Walker sent out and which was filled in by Grand Rapids conchologists. The other was a paleontologist's determination, in every likelihood. *M. elevatus* occurs in the extreme corners of Michigan close to the southern boundary line. The indications are that the southwestern colonies represent migrations out of Indiana along the banks of the St. Joseph River. The single known colony at the southeast corner occupies a situation that was joined to the Ohio mainland until the Maumee River changed its course. What remained of the Ohio end of the land projection was inhabited by *M. elevatus* until an oil refinery took it over. The species has been collected in northwestern Ohio only along the Maumee River and its tributaries.

NOTES ON SALASIELLA FROM MEXICO

BY H. BURRINGTON BAKER

This is part 7 of a series on Mexican mollusks collected for Dr. Bryant Walker in 1926. The first part appeared (1928) as Occasional Papers Mus. Zool. Univ. Michigan, no. 193, in which the symbols for localities are explained on pp. 2–25. In plate 6, the small numbers over the scales indicate their lengths in millimeters or fractions; all the figures of shells, genitalia or radulae, with the exception of 5 to 7, have about the same magnification. Those abbreviated labels, which are not explained in the text, are defined in Bull. Bishop Museum 158: 92–93 (1938).

In the following description of the anatomy of the genus *Salasiella*, use is also made of Strebel's (1878, Beitrag 3: 29, pl. 10, f. 1–7) figures of *S. joaquinae*.

Foot elongate; lower pedal groove distinct; tail without middorsal groove; sole narrow, attenuate but rounded posteriad. Mantle collar very broad either side of pedal groove and dorsally, so that pneumostome is distant from anterior wall of lung (Strebel's f. 5), with a broad glandular zone and a narrow anal extension along hindgut (Strebel's f. 4); right mantle-lappet not free; anterior and posterior left ones of medium size and widely separated; umbilical lobe small. Lung wall with indistinct minor venation. Kidney (Strebel's f. 6) with a triangular limb along and longer than pericardium and an exceedingly

attenuate one extending diagonally to hindgut; ureteric opening just short of posterior corner of lung, but continued by broad groove along hindgut.

Ovotestis (G, my f. 6) consisting of few clavate alveoli; talon not evident; carrefour (X) sphaeroid, shallowly imbedded or exposed (small species). Albumen gland (GG) stout. Uterus (UT) attenuate apically; free oviduct (UV) and vagina (V) various; spermathecal sac (S) imbedded above aorta between limbs of first S-loop of hindgut. Prostate (DG) ellipsoid, attached to uterus but with free apical end not reaching uterine apex, along which it appears to be continued by an internal groove. Epiphallus (E) consisting of an apical thin-walled sac, which internally is papillate, and a long thick-walled basal region, which internally is longitudinally plicate; invested terminally by penial retractor and opening into penis through a verge (PV, my f. 7). Penial retractor arising from diaphragm and inserting mainly on penial apex around epiphallus. Penis enervated from cerebral ganglion, with a lateral diverticulum (PL), which contains a pilaster and is solid at tip (PA). Atrium (Y) short, opening shortly behind and above inferior tentacle.

Columellar muscle system with heavy tail-fan practically free, pharyngeal retractor almost so, and two free retractors separating near origin. Free retractors similar to those of *Euglandina sowerbyana* (Strebel, pl. 17, f. 1) but lateral branches slenderer; right ommatophoral muscle in penioviducal angle.

Labial lobes (retracted) fairly large and triangular. Alimentary canal well shown in Strebel's fig. 2; S-loops of hindgut long. Radula with all 23–31 teeth unicuspid and aculeate (but 2nd of *Salasiella* s.s. with broad blade).

Central nervous system similar to that of *Spiraxis* (1939, Naut. 53: pl. 3, f. 9) but cerebral commissure reduced to a constriction and pedal or pleural connectives 2 or 3 times as long as either cerebral ganglion.

Salasiella (Perpusilla) perpusilla (Pfeiffer), **new subgenus** (Pl. 6, figs. 1–4).

This species was collected at Necaxa, altitude 3100–5500 feet (BCD, III, a, 31, 33–35, 41, 52). To my eye, the most salient difference, between *S. perpusilla* and *S. modesta* from Necaxa, is in the larger apical whorls of the former, which also has larger whorls that more widely override preceding ones and render the spire shorter. In addition, *S. modesta* usually has closer growth-striae, which appear shallower because their interspaces are more convex. Both species are very variable in shape, but in shells

of the same length and number of whorls, *S. perpusilla* is usually stouter. Shells of 4 whorls may attain sexual maturity but individuals from stations 41 (f. 3) and 52 develop 5.

Animal (station 33) similar to *S. joaquinae*, but foot and tentacles less pigmented and liver with black pigment between alveoli. Lung about twice as long as its base or kidney length, which is 1.5 pericardium. Ovotestis (G, f. 1) consisting of 5 or 6 alveoli imbedded in basal half of apical liver lobe. Papillate apex of epiphallus (E) about ⅓ its length. Verge (PV, exposed by excision of penial wall) cylindric. Penial retractor arising near base of prostate; diverticulum short and stout but larger than epiphallic branch. Atrium without demarcated thickening. Radular formula (f. 2): 15–1–15, 65 rows counted; central relatively larger and less remote; all teeth with elongate blades; rows (T shows shape of right half with spacing of teeth marked) V-shaped; entire radula 1.19 mm. long.

The distinguishing characteristics of the subgenus *Perpusilla*, type *S. perpusilla* from Necaxa (station 33, f. 4), are outlined in the following key:

A. Radula with 45–65 rows of small, slender teeth, which decrease in size from first (less than .033 mm. long) out; vagina short; shell minute ..... subgenus *Perpusilla*, new.

AA. Radula with fewer rows of big teeth (but central reduced and remote), of which second is much the longest (0.33 mm.) and widest; vagina long; shell small.
subgenus *Salasiella*, s.s.

		Alt.	diam.	alt. ap.	diam. ap.	whorls
S. perpusilla	(S–41)	5.59	43(2.38)	60(3.38)	38(1.27)	5
	(S–33)	4.12	42(1.73)	60(2.48)	36(0.89)	4.6
S. modesta	(S–52)	3.92	40(1.58)	53(2.06)	40(0.83)	4.3
	(S–3)	3.88	39(1.51)	55(2.13)	37(0.79)	4.5+

SALASIELLA (P.) MODESTA (Pfeiffer) (Pl. 6, figs. 8–10).

Races of this species were found near Córdoba, alt. 2600–3100 ft. (D, III, a, 3, 4) and around Necaxa, alt. 2600–5500 ft. (BCD, III, a, 33, 34, 52–54). Those from Córdoba have smaller but more whorls than those from Necaxa (f. 9). The differences in genitalia, noted below, may be partly due to divergences in age or contraction.

Animal (station 52) similar to *S. perpusilla*. Left mantle-lappets relatively larger. Lung length almost 2.5 its base or thrice kidney length. Ovotestis with 3 alveoli. Penial diver-

Figs. 1–4, *Salasiella perpusilla*. Figs. 5–7, *S. joaquinae*. Figs. 8–11, *S. modesta*. Figs. 12, 13, *S. minima*.

ticulum (PL, f. 8) shorter than epiphallic branch, which contains conoid verge (PV). Radular formula: 12 + 1 + 12, 52 rows counted; central relatively shorter.

Animal (station 3) like preceding but smaller. Lung without pigment. Ovotestis with 2 alveoli, but terminal one has small branch on either side. Penis and diverticulum (PL, f. 10) slenderer; verge more cylindric. Radular formula (f. 11) the same; 58 rows counted.

Perhaps these two races may be subspecifically distinct but they do not differ more than do Pfeiffer's (1862), Strebel's (1878) and Pilsbry's (1907) descriptions of *S. modesta*, and the separation of even the species of *Perpusilla* is difficult enough.

Salasiella (P.) minima Pilsbry (Pl. 6, f. 12–13).

The specimens dissected, from below Necaxa, alt. 2600–3100 ft. (D, I, a, 53, 54), are larger (alt. 2.98 mm. with $4\frac{1}{8}$ whorls) than the type lot.

Animal (station 54) similar to *S. perpusilla* but without pigment except black eyes. Mantle collar much narrower. Lung almost 4 times as long as base or thrice kidney length, which is $1\frac{1}{4}$ times its base or 1.5 pericardium. Carrefour (X, f. 13) exposed. Free oviduct slenderer. Penial retractor (PR) arising above prostate. Penis and especially its diverticulum (PL) relatively enormous but verge (PV) small. Radular formula (f. 12): 11 + 1 + 2 + 9, 45 rows counted; first 2 teeth strikingly stouter than others.

Salasiella (s.s.) joaquinae Strebel (Pl. 6, figs. 5–7).

My specimens, from Atoyac and Peñuela, alt. 1300–2800 ft. (D, III, a, 1, 3), agree closely with Strebel's (1878, Beitrag 3: 29) account of the type, from Jalapa, but attain 5.6 whorls and a length of 10.55 mm. They thus fit even better Pfeiffer's (1857) description of *S. pulchella*, from Chiapas, although von Martens' figure (1891, Biologia: pl. 5, f. 9) shows a much shorter aperture. Because Pfeiffer indicated that the aperture was almost $\frac{2}{3}$ the total length, *S. joaquinae* may be only a paedogenetoid form of *S. pulchella*.

Animal (station 1) as in genus. Foot with slight dark pigment, intensified toward top of head, which shows middorsal black stripe, bordered by narrow white ones. Lung with faint dark blotches, becoming denser near hindgut and forming dark band anteriad; minor venation present but inconspicuous; 2.5

times as long as its base or kidney length, which is about as long as its diagonal base or 1.5 times pericardium. Ovotestis (G, f. 6) consisting of 4 lobes. Prostate shortly free from uterus (UT) at apical end. Free oviduct much shorter than vagina. Epiphallus with apical (papillate) sac ovoid. Penis (P) internally (opened ventrally and spread out in f. 7) with a slender verge, a pilaster (PP) and longitudinal folds in epiphallic branch (PE) and diverticulum; solid end of diverticulum with concave base. Base of penis and atrium with a large papillate thickening (YD) on dorsal side. Radular formula (f. 5): 13 + 1 + 2 + 11, 23 rows counted (Strebel found 35); second tooth large enough to cover most of 15 complete rows from radula of *S. perpusilla;* see Strebel (pl. 11, f. 8), who also shows 11 marginals; entire radula about 5 mm. long.

SURVIVAL OF FRESH WATER MOLLUSKS DURING PERIODS OF DRYNESS

BY WILLIAM MARCUS INGRAM

The observations included here were made during the period of from June 15 to September 1, 1940, on the Edmund Niles Huyck Preserve, Rensselaerville, Albany County, New York. During this time two species of fresh-water mollusks, one a clam, *Pisidium abditum* Haldeman, the other a snail, *Physa gyrina* Say, were observed living apparently with some success, although deprived of their customary watery habitat.

While collecting mollusks in Trout Pond Stream on the preserve, 21 individuals of *Physa gyrina* were found in the dry streambed which had been without running water for a period of from June 25 to August 13. The stream bottom was formed from compactly packed gravel and large rocks, which prevented these animals from burrowing to carry on aestivation. Thus individuals had the choice of remaining on top of the gravel covering the streambed, or of crawling beneath the rocks which rested on the gravel bottom. The latter location provided an environment with greater moisture than did the exposed situation, for the gravel beneath the rocks was moist.

Of the 21 individuals studied, 9 were beneath stones and 12 were in the open. The snails seemed able to survive unfavorable conditions about equally well in the exposed and concealed situations: 5 of the exposed *Physa* were found dead and 7 were taken

living; 4 of the concealed *Physa* were dead and 5 were living. The living and deceased mollusks in the exposed habitat were all taken from shaded areas of the streambed, where a boulder or maple trees on the bank provided overhang. The streambed was further shaded by the steepness of the surrounding cliffs, which shut out direct sunlight except for about 3 hours from 11 A.M. to 2 P.M. During the period of the stream's dryness there were several rain showers which served to moisten the gravel of its bed, but never did enough water fall to form pools of standing water into which the *Physa* could retreat. However, 90 feet from the area in which the snails were observed, there was a pool of standing water, but no snail moved more than 4 inches during the 49 days that they were away from water.

Animals found beneath rocks with the *Physa* were 2 crayfish, *Cambarus* sp.; 7 water beetles, *Dytiscus* sp.; and 1 water-strider, *Gerris* sp. All of these invertebrates survived the dry period concealed beneath rocks. The 2 *Cambarus* sp., both of which had tunneled into the moist gravel beneath a rock, were apparently the only ones capable of burrowing in the firmly packed gravel bottom.

That other invertebrates, *Physa* excluded, will leave unfavorable conditions, or follow retreating water to seek a stable pool during a drought, seemed to be evidenced by finding the following dense Arthropod aggregation in a standing pool of water not affected by the drought: 83 *Gerris*, 40 *Dytiscus*, and 7 *Eubranchipus*. This pool was 7 feet long by 2 feet wide, with a 5 inch maximum depth.

During the summer of 1939 this stream was without running water for 60 days. The fact that the *Physa* observed were found approximately 300 yards upstream from the nearest permanent pool would probably indicate that in this locality this gastropod can successfully survive extended periods of exposure summer after summer. It does not seem likely that individuals in this stream can travel 300 yards against a current during a period of from 30 to 60 days when the Trout Pond Stream is flowing, an act which would have to take place yearly provided that the upstream population could not survive drought and by so doing maintain an upstream population through dry periods. On August 14 Trout Pond Stream was again with running water.

The 12 living *Physa* which had been observed over the period of June 25 to August 14th were again returned to ideal environmental conditions.

Thirteen *Pisidium abditum* Haldeman were collected beside Myosotis Lake, on the shore of loosely packed flat shale fragments, a habitat which was apparently not typical. This species is usually found, according to Baker (1898, 1918, 1928) and Goodrich (1939) in watery habitats varying from mud, sand, or clay, to aquatic plants and muck bottoms in lakes and streams. At the time these individuals were observed they were 10 feet away from the water's edge, and were 3 feet above the summer's high-water mark. Eleven of the 13 were found in the spring flood zone, beneath the débris consisting of small sticks and dead grass. The other two individuals were beneath large flat shale rocks in the débris zone. These 13 individuals were in such a habitat at least from June 15 to September 1. No standing rain water was ever observed in this area. Several rains during the summer served, however, to keep the Pisidia colony moist, thus possibly enhancing their chances of survival. The shore area was protected from the sun's rays for a part of the day by the overhang of beeches growing on the shore.

The absence of dead individuals of this species in the area under observation seems to indicate that this species under the stated conditions can successfully withstand exposure to air, lack of food, and lack of optimum moisture conditions for extended periods of time on the Myosotis Lake shore. Due to the rocky character of the shore none of the 13 individuals were capable of burrowing into the substratum. Baker (1928), referring to the Sphaeriidae in general, states, "Many of them live in ponds or pools that dry up for a large part of the year, being full of water only in the spring. In these places most of the animals die during the dry interval, a few surviving by burrowing deeply in the mud bottom."

When the observation colony was collected and placed in formaldehyde 6 young were voided into the preserving fluid. The embryos apparently develop within the parent throughout the spring and summer months and are released into the water during late September or in November when the lake level rises. If this does not occur the young would have to be released directly

on the shore or held in the parent through the winter to be released into the water during the following spring flood of May.

This data concerning the Pisidia colony is presented here with Baker's (1928) statement in mind, "There is much need for more accurate data on the ecology of these small clams [Sphaeriidae] as well as upon their age, reproduction, and general habits."

I wish to thank Dr. Stanley Truman Brooks, Curator, Invertebrate Zoology, of the Carnegie Museum in Pittsburgh, Pennsylvania, for identifying the *Pisidium* discussed here. Gratitude is also extended to members of the Biological Board and to the Preserve officers of the Edmund Niles Huyck Preserve.

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DAYLIGHT ACTIVITY OF LAND MOLLUSKS

BY WILLIAM MARCUS INGRAM

The following observations were made between June 15 and September 1, 1940, on the Edmund Niles Huyck Preserve, Rensselaerville, Albany County, New York. The preserve is a tract of land of some 500 acres situated in the Helderberg Mountains, the altitude varying approximately from 1500 to 1750 feet. The climax forest is beech-hemlock.

TABLE 1

Daylight activity of land snails

Snail Species	Total Active	Daylight Hours											
		7	8	9	10	11	12	1	2	3	4	5	6
Triodopsis albolabris	146	11	10	19	25	16	3	1	8	10	24	16	3
Triodopsis dentifera	38	1		1	8	14			1	2	4	4	3
Triodopsis tridentata	6								2		4		
Anguispira alternata	21		3	2		4	6				6		
Zonitoides arbreus	24				1	9	2			10	2		
Ventridens intertextus	15			2	4	5					2	1	1
Haplotrema concavum	5					2	3						
Mesomphix cupreus	30	1			2	10			3		5	8	1
Succinea retusa	27			1	12	6				4	2	1	1
Stenotrema fraternum	1											1	
Philomycus carolinianus	44	1		1	2	3	2		8	8	2	1	16
Grand total active	357	14	13	26	54	69	16	1	22	34	51	32	25

During the summer's collecting an attempt was made to note the daylight activity of the more common mollusks of the preserve during the hours of from 7 A.M. to 6 P.M. Activity data for 357 snails representing 11 species are included (table 1). The species represented are: *Triodopsis albolabris* (Say), *T. dentifera* (Binney), *T. tridentata* (Say), *Anguispira alternata* (Say), *Zonitoides arboreus* (Say), *Haplotrema concavum* (Say), *Mesomphix cupreus* (Rafinesque), *Succinea retusa* (Lea), *Ventridens intertextus* (Binney), *Stenotrema fraternum* (Say), and *Philomycus carolinianus* (Bosc.).

These data are not presented with the idea of showing that snails are typically diurnal in their habits, but principally to indicate that snail activity for the species listed does not cease during daylight hours. The recorded data only concern snails crawling in the open on top of the forest floor humus or in logs; no snails are listed here that were taken moving beneath logs or humus. In addition to the 357 snails which were crawling actively on the forest floor 235 were found crawling beneath humus, beneath logs, or in hollow logs and trees between the hours of 7 A.M. and 6 P.M. These of course were active under conditions approximating darkness. No data were gathered after rainy periods when snails are known to be actively about during daylight hours. The lack of data for the one o'clock hour (table 1) is due to the writer's absence from the field.

The data presented in table 1 indicate that snails are actively about during the daylight hours, and that many of these species are not generally as secretive in their habits during the day as has been supposed. These findings are not in accord with those of Binney (1885) who indicates that snails are definitely nocturnal in their habits. Binney (1885), speaking of American land mollusks as a group, states, "They seldom come from their lurking places while the sun shines, and indeed are never seen ranging in the daytime unless the day be damp and dark. Should they then be surprised by the appearance of the sun, they immediately take shelter from its rays under some cover or on the shaded side of the trunks of trees." Simpson (1901) in his study on *Triodopsis albolabris* states in regard to the activity of this snail, "They remain concealed through the day when the sun

is shining, coming forth for their food toward evening and after showers."

The majority of the snails included in table 1 were observed in the Beech-Hemlock association; a minority were observed in Beech-Maple, pure Maple, and Oak-Maple tree associations. In each tree association area there was a good overhang so that direct penetration of the sun's rays to the forest floor on which the snails were moving was somewhat blocked, but the overhang was by no means dense enough to make the areas dark.

Several of the active snails were observed feeding exposed to direct rays of the sun in open areas of forest. One *Philomycus carolinianus* was found feeding on an unidentified white mushroom at 2:35 P.M. It browsed on the head and stalk of the mushroom during a 20 minute observation period. Another *P. carolinianus* was observed at 2:55 P.M. exposed to the sun feeding on a mushroom. In this instance the slug was stretched out on top of the mushroom; it was active in its exposed position for 15 minutes. It then moved beneath the head of the mushroom and ceased its feeding activity. A young *Triodopsis albolabris* was likewise found partaking of food exposed to the sun at 10:00 A.M.

Gratitude is expressed to members of the Biological Board and to the Preserve officers of the Edmund Niles Huyck Preserve.

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AN HERMAPHRODITIC MYTILUS

BY R. T. YOUNG

La Jolla, California[1]

While hermaphroditism is of common occurrence among mol-

[1] I am indebted to Dr. H. U. Sverdrup, director of the Scripps Institution of Oceanography, for the privileges of the institution during this study.

lusks, especially in the gastropods, a careful search of the literature has revealed only three cases in the Mytilidae. McIntosh (1894) has described an hermaphroditic *Mytilus modiolus* from St. Andrews, Scotland, while Pelseneer (1912) mentions an abyssal mytilid, probably of the genus *Myrina*[2] and the same author (1935, p. 416) gives a record by Bispinghoff of a case of hermaphroditism in *Modiolarca trapezina*.

The following record may therefore be of interest. Among some 800 specimens of *Mytilus californianus* examined in the course of another study I have found one hermaphrodite. In this specimen the right gonad was exclusively female, while the left one contained two patches of male cells. In each of these two areas male and female follicles were indiscriminately mixed, but every follicle was either entirely male or female, indicating the origin of each from a single parent cell.

The cause of such a condition is entirely problematical, but the most probable explanation appears to be a chromosome disorganization in some of the cells of the developing gonad, giving rise to a male determining combination in some of the cells, while the majority retained the (presumably original) female determining combination.

This suggestion accords with the hypothesis of Pelseneer (1894) that "hermaphroditism in Mollusca (is) secondary to a unisexual condition, and, (is) grafted on the female."[3]

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[2] He also mentions "un nouveau genre hermaphrodite, a glande genitale constituée comme celle de *Montacuta*," but does not give its classification.

[3] Fidé Zoological Record, Vol. 31 (1894), Mollusca, p. 30.

FOUR NEW SPECIES OF SPIXIA FROM ARGENTINA

BY JUAN JOSÉ PARODÍZ
Museo Argentino de Ciencias Naturales

Odontostomus (Spixia) tucumanensis, new species (Pl. 7, fig. 10, 12, 13, 16).

Shell ovate conic, rather long, with 9½ slightly convex whorls which are axial rugose and irregularly sculptured. Last whorl almost smooth, nearly one half the total length of the shell. Surface with vestiges of spiral lines. Initial two whorls slightly and finely sculptured. Suture not deep but well defined. Protoconch obtuse (fig. 10). Aperture ovate (fig. 13), with expanded peristome, and containing five well developed teeth, similar to those of other species in the subgenus. Callus of parietal union variable. Color brownish-yellow, with the first four whorls rather whitish. Measurements: 25 × 9 mm.; aperture with peristome 8 × 5 mm. Some specimens may be a little longer or a little shorter than the type.

Type: Margins of Río Salí, near Tucuman City, Argentina; no. 23109 M.A.C.N., coll. R. Schreiter 1919. Other localities: North of the Sierra San Javier; Sierra Vipos; Parque Aconquija; Estación Araoz, Province of Tucumán.

This species is unquestionably very closely related to *O. pyriformis* Pilsbry and *O. martensi* Doering, but is longer and its configuration less pyriform, and possesses 1½ more whorls. In addition it is more conic than *martensi*, with the aperture regularly ovate and possessing very faint spiral lines. The oldest specimens may be confused with *alvarezi* of the *O. spixi* group, though this latter species is almost without striae and very irregular in outline. However, *O. tucumanensis* belongs to the group of *O. pyriformis*, a species of *Spixia*, more related to the subgenus *Plagiodontes* in its general appearances.

Odontostomus (Spixia) holmbergi, new species (Pl. 7, fig. 2, 5, 8, 9).

Shell subcylindrical, small, rather long, with 10 slightly convex whorls. Suture well defined. Surface with sculpture fine, axial, and regular, nearly smooth and somewhat subpellucid; the three last whorls with vestiges of spiral lines. Protoconch obtuse (fig.

8). Aperture quadrangular-subcircular (fig. 5), with peristome broad and thickened, and possessing five fine teeth, only moderately developed, and deeply placed within the mouth. Suprapalatal small to obsolete, palatal relatively well developed with the basal tooth rather low; columellar tooth excavated and twisted, the palatal and the columellar teeth in form somewhat of an arch over the basal tooth. Callus of parietal union, thin. Color brown. Measurements: $11 \times 3\frac{1}{2}$ mm.; aperture with peristome $3\frac{1}{2} \times 3$ mm.

The form, position and increase of the apertural folds is a remarkable character of this species. It belongs to the group of *O. tumulorum* Doering, with similar shape but narrower in outline.

Type: Minas de Cobre, Province of Córdoba; no. 23105 M.A.C.N., coll. Carlos Curt Hosseus, 1917. Other localities: Cima del Redillo, Province of Córdoba.

The species is named in honor of the late Dr. Eduardo Ladislao Holmberg, in acknowledgment for his many contributions to the natural sciences in Argentina.

Odontostomus (Spixia) doellojuradoi, new species (Pl. 7, fig. 11, 14, 15, 18).

Shell fusiform-ventricose, with $8\frac{1}{2}$ rather convex whorls; the last whorl globose and longer than the half of the total length of the shell and with the palatal wall flattened. Columellar axis slightly inclined toward the right side. Suture well defined. Protoconch (fig. 14) rather obtuse. The surface in the early whorls with axial rugosities; the rest entirely smooth, other than the infrasutural line which forms a thin grove. Aperture semi-oval (fig. 15); and brownish-yellow inside of the mouth behind teeth. Peristome is white. Five apertural teeth are present with the suprapalatal obsolete in some paratypes. Callus of parietal union very thin. Measurements: 25×10 mm.; aperture with peristome 9×6 mm. The species is characterized principally by its shining surface, internal color of the mouth and the degeneration of the suprapalatal tooth.

Type: Estación Casa Grande (between Cosquín and La Falda), Córdoba; no. 23124 M.A.C.N., coll. Prof. I. Vattuone 1919. Other localities: Cosquín and Valle Hermoso, Córdoba.

Its form, observed in twenty paratype specimens, can be longer, without a reduction in the globosity of the whorls, though the last is sometimes less globose. The aperture may be more ovate with its margins more sinuous. The teeth are more variable and

in some specimens only three or four teeth reduced to callosities. This species belongs with *martensi* and *tucumanensis* in the group of *O. pyriformis*, both are differentiated, however, by their form, size and sculpture.

I have the pleasure of naming this species for Prof. Martin Doello Jurado, Argentina malacologist, and Director of the Argentine Museum of Natural Sciences.

O. (Spixia) doellojuradoi minor, new variety (Pl. 7, fig. 17).

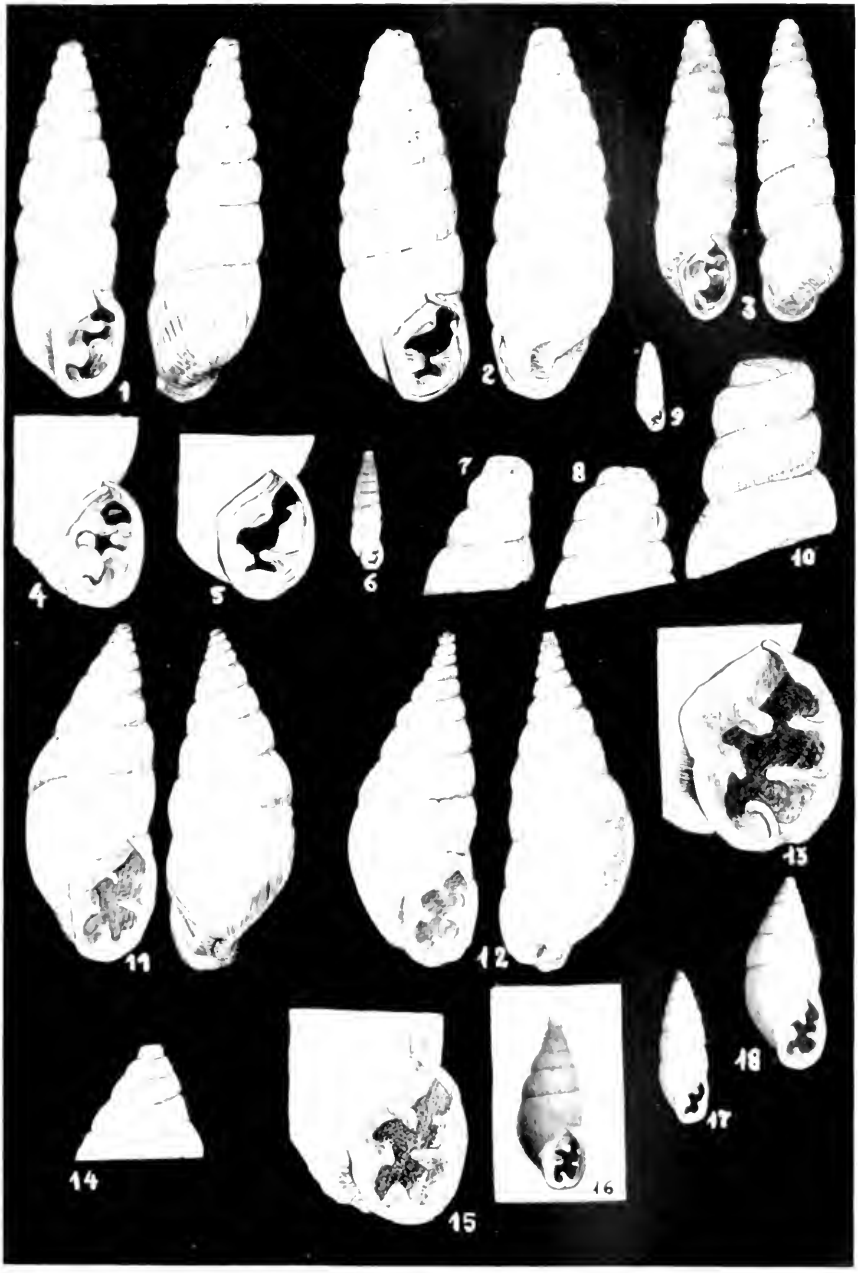
This species is smaller than the typical form, and has a narrower outline. First 2½ whorls generally of a dark brown color, remaining whorls with the surface less shining. The aperture possessing usually only four teeth, the fifth, when present, is formed by a thin callus. There is a feeble callus at the parietal union, which sometimes is absent. The shape, size, and rugosities of the surface are a little variable. Measurements: 20 × 6½ mm.; aperture with peristome 6½ × 5 mm.

Type: Pampa de Pocho, Province of Córdoba. no. 13244, coll. Dr. Alberto Castellanos 1932. Other localities: Pampa de Olaen, Córdoba; Oeste de Renca and Tiporco, Province of San Luis.

Odontostomus (Spixia) columellaris, new species (Pl. 7, fig. 1, 3, 4, 6, 7).

Shell fusiform-turreted, with 9–9½ whorls a little convex, decreasing proportionally in convexity from the first to last. Protoconch obtuse (fig. 7). Sculpture consisting of white, regular and undulating ribs; the first two whorls almost smooth. Between the ribs there are usually spaces of ½ mm. in width with slight vestiges of spiral lines. The last whorl is shorter than half the total length of the shell, and its right wall presents two white spots, which are produced by the internal impressions of the palatal teeth. Suture not deep but well defined. Aperture ovate (fig. 4), with peristome thin and expanded. The five apertural teeth are deeply placed, and the columellar tooth very well developed forwards and partially covering the others. The palatal fold sometimes placed in a semitransversal position, behind the columellar, the parietal twisted above. Callus of parietal union filiform. Color yellowish in the first two whorls; 3rd to 5th chestnut; 8th and 9th rather clear. Measurements: 21 × 3½ mm.; aperture with peristome 3½ · 2½ mm.

Type: Minas de Cobre, Province of Córdoba, Argentina, no. 23107 M.A.C.N., coll. Carlos Curt Hossens 1917. (Figs. 3, 4, 6, & 7 type; fig. 1 paratype.)



Parodiella — New species of Odontostomus — Spain

Upper figs., *Orcohelix parawanensis* Gregg
Lower figs., *Drepanotrema hoffmani* Baker

This species belongs to the group of *O. champaquianus*, and is characterized by the strong columellar tooth which easily differentiates it from the other small species of the subgenus.

Explanation of figures, plate 7.

Fig. 1. *O.* (*Spixia*) *columellaris* paratype. ×2½.
Fig. 2. *O.* (*Spixia*) *holmbergi* type. ×4.
Fig. 3. *O.* (*Spixia*) *columellaris* type.
Fig. 4. *O.* (*Spixia*) *columellaris* type. Apertural view. ×5.
Fig. 5. *O.* (*Spixia*) *holmbergi* type. Apertural view. ×6.
Fig. 6. *O.* (*Spixia*) *columellaris* type. Natural size.
Fig. 7. *O.* (*Spixia*) *columellaris* type. Apical view. ×9.
Fig. 8. *O.* (*Spixia*) *holmbergi* type. Apical view. ×9.
Fig. 9. *O.* (*Spixia*) *holmbergi* type. Natural size.
Fig. 10. *O.* (*Spixia*) *tucumanensis* type. Apical view. ×12.
Fig. 11. *O.* (*Spixia*) *doellojuradoi* type. ×1⅘.
Fig. 12. *O.* (*Spixia*) *tucumanensis* type. ×1⅘.
Fig. 13. *O.* (*Spixia*) *tucumanensis* type. Apertural view. ×3.
Fig. 14. *O.* (*Spixia*) *doellojuradoi* type. Apical view. ×4.
Fig. 15. *O.* (*Spixia*) *doellojuradoi* type. Apertural view. ×2½.
Fig. 16. *O.* (*Spixia*) *tucumanensis* type. Natural size.
Fig. 17. *O.* (*Spixia*) *doellojuradoi minor* type. Natural size.
Fig. 18. *O.* (*Spixia*) *doellojuradoi* type. Natural size.

A NEW OREOHELIX FROM SOUTHERN UTAH

BY WENDELL O. GREGG

Oreohelix parawanensis, new species. Pl. 8, upper figs.

Shell rather small, depressed, sublenticular, with a moderately carinate periphery and a perspective umbilicus. Whorls 4¼, convex below the suture, prominent in the middle and then flattened above the keel. In the final third of the last whorl there is a pronounced fading out of the keel so that the peristome is nearly circular. Peristome simple and connected by a faint callus over the parietal wall. The last third of the body whorl descends slightly bringing the suture line below the keel of the preceding whorl. All whorls visible in the umbilicus which is contained about 3½ times in the diameter of the shell. The entire shell is marked by radial striations, with faint spiral striations over the base of the body whorl. There is a suggestion of spiral sculpture on the second whorl. A fairly well marked band of chestnut-brown above and one close below the keel are present while the rest of the shell varies from cinnamon-brown at the apex to a light buff on the later portion of the body whorl.

Height 5.4 mm., diameter 10.5 mm., umbilicus 3.0 mm.

This shell comes from a rock slide on the southwest slope of Brian Head, Parawan Mountains, Iron County, Utah, altitude about 11,000. In all 31 specimens were taken, all dead and many of them immature. Type no. 176907 A.N.S.P., paratypes no. 324 in authors collection.

This species seems nearest related to *O. eurekensis*, located some 160 miles to the north, and *O. handi*, located about the same distance to the southwest. From *eurekensis* it is readily distinguished by its larger umbilicus and by its keel which is more prominent except on the last third of the body whorl. It is smaller than *handi*, has a larger umbilicus, is less strongly carinate and has its sculpture less strongly developed.

The location was above the timber line and I was surprised to find associated with it a number of snails from the lower wooded altitudes. Other species associated with it were: *Vallonia gracilicostata* Reinhardt, *Vallonia cyclophorella* Ancey, *Oreohelix strigosa depressa* Cockerell, *Microphysula ingersolli* Bland, *Pupilla blandi* Morse, *Pupilla hebes* Ancey, *Vitrina alaskana* Dall, *Zonitoides arborea* Say and *Discus cronkhitei cronkhitei* Newcomb.

A NEW SPECIES OF DREPANOTREMA AND SOME PREOCCUPIED PLANORBID NAMES

BY FRANK COLLINS BAKER

Drepanotrema hoffmani sp. nov. Pl. 8, lower figs.

Shell of six closely coiled whorls regularly increasing in diameter; sutures not deeply indented but well marked; sculpture of regular, fine growth lines crossed by very fine impressed spiral lines; aperture ovately-lunate, outer lip sharp; color brownish horn to chestnut.

Height 2.0; maj. diam. 7.5; min. diam. 6.6; aperture height 1.6; diam. 1.3 mm. Holotype.

Height 2.0; maj. diam. 8.8; min. diam. 7.8; aperture height 1.6; diam. 1.5 mm. Paratype.

Height 2.0; maj. diam. 8.2; min. diam. 7.2; aperture height 1.6; diam. 1.3 mm. Paratype.

The shell differs from *Drepanotrema lucidum* Pfr. in having one more whorl (*lucidum* has 5 whorls), the whorls are more

tightly coiled and do not slope toward the spire side as abruptly as in *lucidum*. The color is always darker. The genitalia also differ, the flagellum being very short while in *lucidum* the flagellum is half as long as the vergic sac; the prostate has as many as 19 diverticula in a single row while in *lucidum* there are less than 10 diverticula. There are other minor anatomical differences.

Type locality: Isabela, Puerto Rico. Holotype 3952, paratypes 3953, collection of F. C. Baker. Collected by Dr. William A. Hoffman, of the School of Tropical Medicine, San Juan, Puerto Rico.

This handsome little species differs in both shell and anatomy from its nearest relative, *Drepanotrema lucidum*. It is a common mollusk in Puerto Rico. I take pleasure in naming the new species in honor of Dr. Hoffman, who has made a detailed study of this and other species as intermediate hosts of Trematode worms. The specimens sent by Dr. Hoffman were heavily infested with stylet cercaria.

In the course of bibliographic research for the monograph of Planorbidae several names were encountered which are homonyms and must have other names applied. These affecting American species are as follows:

Planorbis planulatus Desh., Descriptions des coquilles fossiles des environs de Paris, II, p. 88, tab. x, figs. 8–10, 1824. This name antedates *Planorbis planulatus* Cooper, Rep. Nat. Hist., etc., of Washington Terr., p. 378, 1859. Cooper's species may be called *Menetus cooperi* new name.

Planorbis applanatus Thomae, Jahrb. d. Nassau. Ver. f. Naturk. in Wiesbaden, II, p. 150, 1845, a European fossil. This name invalidates *Planorbis tenuis* var. *applanatus* Martens, Biol. Centr. Amer., Mollusca, p. 384, 1899. Marten's variety may be called *pertenuis* new name.

Planorbis declivis Genth, N. Jahrb. f. Min. Geogn. Geol. u. Petrefaktenk, p. 199, 1848. This makes a homonym of *Planorbis declivis* Tate, Amer. Jour. Conch., V, p. 159, 1869. The American form may be called *Tropicorbis tatei* new name. This form seems at least varietally distinct from *Tropicorbis obstructus* Morelet.

NERITINA VIRGINEA, L., IN JAMAICA, B. W. I.

BY E. A. ANDREWS

(Continued from p. 68)

The shells from the Bahamas are added to the tables to suggest that elsewhere than in Jamaica size and pattern may indicate habitat. These shells with maximum of 15 and volume of .47, and failure to pass sieve b, belong neither in the sea nor in the large fresh water streams, but with high reflection and large percentage of pattern III and dominance of IV over V they might well be in shallow sunlit, saline waters, which is in harmony with any probable habitat in the Bahamas.

TABLE I. SIZE

The shells being placed in the tables with reference to size, it is to be emphasized that the smallest, at the top, are found in saline environment and the largest, near the bottom, in large fresh rivers.

Thus the snails in the sea (omitting the smallest as immature dead shells cast up on shore) had a maximum of but 9–12 and volume of .07–.14 cc., and the majority passed as far as sieved; while the snails in fresh waters had maxima of 10–25 and volume of .39–3.00, and the majority stuck on sieve b.

The greatest number of snails, however, are to be found in the table between these extremes, and the most in numbers are in saline environment of estuarine localities. These snails are intermediate in size as well as in living conditions of mixed fresh and sea waters.

Their maximum size runs from 9.15, and volume .09–.37, and the majority stuck on d, e, or even b.

If we use the term "saline environment" to include both the sea and the brackish waters, it includes a wide range of amounts of salts in solution, but also shallow waters that are generally clear so that the snails are exposed to full sunshine with heating, luminous, and actinic rays and are nourished by what food grows in such conditions. In extreme cases the snails herd browsing on the margin, or even above, the water line.

Assuming that all these snails are one species, the dwarf forms

TABLE I

LOCALITY	DATE	SALINITY	NUMBER	SIZE								
				Range	Av.	Max.	cc.	a.	b.	c.	d.	e.
1. White House	1932	Sea Shore	940	1.3– 7	5	9	.03	0	4	3	16	80
" "	1932	1.0244	190	3 – 7	5	9	.07	0	5	4.7	55	39
2. Sandy Bay	1910	1.0247	196	3.5– 8	4	9	.11	0	1.2	20	63	14
" "	1932	1.02–36	3180	2 –10	6	12	.14	0	12	27	52	8
3. Ft. Clarence	1891	1.0380	382	3 – 8	6	9	.15	0	9	61	25	5
" "	1910	1.0258–75	28212	2.5– 5.5	4	9	.13	0	1.5	35	62	0.4
" "	1936	Salt	3	7 –10	8.5	13.5	.33	0	100	0	0	0
" "	1910	1.0174	6054	4.5–11	7.5	14	.37	0	86	13	0	0
" "	1936	Salt	124	3 –10	6.5	13	.26	0	66	19	13	8
" "	1932	1.0124	382	3.5– 7	5.5	9	.10	0	2	45	51	2
" "	1936	Salt	795	2.5–10	6	12	.10	0	6	22	61	9
" "	1936	Salt	222	3 – 7	5	9	.09	0	2	16	68	12
4. Montego Lagoon	1910	1.0023	51947	2 –10	5	15	.17	0	30	39	25	4
5. Mo Bay Brackish Pond	1910	1.0142	14548	3.5–11	7	15	.27	0	46	35	16	1
" " " "	1932	1.0340	585	5 –16	10.5	17	.39	0.3	66	30	4	0
6. " " Town Creek	1910	Fresh	3005	3 –10	7	15	.30	0	64	23	12	0.09
7. Port Antonio	1891	"	18	4 –10	7	10	.33	0	66	13	20	0
8. Cabaritta	1932	"	337	3.5–17.5	10	20	.38	6.6	31	18	31.5	11.6
9. Broad River	1932	"	91	4 –14	9	10.5	.41	0	66	20	11	2
10. West Lucea	1910	"	2358	3 –15	8	20	.45	0.2	59	19	19	1
" " Eton	1932	"	57	6 –10	8	12.5	.40	0	93	7	0	0
11. Flint River	1910	"	843	5 –19	9	25	.75	2.8	78	11	7	0.5
" "	1932	"	40	7 –18	10	21	1.05	27	62	10	0	0
12. Mt. Pleasant	1932	"	35	13 –20	15	22	1.71	43	57	0	0	0
13. Mo River, Bridge	1910	"	447	8 –17	10	22	1.51	22	77	0	0	0
" " "	1932	"	210	11 –18	15	20.5	1.14	81	17	0	0	0
" " Barnett Mills	1910	"	2094	5 –17	9	22	1.24	5	87	5	1	0
" " " "	1932	"	942	6 –18	11	24	1.14	13	86	0	0.1	0
14. Great River	1910	"	5249	4 –10	10	24	1.10	24	74	0.7	0.07	0.01
" "	1932	"	973	14 –23	18	25	2.79	89	11	0	0	0
15. Redding River	1910	"	48	12 –22	13	25	2.91	98	2	0	0	0
16. Rock Port Spring	1932	"	5	15 –21	20	24.5	3.	100	0	0	0	0
17. Bahama Islands		?	1208	3 –12	8	15	.47	0	90	9	0	0.1

(which may prove to be a distinct species) are found where they may have been very long in saline environment while the largest snails are found in old rivers far up from the sea.

Assuming again that the large snails, as must frequently happen in these cloud burst rivers, have often been washed down into estuarine conditions and finally into the sea, we may regard the brackish forms as transitions from the fresh toward the sea-forms of these snails.

To the general rule that big snails are in old rivers and smaller ones in saline environment, exceptions may be explained as due to lack of time since migration into present localities. Thus, that the snails in the Brackish Pond, Mo Bay, were larger in 1932 than in 1910 may be connected with the fact that they lived under different conditions, in somewhat deeper, darker waters, and not marginal and that they may well have descended from new immigrants from the Montego River and not from the now exterminated colony of 1910, which was in another part of the same pond.

It is elsewhere shown that in the same pond two quite different sizes of snails may coëxist in different states of saline environment.

Again the smaller size of snails in the fresh waters of Town Creek, Cabaritta River, Broad River, and West Lucea River in 1910, when compared with the big snails of upper reaches of other rivers, may have to do with their living so near the sea level as to be at times, now or recently, exposed to saline environments.

TABLE II. PATTERNS AND COLORS

In the field, as striking as differences in size are the differences in light or dark aspects of these shells.

The big shells of big rivers are dark, and they tend to hide under stones in waters often darkened while the marine shells are light and tend to browse in full sunlight in very shallow water, where they are not conspicuous on the mottled, sandy background.

In the table these differences are expressed partly as shade, and "brilliance," that is, relative reflection of light as compared with brilliant white oxide; thus some sea shells in the sea reflect up to 28.5 or in dense saline up to 40 per cent, though in fresh waters the reflections often are but 16–19 per cent.

These differences depend upon the polish of the cuticle, and the amount of pigment in the pattern, but also upon background color due to the cuticle, for as was long since pointed out by Metcalf, these shells from salt waters have a brilliant white background but from fresh streams horny or yellow backgrounds upon which the pattern is displayed. This yellow of the cuticle in some is even in the underlying limy shell.

The fine lines and the reinforced lines of pigment form innumerable patterns upon large or small background light areas.

When such patterns are gross blotches of light with but little pigment between them, we put them in Group IV; but when the pigment is so widespread as to reduce the background to minor areas in a generally dark surface, we call them spotted, or Group V.

While it is easy to recognize the extremes, these two groups grade into one another imperceptibly. In the whole collection the blotched, IV, may run from 9 per cent up to 80 per cent in some cases, and again the spotted, V, may run from 5 per cent up to 76 per cent; while the norms of the two groups are 44 per cent and 40 per cent, and the averages 40 per cent and 38 per cent.

In this species, then, irrespective of environment and of size, there appears a genetic tendency to have most of the shells spotted, or else blotched, but large populations always show some in which these patterns are so placed as to form spiral or banded arrangements, and a few may have the background black and the spots few and white, and still fewer may have a deficiency of pattern and of color.

However, there is some correlation between pattern and environment. It is noticeable in the table that while columns I and II have no marked differences for the small shells in saline and the large shells in fresh waters, the numbers in columns III, IV, and V show general differences between the upper and the lower parts of the columns, that is, the percentages in III are greater above for the saline dwellers and smaller below for the fresh water snails, and again, the upper records in column IV exceed those in column V, while lower down the numbers in column V exceed those in column IV, as a rule.

In fact, of 28,906 shells in saline waters, the percentages were

TABLE II

LOCALITY	DATE	SALINITY	NUMBER	PATTERN						
				Shade	Brilliance	I	II	III	IV	V
1. White House	1932	Sea Shore	940	Very Light	35	1	1.3	17	44	36
" "	1932	1.0244	190	" "	26	4	1	16	53	24
2. Sandy Bay	1910	1.0247	196	Light	28	11	8	18	23	38
" "	1932	1.02–36	3180	Darker	28	3	3	15	69	9
3. Ft. Clarence	1891	1.0380	382	Very Light	35–40	5	2	30	50	12
" "	1910	1.0258–75	28212	Light	20–40	5	4	19	63	8
" "	1936	Salt	3	Darker	27	0	0	0	0	100
" "	1910	1.0174	6054	"	29	13	6	21	45	14
" "	1936	Salt	124	"	21	8	4	5	50	30
" "	1932	1.0124	382	Light	29	2	1	17	67	11
" "	1936	Salt	795	"	29	5	3	15	63	12
" "	1936	Salt	222	"	29	4	1	13	64	14
4. Montego Lagoon	1910	1.0023	51947	Dark	16–19	5	2	31	18	43
5. Mo Bay, Brackish Pond	1910	1.0142	14548	"	19	9	0.6	13	32	44
" " "	1932	1.0340	585	"	19	5	1	7	80	5
6. Mo Bay, Town Creek	1910	Fresh	3005	Very Dark	19	7	0.7	9	26	56
7. Port Antonio	1891	"	18	" "	22	11	11	33	24	24
8. Cabaritta	1932	"	337	Olive Dark	14	2	1	11	40	46
9. Broad River	1932	"	91	" "	19	1	1	11	47	38
10. West Lucea River	1910	"	2358	Very Dark	16	7	3	10	14	64
" " Eton	1932	"	57	Light Olive	14	1	0	5	44	50
11. Flint River	1910	"	843	Very Dark	19	5	2	8	11	72
" "	1932	"	40	Dark Olive	17	6	3	19	6	64
12. Mt. Pleasant	1932	"	35	Dark	15	0	0	8	14	76
13. Mo River Bridge	1910	"	447	Very Dark	19	6	6	7	30	47
" "	1910	"	210	Dark	19	3	1	5	35	55
" Barnett Mills	1910	"	2094	Very Dark	16–19	7	2	8	13	70
" " "	1932	"	942	Dark	16–19	3	0.8	8	39	48
14. Great River	1910	"	5249	Very Dark	12–19	6	3	8	8	73
" "	1932	"	973	Dark	16–19	5	2	4	29	50
15. Redding River	1910	"	48	Very Dark	16–19	4	0	2	20	73
16. Rock Port Spring	1932	"	5	Dark	16–19	0	0	0	40	60
17. Bahama Islands		?	1208	Light	40	5	3	22	44	23

1–12 in Group I, 6–11 in Group II, 3–30 in Group III, 32–80 in group IV, and 5–44 in Group V. But of 86,656 shells in fresh waters, the percentages were 0–11 in Group I, 7–11 in Group II, 0–33 in Group III, 8–80 in Group IV, and 5–73 in Group V.

The rarity of banded shells, III, in fresh waters as compared with saline waters has a notable exception in the Port Antonio collection, but the number collected was too small. In the large population in the Lagoon, 5,472 shells with spots in spiral rows made III very large and formed a peculiarity of this local community. The fact that banded shells are more prevalent in saline waters than in fresh waters is one of the elements of gaiety that is striking in the small saline shells.

Again the greater proportion of blotched shells, IV, in saline environment adds to their brilliance, while the dominance of spotted shells, V, in fresh waters is one of the factors that makes fresh water shells darker than saline shells. The table expresses the shade of the shells as it appears to the eye, and the brilliance as compared with magnesium oxide as reflecting 100 per cent. Fresh water shells are dark to very dark and reflect but 16–19 per cent, while saline shells are light to very light and reflect up to 40 per cent.

Thus it appears that in general, *Neritina virginea* in Jamaica is large with much pigment in fresh waters, and small with less pigment in saline waters. And while the percentages of different arrangements of color seem rather fixed for the species irrespective of environment, yet banded shells are generally more abundant in saline environments; and also the blotched patterns predominate in saline, while the spotted predominate in fresh waters.

We have recorded Broad River as fresh, but the predominance of IV over V and the larger percentage of III associates this population with saline environment. They may be in a transition phase from fresh to brackish, and possibly are immigrating into estuarine habitat. On the other hand, shells in Mo Bay Lagoon and the brackish pond have recorded dominance of V over IV, which may be referred to recent immigration into estuarine conditions from upper reaches of the same Montego River, with change to small size, but as yet no abandonment of river pattern proportions.

Small shells are by no means all equally light; those of the Lagoon are much darker than those of Ft. Clarence Salt Pond and have not only more pigment over the surface, but a yellow background due to cuticle and even inner shell being yellow.

HOW PIGMENT FOR PATTERN MAY BE LAID DOWN

The outer surface of *Neritina virginea* shows much pigment but there is a pale area of the mantle, under which the head may be withdrawn, that presents a striking line of pigment parallel to the mantle groove that secretes the cuticle.

This narrow line of pigment is inferentially the source of all the extended pigment pattern of the shell. This pigment line, used as a die or stamp continuously, might make a uniformly dark shell, or used at regular intervals a pattern of meridional lines with pale background between.

In banded shells it is at once seen that there are a few interruptions in this line exactly corresponding to the colorless bands of the shell; that is, there is a point to point agreement between shell pattern and placement of pre-formed pigment secretors that are absent where bands of no pigment will be formed on the shell. Moreover, in shells of Group I the pigment line is very dark indeed, while in Group II it is quite pale; thus the pattern depends not only upon pre-placement of dies but upon amount of pigment available in those dies. However, while the pattern is to some extent preformed, the complexities of spots and blotches in groups V and IV need added activities. Either the dies must change in character or else in position, else straight lines away from the shell edge would be merely repetitions of the same element. To explain the great irregularities, we assume that the dies are moved about by muscles of the mantle so that they may be drawn upward or downward or toward the shell edge, or even withdrawn from the cuticle so as to deposit no pigment in the shell for a time. Spots on the shell may be of two origins: in Group I they seem merely absence of pigment, as if small parts of the pigment line were absent or inactive; while in Group V edges of spots or of blotches of IV commonly have pigment absent for a time and then added in excess, as if stored up during the short period of no deposit. In some preserved specimens, the pig-

ment line is wavy or zigzag and with heavier and lighter successive parts, and there may be triangular or V-shaped parts of the line with heavy apices toward the mantle edge; such arrangements of pigment would form some of the small spots that have the like shape and accept upon the apex. But many of the larger spots, blotches and diagonals may be due not to such very local contractions or distortions of the pigment line, but to long continued extensive contractions of such nature that a short section of the active pigment line acting as a die and drawn downwards would form a long diagonal of wide pigment; or again, contractions downward along with contractions upward might produce the large Vs seen on many blotched shells. Apparently also the pigment of the line is diffused or spread within the shell substance, so that the pattern may not be as sharp as the line of origin which, however, as above stated, has different widths and intensities along its course.

Granting the various shell patterns may owe their form and character to pre-formed dies, or localized secretors of pigment, we infer these may be moved sidewise, or up and down, small or larger distances, by mantle muscles.

Sometimes the pattern of a shell radically changes and in some cases this is due to injury to the above apparatus of gland cell and muscle when the shell is broken. But there is a strong tendency to recover and return to the normal. In other shells changes seems as if due to inner causes and possibly originate in changed materials supplied to the pigment gland cells.

The final pattern may then involve transport and storage of material, pigment secretion from rather fixed areas, and also the complex movements of these die-like areas by muscles.

CONCLUSIONS

In Jamaica, *Neritina virginea* is smaller and its shell less pigmented in saline environment. But saline environment involves other factors than concentration and proportions of salts and it is not known which are effective, nor what part genetic factors may play. Possibly diminution in size may be associated with salts more or less indirectly as through food; while loss of pigment may arise from intensity of insolation. However, experi-

mentation is needed to analyze connections of saline environment with different aspects of *Neritina virginea*.

To some extent relative proportions of various patterns of shell are independent of environment, but the lessening of pigment quantity in shells in saline environment is accompanied by greatly changed arrangements of the scanty pigment.

Complexities and individual differences in pigment pattern seem dependent upon musele control of pigment secretors.

Increased human populations during 22 years with extended cultivation of hill-sides threaten extinction of fresh water Neritidae in parts of Jamaica.

HENRY C. HIGGINS

Mr. Higgins was born in Cincinnatus, N. Y., May 6, 1865, and died at Keyport, N. J., Sept. 15, 1939.

From boyhood he was an intense lover of nature and everything pertaining to natural history. He made a scientific study of birds and left valuable data pertaining to the birds that annually visited the vicinity of his home town, Cincinnatus, New York. His early education was at the Academy there. His fine collection of birds is in Cortland Museum. The taxidermal work was done by himself.

As a boy he was also a baseball enthusiast and bicyclist, owning the first Columbia high wheel in that section. His vocation was newspaper work. He filled the editor's chair in Uxbridge, Massachusetts, and in the same capacity, conducted his own paper at Belmar, New Jersey, and later, at Keyport, New Jersey.

His main hobby was shells, and how he loved them! His collection was said to be one of the finest private collections in the United States. None but perfect specimens found a place in it. Another hobby was stamps, of which he had a fine collection.

NOTES AND NEWS

SOLARIUM BISULCATUM Orbigny, 1845.—A CHANGE OF GENUS. —Living examples of this interesting little mollusk suggest that it should be placed under the genus *Torinia*. The rather depressed shape probably accounts for its having been classified as

Solarium (=*Architectonica*). The operculum has apparently gone unnoticed. It is corneous, elevated and conically spiral, somewhat suggesting a miniature coil of rope. The body and tentacles of the mollusk are pinkish in color, streaked with narrow black markings. The Boynton specimens, characteristically, were closely associated with living coral polyps in shallow water. Dredged specimens from 50–60 fathoms off Palm Beach are perhaps a little more depressed but not radically different. All specimens observed were covered with a thin epidermis.—THOMAS L. MCGINTY.

TRIDACNA GIGAS.—We have recently shipped to the Florida State Museum two *Tridacna gigas,* one being 44 inches wide and the other 44⅞ inches. The latter weighed 492 lbs. net. They are the largest we have found to date.—W. W. TREVOR, Southseas Shell Products Co., Manila, P. I.

MEASUREMENTS USED IN SHELL DESCRIPTIONS.—The following measures were used mainly during the early part and the middle of the 19th century in descriptions of mollusks. It may be of value to modern workers to have these measures given in millimeters of equivalent value.

1 ligne (French) = 1/12 inch (Fr.) = .088 inch (Eng.), = 2.25 mm.
1 line (English and American) = 1/12 inch (Eng.) = 2.11 mm.
(in Martini and Chemnitz, Helix, Pfr.) = 2.0 mm.
1/8 inch = 3.175 mm. 1/20 inch = 1.27 mm.—C. M. COOKE, JR.

A NATURAL INTRODUCTION OF *Physa*.—For use in fighting forest fires a 300,000 gallon concrete reservoir was constructed at the Missouri Botanical Garden Arboretum at Gray Summit, Missouri. This was filled with water from a well in November, 1939. In October, 1940, this reservoir was found to contain at least 500 *Physa halei* Lea. In addition to the snails there were frogs, tadpoles, water-boatmen, and several species of water-beetles. There were no visible algae, their food consisting of organic matter blown in by the wind.—LESLIE HUBRICHT.

PUBLICATIONS RECEIVED

A STUDY OF THE GREAT BASIN LAND SNAIL, *Oreohelix strigosa depressa* (COCKERELL). By David T. Jones. Bull. Univ. Utah, vol. 31, no. 4. 43 pp. With many illustrations of shell and anatomy, the structure, chemical composition and anatomy of this snail are described, with notes on its bionomics and distribution.

MARINE SHELLS OF THE SOUTHWEST COAST OF FLORIDA.—By Louise M. Perry. No. 95 Bull. Amer. Paleontology, 260 pp., 39 plates. After interesting and useful chapters on "Generalia" and "Collecting and Preservation," the species are described systematically in language as non-technical as is consistent with exactness. The figures are exquisite, by far the finest ever published of most Florida shells. This book is the outcome of several years of collecting on the beaches and dredging, and of critical study of the material in the author's laboratory and in northern museums. It will be most useful to all concerned with Florida shells.—H. A. P.

NORTH AMERICAN SNAILS OF THE FAMILIES POLYGYRIDAE AND SAGDIDAE. By H. A. Pilsbry. Land Mollusca of North America (north of Mexico), vol. 1, part 2 (pp. 575–994). 1940. It must be about fifty years ago that my old friend John Ponsonby expounded to me his views on the American Polygyrid snails. It seemed to him that there was so much variation, with so many intermediates between the supposed species, that classification was almost hopeless. This from a man who had long struggled with the snails of Europe and North Africa, and had studied them intensively in the field. This estimate of Ponsonby's, perhaps not to be taken too seriously, fairly expressed the difficulty and complexity of the problem, but did not prove that a satisfactory solution could not be found. Through the labors of various American conchologists, now greatly extended and splendidly organized and illustrated by Pilsbry, we have a presentation of the Polygyrid fauna in all its known details, at once convincing and illuminating, a book which any intelligent person can use and understand. Has the study thus been completed? By no means; one of the great merits of the treatment is that it not only sets forth what is known, but constantly invites the reader to new explora-

tions, new studies, which cannot fail to be fruitful. With the modern means of transportation, in the course of a short holiday, it is possible to make discoveries of importance among the snails.

It is very remarkable that the various genera, mostly of vast antiquity, have remained within their limited territories, as if surrounded by some invisible fence. The whole subfamily Triodopsinae, very rich in species, is confined to the United States and adjacent border of British America, except that a few species of *Ashmunella* extend into the Mexican state of Chihuahua. *Ashmunella*, of which about fifty species and subspecies are now known from New Mexico and Arizona, has never been seen in California, Utah, Colorado or Texas. Certain species occur as far north as Santa Fé, and it is possible that one will eventually be found in southernmost Colorado, but it is astonishing that such an old and diversified genus, so distinct that it might well typify a tribe Ashmunelli, should have failed to spread into regions which, so far as we can see, are not unsuitable. Another interesting problem relates to the survival and differentiation of species in particular western areas. There is for instance the group of *Mesodon binneyanus*, peculiar to Arkansas and adjacent regions in Texas and Oklahoma. The Ozark region seems to resemble that of Oregon in that it has on the one hand escaped severe glaciation, and on the other desiccation. Hence the survival of interesting endemics, plants and animals. But the plains westward of the Ozarks have been a barrier to migration; only one species of *Polygyra* reached eastern New Mexico, and is now no longer living there. The genus *Allogona* of Pilsbry, with its type the *Helix profunda* of Say, lives in the Mississippi, Ohio and Missouri valleys, but there is a group (subgenus *Dysmedoma*) found from Oregon to British Columbia to western Montana. Far back in Tertiary time these groups, now so widely separated, must have been represented by ancestors in the intervening territory.

There is another set of problems, no less interesting, connected with the evolution of species, subspecies and lesser entities. It is shown that in different series particular features, relating to size, the structure of the aperture, the character of the sculpture, or what not may come and go, so that parallel and superficially similar shells confuse the collector. Sometimes these changes

seem to be related to the environment but commonly not; they seem to result from parallel gene mutations. Sometimes we appear to have the results of extensive hybridization, as in the extraordinarily polymorphic populations of *Ashmunella levettei heterodonta* and *A. tetrodon mutator*. Pilsbry is keen to detect and record variations, racial or individual, but in many cases he leaves them without special names. Recognizable subspecies are all named, but there are very many cases in which this rank seems not to be deserved, either because the peculiarities may be due to the direct effect of environmental factors, or the peculiar individuals occur mixed with the normal population, or the material seen is too scanty to warrant a decision. All such cases invite more careful investigation on the spot. When names have already been applied to them, these are duly cited, and sometimes new names are given. Such minor deviations are called "forms."

At the end of the volume we have an account of the Sagdidae, a typically neotropical family with five genera in our area. It has long existed northward, there being a fossil species in the Eocene of Wyoming. Of the living genera in our fauna all are intrusions from the West Indies or Mexico, except *Microphysula*, which belongs to the Rocky Mountains and the northwest. It is remarkable that this long established genus has not produced more than two species and a subspecies, aside from one or two long extinct.

It will easily be seen that we have a work of extraordinary value, not alone for students of Mollusca, but for all biologists. The snails, for many reasons, afford admirable material for broad biological studies, and now we have an adequate guide to the subject, affording an opportunity to the rising generation of biologists which they must not neglect. I am reminded of my experience in central Africa in 1931. I found railways, roads and steamers, making it easy and relatively very inexpensive to travel through the country which Livingstone explored slowly, facing enormous difficulties and hardships, and eventually losing his life. Taking advantage of the facilities, I found very many new insects and snails, still there awaiting the collector. Pilsbry's book is like a smooth and easy road through the jungles, and those who intelligently take advantage of it will be richly rewarded.—T. D. A. COCKERELL.

THE NAUTILUS

Vol. 54 April, 1941 No. 4

THE CAVE MOLLUSCA OF THE OZARK REGION

By LESLIE HUBRICHT

During the summer of 1940 the author explored about fifty caves in the Ozark region. In several of these caves Mollusca were found, which are reported in this paper. Only such mollusks as were found alive in total darkness are treated. Those found about the mouths of caves, or dead shells which have been washed in, cannot be considered as being a part of the subterranean fauna.

The collecting of this material was made possible by a Research Grant from the American Association for the Advancement of Science.

Zonitoides arboreus (Say)—Missouri: Crawford Co.: Missouri Caverns, 5 miles southeast of Leasburg. Seven specimens were found on rotten wood which had been part of an old stairway. These were probably born in the cave, but their ancestors were undoubtedly brought in on lumber.

Hawaiia minuscula (Binn.)—Missouri: Barry Co.: Crystal Caverns, north of Cassville. A single specimen was found crawling over a muddy bank. It had probably been washed in through a fissure.

Deroceras laeve gracile (Raf.)—Missouri: Camden Co.: River Cave, Hahatonka. This cave is connected with several large sink holes through which cloudbursts wash in large quantities of leaves and trash. The last such rain was about ten years ago when the floor at the lower end of the cave was covered with a six-inch layer of leaves. One mature specimen and several newly hatched young were found on these leaves.

Carychium exile C. H. Lea—Missouri: Camden Co.: River Cave, Hahatonka. Five specimens were found with the last species.

Ferrissia kirklandi (Walker)—MISSOURI: BOONE CO.: Hall's Cave, 4 miles southeast of Rocheport. Abundant on stones in a stream, feeding on bat guano. Their eyes and pigment are normal.

Physa halei Lea—ILLINOIS: MONROE CO.: Ice Cave, Camp Vandeventer, 5 miles west of Waterloo; Morrison's Cave, 2 miles south of Burksville. MISSOURI: PULASKI CO.: Bat Cave, 5 miles south of Crocker. CHRISTIAN CO.: Smallin Cave, 2.8 miles northeast of Ozark. These caves are all connected with sink-holes through which leaves and logs wash in, providing a large quantity of organic matter upon which the snails feed. The snails are quite small with greatly reduced pigmentation.

Amnicola aldrichi antrocoetes Hubricht—MISSOURI: WASHINGTON CO.: Hamilton Cave, 5.5 miles southeast of Sullivan. CRAWFORD CO.: Green's Cave, 4.5 miles southeast of Sullivan. OSAGE CO.: Dowler's Cave, 3 miles west of Cooper Hill. PULASKI CO.: Spring Cave, 5 miles south of Crocker; Piquet Cave, 4 miles southwest of Dixon. SHANNON CO.: Cave Hollow Cave, near Ebb and Flow Spring, 6 miles north of Montier. (For additional localities see Nautilus 53: 120.) A common species in subterranean streams in the eastern Ozarks. Unlike *Physa* it does not require an excess of food. It has been found in streams which seemed to be almost devoid of organic matter.

Amnicola procerpina Hubricht—No additional records are available for this species (see Nautilus 53: 121).

Musculium sp.—ILLINOIS: MONROE CO.: Morrison's Cave, 2 miles south of Burksville. About two dozen specimens were collected in a small stream. They show no modification to their subterranean life, but they are naturally unpigmented and blind.

All of the land snails were apparently recently introduced into the caves and were not modified in the least by their subterranean life. It is doubtful if they will be able to maintain themselves for many generations. The aquatic snails, on the other hand, were breeding freely and have become adapted to their cave habitats and can be considered a permanent part of the subterranean fauna. The pill-clams were breeding, and showed every indication that they would be able to maintain themselves permanently.

THE *STENOTREMA MONODON* GROUP OF *POLYGYRIDAE* IN MICHIGAN

By PHIL L. MARSH

Of the *Polygyridae* which Pilsbry[1] has placed in the Group of *Stenotrema monodon* and Archer[2] has included in Section *Euchemotrema* of Genus *Stenotrema*, three forms are found in Michigan: *Stenotrema monodon* (Rackett), *S. fraternum* (Say) and *S. f. cavum* (Pilsbry and Vanatta). Each is abundant over a large area, and at least one occurs in every part of the state. The differences in the distributions of these three forms are very striking and are of considerable interest.

In Michigan there is very little difficulty in distinguishing between these three *Stenotremata*, and there is no other mollusc with which they may be confused. *S. fraternum* is nearly or entirely imperforate, while the other two have the umbilicus almost completely uncovered. The shell of *S. monodon* is usually darker and more glossy than those of the others, the whorls are more tightly coiled and the parietal denticle differs in being shorter and having its distal end slanting into the aperture. Archer[2] has pointed out that the basal sinus of the lip in *monodon* and its varieties is flattened or dished; in *fraternum* and its varieties this surface is convex. Of the three, *cavum* is the largest; the average diameter of a large number of Michigan specimens is 10.5 to 11.00 mm. The other umbilicate form, *monodon*, usually has a diameter of about 8.00 mm., rarely as much as 10 mm., often less than 7.00 mm.; *cavum*, then, is commonly about one-third larger than *monodon*, and colonies of either may be distinguished from the other at a glance. While the shells of *cavum* often seem somewhat more depressed than those of typical *fraternum*, measurement shows that this is not a constant or significant character; many specimens of the typical form have a smaller height/diameter ratio than the type of *cavum* as given by Pilsbry,[1] and topotypes received from J. B. Henderson from Cazenovia, N. Y. It is probable that in most

[1] Pilsbry, H. A., Land Mollusca of North America, 1940, Vol. I, Pt. 2, pp. 675–687.

[2] Archer, Allan F., NAUTILUS, 1939, 52: 98; 53: 33.

of our land shells the degree of elevation of individuals of a species depends on ecological rather than racial factors.

The ecological preferences of *monodon* and *fraternum* have been pointed out by several observers. *Monodon* is found in wet places; the flood plains of lakes and streams are favored sites, and it is often found in swamps. During the spring floods, large numbers of these shells may be found floating in a river or east up on the shores, and in inundated lowlands the snails are found on hummocks or logs above the water. During the summer their favored home is under the debris left by the subsiding waters. *Fraternum,* on the other hand, is an inhabitant of the uplands, and in Michigan is found in almost any place that is not too wet: woodlands, pastures, roadsides, farmyards. It is one of the few species of the oak-covered glacial moraines of low fertility, where it is associated with *Triodopsis albolabris* (Say), *Anguispira alternata* (Say), *Zonitoides arboreus* and, sometimes, *Z. suppressus* (Say). *Cavum,* in its area of distribution, may be found not only in the uplands, but also along the streams, under drift on lake shores and in cedar bogs. While *monodon* and typical *fraternum* are rarely found together, *monodon* and *cavum* are more often associated.

For the mapping of the regions occupied by these snails in Michigan, few landmarks are needed. It will be remembered that Michigan is unique among the states in that it consists of two large land masses separated by water. The Upper, or Northern, Peninsula forms a long narrow triangle, extending some 350 miles eastward from the mainland of Wisconsin; its long north and south boundaries are formed by the waters of the Great Lakes. The Lower, or Southern, Peninsula extends northward from Ohio and Indiana, with Lake Huron separating it from Ontario on the east, and Lake Michigan separating it from Wisconsin on the west. Its shape, like that of a mitten, is familiar. On the east central shore is Saginaw Bay, separating the "thumb" from the fingers, with Bay City at the inner end of the bay. Jackson is about halfway between the east and west extremes of the peninsula, and is forty-five miles north of the Ohio boundary, or one-fifth of the way up the peninsula. Muskegon, on Lake Michigan on the west, is nearly opposite Bay City.

Stenotrema monodon is found over the entire Southern Peninsula. It is not entirely absent from the high, sandy "jack-pine region" of the north central part, and elsewhere in suitable habitats it is abundant. In the Northern Peninsula it has been found in Menominee County, in the extreme southwest part; presumably this is the result of invasion from Wisconsin. It is interesting that there is a thriving colony in Mackinaw City, on the south side of the Straits of Mackinac, while on the north side of the Straits, some six miles distant, it has not been found. It should be pointed out that from some areas of the central part of the Northern Peninsula there has been little collecting. In the eastern end, however, I have worked during parts of three summers, without finding this species.

Either *Stenotrema fraternum* or its variety *cavum* is found in every area of both peninsulas. The typical form, however, is found only in the most southern counties, while the northern part of the Southern Peninsula and the whole of the Northern Peninsula are occupied by *cavum*. If a somewhat irregular zone about twenty-five miles wide be imagined following a line drawn southwest from Bay City, at the end of Saginaw Bay, to Jackson, in the south central part of the state, and then turned northwest through Grand Rapids and Muskegon, it will be found that *fraternum* occurs only south of this zone, and *cavum* only north of it. Among hundreds of series in the Museum of Zoology, University of Michigan, and in my own collection, there is no exception to this. In the zone of separation both are found. Even here, each colony consists of one or the other, not both; only rarely have I found the two together.

Recently Pilsbry[1] has said of *cavum*, which he originally described with Vanatta, that he is "now inclined to think that its recognition as a subspecies is of little practical utility." Its definite geographical distribution in Michigan, combined with its recognizable characters, makes the retention of the name seem useful. It is a northern form, replacing typical *fraternum* not only in northern Michigan, but also in other northern areas with which I am familiar, such as Vermont, northern Wisconsin and Ontario, north of Lake Huron and in Peel County east of it. Further studies along the north boundary of the United States

are needed to establish the distribution outside of Michigan of these two forms.

MOLLUSCA OF CEDAR BREAKS NATIONAL MONUMENT, UTAH

BY WENDELL O. GREGG

During the Summer of 1935 it was my privilege to spend nearly three months at Cedar Breaks National Monument. This area is about 20 miles east of Cedar City, Utah. Here the Pink Cliffs, in some places exposed for a depth of nearly 2,000 feet, display a great variation of shades of color ranging from white or orange at the top to deep rose and coral. In contrast is the dark green of the heavily forested rim which attains an altitude of 10,400 feet. Though awed by the vastness of this spectacular beauty, my thoughts turned to the molluscan inhabitants which find shelter in these lofty forests of Engelmann spruce and alpine fir.

Though my collecting extended over the entire area, I collected most extensively in the region of "Sunset Point." Here the altitude was 10,000 feet. There was a moderate amount of moisture most of the time and but a few yards away a series of springs in a swampy meadow formed brooklets which were tributary to Long Valley Creek. All species listed except *Oreohelix strigosa depressa* (Cockerell) were found in the vicinity of "Sunset Point." *Oreohelix* was found in only one place at Cedar Breaks, along a steep wooded slope northwest of "Desert View."

The relative abundance of *Microphysula* was noticeable. The material collected here is referable to the Arizona subspecies, *Microphysula ingersolli meridionalis* Pilsbry and Ferriss. I had occasion to collect *Microphysula* from four other localities in southern Utah: Cedar Canyon, 10 miles from canyon mouth; southwest slope of Brian Head, Parawan Mts., at 11,000 feet altitude; head of Deep Creek, Kane County; and head of Mammoth Creek, Garfield County. These are all referable to *meridionalis*.

Many specimens of *Pupilla blandi* Morse were collected here, also from the following localities in southern Utah: head of Mammoth Creek; Zion National Park; head of Deep Creek; southwest

slope of Brian Head; and Cedar Canyon, 10 miles from canyon mouth. These specimens were all examined carefully and comparisons were made with unmistakable specimens of *Pupilla syngenes dextroversa* Pilsbry and Vanatta from Grand Canyon, Arizona. After a careful study it has been concluded that the Utah specimens are all referable to *P. blandi*. *Pupilla syngenes dextroversa* probably does not exist in this part of Utah.

The seventeen species and subspecies found at Cedar Breaks are:

Pisidium sp.[1]
Oreohelix strigosa depressa Cockerell.
Microphysula ingersolli meridionalis Pilsbry and Ferriss
Vallonia gracilicosta Reinhardt.
Vallonia cyclophorella Ancey.
Pupilla blandi Morse.
Pupilla hebes Ancey.
Vertigo gouldii arizonensis Pilsbry and Vanatta.
Discus cronkhitei cronkhitei Newcomb.
Vitrina alaskana Dall.
Zonitoides arborea Say.
Retinella electrina Gould.
Euconulus fulvus alaskensis Pilsbry.
Succinea avara Say.
Stagnicola bulimoides techella Haldeman.
Stagnicola bulimoides cassi Baker.
Stagnicola caperata Say.

FLUMINICOLA AVERNALIS AND *FLUMINICOLA AVERNALIS CARINIFERA* FROM NEVADA

By WENDELL O. GREGG

The material from which *Fluminicola avernalis* Pilsbry and *Fluminicola avernalis carinifera* Pilsbry were described bore only the indefinite locality "Colorado Desert." Dr. Pilsbry[1] assumed that this referred to the Colorado Desert in the usually restricted sense and gave the type locality as "Colorado Desert,

[1] The *Pisidium* has been turned over to Dr. Stanley Brooks for determination.

[1] Pilsbry, H. A., NAUTILUS, 48: 90, 1935.

California." Junius Henderson[2] later listed the above two with species from this region. We now restrict the term Colorado Desert to that desert region in California which lies to the west of the Colorado River and also the low lying areas which drain into the Salton Sink. "The northern limit of the Colorado Desert may be arbitrarily placed as far north as a line drawn from the Morongo Pass easterly to the Colorado River."[3]

It is suggested by Morrison[4] that *Tryonia clathrata* Stimpson is probably restricted to Nevada, and I know of no records which would definitely place it in California. On the basis of association with *Tryonia clathrata*, Morrison assumes that *Fluminicola avernalis* Pilsbry and *Fluminicola avernalis carinifera* Pilsbry are also from the Pahranagat Valley, Nevada, and not from the Colorado Desert in the restricted sense.

A discovery which I made in November, 1934, while acting as camp surgeon at a CCC camp near the Home Ranch, about six miles west of Moapa, Nevada, gives us one definite locality record for these two forms. At this camp site there are five or six warm springs, all within a distance of about 75 yards. The streams from these springs converge to form a brook which is tributary to the Muddy River. The temperature of the water at these springs varied from 87.5 to 89.5. The elevation was 1700 feet. The vegetation was typical of the lower desert flora. There were quite a few native palms (*Washingtonia*) along the brooklets with ash, screw-pod mesquite and white cottonwood. Having been told of the springs, my first thought was to look for mollusks, and I was not disappointed. The following five species were found: *Amnicola longinqua* Gould, *Tryonia protea* Gould, *Tryonia clathrata* Stimpson, *Fluminicola avernalis* Pilsbry and *Fluminicola avernalis carinifera* Pilsbry.

On some of the older maps the Home Ranch is designated as "Muddy Spring." It is about 50 miles south of the Pahranagat Valley.

I am indebted to Dr. Pilsbry for identifying the specimens of *Fluminicola* and *Tryonia clathrata*.

[2] Henderson, Junius, NAUTILUS, 50: 41, 1936.

[3] Jaeger, Edmund C., The California Deserts, p. 3.

[4] Morrison, J. P. E., NAUTILUS, 53: 124, 1940.

NOTES ON CHINESE SPECIES OF *ASSIMINEA*

By TENG-CHIEN YEN[1]

The history of *Assiminea*[2] is comparatively little complicated. The genus was proposed by Leach as early as "1819" in a manuscript, not being published till 1828 by Fleming. In 1821, Gray proposed *Nerita Syncera Hepatica* apparently for the same group of shells. However, in 1835 (Phil. Trans. Roy. Soc. London, p. 303), he recognized clearly: "The shell in question and its animal were described and figured by Dr. Leach, in his hitherto unpublished work on *British Mollusca,* under the name of *Assiminea Grayana;* and as this name has been referred to by Mr. Jeffries and other conchologists, it may be regarded as established, and that of *Syncera hepatica*, proposed by myself in the Medical Repository, vol. x, p. 239, will take the rank of a synonym."

Except that in his Manual of Mollusca Woodward adopted *Syncera hepatica* Gray for *Assiminea grayana* Fleming, *Assiminea* seems to have been accepted by most of the malacologists working in the century following. A few useful lists of species of this genus successively appeared in the literature, notably that given by Martens in 1866 (Ann. Mag. Nat. Hist. Lond. III, 17, pp. 202–207); Pease in 1869 (Jour. Conchyl., pp. 161–167); and Boettger in 1887 (Jahrb. d. malak. Ges., 14, pp. 147–234). In these lists, as in other early literature, some heterogeneous elements were included, but the last-mentioned work is by far the most comprehensive and useful as a basis for further studies of this genus.

So far as the Chinese species are concerned, two forms were involved in confusion, namely *Hydrocena chinensis* Pfeiffer and *Laguncula pulchella* Benson. During my last visit to Europe I was able to examine the type-lots of both species in the British Museum (Natural History), and found *Hydrocena chinensis* Pfeiffer is only the young form of a certain Borneo species of *Schistoloma* Kobelt, which has been so far not recorded from China. *Laguncula pulchella* Benson is a doubtful group of

[1] With the grant-in-aid from American Philosophical Society in Philadelphia and heartfelt thanks to Dr. H. A. Pilsbry for his encouragement.

[2] *Syncera* Gray 1821 of some authors.

Naticidae. I have dealt elsewhere with both cases in fuller detail as well as with illustrations, in a paper left in London for publication, and they are certainly not species of *Assiminea,* nor connected with Assimineidae nor Viviparidae.

Among other Chinese species of *Assiminea,* there are no fewer than 20 forms on record with but a few of them whose specific standing needs further consideration. However, these species seem to agree well with *Assiminea* Fleming with *Assiminea grayana* as its genotype, and most, if not all, of these Chinese species are comprised in one of my recent works on Chinese gastropods.[3]

In a recent issue of NAUTILUS (vol. 53 (2), p. 68), Dr. Morrison attempts to show that some of Chinese species, hitherto being accepted as *Assiminea,* belong to the Indian genus *Ekadonta* Rao, namely "*colombiensis*" (probably means *colombeliana*) and *scalaris,* both being described by Heude from Yangtze valley. He seems to be almost certain that the former is an *Ekadonta,* while the latter "may belong to this group also."

Assiminea colombeliana Heude 1885, a species named in honor of its collector, R. P. Colombel, is comparatively a narrower shell and was collected from a brackish habitat at the mouth of the Yangtze river. However, it differs but slightly from *Assiminea scalaris* Heude 1882, a very common species of amphibious habitat existing in the interior farther from the coast. These two forms are closely related, if not identical, and the latter opinion was held by Boettger (*l.c.*, p. 170).

As compared with Rao's detailed descriptions and figures of *Ekadonta shanensis,* I found that his species resembles in some shell and radula features *Assiminea scalaris* Heude, material of which is available in my hand at present. But, nevertheless, I fail to trace out much difference *in kind* of *scalaris* from *grayana.* It is true that, for instance, the marginals of *scalaris* carry more numerous and minuter cusps than that in the case of *grayana,* but could that difference be specific rather than generic?

On the other hand, if all other differences be proved that

[3] Yen, Teng Chien, Die chinesischen Land und Süsswasser-Gastropoden des Natur-Museum Senckenberg, Abhandl. senck. naturf. Ges. Frankfurt a. M., 444, S. 1–233, 16 Taf., 1939.

scalaris, as well as *colombeliana*, should rightfully be separated generically or subgenerically from *Assiminea*, Heude in 1882 already proposed *Solenomphala* for *scalaris* as a subgenus of *Assiminea*. Moreover, if both these Chinese species, *scalaris* and *colombeliana*, be further confirmed in detail comparison that they are congeneric with *Ekadonta shanensis* Rao, still Heude's name *Solenomphala* will have precedence over *Ekadonta* Rao.

LYMNAEA CONTRACTA CURRIER

By CALVIN GOODRICH

The mollusk was described by Currier in 1868 from shells taken in Higgins Lake, Roscommon County, Michigan. From time to time for seventy years thereafter, additional specimens were collected, but always from the same body of water. It has never been found in Houghton Lake, into which Higgins Lake discharges, or in Marl Lake, a small feeder of Higgins Lake and probably once an arm of it.

The most striking characteristic of *L. contracta* is the pinched, flattened, strongly shouldered body whorl. The plaited columella, for one character, justified Mr. Frank Collins Baker in connecting the shell closely with *L. emarginata*. In one form or another, this species is in all the lakes of the Higgins group and in at least one stream of it. *L. contracta* has not been found living, and from this Dr. Bryant Walker suspected that the shell is an occupant of deep water "that only comes to shore occasionally."[1] Still earlier, he ventured the opinion that it might be "semi-fossil" or "extinct."[2]

Among mollusks taken by Dr. Laurence C. Stuart in Barney Lake of Beaver Island, Lake Michigan, in 1939 were two examples of *contracta*. Though without soft parts, the shells were quite plainly of animals recently alive. I myself visited the lake in July, 1940. I came upon numbers of *contracta* which currents had brought together in shallow depressions of the lake bed, but yet did not see a living specimen. It is probably relatively rare. The fact of this rarity, both in Higgins and Barney lakes,

[1] F. C. Baker, The Lymnaeidae of North and Middle America, 1911, p. 434.
[2] Bryant Walker, NAUTILUS, 6, 1892, p. 33.

its geographical discontinuity and the resemblance to *L. emarginata*, which is common in the two regions, provides ground for the belief that *contracta* is not a true species, but simply an environmental variation. The identity of the shells has been verified by Mr. Baker.

Barney Lake lies in an irregularly shaped pocket, one end of which is a curving sand dune. A little over this dune is Lake Michigan. The owner of Barney told me that the water level varies with the general level of the large lake, and that at one time it went almost completely dry. This was when Lake Michigan was in a cycle of falling levels. So it may be that the molluscan fauna of the inland Barney Lake has to be renewed at periods and *contracta* has to be evolved from reintroduced *L. emarginata.*

A COMPARISON OF YOUNG *HELMINTHOGLYPTA UMBILICATA* AND *H. DUPETITHOUARSI*

BY GLENN R. WEBB

It seems desirable to record some chance observations on the likenesses and differences of equal sized 2–2½ whorled young of *Helminthoglypta umbilicata* (Pilsbry) and *H. dupetithouarsi* (Deshayes). The young *umbilicata* are the offspring of adults received from Mr. Ernest N. Wilcox, who obtained them from ". . . under old logs in a swamp just back of the pump station of the Union Oil Co. at Santa Margarita, California." I am equally indebted to Mr. E. P. Chace for the *dupetithouarsi* specimens, the parent material being collected under brush and trash of an open pine grove near Point Pinos, Monterey County, California.

The unsought opportunity of studying the young of these two species was occasioned by the numerous viable eggs deposited by adults kept for anatomic studies. In view of the fact that I have not had extensive personal experience with these Western land snails, and that much of the literature is probably unknown to me, these observations may not be entirely new.

Helminthoglypta umbilicata young: The slightly indented nuclear section of the embryonic whorl occupies one-fourth volution and is smooth, unpolished, and microscopically granular.

Within the next quarter-volution, transversely elongate pustules appear by the inferior suture, lengthen, increase in numbers, and ultimately bridge from suture to suture. Within the first-quarter of the last-half of the first volution, the elongate pustules tend to become broken-up, scattered, and slightly sinuous, disappearing on the whorl-face as dot-like papillae among the arising ripple-striae; the diminished, papilliform pustules persist by the inferior suture, however, until nearly the end of the first whorl. With the disappearance of the apical-pustules, a series of transverse, close-spaced, finely undulant or rippled striae appear and become progressively finer and closer spaced until they disappear on the post-embryonic whorl—breaking up into smaller and smaller segments to form micro-papillae. An examination of fresh shell-growth on a near-mature collected specimen failed to reveal either micro-papillae or the much larger hair-base papillae. The transformation of the ripple-striae is somewhat veiled by the conspicuous growth-striae which appear on the post-embryonic whorls.

The young shell is strongly hirsute on the early whorls with conspicuous, tapering hair-spinules; these arise on the last half of the first whorl. The hairs are aligned in protractive and retractive, oblique, curved series. This dual alignment is more perfect in some specimens than others, particularly in respect to the retractive trend. The hairs are shorter, closer spaced, and more numerous on the later whorls—the progressive shortening being quite apparent. The regular ripple-striae are interrupted about the base of the hairs, giving them the appearance of having erupted through the ripple-striae. The hairs on the post-embryonic shell (after the disappearance of the ripple-striae) still present this "erupted" appearance, being encircled sparsely by radiating, hyphen-shaped micro-papillae.

On most young shells, the revolving, brown shell-band is not yet evident.

The deep, narrow umbilicus exhibits numerous small, hyphen-shaped pustules aligned in curved, retractive series on the first whorl; but these seem to become transformed into scattered papillae on the second. The ventral-surface hairs (often disarrayed and variously twisted) do not usually extend into the umbilicus.

Helminthoglypta dupetithouarsi young are similar in general shell-sculpture to young *umbilicata;* however, there are a number of constant and nonconstant differences. Enumerated, the constant differences include:

(1) The shorter, more numerous hairs of *dupetithouarsi.* (2) The more widely spaced hair-lines of *umbilicata.* (3) The reddish shell of *dupetithouarsi* as compared to brownish *umbilicata.* (4) The prominent, red color-band of *dupetithouarsi.* (5) The more polished shell of *dupetithouarsi.* (6) The more intensely black-spotted mantle of recently hatched *umbilicata.* (7) The coarser, more intensive sculpture of the intra-umbilical whorls of *umbilicata.* (8) The less black more slate-blue body coloration of *dupetithouarsi.*

Whether all of these constant differences are typical of the species or merely relative to the respective strains of the species compared, I do not know. Stated for *dupetithouarsi,* the nonconstant characters are: the generally larger apical whorl; the weaker and more scattered apical pustules; the finer, less persistent ripple-striae; the smaller hair-base papillae and bent-tipped hairs, the curl causing the hair-tip to point in an up-spire direction; and lastly, the earlier development of the shell-band. These characters, by appropriate negative or positive implication, characterize *umbilicata* as well.

Before concluding this *dupetithouarsi-umbilicata* comparison, the resemblances demand consideration. Thus, as has already been suggested, the general plan of sculpture is similar for the two forms. Both have an initially smooth shell-nucleus, apical pustules, ripple-striae, hair-spinules, and "erupted-hair" appearance. The resemblances continue on the post-embryonic whorls in the "erupted-hair" marks and the numerous micropapillae.

By way of conclusion, I offer a few queries which presented themselves during the coarse of the observations. These are: (1) Do all young *Helminthoglypta* bear hairs? (2) Are the larger papillae evidence of past hirsuteness in adult shells? (3) Is *H. walkeriana* (Hemphill) papillate? (4) May not size of hair and space between hairlines afford important taxonomic-phylogenetic clues? (5) Would the offspring of alleged *dupetithouarsi-umbilicata* intergrades duplicate the differences cited here?

A casual survey of the most accessible descriptive data, principally from the synopsis of *Helminthoglypta* species presented by Dr. Pilsbry,[1] affords some interesting hints in answer to some of these queries. Thus, about 12 species are known to be hirsute: *H. benitoensis*, *H. californiensis*, *H. cuyama*, *H. cuyamacensis venturensis*, *H. dupetithouarsi*, *H. fontiphila*, *H. nickliniana*, *H. petricola* and var. *orotes*, *H. sequoicola*, *H. traski tejonis*, *H. tularensis sequoia*, and *H. umbilicata*. Also, all species except five (*H. allyniana*, *H. berryi*, *H. contracostae*, *H. exarata*, *H. ferrissi*) possess papillae. Possibly *H. walkeriana* should be included among the non-papillate species, although several specimens in my possession exhibit papillae in oblique, curved, protractive rows on the embryonic-shell.

THE TYPE OF *NEPTUNEA* "BOLTEN" RÖDING

Dr. Pilsbry, Chairman of Committee on Nomenclature, A. M. U., has received the following inquiry from Dr. Joshua L. Baily, Jr.

"Would you mind giving me benefit of your opinion on the use of the name *Neptunea*? This name first appeared in the Museum Boltenianum, 1798, without diagnosis. It included a multiplicity of species now placed in different families.

"In 1840 Swainson suggested the name *Chrysodomus*, naming *Neptunea antiqua* as type. Then in 1901 Cossmann named the same species as type of *Neptunea*. This serves to make the two names synonymous, and whichever name is used will be determined by whether a name published without a description has any standing. In this case where species were given it is possible to tell what the author intended, but the fact that he included a heterogeneous assembly makes it doubtful what he would have considered was typical of his genus.

"Then in 1918 Dall designated *Neptunea clathrus* Bolten as type of *Neptunea*. Apparently he was unaware of Cossmann's earlier designation or he may have believed that Swainson's selection of this species as type of *Chrysodomus* precluded its later selection by Cossmann. But *Neptunea clathrus* had already become the type of *Boreotrophon* Fischer, 1884, by monotypy. If this

[1] Pilsbry, H. A., 1939, Land Moll. of N. America, Vol. 1, pt. 1, pp. 63–201.

designation by Dall is allowed to stand *Neptunea* and *Boreotrophon* will be synonymous.

"There are thus two questions to be answered. First is the name *Neptunea* available at all, being nondescript? Second, if it is should it replace *Chrysodomus* or *Boreotrophon?*"

These questions have been considered by all members of the Committee, Horace B. Baker, Paul Bartsch, H. A. Pilsbry, and Harald A. Rehder, who unanimously agree in the following opinion, written by Rehder with the coöperation of Bartsch.

"Pilsbry has asked me to send you my opinion concerning the question of the type of *Neptunea* Bolten raised by Joshua L. Baily, Jr., as outlined in his letter herewith enclosed.

"It is the opinion of those of us here that the type designation of Cossmann (Essais de Pal. Comp., vol. 4, 1901, p. 99) is valid. However, there is an earlier type designation which seems to be valid and which is found in an article by Kobelt (Jahrbücher d. malak. Ges., vol. 3, 1876, p. 63). The sentences of importance in this connection are:

" 'Die Neptuneen der borealen und arctischen Regionen umfassen zwei ziemlich scharf geschiedene Gruppen, deren Typen einerseits Neptunea antiqua, andererseits islandica Chemnitz sind. Man hat aus ihnen zwei Gattungen, *Neptunea* and *Sipho,* gemacht, und Troschel hat in seinem ausgezeichneten Werke die letztere auf Grund einer Angabe Lovèn's sogar ganz von Neptunea entfernt und zu den Fasciolariiden gestellt.'

"This earlier type designation, *Neptunea antiqua* (L.), fortunately, does not change the nomenclature of this group."

Dr. Baily's question as to the validity of an undefined name is not here considered, as the list of species is accepted as an "indication" of the characters of a genus in the meaning of the International Rules, Art. 25a.

SOME SHELLS FROM SOUTH CAPE MAY BEACH

BY ROBERT C. ALEXANDER

Lying between the western end of the Cape May boardwalk and the Coast Guard Station at Cape May Point, New Jersey, is a strip of beach a mile and a half long. This beach has no name as

far as I have been able to discover but, because a portion of it extends along the ocean front of South Cape May, I have become accustomed to refer to it as South Cape May Beach. During the summer of 1940, I visited this beach many times.

Donax fossor Say and *Nassarius trivittata* Say live near the ebb tide line; *Spisula solidissima* Dillwyn, *Mytilus edulis* Linne, *Mytilus edulis* var. *pellucidus* Pennant, and *Modiolus demissus*, an inhabitant of the salt marshes, are found cast up alive on the beach by the breakers; and growing on shells washed up on the beach are *Crepidula fornicata* Linne, *Crepidula convexa* Say, and *Crepidula plana* Say. *Crepidula plana* usually grows inside the opening of empty gastropod shells but I have found it here several times growing on the exterior of *Mytilus edulis* shells.

Besides the common shells which are found on the beach, I have found the worn valves of *Astarte castanea* Say which inhabits the deeper water off the coast, a few shells of *Epitonium lineatum* Say, and two small shells of *Epitonium humphreysii* Kiener. I believe this is the first time *Epitonium humphreysii* has been reported from this place. On several occasions, I have found a number of separate valves as well as large, entire shells of *Solen viridis* Say. Whether this species still lives off-shore here or whether these shells are remnants of a by-gone period, I do not know.

A part of this beach has been washed away by the ocean currents revealing flat areas of old meadow sod some of which are exposed at ebb tide. In this sod lives *Petricola pholadiformis* Lamarck. Although the color of this shell is normally white, I have found a great many of them here with a dull reddish-purple coloration near the posterior extremity and sometimes throughout a young shell. This coloration may be an artificial condition caused by an excess of some chemical in the sea or the land in this locality. However that may be, the same coloration is present in shells on the bay shore several miles above Cape May Point in Cold Spring Harbor and also on the beach east of Cape May. *Urosalpinx cinerea* Say lives on these flats and I have found one small living specimen of *Barnea truncata* Say here too.

Fossil shells found here during the summer include two valves of *Arca* (*Noetia*) *ponderosa* Say; a full-grown specimen of

Busycon perversum Linne; and three specimens of *Neptunea stonei* Pilsbry, varying from less than three-quarters of an inch to two and a half inches in length. The largest of these *Neptunea stonei* shells, an extinct species, is one of the best-preserved specimens I have seen.

EFFECT OF SOIL MOISTURE AND ALGAE ON THE SURVIVAL OF A POND SNAIL DURING PERIODS OF RELATIVE DRYNESS

BY E. J. STRANDINE
Northwestern University and North Park College

The fate of aquatic snails in temporary prairie ponds during the dry summer months is a problem which few investigators have considered. Pilsbry (1896) records the observation that two dozen out of fifty *Lymnea bulimoides* Lea were still alive after having been out of water for 45 days. Cooke (1913) mentions that several aquatic snails will bury themselves in mud during periods of drought. Baker (1914) has observed that some species of aquatic snails may survive periods when ponds are dry, whereas in other species the adults die and only the eggs which are buried in the mud survive. Barlow (1933) has reported that certain species of Egyptian snails, which are involved in the spread of schistosomiasis, can survive drying for periods of 30 to 50 days. Van Cleave (1931) notes that the great drought of 1930 reduced land snails to 1 per cent of their usual numbers, and killed many pond and lake animals which were left in the dried out aquatic habitats.

During the course of an ecological survey of a temporary pond in Orland Park Township of Cook County, Illinois, I encountered a dense population of *Gyraulus parvus* (Say), which apparently is able to withstand long periods of drought.

This pond was completely dry from the first of August to the 11th of November, except for short periods following heavy rain storms. The algae (*Zygnema*, *Oedogonium*, and others) in the pond had formed a dry dense mat over the soil in the dried out pond, but the soil (Table 1) underneath this dry algal mat was very moist and exhibited a moisture gradient from the edge (Station A) to the deepest point in the pond (Station E).

TABLE 1

Station	No. in 10 cm. square			Per cent moisture in soil (Based on dry wt.)
	Total	Alive	Per cent alive	
A, near shore	51	11	21.6%	44.8%
B, on bottom flats	88	79	89.8	58.9
C, on bottom flats	66	56	84.9	
D, on bottom flats	71	64	90.4	
E, in deepest hole	142	122	86.0	113.9
Average	83.6	66.4		

All of the *Gyraulus parvus* found in an area 10 cm. square underneath the protective algal mat were collected, counted, and put into water to determine the number living. The result of quantitative collections on September 30 (*i.e.*, 60 days after drying out) in various regions on the dry pond bottom is shown in Table 1. Station A, which was near the shore and had been dry for the longest period of time (66 days), had the driest soil, the smallest population density (11 snails per 10 cm. square) and the smallest per cent (21.6%) of living snails. The greatest population density (122 living snails per 10 cm. square) was found in the deepest place in the pond where the soil moisture was the greatest. The high per cent of soil moisture in Station E was due to this area drying out last, and to the nearness of the surface of the soil to the water table, which was only six inches beneath the surface. Evidently, the algal mat and the soil moisture provide an environment which is favorable to the survival of many of these snails during periods of drought, when these aquatic snails aestivate. Less moist areas near shore are not as favorable for survival, as indicated by the percentage of dead snails.

That the greater number of snails were found in that part of the pond which became dry last is to be expected, as removal of the water tends to concentrate the population. Using the 5 quadrats which were taken at random on various parts of the pond bottom to compute the average number of living snails per unit area, we find an average of 66 individuals per 10 cm. square area, or 6600 per square meter, or 26,710,200 per acre of pond floor. Before the pond became dry, this number was undoubtedly

even greater. The great population density of this small snail indicates that *Gyraulus parvus* plays not an insignificant role in the community of this pond. The ability of this snail to survive during periods of drought is probably augumented by the protective action of a dense dry algal mat which is left on the pond bottom when the pond dries out.

The results of this study demonstrate that *Gyraulus parvus* produces a dense population in this temporary prairie pond; that a high percentage of these snails can survive long periods of drought; that the algae in the pond form a protective mat on the bottom of the pond when it dries out; and that the great amount of moisture in the soil of the dried pond and the protective algal mat provides a favorable environment for the survival of these snails.

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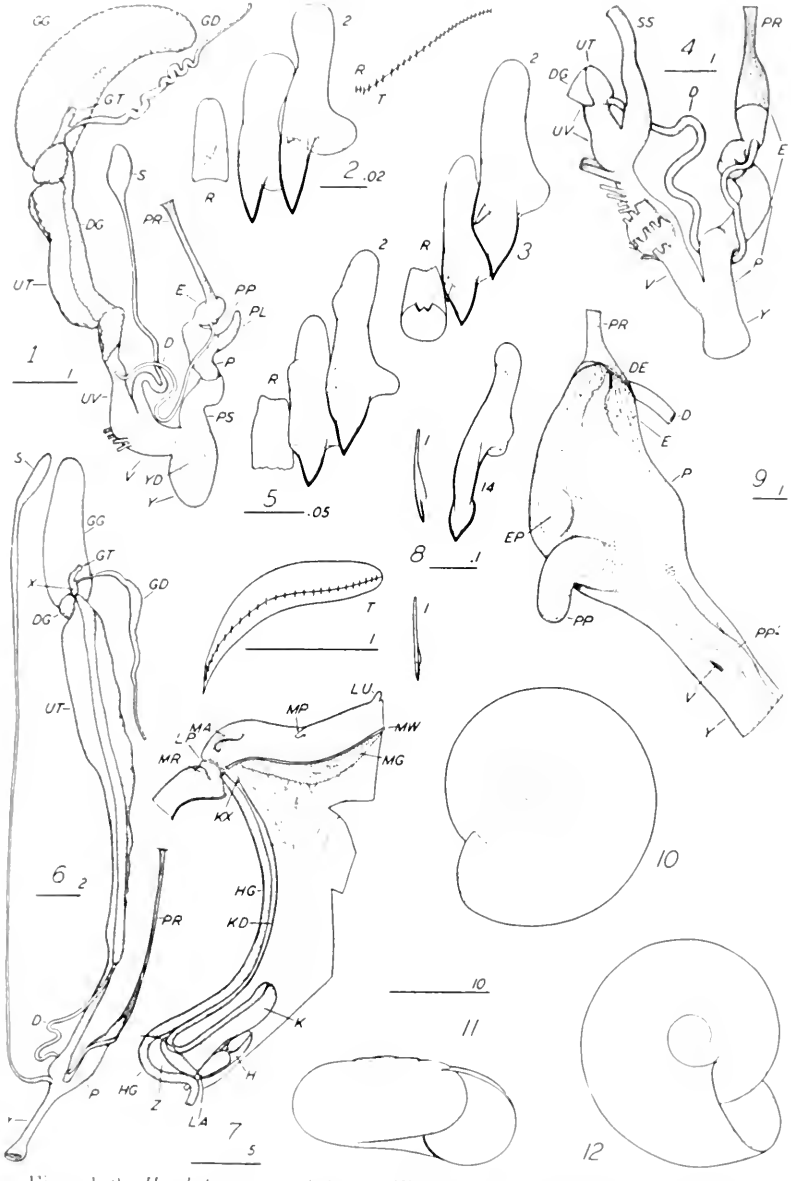
SOME HAPLOTREMATIDAE

BY H. BURRINGTON BAKER

Since 1930 (Proc. A.N.S.P., 82: 307), Drs. W. O. Gregg and G. D. Hanna have kindly sent me the animals of 3 additional species of *Haplotrema* from California, and 2 of *Austroselenites* have been collected in Puerto Rico. In plate 9, the small numbers at the end of each scale indicate their lengths in mm. or fractions. Those abbreviated labels, which are not explained in the text, are defined in Bull. Bishop Museum 158: 92–93 (1938).

Incidentally, in 1930, I retained the term "entocone" for the



Figs. 1–2. *Haplotrema cadatum*. Figs. 3–4, *H. vaganum*. Fig. 5, *H. transfuga*. Figs. 6–7, *Anstrosclenites concolor*. Figs. 8–12, *A. alticola*.

peculiar and very variable denticle under the principal cusp on some inner radular teeth of *Haplotrema*. But, since the true entocone disappears first in most pulmonates that approach carnivorous dentition, it may actually be the mesocone, which would make the principal cusp an ectocone, homologous with the one that, on the laterals of the Spiraxinae, about equals in size the mesocone, but, in most Oleacinidae, completely disappears. The compounded term "under-cusp" seems self-explanatory and obviates any decision. Because laterals and marginals are rarely differentiated, "centrifugals" is also used, to include all teeth except the centrals.

HAPLOTREMA (GREGGIELLA) CAELATUM (Mazýck), new subgenus (Plate 9, figs. 1, 2).

The figured animals were collected Dec. 6, 1931, by Dr. W. O. Gregg (for whom the subgenus is named), under willow trees, along Los Angeles River, near Glendale, California.

Animal similar to *H. alameda* but foot lighter; lung with black blotches. Ovotestis (omitted from f. 1) with 7 small, fan-shaped lobes of few clavate alveoli visible, in basal half of apical liver lobe. Epiphallic chamber (E) more constricted at base. Penis (P) with a white diverticulum (PL) and containing a subapical stimulator-papilla (outlined at PP). Atrial stimulator (outlined at YD) quite large; atrial opening not far from inferior tentacle. Radular formula (f. 2): 25 + 1 + 25; 50 rows counted; central without definitely free cusp; vestigial under-cusp on second tooth but absent from all others.

Greggiella, type *H. caelatum,* differs from *Ancomena* in its penial diverticulum, which is reminiscent of *Salasiella* and *Oleacina,* in its simpler radula, and in the heavy and angular, but low riblets on its smaller shell.

HAPLOTREMA (ANCOMENA) TRANSFUGA (W. G. Binney) (Plate 9, fig. 5).

The figured animals were collected April 20, 1940, by Dr. W. O. Gregg, in La Mision Valley, Baja California.

Animal similar to *H. alameda* Pilsbry, H.B.B., 1930: 414. Spermatheeal sac long ellipsoid; free oviduct with slender apical region and more abruptly swollen base. Internal folds of apical

penial chamber more papillate. Radular formula (f. 5): 13 + 6 + 1 + 19; 35 rows counted; central without evident cusp; undercusps without definitely free points but represented by thickenings on inner 6 teeth, under and apparently fused to undersides of principal cusps.

The divergences in genitalia between *H. transfuga* and *H. alameda* might be due to differences in contraction, but the radular ones seem slightly more important.

Thiele's (1931, Handbuch) reduction of *Ancomena* to the synonymy of his *Proselenites*, although reasonable enough, is nomenclatorially indefensible. Incidentally, the apparent discourtesy of my (1928) valid designation of *H. concavum* as the type of *Proselenites* came about because, at the time, neither Thiele nor I had realized that *Ancomena* (*H. vancouverense*) and *Geomene* (*H. concavum*) were even sectionally distinct.

HAPLOTREMA (ANCOTREMA) VOYANUM (Newcomb) (Plate 9, figs. 3, 4)

The figured animal was collected in June, 1931, by Dr. G. D. Hanna, along a small creek entering Stuarts Fork, Trinity River, ½ mile north of Trinity Alps Camp, Trinity County, California. No embryos have been observed by me.

Animal similar to *H. sportella* (Gould), H.B.B., 1930, Proc. A.N.S.P. 82: 418. Lung with brown spots, sometimes grouped into a vague network. Vagina (V, f. 4) much longer, with muscular collar near middle. Penial retractor (PR; ⅔ omitted) arising partly from diaphragm but connecting with nearby tail fan by muscle strands. Penis (P) internally shows, in apical half, high, papillate folds below entrance of vas deferens; small apical pocket much less sharply demarcated; basal chamber very thick-walled, but with longitudinal folds much weaker towards apex (basally also smooth when everted). Radular formula (f. 3): 12–13 + 8 + 1 + 20–21; 29 rows counted; central with two minute points, visible only on more posterior teeth; under-cusps longer, on inner 8 teeth.

The longer vagina, the shifted origin of the penial retractor and the stronger radular entocones of *H. voyanum* approach the conditions in the section *Ancomena*.

AUSTROSELENITES (ZOPHOS) CONCOLOR (Férussac) (Plate 9, figs. 6, 7). *Z. c.* H.B.B., 1925, Occ. Papers Mus. Zool. Univ.

Mich. 56: 19, radula. *Haplotrema c.* H.B.B., 1920, Proc. A.N.S.P. 82: 422, fragmentary anatomy.

The figured animal was collected Aug. 24–29, 1939, under limestone rocks in rich humus, altitude 0–300 feet, 2 miles south of Cataño, Puerto Rico. It was not pregnant but had apparently been so. This species appears to attain sexual maturity at almost any size; the uterus in some specimens contained as many as 7 large, shell-less eggs, in others embryos.

Sides of foot blue-blackish with white sulci; tentacles dark; tail abruptly pointed. Lung (f. 7) colorless except for black blotches over kidney (K), which has a transverse extension towards hindgut (HG); ureter (KD) complete; mantle-glands (MG) broadly invading. Ovotestis (omitted from f. 6) with 8 lobes, separated by liver tissue, visible in basal $\frac{2}{3}$ of long apical liver lobe. Hermaphroditic duct (GD) swollen. Talon (GT) digitiform with apical white knob; carrefour (X) largely exposed. Uterus (UT) very thin-walled after (and greatly swollen during) pregnancy. Spermathecal sac (S) ellipsoid (often more swollen), imbedded, between stomach and first limb of intestine, to opposite apex of albumen gland (GG). Anterior genitalia very slender. Penis (P) enervated from cerebral ganglion. Pharyngeal retractor separating almost immediately, as heavy as all others combined and enveloping apex of buccal mass; tentacular retractors very soon free; right ommatophoral free from genitalia; inferior tentacular branching off just behind nerve ring; lateral retractors fused to tail fan. Labial lobes not evident. Buccal mass stout and cylindric, almost as long as retracted foot, with heavy protractors, and with oesophageal entrance not much over 0.1 length from anterior end (about 0.4 in *Haplotrema*); oesophagus often greatly swollen anteriad to form a conical crop stouter than and as long as buccal mass; stomach small and little more swollen than upper oesophagus or intestine; second of S-loops (HG, f. 7) short. Salivary glands slender, $\frac{1}{4}$ as long as buccal mass, lying above oesophagus, attached to both body walls by muscles and fused for 0.8 of length; ducts 3 times as long as glands. Cerebral ganglia closely joined but pleural or pedal connectives often 10 times as long as either ganglion; pleural, parietal and visceral ganglia juxtaposed; right parietal and visceral only demarcated by shallow groove; buccal ganglia relatively larger than in *Haplotrema*. Jaw fold without evident cornification. Radular formula of large individual: 35 + 0 + 35; 68 rows counted. Formula for 2-whorled embryo: 25 + 0 + 25; teeth relatively somewhat stouter but very similar.

These more complete data on the shape of its kidney, with complete ureter, its more thoroughly vestigial jaw and its much larger radular pouch, as well as the radula, of which the embryonic data seemingly connote ancient fixation, all indicate that *Zophos* is but distantly related to *Haplotrema*. On account of its very similar shell, it is still subordinated to *Austroselenites* Kobelt (1905).

Although well preserved animals of *Haplomena* will be needed for proof, the salivary glands, long kidney and lack of radular central in *A.* (*?*) *paucispira* (Poey) suggest that it also belongs in this genus. The first radular centrifugal of this species has been reëxamined and its "vestigial entocone" is, even when most evident, little more than an angle on the thickened support of the main cusp.

Until new studies of *Haplomena* can be made, the **new subfamily,** Austroselenitinae, is retained in the Haplotrematidae, although it seems, in some ways, more aberrant than the Rhytidae and similar to the Spiraxinae, as outlined in the following key to agnathomorph families and their American subfamilies:

1. Kidney triangular or longer than broad; penis not armed with thorns and with weak epiphallus; genital talon evident; shell heliciform or depressed, umbilicate and with simple columella; lung with weak minor venation . . . . . Haplotrematidae.

1a. With kidney and ureteric opening separated from hindgut by posterior angle of lung-wall; S-loops of hindgut large; salivary glands forming a ring around oesophagus; shell-growth discontinuous and peristome thickened or weakly reflected; jaw thin but large; radula with reduced central and with under-cusp represented on some inner centrifugal . . . . . Haplotrematinae.

1b. With hindgut limb of kidney evident and ureter complete; S-loops much reduced; salivary glands forming lanceolate shield over gullet; shell-growth continuous and peristome sharp; jaw at best vestigial; radula without central and with all centrifugals unicuspid . . . . . Austroselenitinae.

2. Like 1, with kidney and S-loops (excl. *Schizoglossa?*) like 1a and salivary glands, shell-growth and radula (central various) like 1b, but talon apparently smaller, jaw absent and lung venation like 3a . . . . . Rhytidae.

3. Like 1, with shell-growth like 1b, but talon vestigial, shell elongate and usually imperforate, columella variously

modified, jaw absent, and radular centrifugals with mesocone becoming dominant ..... Oleacinidae.

3a. With kidney, S-loops and salivary glands like 1a; radular centrifugals with mesocone always largest and ectocones usually lost; epiphallus usually more prominent and lung in big species strongly venate ..... Oleacininae.

3b. With kidney, S-loops and salivary glands like 1b; ectocone on all centrifugal teeth and subequal to mesocone on laterals ..... Spiraxinae.

4. Unlike 1–3, because kidney more oblong and transverse, and penis armed with thorns, but radula like 1b, 2 or most 3a, shell-growth like 1a but more so (excl. *Streptostele?*) and lung venation like 3a ..... Streptaxidae.

AUSTROSELENITES (Z.) ALTICOLA, **new species** (Plate 9, figs. 8–12).

The type (A.N.S.P. 177180) and the figured animals were collected under dead leaves and strips of bark, near the top of El Yunque, altitude 3000–3500 feet, eastern Puerto Rico (station ER4), July 12 and 14, 1939. The uterus of the type contained two subspherical chalk-shelled eggs about 2 mm. in diameter; a specimen 11 mm. in shell-diameter contained 5, but the protandrous animal figured, although almost as large as the type, had immature female organs. *A. alticola* was only obtained at altitudes above 1500 feet, but was found as far west as Maricao, often with similar eggs but never with embryos.

Shell (f. 10–12) similar to *A. concolor* but almost flat apically, with larger, more terete whorls, but with closer sutural spiral and smaller umbilicus; darker in color (type almost black), without distinct varices. Embryonic whorls (badly eroded except in very small shells) about 2, appearing polished but soon assuming fine, weakly incised, spiral striae, and more gradually developing growth-threadlets. Later whorls with much more regular and sharper, subequal, closely spaced growth-threadlets (about 24 per mm. on late 5th), which gradually weaken on base; spiral striae becoming almost obsolescent; suture less impressed and more widely overriding. Aperture much more evenly rounded, with dark blue interior; peristome sharp and simple, weakly arcuate above and about 25° to shell-axis. Umbilicus conoid; maj. diam. 4.3, minor 4.9 times in maj. diam. of shell. Altitude 11.1 mm., maj. diam. 222 (22.4 mm.), min. diam. 179 (19.85), alt. apert. 8.7 (9.7), diam. apert. 95 (9.25); 5.6 whorls. Maj. diam. at 4.5 wh., 12–(?); 5 wh. 16.85; 5.5 wh. 22.0; 6 wh. 27 + (?) mm.

Living animal almost black with bluish-green sulci, or with longitudinal black stripes on tail; lower tentacles with pale tips; eyes small and ommatophores not much enlarged apically; mantle-collar and lappets bluish-green; tail almost cylindrical. Has habit of raising anterior end, which is longer than tail, off the ground. Anatomy similar to *A. concolor*, but mantle-glands less deeply invading; lung about 6 times as long as its base or over 2.5 length of kidney, which is slenderer and about twice its base or pericardial length. Genitalia very similar but penis relatively larger and more stoutly fusiform, with terminal entrance (DE) of vas deferens (D); internally (f. 9, opened out), more spongy epiphallic chamber (E; sometimes containing a soft spermatophore) demarcated largely by an ovoid thickening (EP); middle region of penis (P) containing a large papilla (PP) with apical half recurved, digitiform and free; basal part with a pilaster (PP'), which continues halfway down atrium (Y; mostly omitted). Jaw apparently represented by a very much wrinkled plate, which is usually doubled around jaw fold but appears weakly cornified. Radular formula (f. 8): 24–25 + 0 + 24–25; 49 rows counted; inner 4 or 5 teeth similar, increasing rapidly in size; others developing sharp wings on either side of tip, attaining (9th or 10th) almost 0.5 in length, then gradually decreasing (to 23rd) and finally diminishing rapidly until last is about 0.6 as long as first. [T shows shape of right half of a crowded posterior row; anterior ones may expand to over twice as long.]

The structure of the penis and the expanded tips of most radular teeth indicate that *A. alticola* is a very distinct species from *A. concolor*. Also, no intergradation in their shells has been seen, although *A. alticola* sometimes has fairly evident varices on a diluted background. The oviparity of this highland species seems probable but is not completely proven.

AQUARIUM BEHAVIOR OF *EUNATICINA OLDROYDII* (DALL)

BY WILLIAM MARCUS INGRAM
Zoological Laboratory, Cornell University

The specimens of the Gastropod, *Eunaticina oldroydii* (Dall), upon which this paper is based were obtained in October, 1937, by means of a beam-trawl of the kind commonly used by Monterey Bay fishermen in obtaining flounders. Twenty animals

were taken in approximately 20 fathoms of water off-shore from Elkhorn Slough, which empties into Monterey Bay. An additional 5 specimens of uncertain locality other than Monterey Bay were supplied through the courtesy of the Hopkins Marine station of Leland Stanford Jr. University. The animals were brought into the Agassiz laboratory of the marine station and placed in marine aquaria supplied with running sea water. A sand bottom was provided in an attempt to approximate a natural benthonic habitat.

Data listed here include method of reproduction, formation of the egg collar, movement, and burrowing by *Eunaticina.*

The fact that 20 specimens of *Eunaticina* were collected from one locality by the writer, and that the 5 presented to him by the Hopkins Marine Station were also collected together, possibly indicates that this mollusk is a gregarious one. Ideal bottom conditions no doubt bring individuals naturally together. Individuals thus form aggregates to enjoy ideal environmental conditions offered by only restricted areas of sea bottom.

Copulation.—The act of copulation was observed once among the animals kept under observation in the aquaria. The opening of the genital duct in both male and female of this dioecious species is located at the base of the columellar muscle on the right side of the animal, necessitating an approach of the sexes in opposite directions preparatory to the copulatory act. In the instance under observation this process occurred while both animals were active on the surface of the sand in the aquarium. The male was the aggressor; approaching the female "head-on" in order to bring the penis in close proximity to the external genital opening of the female. The male inserted the penis into the vagina on the fourth attempt. His failure in the first attempts was due to the temporary obstruction caused by the right dorsal margin of the propodium, which rests in front of the vaginal opening, and had to be forced aside before the external sex organs could come in contact with one another. The copulatory act consumed 47 minutes. During the process slight muscular contractions and expansions passed over the foot. No actual purchase upon one another by use of the foot was attempted by either sex during the act.

Egg Collar Formation.—One egg collar, characteristic of the *Naticidae,* was observed still in the gelatinous state, but in such a condition that no measurements of its diameter or circumference could be obtained. This collar was adhering to a female which had been removed from under the sand in an aquarium and killed for dissection. The collar was in place around the foot under the dorsal extensions of the propodium, mesopodium, and metapodium. A dissection of the oviduct showed that it was distended with eggs embedded in a mucous mass. This information together with other available data on the anatomy of the female genital tract, and field knowledge about completely formed collars in related genera of the *Naticidae*, *Polinices* and *Natica,* make possible the reconstruction of the egg laying process given below.

Gross dissections of females with ripe ovaries indicate that there are two general histological divisions of the oviduct, namely, a proximal non-glandular portion, and a distal glandular portion. Eggs occupying the extent of the oviduct were found in two females. The eggs in the non-glandular area lacked the addition of the mucous mass, while those in the glandular portion were embedded in mucous.

The egg mass in the captive individual was apparently secreted while the female was under the sand. The first eggs to be forced from the oviduct are apparently directed by the pressure of the succeeding eggs, since the distal half of the oviduct is glandular rather than muscular. On reaching the external genital opening, the eggs in the mucous mass are directed around the shell between it and the dorsal expansions of the three foot divisions until they make a complete circuit of the shell. When this circuit is completed the initial part of the gelatinous mass overlaps the portion which is still issuing from the oviduct. Since the egg mass is held in place between the shell and the foot divisions it is prevented from floating away until the collar is complete. Sand is apparently allowed to accumulate between the foot and the shell during the egg-laying process, for the presence of innumerable sand grains in the incomplete egg collar of *Eunaticina oldroydii* (Dall) and in mature collars of *Polinices* and *Natica* seems to indicate that sand is a mechanical factor which serves to give

them stiffness. Egg collars collected in the Monterey Bay region offer evidence that they are allowed by the female to float free after they have been completed. The writer has often observed similar collars of *Polinices* in the mud-flat region of Balboa Bay, California, both in place and floating. Johnson and Snook (1935), concerning egg collars of *Polinices lewisii* (Gould), *P. draconis* (Dall), and *P. recluziana* (Deshayes), state, ". . . the eggs are laid in a gelatinous sheath which is apparently moulded over the foot of the animal for it is about the same size, and shaped like a collar. These "collars" are encrusted with sand. . . ."

Movement.—Movement in this species of *Eunaticina* is accomplished by waves of contraction initiated at the tip of the metapodium. These waves pass over the mesopodium and terminate at the anterior extremity of the propodium. The animal, by means of the transversely situated mucous gland located at the posterior-ventral portion of the propodium, secretes a viscous substance which is laid down on the substratum, and over which the mesopodium and metapodium pass with ease.

The animal precedes forward movement by a cautious testing of the substratum with the tip of the propodium; if the substratum is satisfactory it moves ahead; if not it bends the propodium laterally and turns to one side. In the aquaria it was often observed that if a rock were placed in the path of one of the animals, it made no effort to try to surmount the obstacle, but instead turned aside and moved around the rock or reversed its initial path of progression. The activity of these mollusks as observed in the aquaria was nocturnal rather than diurnal.

Burrowing.—The time consumed in burrowing, from the surface of the sand until the animal assumed its normal resting position under its surface, was recorded for twelve individuals. This time varied from one minute and fifty seconds to three minutes, with an average of two minutes and fifteen seconds for the animals subjected to these tests.

The means by which the mollusk accomplishes its burrowing are quite interesting. Crawling over the aquarium bottom, apparently trying to find a suitable place to burrow, it tests the surface from time to time by lifting the tip of the propodium and

pressing it against the sand. The highly developed, muscular tip of the propodium serves also as an efficient wedge in forcing an entrance into firmly packed sand. When a suitable location is found the animal thrusts the tip of the propodium downward and turns it back and forth. The mesopodium and the metapodium are held parallel to the bottom on the surface of the sand for purchase, while the propodium pushes the sand from side to side. When the propodium is well submerged the mesopodium and metapodium are raised free from the bottom at an angle comparable to that at which the propodium first entered the substratum, and twisting them both from side to side, accompanied by additional lateral movement of the propodium, the animal makes its final entrance. The body of the animal is then adjusted so that the sole of the foot is parallel to the bottom of the aquarium. This final position was observed always to leave the apical whorls and the pseudosiphon projecting from the sand, thus, apparently, allowing the animal to control the water content of the mantle cavity.

It is to be understood that the observations included here were made in aquaria. They should not be thought of as applying to this species in its natural habitat. Exceptions to scientific rules exist throughout the animal kingdom; the included data may be only one phase of egg collar formation, copulation, burrowing, and movement. When more of these animals are studied no doubt variations in carrying out actions cited here will be found.

I wish to express my gratitude to Dr. Taga Skogsberg, who first interested me in the study of this mollusk at the Hopkins Marine Station of Stanford University.

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NOTES AND NEWS

THE BEAL COLLECTION.—The large and valuable collection of shells assembled by Dr. J. H. Beal, of Merritt Island, Florida, and presented by him to Rollins College, was opened to the public

on February 22. It occupies a special building on the Rollins campus, the gift of Mr. B. L. Maltbie, of Newark, N. J., and Altamonte Springs, Fla. The collection comprises shells from all over the world, and is notable for the beauty and perfection of the specimens. One of its treasures is the great Mosier collection of Florida *Liguus*. Conchologists visiting Florida should not fail to include Rollins College, Winter Park, in their itineraries.

A SINISTRAL ALBINO.—In the molluscan collection of the Kent Scientific Institute of Grand Rapids, Michigan, recently transferred to the University of Michigan, is a specimen of *Helminthoglypta nickliniana ramentosa* (Gould) which is sinistral, and at the same time albino. The color is pure white except the embryo shell, amounting to one and a half whorls, that is slightly tinged with yellow. The specimen is labelled simply as from California. No clue is provided as to who the collector was. In looking over accounts of species that are rarely sinistral and whose sinistrality is reported upon, no instance was found reported in which the abnormality was combined with albinism. I admit the search has not been thorough.—CALVIN GOODRICH.

Viviparus contectoides BINNEY IN MASSACHUSETTS.—While collecting in Fresh Pond, Cambridge, Massachusetts, during October, 1940. I found examples of *Viviparus contectoides* Binney. This species is well established in Little Fresh Pond, and is also found in several other small bodies of water nearby. This is a new record for this species, since it has not previously been cited from Cambridge, Massachusetts. Although this species was recorded by C. W. Johnson from the public gardens in Boston (NAUTILUS, 1916, Vol. 30, p. 72) it has since disappeared there.—RICHARD I. JOHNSON.

Myrsus H. AND A. ADAMS 1858, THE VALID NAME FOR *Apolymetis* SALISBURY 1929.—When A. E. Salisbury (Proc. Malac. Soc. London, vol. 18, 1929, p. 255) rechristened the preoccupied name *Metis* H. & A. Adams (Genera Recent Mollusca, vol. 2, p. 399) *Polymetis* Salisbury, and then later (*op. cit.*, p. 258) named it *Apolymetis,* he did not realize that H. & A. Adams had already given their genus a new name. In the Additions and Corrections

of their work, found on pages 653–660 of the second volume, and published in 1858, they replace *Metis* with *Myrsus* H. & A. Adams (p. 660), which therefore becomes the proper name for this group. This name has been generally overlooked, as the most recent workers have used the name *Apolymetis* Salisbury. S. A. Neave, however, in his Nomenclator Zoologicus, cites it, as do Schulze *et al.* (Nomenclator animalium generum et subgenerum). Strangely enough, Grant and Gale mention it in the synonymy of *Apolymetis* (Mem. San Diego Soc. Nat. Hist., vol. 1, 1931, p. 363), but they apparently did not realize the validity of the name.—H. A. REHDER.

WINTER "COLONIZATION" OF SNAILS.—On February 5, 1941, I uncovered a "colony" of snails containing four species. Included were 58 *Mesodon thyroidus* (Say) (of which two were immature), 14 *Triodopsis tridentata* (Say) (one of these was an empty shell), two *Anguispira alternata* (Say) and one *Ventridens ligerus* (Say). They filled an area that would be the equivalent of about one liter. Soil filled all interstices between the specimens, and adhered closely to all the shells even after the animals became active. The temperature at the time of uncovering was about 30° F. The snails were about 12 inches below the surface of the leaf mold, which was two inches thick and frozen, as was the first two inches of the soil. There was about five inches of snow over all. The animals had clustered on the uphill side of a log, and were not directly beneath the log itself.

Most of the animals became active within three or four hours after being introduced into a terrarium. They were all active within 12 hours.

None of these snails had an observed epiphragm, but all had a soil "plug" that filled about the first ¼ whorl of the shell. This was pushed out with the posterior end of the foot as the animals became active.

The locality was near the Churchill Valley Country Club in Churchill Borough, Allegheny County, Pennsylvania. It was situated on a hillside which sloped in a northerly direction.

R. E. Call in his Mollusca of Indiana (1898) mentions several species, including *Mesodon thyroidus* (Say), as commonly occurring in such situations, but I think this is the first record of such

a "colony" containing more than one species. Although this colonization action has apparently been observed a number of times I have never seen any full descriptions of such colonies.—CHARLES B. WURTZ.

COPULATION AND EGG LAYING OF *Mesodon thyroidus* (SAY) AT ITHACA, NEW YORK.—The writer has an additional copulation date of *Mesodon thyroidus* (Say) to add to those of Van Cleave and Foster (1937, NAUTILUS, vol. 51, no. 2, p. 51). A pair of snails were found copulating on October 16, 1940, in the Cascadilla Creek Gorge at Ithaca, New York. This record gives further evidence that in some individuals of this species of snail fertilization occurs in the fall, and that the eggs are retained within the parent during the winter months and are deposited in the spring. The copulation records of the above writers for *M. thyroidus* in Illinois were made on November 2, 1931, and on September 21, 1935. The same authors report that egg laying by this species in the field continued until August 15 in Illinois. Freshly laid egg masses of *M. thyroidus* were found in beech and in sycamore woodlands at Ithaca in the fall of 1940 as late as October 1. Field observation of such masses indicates that they are destroyed by cold weather and do not hatch.—WILLIAM MARCUS INGRAM, Zoological Laboratory, Cornell University, Ithaca, New York.

Turritomella, NEW SUBGENERIC NAME FOR *Turritoma* BARTSCH.—My attention has been called to the fact that Ulrich and Scofield published *Turritoma* in 1897, Mem. Acad. Sci. Torino, ser. 2, vol. 42, p. 623, which of course antedates my *Turritoma*, 1941, Proc. Biol. Soc. Washington, vol. 54, p. 7, Feb. 26. I therefore suggest *Turritomella* to replace my *Turritoma*.—PAUL BARTSCH.

MARL DEPOSIT IN HOULTON, AROOSTOOK COUNTY, MAINE.—On August 16, 1933, near the Maine No. 1 highway, on Mr. Edward C. Currier's farm in the northern part of Houlton, I discovered a peat bog of about 4 feet in thickness. It was underlaid by a marl bed about a foot thick, and in this marl deposit are a lot of fresh water shells, all of which are of a large size for their species. *Lymnaea stagnalis* L. is found in the top of the marl and must have been in abundance as several specimens were there, all of a

good size, but so brittle that only a few good specimens were secured. This is the first time this large fresh water snail has been found in the eastern part of North America to my knowledge.

A list of the fourteen species of shells observed follows:

Valvata lewisi Currier
Physella heterostropha Say
Lymnaea stagnalis Linne
Fossaria obrussa decampi Streng
Helisoma trivolvis Say
Helisoma antrosa Conrad
Helisoma companulata Say
Gyraulus parvus Say
Sphaerium sulcatum Lamarck
Sphaerium rhomboideum Say
Musculum securis Prime
Pisidium variabile Prime
Pisidium ventricosum Prime
Pisidium contortum Prime

OLOF O. NYLANDER, Caribou, Maine.

MARL DEPOSIT IN BONAVENTURE, NORTH OF BAY CHALEUR, QUEBEC, CANADA.—Since the opening of the road from St. Leonards across the north of New Brunswick to Bay Chaleur, I have been able to make a trip there nearly every summer; sometimes even two. My chief object has been to check up on the many publications related to the fossils and to collect specimens for my collection, and to take photographs of the most important places.

On October 19th, 1940, we stopped at a place along the road to examine a marl deposit that I had noticed in passing by there several times before. This was on a farm belonging to Mr. Leazari Henry in east Bonaventure, north of Bay Chaleur. The day was cold and windy, and our time limited, so I could not spend the time to give the subject all the attention it should have had. The marl deposit is 12 feet thick (overlaid by two feet of peat), which has been worked for 17 years. The marl was sold to farmers for 50c a yard and is used for improving the land. The marl is largely deposited by algae and some remains of fresh water shells. In the top layer of the marl are a lot of the large fresh water snails, *Lymnaea stagnalis* L., in a good state of preservation.

Fossaria umbilicata C. B. Adams, rather scarce.
Helisoma trivolvis Say, 7 specimens
Gyraulus parvus Say, common
Sphaerium sulcatum Lam, 1 partly preserved
Pisidium, 1 large specimen of a species not seen before

This last one is remarkable. *L. stagnalis* is abundant in the top layer. To my knowledge it has not been found living in any body

of water in north-eastern America where all the other species are of common occurrence.—Olof O. Nylander.

A Wisconsin Colony of *Helix pomatia* L.—Some years ago while gathering specimens of land snails along the banks of the Milwaukee River some ten miles north of the city of Milwaukee, my attention was drawn to numerous large empty shells of a species with which I was unfamiliar. Thinking I had discovered something unique, I brought a few empty shells home with me. Investigation proved them to be *Helix pomatia*, the European edible snail. Becoming more interested in my find, I revisited the site and found numbers of living specimens. The question then arose as to the origin of this colony. My efforts at first were fruitless, but in a casual conversation with a naturalist friend I learned that they had been planted on an island in the river some miles north of the colony and had been used as a source of food by an epicure. Some years ago a spring freshet washed them away from the island but apparently a few must have floated downstream and landed on the mainland where they have apparently become permanently established.

The colony at present is flourishing and living specimens can be found at any time during the summer.[1] The colony is located in a county park but in a location not much frequented by picnickers. If not ruined by some W.P.A. project it should be permanent.

Two years ago I planted a few on a point in Pine Lake in Waukesha county about thirty miles from Milwaukee, but so far have not succeeded in finding any active colony.—Dr. Robert G. Washburn, 2502 N. Frederick Ave., Milwaukee, Wis.

Cleaning Shells with Aid of Blow-fly Maggots.—During the past Summer, June 26th to Oct. 19th, 1940, while engaged in the herring fishery at Thum Bay, Knight Island, Prince William Sound, Alaska, I collected a large series of the slender variety of *Thais lamellosa*, which reaches its perfection in beauty in Prince William Sound. About 1,000 selected specimens were taken in all sizes, colors, shapes and in different depths and habitats.

[1] They are associated with *Allogona profunda*, *Triodopsis multilineata*, *Anguispira alternata*, as well as numerous small forms as *Pomatiopsis lapidaria* and *Stenotrema hirsutum*.

The principal drawback in collecting *Thais lamellosa* for the cabinet is in the difficulty of cleaning them. Generally, when they are being extracted from the shell after a slight boiling, a small portion of the soft liver is left. This decays, darkens the tip of the shell and attracts *Dermestes* beetles. The general procedure in cleaning *Thais,* after failing in pulling the whole animal out of the shell, is to throw it away. At the herring saltery where I worked, thousands of tons of herring meal was prepared. Often, when some of the sacks of meal were not properly dried or became damp, they attracted blow-flies which soon produced teeming masses of maggots.

About a gallon of *Thais* and other mollusks were brought to a boil in a pail of water and left to stand for a week or more until slightly putrid, then the water was thrown away and about a pint of maggots put into the pail, or box, with the shells. In a week or ten days the shells were all washed and found to be cleaner than a whistle. A bath in a weak solution of chlorox for several hours was then sufficient to make a clean, attractive specimen of each shell.

Of the many methods used for cleaning shells that are difficult to extract, I have found the above method of recruiting the repulsive maggots to do the work has been the most efficient.—WALTER J. EYERDAM.

THE ELEVENTH ANNUAL MEETING OF THE AMERICAN MALACOLOGICAL UNION

The Eleventh Annual Meeting of the American Malacological Union will be held in Thomaston and Rockland, Maine, August 26 to 29. The opening session will be in the Knox Academy of Arts and Sciences on Tuesday, the 26th. Mr. Norman W. Lermond, Director, is preparing a most attractive program for the meeting.

Hotel headquarters will be in The Crescent Beach Inn, Owls Head, Rockland, which will be available for all meetings. A flat rate of $15 per person includes room, meals, and boats during the meeting, whenever desired.

Reservations should be made early through Mrs. Harold R. Robertson, Buffalo Museum of Science, Buffalo, New York, to whom titles of papers should also be sent.

Vol. 54 JULY, 1940 No. 1

THE NAUTILUS

A QUARTERLY
DEVOTED TO THE INTERESTS OF CONCHOLOGISTS

EDITORS AND PUBLISHERS
HENRY A. PILSBRY, Curator of the Department of Mollusca, Academy of Natural Sciences, Philadelphia
H. BURRINGTON BAKER, Professor of Zoology, University of Pennsylvania

CONTENTS

A Visit to the Arctic of Eastern Canada. By *John Oughton* 1
Civilization and Aquatic Mollusks. By *Calvin Goodrich* 6
The Snails of Ted Cave, Tennessee. By *Leslie Hubricht* 10
Two New Snails of the Genus Campeloma from Ontario. By *N. T. Mattox* 12
A New Helisoma from the Pliocene of Florida. By *Frank C. Baker* 17
Land Mollusca of a Ruderal Field Community in North Central Alabama. By *Allan F. Archer* 18
Mollusca from Point Isabel, Texas. By *H. B. Stenzel* 20
Neritina virginea in Jamaica. By *E. A. Andrews* 21
Mollusks of the Oquirrh and Stansbury Mountains, Utah. By *David T. Jones* 27
Mollusks of Zion National Park, Utah. By *W. O. Gregg* 30
Notes and News 32
Tenth Annual Meeting of the A. M. U. By *Mrs. Harold R. Robertson* 35

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HORACE B. BAKER, *Business Manager*
Zoological Laboratory, University of Pennsylvania,
38th and Woodland Avenue, Philadelphia, Pa.

Entered as Second-Class matter, October 29, 1932, at the Post Office at Philadelphia, Pa., under the Act of March 3, 1879.

THE NAUTILUS:

A Quarterly Journal devoted to the study of Mollusks, edited and published by HENRY A. PILSBRY and H. BURRINGTON BAKER.

Matter for publication should reach the senior editor by the first of the month preceding the month of issue (January, April, July and October). *Typescript should be double spaced.* Proofs will not be submitted to authors unless requested.

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EXCHANGE NOTICES

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Vol. 54 OCTOBER, 1940 No. 2

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CONTENTS

The Rock Dwellers of the Florida Keys. By *B. R. Bales* 39
Two New Marine Mollusks from Japan. By *Maxwell Smith* 43
New Recent and Fossil Mollusks from Florida. By *Maxwell Smith* 44
Addition to the Molluscan Fauna of California. By *Tom Burch* 46
Notes on the Snail Humboldtiana fortis Pilsbry. By *E. J. Koestner and Richard A. Schneider* 47
New Mollusca from Florida. By *Jeanne S. Schwengel* 49
Freshwater Shells of New Hampshire. By *William J. Clench and Henry D. Russell* 52
Some Maximum Sized Cardium corbis from Alaska. By *Walter J. Eyerdam* 53
A New Race of Cancellaria from Florida. By *H. A. Pilsbry* 54
Some Antillean Sagdidae or Polygyridae. By *H. Burrington Baker* 54
New Marine Shells Dredged off Palm Beach, Florida. By *Thomas L. McGinty* 62
Haldeman's 1840 Supplement. By *J. P. E. Morrison* 64
Neritina virginea in Jamaica. By *E. A. Andrews* 66
Notes and News 68
Publications Received 74

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Zoological Laboratory, University of Pennsylvania,
38th and Woodland Avenue, Philadelphia, Pa.

Entered as Second-Class matter, October 29, 1932, at the Post Office at Philadelphia, Pa., under the Act of March 3, 1879.

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Vol. 54 JANUARY, 1941 No. 3

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A QUARTERLY
DEVOTED TO THE INTERESTS OF CONCHOLOGISTS

EDITORS AND PUBLISHERS
HENRY A. PILSBRY, Curator of the Department of Mollusca, Academy of Natural Sciences, Philadelphia
H. BURRINGTON BAKER, Professor of Zoology, University of Pennsylvania

CONTENTS

Wreck of the Janthina janthina. By *George Floyd Rogers* 75
On Certain Land Shell Localities. By *Calvin Goodrich* 78
Notes on Salasiella from Mexico. By *H. Burrington Baker* 80
Survival of Fresh Water Mollusks During Periods of Dryness. By *William Marcus Ingram* 84
Daylight Activity of Land Mollusks. By *Wm. M. Ingram* 87
An Hermaphroditic Mytilus. By *R. T. Young* 90
Four New Species of Spixia from Argentina. By *Juan José Parodíz* 92
A New Oreohelix from Southern Utah. By *Wendell O. Gregg* 95
A New Species of Drepanotrema and Some Preoccupied Planorbid Names. By *Frank Collins Baker* 96
Neritina virginea L., in Jamaica, B.W.I. (cont.). By *E. A. Andrews* 98
Henry C. Higgins 106
Notes and News 106
Publications Received 108

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Vol. 54 APRIL, 1941 No. 4

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CONTENTS

The Cave Mollusca of the Ozark Region. By *Leslie Hubricht* 111
The Stenotrema Monodon Group of Polygyridae in Michigan. By *Phil L. Marsh* 113
Mollusca of Cedar Breaks National Monument, Utah. By *Wendell O. Gregg* 116
Fluminicola avernalis and Fluminicola avernalis carinifera from Nevada. By *Wendell O. Gregg* 117
Notes on Chinese Species of Assiminea. By *Teng-Chien Yen* 119
Lymneae contracta Currier. By *Calvin Goodrich* 121
A Comparison of Young Helminthoglypta umbilicata and H. dupetithouarsi. By *Glenn R. Webb* 122
The Type of Neptunea "Bolten" Röding 125
Some Shells from South Cape May Beach. By *Robert C. Alexander* 126
Effect of Soil Moisture and Algae on the Survival of a Pond Snail during Periods of Relative Dryness. By *E. J. Strandine* 128
Some Haplotrematidae. By *H. Burrington Baker* 130
Aquarium Behavior of Eunaticina oldroydii (Dall). By *W. M. Ingram* 136
Notes and News 140

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