STERKIANA

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ANNOUNCEMENT

STERKIANA is named after Dr. Victor Sterki (1846-1933) of New Philadelphia, Ohio, famed for his work on the Sphaeriidae, Pupillidae, and Valloniidae. It is fitting that this serial should bear his name both because of his association with the Midwest and his lifelong interest in non-marine Mollusca.

The purpose of STERKIANA is to serve malacologists and paleontologists interested in the living and fossil non-marine Mollusca of North and South America by disseminating information in that special field. Since its resources are modest, STERKIANA is not printed by conventional means. Costs are kept at a minimum by utilizing various talents and services available to the Editor. Subscription and reprint prices are based on cost of paper and mailing charges.

STERKIANA accepts articles dealing with non-marine Mollusca of the Americas in English, French, or Spanish, the three official languages of North America. Contributors are requested to avoid descriptions of new species or higher taxa in this serial as the limited distribution of STERKIANA would probably prevent recognition of such taxa as validly published. Papers on distribution, ecology, and revised checklists for particular areas or formations are especially welcome but those on any aspect of non-marine Mollusca will be considered.

STERKIANA will appear twice a year or oftener, as material is available. All correspondence should be addressed to the Editor.

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STERKIANA est une collection de travaux sur les Mollusques extra-marins des deux Amériques, distribuée par un groupe de malacologues du centre des Etats-Unis. STERKIANA publie des travaux en anglais, en français et en espagnol acceptés par le conseil de rédaction. Prière d'adresser toute correspondance au Rédacteur.

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STERKIANA es una coleccion de trabajos sobre los Moluscos extra-marinos viventes y fosiles de las dos Americas, editada por un grupo de malacólogos de los Estados Unidos centrales. Contenirá en el porvenir trabajos en inglés, francés, y español que serán acceptados por la mesa directiva. La correspondencia deberá ser dirigida al Editor.

PRECIO: 50¢ el número.

Alcide d'Orbigny,
né à Couëron (France)
en 1802

ALCIDE-CHARLES-VICTOR DESSALINES D'ORBIGNY (1802-1857)

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The name of Alcide d'Orbigny looms large in the study of Mollusca as any perusal of a systematic work in the field will show. His paleontological work is no less worthy of attention in spite of the fact that his books are now rarities. He traveled extensively in South America, visited North America on his return, and diligently described his finds in what are the foundation works of South American geology, paleontology, malacology, and added much to the knowledge of that continent's mammals and birds. Yet, unless some obscure work has escaped my eye, it seems that there is no account of his life and work in English save summaries (e. g. Zittel, 1908, p. 506) and mention in standard biographical works. In French, accounts of his life and work are no less scarce. The most extensive account is that of Fischer (1878). Roule (1933) and Lys (1957, 1958) have published short biographic accounts, the last two on the occasion of the centenary of d'Orbigny's death.

Even if his evolutionary and stratigraphic theories have now been discarded, the worth of his paleontological and natural history works should ensure that his life and work be better known in this country. In addition to the brief biographic information which he himself gives in his 'Voyage Pittoresque dans les deux Amériques' (1836, *passim)* I have used many secondary sources which I have listed in the References Cited. Of these, the most detailed is that of Fischer (1878) which also includes the list of d'Orbigny's works reproduced in this paper. In spite of their variety, these sources give us very little information on d'Orbigny's background, his father's career previous to settling in Couëron to practice medicine, and many other points which might shed some light on his character.

Of d'Orbigny senior, we do know that he had great interest in natural history; in collaboration with Fleuriau de Bellevue, he assembled a collection of marine animals of the coasts of Aunis and Vendée; together, they founded the first French regional museum at La Rochelle. They were in corrrspondence with Latreille, Savigny, Cuvier, Audouin, and Milne-Edwards who identified and described the rarest species for them.

Charles-Marie Dessalines d'Orbigny (1770-1856) had lived in Santo Domingo, had served as a naval surgeon and in 1802 was practicing medicine at Couëron when his son Alcide was born. Couëron is a small town with a population of only 4,338 in 1857 when it was described by Bescherelle (1857) in his great Geographic Dictionary as a good small port for provisioning and careening ships. It had a small glass bottle factory and fairs four times a year. It is situated on the right bank of the Loire River, department of Loire-Inférieure, in Brittany. Later the d'Orbignys moved to Esnandes, a smaller place with only 191 inhabitants in the de-

partment of Doubs (Franche-Comté) and later still to La Rochelle where d'Orbigny senior died in 1856, one year before his eldest son.

There is no doubt that the father's interest in natural history rubbed off on his sons who both had distinguished careers in the natural sciences. They roamed the beaches with their father and helped him collect the marine invertebrates which he classified for the Museum of La Rochelle. Both sons also helped their father with the illustrations of the invertebrates he studied for both of them were gifted draftsmen. Alcide's career was determined by an engrossing interest in almost microscopic organisms then classed as cephalopods (Polythalamous Cephalopods of Lamarck). Lamarck's subdivisions were hopelessly inadequate for he had included dibranchiate and tetrabranchiate cephalopods, Foraminifera, and pelecypods in a single family. Denys de Montfort had attempted to revise the Polythalamia but his drawings were obscure and his scientific integrity was in doubt. Alcide d'Orbigny spent seven years studying all the Foraminifera he could examine and then summarized his discoveries in the 'Tableau méthodique de la classe des Céphalopodes,' published in 1826; he was then only 24 years old but his system, although not a natural one, was such an improvement over previous ones that it won him immediate prestige and respect. He still considered the Foraminifera, whose name he coined, as cephalopods but separated them from the true cephalopods and divided them into 5 classes, 53 genera, and 600 species.

His basic characteristic was the arrangement of the chambers or segments of the shells. In modified form, d'Orbigny's classification is still used today. Throughout his life, d'Orbigny continued to study the Foraminifera, both living and fossil, but the honor of assigning them to the Phylum Protozca was reserved for Dujardin who observed and correctly interpreted the nature of the living animal in 1835.

Soon after publication of his 'Tableau méthodique....' d'Orbigny was entrusted with a scientific expedition to South America. He left France in June 1826 and did not return until March 1834. In between, he collected assiduously from the Atlantic shores of South America to the Pacific, climbed the highest plateaus of the Andes and recorded thousands of observations which were to serve as the materials for several books and many papers.

An expedition to South America at that time was a priceless opportunity for a young scientist. The great Alexander von Humboldt, Spix and Martius, the prince of Wied-Neuwied, Auguste Saint-Hilaire, had collected and described the animals and plants of Brazil and Peru; but the geology and paleontology had barely been touched for the work of Richard Owen, Charles Darwin, Burmeister, and others was still in the future. It is to d'Orbigny's credit that he took full advantage of the opportunity and faithfully recorded his findings for posterity.

The collecting and preserving of natural history specimens occupied a great deal of time and involved a great deal of detail but d'Orbigny was also able to generalize and synthesize. For example, he early perceived that the Mollusca and Foraminifera of the Atlantic and Pacific coasts belonged to two quite distinct faunas. When C. B. Adams, P. P. Carpenter and A. A. Gould analyzed the marine faunas of Central America and Mexico they amply confirmed d'Orbigny's findings. The subject of zoological provinces was later taken up by Edward Forbes and his disciples, building on the bases established by d'Orbigny. He noted the distribution of animals according to latitude and the close parallel with their distribution with altitude, comparing these zonations with the distribution of marine animals according to depth.

In addition, he studied the geography, ethnography, and anthropology of South America, the latter sometimes uncomfortably close at hand; Fischer writes that he was with a party of South American soldiers besieged in Carmen by the Patagonians, and that he noted, from abundant subject material for observation, that their average height was only 5 feet 4 inches, thus disproving the errors concerning their gigantic height.

His work in Bolivia, then Upper Peru, was greatly facilitated by President Santa Cruz who gave him every encouragement and facility. This enabled him to complete the triangulation begun by the Englishman Pentland and to publish excellent (for the time) geologic and geographic maps of Bolivia.

Upon his return to France in 1834, d'Orbigny published the results of his South American voyage in nine volumes, the last of which appeared in 1847. His work was praised by Elie de Beaumont who wrote 'This immense work presents in

an almost encyclopedic framework one of the most extensive monographs ever given on any region of the earth.' It was to be surpassed in time, but it still remains an impressive accomplishment.

It would seem that the identification, study, illustration, and writing of the text of this vast work would be sufficient to occupy the energies of one man, yet d'Orbigny continued his studies on the Foraminifera, collaborated with Férussac in a work on cephalopods, with Webb and Berthelot on the natural history of the Canaries, with Ramon de la Sagra on that of Cuba and the West Indies. He also published a natural history of the crinoids, a work on the Birds of Europe, many short papers on the habitat of pelecypods, and a series of paleontologic memoirs on such diverse areas as the steppes of the Caspian Sea, the Caucasus, and the Crimea, European Russia and the Ural Mountains for insertion in the works of Murchison, de Verneuil, and of Keyserling. Finally, he began work on his encyclopedic 'Paléontologie française' to which he devoted the last years of his life.

As we shall see, his paleontological and stratigraphic works irritated both zoologists and geologists. Busy with the collecting and publication of his materials, d'Orbigny paid little attention to his financial affairs and to the mounting chorus of criticism that rose from official scientific circles. He seemed to suppose, with some naïveté, that it was sufficient to deserve a position to obtain it. When official science failed to offer him one, he finally asked for an appointment as Professor, but was turned down. Still, his reputation was growing and in spite of his critics, Paleontology was coming to be recognized as a science. He had a large following, who were unable to convince the bureaucracy of his worth; they did manage to convince the new Emperor of the French, Napoleon III, of d'Orbigny's merit; he cut through the massive knot of red tape by creating a new chair of Paleontology at the Muséum d'Histoire naturelle and appointed d'Orbigny as its first incumbent.

This was not the end of d'Orbigny's troubles; his reaction to unfriendliness and ill-concealed jealousy was to retreat to his laboratory and to try to forget his detractors by prolonged hard work. More and more he shut himself up with his beloved collections; but this kind of life impaired his health. He developed a heart ailment and died, after a year of pain, on the 30th of June, 1857.

After more than a hundred years have passed since his death, it is difficult to see why his theories should have aroused such antagonism, brought on such unkind criticism, and conduct bordering on persecution and ostracism on the part of the greatest personalities of French science at the time. Let us examine these doctrines and place them, if we can, within the framework of French scientific thinking in the middle years of the nineteenth century.

The 'Prodrome de Paléontologie stratigraphique universelle' (1850) was conceived on a grand scale. It was to include descriptions and stratigraphic range of all fossil species, arranged systematically. D'Orbigny followed Buffon's advice which the latter had given his scientific heirs when he wrote: 'It is especially in the shells and fishes, first inhabitants of the globe, that we can count a greater number of species which no longer survive; we shall not undertake here to give an enumeration of them, which, although very lengthy, would still be incomplete; this work on ancient nature would require by itself more time than remains for me to live, and I can but recommend it to posterity.' (Buffon, Minéraux, p. 156). D'Orbigny took up the challenge and used a then new approach. He considered the name and nature of the fossil to have but a secondary importance, overridden by that of age. He wrote: 'The first concept to obtain in a paleontologic study (Prodrome, Paléont., v. I, p. xv) is the date. Without these preliminary researches, no paleontology is possible, or merely chaos. It seems to us that this principle has not been understood, for most often the procedure has been in the opposite direction.' Consequently, he divided the sedimentary column into 27 stages, distinguished by names with uniform endings, containing 27 extinct faunas. When a species had been recorded for two or more formations, he observed that almost always this was due to errors of determination. Gradually, he came to consider as proved that no species survived from one stage to another, and that therefore Nature presented the aspect of 28 distinct creations (including the present fauna), since life had been renewed 28 times on the surface of the globe. The idea was not

popular in his day nor is it accepted now by geologists and paleontologists.

D'Orbigny taught these ideas and incorporated them into his 'Cours élémentaire de Paléontologie' (1852). In this textbook, d'Orbigny stated his views as follows: 'An initial creation appeared in the Silurian stage. After the annihilation of the latter, by some geologic cause, after a considerable lapse of time, a second creation took place in the Devonian stage; and successively 27 times, distinct creations have repopulated the entire earth with its plants and animals, after each geologic disturbance which had destroyed everything in living nature. Such is the fact, the certain but incomprehensible fact, which we merely observe without seeking to penetrate the superhuman mystery which surrounds it.' This was out-Cuviering Cuvier but d'Orbigny had the agreement at least of Agassiz and d'Archiac among his paleontological contemporaries, and of Elie de Beaumont in the geological fraternity. On the whole, however, the zoologists resented his authoritarian attitudes on taxonomy and the geologists resisted his reworking of the geologic column to conform with his 28 successive creations. There was undoubtedly an element of jealousy involved at the immense luck of this young man getting the opportunity of the century in the field of natural history; at his outstanding industry in working up and publishing his materials; and even at his popular success as a lecturer. The personal attacks we must leave in the dusty archives of the time to concentrate on the scientific criticism, of which two examples should suffice.

Deshayes (Description des Animaux sans vertèbres du bassin de Paris, vol. 2, p. 171) wrote: 'In sum, what kind of picture does the Paris Basin offer us? Appearances of species and their more or less rapid extinction; the ones resisting little to causes of destruction, others a little more, others still more, all, in the end, disappearing at certain points, the more hardy serving as a common link for all the parts of the whole, and the others relating between themselves the subdivisions of lesser importance.'

Philippi (1808-1904) who also worked on the faunas of South America, was even sharper in his criticism when he wrote 'There is no separation between the Eocene, the Miocene, and the Pliocene; our distinctions are purely subjective and misleading; creation has always continuously and slowly continued its work.'

No one today subscribes to d'Orbigny's theory of successive creations except possibly rare members of the ultra-reactionary fringe of fundamentalist religious sects who might see in it a way of disproving evolution. Nevertheless, his divisions of geologic time, his stages, were established with such care and clarity that they have been adopted not only for France but for most of the world.

The overwhelming preoccupation with Darwinian evolution which absorbed the attention of biologists after 1859 caused d'Orbigny's theory to be forgotten. Nevertheless, as early as 1878, that discerning malacologist Paul-Henri Fischer (1835-1893) who succeeded Deshayes at the Muséum and was well aware of its half-concealed feuds, could write in the Bulletin of the Geological Society of France that d'Orbigny '....owed his superiority as a paleontologist and geologist to the knowledge he had acquired in his travels and by practicing zoology. His doctrines on the chronology of fossil organisms, in spite of their exaggeration, his immense paleontological works, in spite of the errors inevitable in a large work, have renewed the science in our country and assured our compatriot a well deserved place among the great geologists of this century.'

A century after his death, d'Orbigny was honored (e.g. by Lys, 1957, 1958) as the 'founder of a universally accepted classification of the Foraminifera.' No less important is the fact that his stage names (e. g. Sinemurian, Toarcian, Bajocian, Bathonian, Callovian, Albian, Cenomanian, Turonian, Senonian, to cite only the Mesozoic ones) have been adopted, as Fischer pointed out, throughout the world; and more, that the stages he missed have been named after the same method by his successors, Desor, Coquand, Renevier, Thurmann, Kilian, Toucas, and many others.

Finally, any attempt to state the position of d'Orbigny as a geologist or a zoologist is still difficult more than a hundred years after his death. Let it suffice to say that he made mistakes, being human; that he worked hard and wrote much, being entranced with nature and the animal kingdom; that he was neither the

shameless scoundrel that his enemies saw in him nor the great prophet of paleontology which his admiring followers called him.

LIST OF ALCIDE D'ORBIGNY'S WORKS COMPILED BY PAUL-HENRI FISCHER (1878, PP. 450-453)

Monographie d'un nouveau genre de Mollusques gastéropodes de la famille des Trochoïdes, nommé Scissurelle (Mem. Société d'Hist. nat. Paris, t. I); 1823.

Notice sur deux espèces du genre Ptérocère, observées dans le Calcaire Jurassique du département de la Charente-Inférieure (Ann. Sc. nat., t. V); 1825.

Notice sur les becs de Céphalopodes fossiles (Ann. Sc. nat., t. V); 1825.

Tableau méthodique de la classe des Céphalopodes (Ann. Sc. nat., t. VII): 1826.

Voyage dans l'Amérique méridionale, 9 vol. in-4°; 1834-1847.

Notice sur un nouveau genre de Cétacé, des rivières du Centre de l'Amérique méridionale (Nouv. Ann. Muséum d'Hist. nat., t. III): 1834.

Synopsis terrestrium et fluviatilium Molluscorum Americanorum (Mag. Zool., t V); 1835.

Galerie ornithologique des Oiseaux d'Europe (52 livraisons); 1836-1838).

Mémoire sur des espèces et sur des genres nouveaux de l'ordre des Nudibranches observés sur les côtes de France (Mag. Zool., t. VII); 1837.

Mémoire sur une seconde espèce vivante de la famille des Crinoïdes ou Encrines, servant de type au nouveau genre Holope *(Holopus)* (Mag. Zool., t. VII); 1837).

Description d'une nouvelle espèce du genre Coroucou (Mag. Zool., t. VII); 1837.

Mémoire sur la distribution géographique des Oiseaux passereaux dans l'Amérique méridionale. (C.-R. Ac. Sc., t. VII); 1838.

Nouvelle espèce du genre de Zoöphytes échinodermes nomme Galérite (Rev. Zool., t. I): 1838.

Note sur le genre Caprine (Rev. Zool., t. II); 1839.

Histoire naturelle générale et particulière des Céphalopodes acétabuliferes vivants et fossiles; 1839-1848 (en collaboration avec de Férussac).

Mémoire sur les Foraminifères de la Craie blanche du bassin de Paris (Mém. Soc. géol. France, lre sér., t. IV); 1840.

Mollusques, Echinodermes, Polypiers, Foraminifères des îles Canaries, in Webb et Berthelot: Histoire des îles Canaries; 1839-1840.

Ornithologie, Foraminifères Mollusques de l'île de Cuba et des Antilles, in Ramon de la Sagra, Histoire naturelle de Cuba; 1839-1843.

Histoire naturelle générale et particulière des Crinoïdes vivants et fossiles, comprenant la description zoölogique et géologique de ces animaux; 1840.

Paléontologie française. Description zoölogique et géologique de tous les animaux mollusques et rayonnés fossiles de France. lre partie: terrains crétacés: Céphalopodes, Gastéropodes, Lamellibranches, Brachiopodes, Bryozoaires, Echinodermes; 1840-1856; -- 2e partie: terrains jurassiques: Céphalopodes, Gastéropodes; 1842-1856.

Considérations paléontologiques et géographiques sur la distribution des Céphalopodes acétabulifères (Ann. Sc. nat., 2e sér., Zool., t. XVI; et Bull. Soc. géol., lre sér., t. XII); 1841.

Considérations zoölogiques, géologiques et géologico-géographiques sur les Ammonites du terrain crétacé (Ann. Sc. nat., 2e sér., Zool., t. XVI); 1841.

Nouvelle espèce de Volute (V. Lagillertiana) Rev. Zool., t. IV); 1841.

Description de quelques espèces de Mollusques fossiles de France (Rev. Zool., t. IV); 1841.

Considérations sur les Céphalopodes des terrains crétacés (Ann. Sc. nat., 2e sér., Zool., t. XVII); 1842.

Mémoires sur deux nouveaux genres de Céphalopodes fossiles (les *Conoteuthis* et *Spirulirostra*), offrant des passages d'un côté entre la Spirule et la Sèche, de l'autre entre les Bélemnites et les Ommastrèphes (Ann. Sc. nat., 2e ser., Zool., t. XVII); 1842.

Coquilles et Echinodermes fossiles de Colombie, recueillis de 1821 a 1833, par M. Boussingault; 1842.

Note sur des oeufs de Mollusques recueillis en Patagonie (Ann. Sc. nat., 2e ser., Zool., t. XVII): 1842.

Quelques considérations zoölogiques et géologiques sur les Rudistes (Ann. Sc. nat., 2e ser., Zool., t. XVII; et Bull. Soc. geol., lre ser., t. XIII); 1842.

Considérations générales sur le grand systeme tertiaire des Pampas (C.-R. Ac. Sc., t. XIV); 1842.

Considérations générales et coup d'oeil d'ensemble sur les grands faits géologiques dont l'Amérique méridionale a été le théâtre (C.-R. Ac. Sc., t. XV); 1842.

Sur l'absence du Gault et du Néocomien dans le bassin crétacé de la Loire (Bull, Soc. géol., 1re sér., t. XIII); 1842.

Sur l'application de l'Helicomètre à la mesure des coquilles turbinées (Ann. Sc. nat., 2e ser., Zool., t. XVII; et Bull. Soc. géol., 1re ser., t. XIII); 1842.

Memoire sur les Bélemnites (Ann. Sc. nat., 2e sér., Zool., t. XVIII); 1842.

Considérations géologiques et géologico-géographiques sur l'ensemble des Mollusques gastéropodes des terrains crétacés (Ann. Sc. Nat., 2e sér., Zool., t. XX; et Bull. Soc. géol., 1re sér., t. XIV); 1843.

Quelques considérations sur la station normale des animaux mollusques bivalves (Ann. Sc. nat., 2e sér., Zool., t. XIX; et Bull, Soc. géol., 1re sér., t XIV); 1843.

Note sur des traces de remaniements au sein des couches de Gault ou terrain albien de France et de Savoie (Bull, Soc. géol. Fr., 1re sér., t. XIV); 1843.

Paléontologie du voyage de M. Hommaire de Hell dans les Steppes de la mer Caspienne, le Caucase, la Crimée et la Russie méridionale; 1844.

Recherches sur les lois qui président à la distribution des Mollusques côtiers marins (Ann. Sc. nat., 3e sér., Zool., t. III); 1845.

Mollusques du système secondaire et du terrain tertiaire, in Murchison, de Verneuil et de Keyserling, Géologie de la Russie d'Europe; 1845.

Mollusques vivants et fossiles, ou Description de toutes les espèces de coquilles et de mollusques classées suivant leur distribution géologique et géographique, 1er volume; 1845-1847.

Considérations zoölogiques sur les Bélemnites; -- Recherches sur les Ammonites (Thèses présentées à la Faculté des Sciences de Paris); 1846.

Foraminifères fossiles du bassin tertiaire de Vienne (Autriche); 1846.

Considérations zoölogiques et géologiques sur les Brachiopodes ou Palliobranches (Ann. Sc. nat., 3e sér., Zool., t. VIII); 1847.

Sur les Mollusques vivants et fossiles (Arch. Bibl. univ., t. VI); 1847.

Cours élémentaire de Paléontologie et de Géologie stratigraphiques; 1849-1852.

Description de quelques genres nouveaux de Mollusques bryozoaires (Rev. et Mag. Zoöl., t. I); 1849.

Note sur la classe des Amorphozoaires (Rev. et Mag. Zool., t. I); 1849.

Note sur les fossiles de l'étage danien (Bull. Soc. géol., 2e sér., t. VII); 1850.

Prodrome de Paléontologie stratigraphique universelle des animaux mollusques et rayonnés; 1850-1852.

Recherches zoölogiques sur la marche successive de l'animalisation à la surface du globe, depuis les temps zoölogiques les plus anciens jusqu'à l'époque actuelle (C.-R. Ac. Sc., t. XXX); 1850.

Mémoire sur l'instant d'apparition, dans les âges du monde des ordres d'animaux, comparé au degré de perfection de l'ensemble de leurs organes (C.-R. Ac. Sc., t. XXXI); 1850.

Recherches physiologiques sur les milieux d'existence des animaux dans les âges géologiques (C.-R. Ac. Sc., t. XXXI); 1850.

Note sur quelques espèces remarquables d'Ammonites des étages néocomien et aptien de France (Journ. Conchyl., t. I); 1850.

Description d'un nouveau genre de coquilles bivalves, nommé *Myllite (Myllita)* (Journ. Conchyl., t. I); 1850.

Note sur quelques espèces nouvelles de Bryozoaires fossiles des terrains crétacés de la France (Rev. et Mag. Zool., t. II); 1850.

Catalogue des espèces fossiles de Mollusques bryozoaires, de Polypiers et d'Amorphozoaires de l'étage néocomien (Rev. et Mag. Zool., t. II); 1850.

Recherches zoölogiques sur la classe des Mollusques bryozoaires (Ann. Sc. nat., 3e ser., Zool., t XVI); 1851.

Note sur un nouveau genre de coquille lamellibranche d'eau douce découvert dans les rivières de la Nouvelle-Grenade par M. Acosta (Rev. et Mag. Zool., t. III); 1851.

Notice sur le genre Heteroceras, de la classe des Céphalopodes (Journ. Conchyl., t. II); 1851.

Note sur une nouvelle espèce géante du genre *Terebrirostra*, de la classe des Brachiopodes (Journ. Conchyl., t. II); 1851.

Notice sur le genre *Hamulina* (Journ. Conchyl., t. III); 1852.

Note sur quelques coquilles fossiles, recueillies dans les montagnes de la Nouvelle-Grenade, par M. le général Joaquin Acosta (Journ. Conchyl., t. IV); 1853.

Note sur le nouveau genre *Hypotrema* (Journ. Conchyl., t. IV); 1853.

Note rectificative sur divers genres d'Echinoïdes (Rev. et Mag. Zool., t. VI); 1854.

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and a half convex whirls, separated by a well marked suture; spire obtuse, rather longer than the aperture; umbilicus narrow; aperture ovate-orbicular, forming an angle posteriorly; a small portion of the labium confluent with the body whirl posteriorly.

Fig. 165.

Color pale ochraceous, translucent.

Inhabits Lake Champlain.--Prof. Adams.

Intermediate between *lustrica* and *porata*. It is not as short and transverse as the former, which, moreover, is widely umbilicate, and has the aperture regularly rounded posteriorly. According to the description of Professor Adams, the labium sometimes scarcely touches the body of the shell. The spire is comparatively longer than in *porata*, the outline less transverse, and the aperture not orbicular. *(Haldeman.)*

Amnicola pallida, Haldeman, Mon. pt. 4, p. 3 and 4 of wrapper (1842); Mon. p. 12, pl. i, f. 7 (1844?).
Amnicola lustrica, Adams, Thompson's Vermont, 169, 152 (1842), teste Haldeman.

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Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8943	3	Little Lakes, N.Y.	Dr. J. Lewis.	Cabinet series.
8974	20+	"	"	" "

Amnicola limosa, Say.--Shell conic, subumbilicate, dark horn colored, generally incrusted with a blackish irregular covering on the spire, and sometimes on the body, which completely obscures the obsoletely wrinkled epidermis; aperture ovate-orbicular; suture impressed.

Fig. 166.

Length three-twentieths, breadth one-tenth, of an inch. Cabinet of the Academy.

Animal whitish; head brown; mouth, tentacula, orbits, and vitta on each side of the neck, white; tentacula filiform, more than half as long as the base of the animal; rostrum about half as long as the tentacula, annulate

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with darker lines above; foot white, brownish above, short, suboval, truncated before, and rounded behind.

Extremely numerous on the muddy shores of the rivers Delaware and Schuylkill, between high and low water marks. *(Say)*.

Paludina limosa, Say, Journ. Ac. Sc. Phila. I. 125 (1817).--Ib. Nich. Encycl. ed ed. (1819); Binney's ed. p. 61.--DeKay, N.Y. Moll. 88.
Paludina porata, Adams in Thomp. Hist. of Vt. p. 152 (1842) (teste Hald.).--Philippi, Z. fur Mal. II, 77 (1845).
Amnicola porata, Gould, Inv. of Mass. p. 229, f. 157 (1841).
Amnicola limosa, Haldeman, Mon. 10, pl. i, f. 5, 6 (1844?).--Anonymous, Can. Nat. II, 214, fig. (1857).

No. 8960 of the collection is labelled *A. perobtusa* by Dr. James Lewis, but I know of no published description under that name.

From Hudson's Bay and Wisconsin to Virginia.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8953	5	Madison, Wis.	I. A. Lapham.	*lustrica*, teste Lea.
8954	20+	Mohawk, N. Y.	Dr. Lewis.	
8955	20+	Burlington, N. J.	W. G. Binney.	
8956	12	Washington, D. C.	Dr. E. Foreman.	*porata*, teste Form.
8957	7	Nantucket.	W. Stimpson.	
8958	15+	Boston.		
8959	12+	Milwaukie, Wis.	I. A. Lapham.	
8960	20+	New York.	Dr. J. Lewis.	
8961	20+	Massachusetts.	W. Stimpson.	
8962	50?	Little Lakes, Mich.	Dr. J. Lewis.	
8963	9	Elyria, O.	W. G. Binney.	
8964	100?	Cambridge, Mass.	Dr. J. Lewis.	*A. porata*, Gould.
8965	2	.....	.....	Teste Lea.
8940	6	Burlington, N. J.	W. G. Binney.	
9020	5	Moose Factory.	C. Drexler.	

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Amnicola decisa, Hald.--Animal dark colored; head blackish, getting lighter posteriorly; tentacles translucent, dark on the edges; an

orange-yellow spot at the posterior internal base of the tentacles; foot yellowish, thickly dotted with black above anteriorly; anterior edge nearly as dark as the head; base of the foot thickly dotted with orange on each side of the middle, the dotting being more sparse posteriorly, and entirely wwnting anteriorly.

Shell rather short, conical; surface smooth, shining (when the dark foreign matter is removed) lines of growth fine; whirls five not very convex, sutures impressed, base slightly perforate; aperture dilated, semicircular, labium slightly concave in contact with the shell posteriorly, and nearly so throughout its length.

Fig. 167.

Color pale-green, and slightly translucent when the black foreign matter is removed. (See Fig. 160, on p. 81.)

Inhabits small streams connected with the Susquehanna, and has been observed in the Schuylkill by Dr. Griffith.

Allied to *Paludina similis,* Mich., of Europe. A greater portion of the labium lies closer to the shell in this species than in any other here described, except *A. nicklini-ana,* and *A. tenuipes,* which are slender species. At first view it might be taken for a minute *Paludina decisa,* and I have named it accordingly. In my correspondence I have hitherto called this species *limosa. (Haldeman.)*

Cat. No.;	No. of Sp.;	Locality.; From whom received.	Remsrks.
8929	1	District of Columbia. Dr. E. Foreman.	Cabinet series.
8944	17	....	

Amnicola cincinnatiensis, Anthony.--Shell somewhat ventricose, subumbilicate color delicately green, whirls four, smooth; spire entire at the apex and prominent; suture deeply impressed; aperture much dilated, approaching to orbicular, nearly half the length of the shell; length one-fifth of an inch.

Fig. 168.

Found in the canal at Cincinnati, clinging to small stones. *(Anthony.)*

Paludina cincinnatiensis, Anthony, Boston J. N. H. III, pt. 1 and 2, p. 279 pl. iii, fig. 3, Jan. 1840.--Küster in *Chemn.* ed. 2, p. 52, pl. x, f. 13, 14.

Amnicola cincinnatiensis, Anthony, List of Cinc. Shells, ed. 2 (1843), no descr.--Haldeman, Mon. p. 9, pl. i, f. 4 (1844?). --De Kay, N. Y. Moll. 88 (1843).

Paludina emarginata, Küster Ch. ed. 2, p. 50 pl. x, f. 3, 4.

'This is the most robust species hitherto noticed among us,

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and is, in form, a miniature representation of *Paludina ponderosa,* except that it is decidedly umbilicated.' *(Haldeman.)*

Fig. 169.

Specimens labelled by Mr. Anthony are in the collection of the Smithsonian. Küster's description now follows. His figure is copied in Fig. 169. He quotes *Lymnaeus emarginatus,* Say, as a synonym on authority of Bronn.

Paludina emarginata, Küster.--Shell small, narrowly rimate, ovate conic, apex eroded, subtruncated, shining, thin, delicately striate, dark horn-colored; spire conic, whirls 4, convex; suture deep; aperture ovate; peristome straight, acute, its columellar portion reflected. *(Küster.)*

Cat. No.;	No of Sp.;	Locality.; From whom received.	Remarks.
9026	3	Ohio. J. G. Anthony.	.....

Amnicola granum, Say.--Shell conic-ovate; whirls not perceptibly wrinkled convex; suture deeply impressed; aperture orbicular, hardly angulated above; labium with the superior edge appressed to the surface of the penultimate volution; umbilicus rather small, profound.

Fig. 170.

Length less than one-tenth of an inch. Inhabits Pennsylvania. This very small species is found in plenty in the fish ponds at Harrowgate, crawling on the dead leaves which have fallen to the bottom of the water. It resembles *P. lustrica,* but is a smaller, less elon-

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gated shell, and the superior portion of the labium is not an unaltered continuation of the lips as in that shell, but is appressed to the surface of the penultimate whirl in the usual manner of calcareous deposition upon that part. *(Say.)*

Paludina grana, Say, Journ. A. N. Sc. II, 378 (1822); Binney's ed. p. 110.
Amnicola granum, Haldeman, Mon. p. 17 (1844?). --De Kay, N. Y. Moll. 88 (1843).

Ranges from Lake Superior to Virginia.

Fig. 150 is drawn from an authentic specimen given by Mr. Say to the Philadelphia Academy.

Cat. No.; No. of Sp.; Locality.; From whom received. Remarks.
8930 2 District of Columbia. I. Lea. Cabinet series.

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Amnicola parva, Lea.--Shell obtusely conical, rather thin, yellowish, smooth, umbilicate; spire short; suture impressed; whirls four, inflated; aperture large, nearly round.

Springfield, Ohio. Diam. .15, length .18 inch. Fig. 171.

The shell described by Mr. Anthony as *Paludina cincinnatiensis,* resembles this species, but is more elevated in the spire, and is a larger shell. It is more nearly allied to *Amnicola orbiculata,* herein described, but may be distinguished by its being a smaller shell, and being less round in the aperture. The base of the lip is disposed to be slightly angular; the aperture is about one half the length of the shell. *(Lea.)*

Amnicola parva, Lea, Tr. Am. Phil. Soc. IX, 16 (1844); Obs. IV, 16; Proc. II, 34 (1841). --Haldeman, Mon. p. 24 (1844?).

Fig 151 is drawn from Mr. Lea's original specimen.

Amnicola orbiculata, Lea.--Shell orbicular, rather thin, yellowish, smooth, umbilicate.

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spire short; sutures much impressed; whirls five, inflated; aperture large, round.

Springfield, Ohio. Schuylkill? near Philadelphia. Diam. .18, length .18 inch. Fig. 172.

This species is very nearly allied to *Am. parva,* and may prove to be only a variety of it. The specimens before me are all larger, and they appear to be more globose. The aperture is about half the length of the shell. I found a single specimen of this species among many small shells which were thrown together in a box, as being collected from our vicinity. It may be possible it is an Ohio specimen gotten by mistake into the box. Found also in Cayuga Lake. *(Lea.)*

Amnicola orbiculata, Lea, Tr. Am. Phil. Soc. IX, 16 (1844); Obs. IV, 16; Proc. II, 34 (1841).--Haldeman, Mon. p. 24 (1844?).

Figure 153 is drawn from Mr. Lea's original specimen.

Amnicola longinqua, Gould.--Shell small, elongate-ovate, smooth; apex obtuse; whirls 5, rounded; suture deep; aperture elliptical, rounded posteriorly; columella very arcuate, subperforate. Length one-eighth, breadth one-tenth inch. Fig. 173.

Found in the Colorado Desert (Cienaga Grande) by W. P. Blake.

In form it is much like *A. cincinnatiensis,* Hald., or like *A. galbana,* or like miniature specimens of *Paludina ponderosa.* It has a bleached or chalky color, probably from exposure, like the

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other species found on the Cienaga Grande, a region which is immersed a portion of the time, and dry the remainder, and was once, apparently, an extensive marsh, or shallow lake. *(Gould.)*

Amnicola longinqua, Gould, Pr. Bost. S.N.H. 130 (Mar. 1855); P. R. R. Report, V, 333, pl. xi, fig. 10, 11 (1857); Prelim Rep. App. 24 (1855); Otia, 217.

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Fig. 173 is a fac-simile of the original figures referred to.

Cat. No.; No. of Sp.; Locality.; From whom received. Remarks.
9220 5 Colorado Desert. Blake. Type.

DOUBTFUL AND SPURIOUS SPECIES OF AMNICOLA.

Amnicola integra, Say of Anthony's List of Cincinnati Shells is *Somatogyrus integer*.

Amnicola gracilis, Gould mentioned by name only, from Hot Springs, Va. Pr. A.N.S.P. Phil. II, 167. The New Zealand species of this name is the same as *Amnicola egena*, Gld., vide Otia, p. 245.

Amnicola elongata, Jay, Cat. [illegible] 278, Virginia; no descr.

Amnicola seminalis, Cooper, P.R.R. Rep. XII, pt. 2, p. 374. *Vide Fluminicola nuttalliana.*

Amnicola nuttalliana, Cooper, (*l. c.*), p. 374. *Vide Fluminicola nuttalliana.*

The following are mentioned by name only in Wheatley's Cat. of U.S. Shells. No description of them was ever published.

Amnicola albilabris, Ward, Ohio.
Amnicola dentata, Say, Florida.
Amnicola gibbosa, Anth.
Amnicola sayana, Lea, Ohio
Amnicola pallida, Lea. See *Somatogyrus isogonus*.

FOSSIL SPECIES OF AMNICOLA.

Amnicola galbana, Hald.---Shell conical, smooth, shining, composed of four and a half not very convex whirls, having the lines of growth very fine; base with a narrow umbilic; aperture nearly circular, slightly produced in an angle posteriorly; labium slightly thickened; a small portion of it, which is rectilinear, in slight contact with the body whirl.

Fig. 174.

Color . . . bleached and chalky.

Occurs fossil in the fresh water newest tertiary deposit in Sussex County, New Jersey. *(Haldeman.)*

Amnicola galbana, Haldeman, Mon. p. 15, pl. i, f. 9 (1844?); pt. 4 p. 4 of wrapper (1842).

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FLUMINICOLA, Stimpson.

Lingual dentition of the type: Rhachidian tooth more than twice as broad as long. Outer lateral teeth with a smaller number of denticles than the inner. Formula of the denticles: $\frac{5}{3-3}$ - 6 - 10 - 7.

(FIG. 175.)

Shell comparatively large, obliquely ovate, thick, smooth, imperforate; spire moderate, obtuse. Aperture ovate; inner lip flattened, callous; outer lip effuse and projecting anteriorly, so that the peritreme is not continuously in the same plane. Operculum corneous. Tentacles tapering. Rostrum rather large. Foot broad. Verge large, compressed, with a broad semicircular laminiform expansion or wing on its left side. Ova-capsules large, circular, depressed, almost discoidal, each containing a large number of eggs.

Station, fresh water.

Distribution Oregon and California. (Stimpson.)

Fluminicola nuttalliana, Lea.--Shell subglobose, horn-colored, smooth; sutures rather impressed; whirls 4; aperture white, nearly round. Fig 176.

Wahlamat, near its junction with the Columbia River: Prof. Nuttall. My cabinet; cabinet of Prof. Nuttall. Diam. .3, length .4 inch.

There is a very close resemblance between this species and *P. nuclea* (herein described). It is however, less oblique, larger and less elevated in the spire. *(Lea.)*

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Paludina nuttalliana, Lea, Tr. Am. Phil. Soc. VI, 101, pl. xxiii, f. 109 (1839); Obs. II, 101.
Amnicola nuttalliana, Cooper, P.R.R. Rep. p. 374 (no descr.) (1859).
Paludina seminalis, Hinds, Voy. of the Sulphur, p. 59, pl. xvi, f. 22.

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(1844); Arch. f. Nat. 1843, II, 130; Annals Nat. Hist. X, 83, pl. vi, f. 8.
?Leptoxis nuttalliana, Haldeman, Mon. Lept. 6, pl. v, f. 156 (1847?).
Anculotus nuttallii, Reeve, Con. Icon. 46 (1861) (excl. syn. *A. fuscus).*
Bithynia seminalis, Carpenter, Brit. Ass. Ad. Sc. 1857, 326, no descr.
Amnicola seminalis, Cooper, P.R.R. Rep. XII, 374 (1859), no descr.
Amnicola hindsi, Baird Pr. Zool. Soc. Lond. 1863, 67.

A very common species through Oregon and California. It was originally described and figured (as copied above) under the name *Paludina,* and has since been referred to the genera *Amnicola, Bithynia,* and *Leptoxis.* Its outward features are most closely allied to those of the last mentioned genus. I should have considered it a *Leptoxis* had not Dr. Stimpson discovered its true characters. From the other genera to which it has been referred it is readily distinguished by its horny subspiral operculum and thick shell.

Fig. 177.

I have seen no authentic specimen of *Paludina seminalis,* but have no doubt of No. 9212 and 9213 of the collection being referable to it. The original description and figure are copied below. It is from them I am induced to place it in the synonymy of *nuttalliana,* as done by Haldeman.

Fig. 178. *Paludina seminalis,* Hinds.--Shell obtusely turreted, solid, horn colored, smooth; apex eroded; whirls 4; aperture bluish, expanded.

River Sacramento, California.

Distinguished from *P. nuclea,* Lea, which is

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from a neighboring locality, by its somewhat smaller size, bluish instead of white mouth, having one whirl less, the aperture more expanded, and absence of the black lines round the mouth which when present is so good a character in his shell, but which, in any numerous specimens of it, I do not find at all constant, and usually only to be seen in those better developed. *Anodon angulatus* is also found abundant in this river, &c. *(Hinds.)*

I have not seen an authentic specimen of *Amnicola hindsi.* By the kindness of Mr. Carpenter I am able to give a translation of the original description and copy of the original figures. The latter will be published in the Report of the British N.A. Boundary Commission. The species seems to me identical with *Fluminicola nuttalliana.*

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Amnicola hindsi, Baird.--Shell obtuse, rather solid, greenish-olive, with delicate longitudinal wavy striae and ill-defined transverse furrows; apex eroded; whirls four, the last one bluntly carinated near the middle, channelled at the impressed sutures; columella white; aperture bluish.

Fig. 179.

River Kootania and stream at foot of Rocky Mountains, British Columbia.

Differs from *Paludina seminalis,* Hinds, in contour, being bluntly carinate round the middle of the last whirl, and in being channelled round the suture. The surface of the shell is distinctly marked with numerous flexuose striae, the lines of growth, and near the sutures is rather indistinctly marked with circular striae. *(Baird.)*

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9211	6	Columbia Riv.	Dr. Cooper.	.....
9226	1	Rogue's R.	Jacksonville, Or.	.....
9227	30+	Upper des Chutes R.,	Or.	Newberry.
9230	13	"	"	"
9231	3	Willamette River,	Or,	"
9232	20+	Canoe Creek,	Cal.	"
9233	6	Pitt River,	Cal.	"
9234	11	E. Br. of Klamath R.,	Or.	"

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9302 3 California Newberry. Type, Fig. 177.
9212 5 Oregon and W.T. " Pal. seminalis.
9213 2 " " .....

Fluminicola virens, Lea.--Shell oblique, thick, somewhat granose, green; whirls rather inflated; aperture ovate.

Fig. 180.

Wahlamat, near its junction with the Columbia River: Prof. Nuttall. My cabinet; cabinet of Prof. Nuttall. Diam. .2, length .4 inch.

The apices of all the specimens which Prof. Nuttall gave me are destroyed, so that it is impossible to give some of the characters of this species. It is remarkably solid for so small a species. *(Lea.)*

Paludina virens, Lea, Tr. Am. Phil. Soc. VI, 91, pl. xxiii, f. 93 (1839); Obs. II, 93.

Leptoxis virens, Haldeman, Lept. 5, pl. v, f. 147-150 (1847?). Fig. 181. See my Fig. 181.

Paludina nuclea, Lea *(l. c.)*, VI, 91, pl. xxiii, f. 103 (1839); Obs. II, 91.

Haldeman, *l. c.*, places doubtfully in the synonymy *Pal. nuclea,* Lea, of which the original description and figure are given below.

Paludina nuclea, Lea.--Shell obtusely turreted, solid, horn-color, smooth; sutures impressed; whirls 5; aperture white, oval.

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Fig. 182. Wahlamat, near its junction with the Columbia River. Prof. Nuttall. My cabinet. Cabinet of Prof. Nuttall. Diameter .2, length .4 inch.

This is a small, solid species, and is more oblique than *P. decisa,* Say. Like it, the apex is usually cut off. Round the mouth there is a black border, which contrasts with the pale horn-colored epidermis. *(Lea.)*

Cat. No.; No. of Sp.; Locality.; From whom received. Remarks.
9225 2 Willamette River, Or. ....

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Fluminicola fusca, Haldeman.--Shell subglobose, conic, smooth; spire loosened, with excoriated apex. Whirls subangular, forming posteriorly a slight projection on account of the labium turning abruptly at the suture, which is thus made conspicuous. Aperture rounded, posteriorly produced into a moderate angle. Columella thickened, somewhat concave, scarcely emarginate. Peritreme nearly uniform. Color reddish, labrum white.

Fig. 183. Fig. 184.

Inhabits Oregon Territory.

Somewhat resembles the preceding *(L. pisum),* but easily distinguished by the straighter labium and want of columellar emargination. In Fig. 84, the lines of growth are heavier, and a disposition is seen to form encircling striae. *(Haldeman.)*

Fig. 185.

Leptoxis fusca, Haldeman, Mon. Lept. 4 pl. iii, iv, f. 83, 84 (1847?).

To this species, of which the original description and figures are given above, I refer numerous specimens from Utah, Oregon, &c., in the collection.

Reeve quotes this species as *Anculotus fuscus* in the synonymy of *Anc. nuttalli.*

Cat. No.; No. of Sp.; Locality.; From whom received. Remarks.
9221 4 Head of Green R., Utah. Malloney.
9222 6 Shores of Lake Utah. Capt. Burton.

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POMATIOPSIS, Tryon.

Jaws like those of *Amnicola,* though smaller. Lingual membrane with numerous rows of 3, 1, 3 teeth; centrals small, broader at base, cusp recurved and tridentate, base with two obtuse denticles; laterals longer than broad, cusp recurved and denticulate, the inner lateral much broader than the two outer ones.

(FIG. 186.)

Tentacles short, subulate, pointed, rostrum large, longer than the tentacles. Foot broad. Verge very large, flattened, broad, convoluted in a spiral coil of one and a half turns. Ova capsules ----? Shell small, thin, smooth, long, subumbilicate. Spire turreted. Aperture ovate, peritreme reflected. Operculum corneous.

Fig. 187.

Eastern North America.

Terrestrial.

Pomatiopsis lapidaria, Say.-- Shell turreted, subumbilicate with six volutions, which are obsoletely wrinkled across. Suture impressed. Aperture longitudinally ovate-orbicular, operculated, rather more than one-third of the length of the shell.

Fig. 188.

Length about one-fifth of an inch. Collection of the Academy of Natural Sciences.

Inhabitant not so long as the shell pale; head elongated into a rostrum as long as the tentacula, and emarginate at tip; tentacula two, filiform, acuminated at tip, short; eyes prominent, situated at the external or

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posterior base of the tentacula; base or foot of the animal dilated, oval, obtuse before and behind.

Found under stones, &c., in moist situations, on the margins of rivers. Like those of the genera *Lymnaea* and *Planorbis,* this animal possesses the faculty of crawling on the surface of the water, in a reversed position, the shell downward. *(Say.)*

Cyclostoma lapidaria, Say, Journ. A. N. S. Phila. I, 13, (1817); Binney's ed. 59.
Amnicola lapidaria, Haldeman, Mon. p. 18, pl. i, f. 10 (1844?); Jour. A.N.S. Phila. VIII, 200 (1842).
Paludina lapidaria, Say, Nich. Ency. 3d ed. (1819); Binney's ed., p. 56.--Küster in Chemn., ed. 2, p. 54, pl. x, f. 21, 22.--DeKay, N. Y. Moll. 86 (1843).
Melania lapidaria, Lewis, Bost. Proc. VIII, 255; Phila. Pr. 1862, 290 (no descr.).

Pomatiopsis lapidaria, Tryon, Proc. Phila. Acad. 1862, 452 (no descr.).

This is a widely distributed species, ranging at least from Georgia to New York, and from Missouri to Michigan. It is also found in the postpleiocene of the Mississippi River bluffs.

I have already given a figure of the animal and lingual dentition (Figs. 186 and 187).

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8945	9	North Georgia.	A. Gerhardt.	.....
8946	9	Ohio?	J. G. Anthony.	.....
8947	8	Dist. of Columbia.	Dr. E. Foreman.	
8948	25+	.....	.....	.....
8949-8950	20+	Ann Arbor, Mich.	W. G. Binney.	
	6	St. Louis.	W. G. Binney.	Post-pleiocene?
8951	10+	New York.	Dr. J. Lewis.	.....
8952	20+	Elyria, O.	W. G. Binney.	.....
8935	3	New York.	Dr. J. Lewis.	Cabinet series.

Pomatiopsis lustrica, Say.--Shell conic; whirls slightly wrinkled, convex; suture profoundly indented; aperture oval, nearly orbicular; labrum with the superior edge not appressed to the preceding whirl, but simply touching it; umbilicus rather large, rounded.

Fig. 189.

Length less than one-tenth of an inch. Cabinet of the Academy.

The smallest species I have seen. The aperture somewhat resembles that of a *Valvata,* to which genus it may probably be referable. Mr. Jessup obtained two specimens on the shore of Cayuga Lake. *(Say.)*

Paludina lustrica, Say, Journ. A.N.S. Phila. II, 175 (1821); Binney's

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ed. p. 69.--Küster in Chemn. ed. 2, p. 63, pl. xii, f. 6, 7, not of Adams *(=pallida).*
Amnicola lustrica, Haldeman, Mon. p. 16 (1844).--DeKay, N. Y. Moll. 87 (1843).

Found also in Wisconsin and British America.

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Fig. 189 is drawn from an authentic specimen given by Mr. Say to the Philadelphia Academy.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8975	20+	Mohawk River.	N. Y. Dr. Lewis.	.....
8939	..	"	"	Cabinet series.
8977	2	Four Lakes, Wis.	I. A. Lapham.	
9019	3	Moose Factory.	C. Drexler.	

FAMILY CYCLOPHORIDAE.

Lingual membrane narrow, with seven rows of recurved, hooked teeth. Head proboscidiform; tentacles subulate; eyes on the outer side of the base of the tentacles. Foot elongsted. Operculum distinctly spiral, testaceous, cartilaginous or horny; whirls very numerous and sub-equal, or few and rapidly increasing. Shell usually covered with a horny epidermis; aperture for the most part, circular.

SUBFAMILY CYCLOSTOMINAE.

Operculum ovate, rarely subcircular, composed of a few gradually increasing whirls; nucleus somewhat excentrical.

CHONDROPOMA, Pfr.

Animal short, tentacles slender, enlarged at tips; eyes prominent,

Fig. 190. situated on a tubercle at the external base of the tentacles. Proboscis bifurcate. Operculum oval, subcartilaginous, flat, with few rapidly increasing whirls, and a nucleus generally very excentric. Shell oblong-turreted, generally truncated at tip, more rarely globosely conic; aperture oval;

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peristome simple, or more or less thickened, somewhat straight, rather expanded or broadly reflected.

Chondropoma dentatum, Say.--Shell conic cylindrical, or turreted, truncate at tip, the

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surface finely csncellate with

Fig. 192. raised, longitudinal, and revolving lines; color varying from yellowish to brown, usually with darker brown bands, which are generally interrupted in such a manner that the colors also form longitudinal stripes; whirls, when complete, seven; but the three uppermost are usually lost; they are rounded, and separated by a deep, crenulated suture; aperture rounded ovate, a little angular posteriorly; peristome a little reflexed, white; base with a minute perforation. Length 12, breadth 4 mill.

Cyclostoma dentatum, Say, Journ. Phila. Ac. V, 125: Binney's ed. 29.--De Kay, N. Y. Moll, 82.--Binney, Terr. Moll. II, 348, pl. lxii.

Chondropoma dentatum, Pfeiffer, Mon. Pneum. Viv. I, 286; II, 140; Mal. Blatt. 1856, 132.--Gray & Pfeiffer, Brit. Mus. Cat. Phan. 203.--W.G. Binney, Terr. Moll. IV, 91, pl. lxxv, f. 24.

Key West: Fort Dallas, Florida.

Animal (see Fig. 190): Body very short, pale, tentacles darker, slender, somewhat enlarged at tips; eyes black, prominent, situated on a tubercle at the external base of the tentacles. Proboscis bifurcate, the two points

Fig. 193. serving the purpose of buccal tentacles. Operculum horny, the spiral of about two and a half turns.

The shell is carried somewhat laterally, and very little elevated. The motions of the animal are very rapid; the locomotive disk contracts in an undulatory manner; and when the animal has advanced so that the shell drags along by its side, by a sudden con-

Fig. 194. traction of the neck the tip of the shell is suddenly jerked forward, so as to bring the shell at right angles with it; and this movement, in a quarter of a circle, is very rapidly performed. As the operculum prevents the animal, when at rest and retired within its shell, from adhering by means of its foot, as is usual with the *Helicidae,* the animal has the power of spinning

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a short thread, which is attached to the object

of support; and by this it hangs suspended at pleasure.

Cat. No.; No. of Sp.; Locality.; From whom received. Remarks.
8534 7 Florida. W.G. Binney. Cabinet series.

SPURIOUS SPECIES OF CYCLOPHORIDAE.

Cyclostoma cincinnatiensis, Lea, not Anthony & De Kay, is an *Amnicola*, and *C. lapidaria*, Say, Linsley, and Kirtland, is a species of *Pomatiopsis*, q. v.

Cyclostoma marginalis, Kirtland (Ohio Rep.), *C. marginata*, Say, are species of *Pupa*, q.v.

Cyclostoma tricarinata, Say, is a *Valvata*.

Ctenopoma rugulosum, Pfeiffer, may, perhaps, prove an inhabitant of Florida. A single specimen found there is here figured. Fig. 195.

FAMILY TRUNCATELLIDAE.

Lingual membrane with seven rows of recurved, hooked teeth. Animal with a broad, produced, bilobed muzzle, tentacles flattened, sub-triangular, eyes sessile on the middle of their upper bases. Foot very short and rounded. Operculum horny, subspiral. Shell lengthened, truncated, with a rounded aperture.

TRUNCATELLA, Risso.

Animal with a small foot, against the end of which rests the operculum when the animal is withdrawn; the tentacles are short, acute; the snout is extended beyond them as much as the whole length of the animal. The shell is carried horizontally. Operculum horny, hardly spiral, with a basal nucleus. Shell imperforate, but with an umbilical groove, cylindrical, turreted, usually pellucid and smooth, of a reddish horn-color; the upper whirls Fig. 196.

are also truncated in the adult, the remaining ones are usually gradually increasing in size, and covered with more or less strongly developed ribs; the peristome is simple or double, sometimes reflected; the base is generally furnished with a prominent carina or ridge, formed by the peristome. Aperture rounded.

Dr. Gray describes *Truncatella* with distinct white jaws.
Fig. 197.

The teeth of *T. caribaeensis*, by Troschel: Central rather narrow, conical, apex recurved; first lateral very broad, apex recurved, denticulate; second lateral narrower, denticulated; outer lateral narrow, simple.

Truncatella caribaeensis, Sowb.--Shell subrimate, subcylindrical, rather solid, in its truncated state but slightly decreasing in size towards the apex, reddish, or dark amber-colored, with delicate ribs, which are but little curved, and often hardly perceptible on the middle of the whirls; suture slight; whirls not truncated, three or four, distinctly increasing in size, equally convex, the last often smooth, slightly carinated on its base; aperture subvertical, ovally elliptic, angular above; peristome continuous, straight, thickened at its connection with the penultimate whirl. Length 7-8, diameter 3 millimetres; length of aperture 2½ millimetres. Fig. 198.

Truncatella caribaeensis, Sowerby MSS.--Reeve, Conch. Syst. 11 t. clxxxii, f. 7.--Pfeiffer in Zeitsch. f. Mal. 1846, 182; Mon. Auric. Viv. II, 185; Mon. Phan. Viv. II, 7; Brit. Mus. Cat. 134.--W.G. Binney, T. M. IV, 185, pl. lxxv, f. 2, 4.--Chemnitz, ed. 2; Auric. p. 9, pl. i, f. 35, 36; pl. ii, f. 22; not pl. ii, f. 2-4.
Truncatella gouldii, Adams, ined.
Truncatella succinea, Adams, Proc. Bost. Soc. 1845, 12.

Florida Keys, Mexico, Alabama; also Cuba and Jamaica.

Cat. No.; No. of Sp.; Locality.; From whom received. Remarks.
8534 3 Florida. W. G. Binney. Cabinet series.

Binney, p. 99

Truncatella bilabiata, Pfr.--Shell subrimate, cylindrical, elegant, solid, opaque, brownish; ribs subarcuate, elevated, obtuse, at equal distances; suture deep and simple; remaining whirls 4½ to 5, convex, the last scarcely longer than the others, heavy and subcompressed at base; aperture vertical, oval, scarcely angular above; peristome double, the outer one white, heavy, and terminating in the basal ridge or carina, the inner one continuous. Length 5¾, breadth 1¼; length of aperture 1½ millimetres. Fig. 199.

Truncatella bilabiata, Pfeiffer in Wiegm. Arch. 1840, I, 253; in Zeit. f. Mal. 1846, 187; Mon. Auric. Viv. 192; Mon. Pneum. Viv. II, 8; Brit. Mus. Cat. 140.--W. G. Binney, T. M. IV, 188, pl. lxxv, f. 3, 7. --Chemnitz, ed. 2, p. 7, pl. i, f. 27-31.

Florida, Cuba, Carmen Island.

Cat. No.; No. of Sp.; Locality.; From whom received. Remarks.
8532 3 Florida. W. G. Binney. Cabinet series.

Truncatella pulchella, Pfr.--Shell subrimate, oblongly subcylindrical, light, reddish horn-color or amber, shining pellucid, lightly ribbed; ribs scarcely elevated, thread-like at irregular intervals, often more distinct at the moderate suture; remaining whirls 4 to 4½, rather convex, gradually increasing in size, the last generally smooth below the middle, compressly carinated at its base; aperture subvertical, obliquely elliptical, enlarging at base; peristome simple, continuous, somewhat expanding, and furnished with a slight ridge at its right extremity. Length 4½-5, of aperture 1 2/3 mill. Fig. 200.

Truncatella pulchella, Pfeiffer in Wiegm. Arch. 1839, I, 356; in Zeitsch. f. Mal. 1846, 186; in Mon. Auric. Viv. 192; Mon. Pneum. Viv. II, 8; Brit. Mus. 140.--W. G. Binney, T. M. IV, 189 pl. lxxv, f. 1, 9, 10.--Chemnitz, ed. 2, Auric. 10, pl. ii, f. 11-15.

Florida. Also a West Indian species.

Cat. No.; No. of Sp.; Locality.; From whom received. Remarks.
8533 2 Florida. W.G. Binney. Cabinet series.

(PAGE 100)

Truncatella subcylindrica, Gray.--Shell scarcely rimate, cylindrical, furnished with regular, crowded ribs, less prominent or obsolete at the suture, shining, pellucid, yellowish horn-color or hyaline; remaining whirls four, rather convex, flattened in the middle, regularly increasing, the last not ridged on the base; aperture vertical, ample, angularly oval, subeffuse at base; peristome lightly thickened, its external margin sub-produced, the columellar portion briefly reflected, appressed and above thickened. Length 5, breadth 2 mill. Fig. 201.

Helix subcylindrica, Pulteney, Cat. Dorsetsh. 49.--Montagu, Test. Br. II, 393.
Truncatella subcylindrica, Gray in Turton's Man. 22, f 6.--Shuttleworth, Diagn. 7, 154.--Pfeiffer, Mon, Auric. Viv. 187; Mon. Phan. Viv. II, 7; Br. Mus. Cat. 136.--W. G. Binney, T. M. IV, 186, pl. lxxv, f. 5, 6, 8.--Orbigny, Moll. Cub. II, 5 (excl. *T. truncatula*).
Truncatella truncatula, Lowe in Zool. Proc. 1845, 217?; in Zool. Journ. V, p. 299, tab. xiii, f 13-18?
Truncatella caribaeensis, Pfeiffer in Zeitsch. f. Mal. 1846, 182, ex parte.--Küster in Chemn. ed. 2, Auric. pl. ii, f. 1-4.

A West Indian species found on the Florida Keys.

Truncatella californica, Pfr.--Shell not rimate, cylindrical, truncated at tip, thin and translucent with light striae, shining, amber-colored; spire in the perfect state of the shell composed of about ten whirls, of which four only are not deciduous; these are convex, increasing in size rather rapidly; aperture oval, vertical, rounded above; peristome simple and continuous, slightly expanded, its pillar margin scarcely attached to the shell. Length 4 2/3, diam. 1 2/3 mill. Fig. 202.

Binney, p. 100

Truncatella californica, Pfeiffer, Proc. Zool. Soc. London, May, 1857, 111; Mon. Pneum. Viv. II, 7.--W. G. Binney, T.M.U. S. IV, 28, pl. lxxix, f, 20, 22.
Truncatella gracilenta, Gould, Proc. Phila. Ac. Nat. Sc. X, 1858, errata.

San Diego, California.

FAMILY NERITIDAE.

Jaws two, above and below, with denticulated margins. Lingual dentition very similar to that of the *Trochidae;* the central teeth few, the lateral hooks, or uncinae, very numer-

(PAGE 101)

ous. Head with a broad, short muzzle; tentacles slender and subulate, with the eyes on stout peduncles at their outer

(FIG. 203.)

bases; no head-lobes or neck-lappets. Foot oblong, triangular, the sides simple, without filaments, or lateral membrane. Operculum articulated, shelly, subspiral. Shell depressed or oval, not umbilicated; spire very short, cavity simple from the absorption of the internal portions of the whirls; aperture semiovate, not pearly within.

In this tribe of Scutibranchiate mollusks the sides of the foot are without membranaceous fringes and tentacular filaments; the animal is not voluminous, and the foot is small and never envelops the shell; in their dental system they resemble the *Trochidae,* as also in their muzzle-shaped heads and pedunculated eyes. They are littoral animals, inhabiting the stones and rocks along the shore, feeding on the algae that abound in that situation. They appear to be more active during the night, resembling in this respect, the *Patellidae,* which are said to enjoy considerable locomotive powers at that time.

There are several genera included in this family which are not fluviatile, and therefore not noticed by me. Such are *Nerita, Clithon,* and *Catillus.* The genus *Neritella* alone is referred to.

Binney, p. 101

NERITELLA, Humphrey.

Operculum testaceous, the outer surface smooth, with two apophyses, the upper shorter, sometimes dilated and crested, the lateral in the form of an arched rib. Shell globose, oval, turriculated or conical, thin, often depressed, covered with a horny epidermis; aperture semilunar; inner

Fig. 204.

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lip straight, flattened, the margin smooth or denticulated; outer lip simple internally.

The *Neritellae* are tolerably numerous in species; they are inhabitants of fresh water, and are usually covered with an epidermis; some among them are found crawling on the stones in shallow water; others live in deeper water, half buried in the mud, some in brackish and others even in salt water; some are amphibious, clinging to the roots of Nipah palms and other trees on the margins of rivers, while a few inhabit the foliage of tall trees that overhang ponds and rivulets. The genus *Neritella,* as restricted, is characterized by the shell being transverse, elliptical or hemispherical; the spire lateral or none; the inner lip septiform, flattened and striolate, with the margin finely denticulate; with one or two exceptions they are not found in the frigid or temperate zones, but are extensively distributed in every other part of the world.

I adopt the name *Neritella,* instead of *Neritina,* on account of its having precedence. I presume a description was published by Humphreys, but do not have access to a copy of the Museum Colonnianum. *Neritella* is generally preferred in the more recent works on Conchology.

The genus *Neritella,* as restricted by Messrs. Adams, contains no North American species. The following are the subgenera proposed by them, with the American species quoted in each:--

Subgenus Neritina, Sw. *(Clithon,* Recluz).--Shell globular, oval or turriculated, smooth or spirally striated, often adorned with vivid and varied colors; inner lip septiform, crenulated rarely simple.

N. cassiculum. *N. sayana.*
N. reclivata.

Subgenus Vitta, Klein *(Theodoxus,* Montf.; *Elea,* Ziegl.).--Shell transverse, smooth or nearly smooth; spire lateral, inclined over the aperture, more or less prominent; inner lip usually flat, with the margin simple or denticulated; operculum uniform, without colored zones.

N. jayana. *N. picta.*

Subgenus Dostia, Gray (*Sandaliformes, Mitrula,* Mke.).--Shell slipper-shaped, solid; apex entirely posterior, rolled in a half turn on the

(PAGE 103)

side; peritreme continuous and free; inner lip septiform, the margin united to the inner portion of the peritreme, slightly arched in the centre, and denticulated.

(No American species.)

Subgenus Alima, Recluz.--Shell depressed, orbicular, with the upper extremity of the outer margin prolonged into a lateral wing; spire subposterior and lateral; inner lip septiform, margin finely denticulate.

(No American species.)

Subgenus Neripteron, Lesson.--Shell catilliform, with the two extremities of the outer margin prolonged into lateral auricles; spire subposterior and lateral; inner lip septiform; margin finely denticulate.

(No American species.)

Nerita reclivata, Say.--Shell thick, strong, globose-oval, greenish-olive, with numerous approximate, parallel, irregularly undulated green lines across the volutions; volutions about three, the exterior one occupying nearly the whole shell; spire very short, obtuse at the apex, and frequently eroded to a level with the superior edge of the body whirl; mouth within bluish-white; labrum acutely edged; labium callous,

Fig. 205.

Fig. 206.

minutely crenated on the edge and with a small tooth near the middle. Greatest diameter nineteen-twentieths of an inch; greatest transverse diameter four-fifths of an inch.

Inhabits East Florida. Cabinet of the Academy and Philadelphia Museum.

Animal pale or less distinctly lineated, or clouded with black; foot rounded, almost orbicular, hardly as long as the shell is broad; above with four more or less distinct, black, parallel lines; rostrum dilated, truncated, tip with four black lines, a black band connecting the eyes; eyes prominent appearing to be placed on a tubercle at the outer base of the tentacula, black, with a white orbit; tentacula with darker or black lines, setaceous, and longer than the breadth of the rostrum; beneath immaculate.

I found this species in great plenty, inhabiting St. John's River in East Florida, from its mouth to Fort Picolata, a distance of a hundred miles, where the water was potable. It seemed to exist equally well where the water was salt as that of the ocean, and where the intermixture of that condiment could not be detected by the taste. Its movements are remarkably slow. *(Say.)*

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Theodoxus reclivatus, Say, Journ. A. N. Sc. Phila. II, 257; Binney's ed. 87.
Neritina reclivata, Reeve, Con. Icon. 34 *a, b,* Oct. 1855.
Neritina floridana, Shuttleworth in Reeve, Con. Icon. 85 *a* ? Nov. 1855.

Fig. 207 represents the lingual dentition of this species from a

(Fig. 207.)

specimen presented the Smithsonian Institution by Prof. Agassiz. The lingual plate is composed of 48 rows; median tooth small, slightly tridentate; first lateral large, trapeziform; second and third lateral minute simple; uncini 18 or 19, first large, marked with one large denticle, flanked by ten minute denticles; the rest close set. long, slender, recurved, and blunt at ends.

Binney, p. 104

Reeve quotes it from Mexico.

I have seen no authentic specimen of *Neritina floridana,* Shuttl., placing it in the synonymy after a study of Reeve's description and figure, which are copied below.

Neritina floridana.--Shell compressly-globose, rather solid, spire obtuse, whirls rather flattened at the upper part, columellar area callous; greenish-white, densely elegantly painted with very fine olive lines.

Fig. 208. *Neritina floridana,* Shuttleworth MS. in Museum Cuming.

Florida. Closely allied to *Neritina reclivata,* from which it scarcely differs, except in being of a more stunted growth. *(Reeve.)*

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9299	1	Florida.	L. Agassiz.	Fig, 207.
9307	..	"	"	Fig. 208.

Neritella californica, Reeve.--Shell ovate, rather thin, concave beneath, spire rather narrowly produced, obtusely flattened at the apex, whirls smooth, aperture expanded, columellar area concavely flattened,

(PAGE 105)

rather broad; black, blue within, columellar area deep blood-stained.

Fig. 209.

Gulf of California. This appears to be distinct from any of its congeners in form, while the deep-toned coloring is characteristic. *(Reeve.)*

Neritina californica, Reeve, Con. Icon. 20, *a, b* (Oct. 1855).

I have seen no authentic specimen of this species, the original description and figure of which are given above.

Neritella cassiculum, Sowerby.--Of a globose form, slightly inclining to oval, with an olive-green epidermis, under which may be seen numerous black lines, angulated so as to leave white,

Binney, p. 105

triangular spots, which are larger in three bands across the shell; spire obtuse, consisting of four whirls; aperture semicircular, with the outer lip slightly thickened and the columella inclining to orange, narrow, swelled, and minutely crenulated on its nearly straight edge. Locality unknown. *(Sowerby.)*

Fig. 210.

Neritina cassiculum, Sowerby, Conch. Ill. f. 55; Thes. Conch. 521, pl. cvi, f. 194.--Carpenter, Maz. Shells (1858), 258; Brit. Mus. Rep. pl. ix, f. 5 (1857).

Carpenter quotes this species from Mazatlan. I have seen no specimen, but give above the original description and figure.

Neritella picta, Sowerby.--Subglobose, grayish, variously painted, with black lines or reticulations and whitish spots. There is a peculiar enamel-like appearance about the external surface; the columella is invariably of a chestnut color, rather swelled, and obscurely crenulated at the margin.

Fig. 211.

Panama, on a mud bank, partially overflowed with fresh water: Cuming. *(Sowerby.)*

Neritina picta, Sowerby, Pr. Xool. Soc. 1832, 201; Illustr. pl. lxxxvi, f. 1; Thes. Conch. 530, pl. cxvi, f. 267-9.--Reeve, Con. Icon. 101.--Deshayes in Lamarck, VIII, 588.--Carpenter, Maz. Cat. 259 (1856).

A very variable species found within the limits included in my work--at Mazatlan, as well as further south. The original description and figure are given above.

There is a *Neritina picta,* of Ferussac (Hist. fig. 4-7), found

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fossil in France. Some of the references quoted above are referred to Ferussac's species by Grateloup (Soc. Lin. Bord. XI, 127). I have not the means of settling the synonymy.

Neritella showalteri, Lea.--Shell smooth, rounded, semitransparent, yellowish-horn-color;

Binney, p. 106

spire very much depressed; sutures slightly impressed; whirls three, inflated; aperture semi-rotund; inner lip dilated, white, thickened; without teeth a nd incurved; outer lip acute, dilated and thin. Operculum--?

Fig. 212.

Coosa River, ten miles above Fort William, Shelby County, Alabama: E. R. Showalter, M. D. My cabinet, and cabinets of Dr. Showalter and Dr. Lewis, and Academy of Natural Sciences. Diam. .22, length .18 inch.

The discovery of this shell by Dr. Showalter marks the first notice, I believe, of the genus *Neritina* being found in our waters. His very close observation and active investigations of the waters of central and northern Alabama have enabled him to lay the naturalists of this country under many obligations by new discoveries, and this is certainly one of much importance. We now see for the first time that this genus, which is common in Europe, Africa, Asia, South America, and the West Indies, also inhabits our southern rivers. I have great pleasure in naming the species after the discoverer. This species is not allied to any which has come under my notice. It is more rotund than usual, has a clear horn-colored epidermis, smooth and shining. The substance of the shell is so thin as to permit the column to be visible through it. The inner lip is broad and slightly notched where it is in contact to the body whirl. It is to be regretted that among the four specimens sent to me by Dr. Showalter neither had an operculum. The soft parts have not yet been observed. *(Lea.)*

Neritina showalteri, Lea, Pr. Acad. Nat. Sc. Phila. 1861, 55; Journal I n.s. I, V, pt. 3, 267, pl. xxxv, f. 78, 78*a* (Mar. 1863); Obs. IX, 89.

I can add nothing to the knowledge of this species contained in Mr. Lea's description copied above. One of his figures is copied in my Fig. 212.

Neritella jayana, Recluz.--Shell rather small, transversely-ovate, thin, concentrically and delicately striated, yellowish under the epidermis, varied with delicate angularly-flexuose, reticulated, small black lines and small white spots; behind generally of an uniform black; whirls three, almost conic above, and with a narrow canaliculated suture; spire inclined towards the side; labium compressed, white with black spots, edentulate and scarcely arched in the centre; labrum greenish-yellow. Height 4¼, breadth 6, thickness 3 mill.

Fig. 213.

North America ?

(PAGE 107)

We are indebted for this little species to Dr. Jay, of New York, in whose honor it is named. It cannot be confounded with the European species *N. fluviatilis*--of which it is the American analogue--not only on account of its constant coloration, but still more on account of its conical spire and canaliculated suture. *(Recluz.)*

Neritina jayana, Recluz, Journ. de Conch. I, 157, pl. vii, f. 13 (1850).

I am unable to add any information regarding this species or its habitat, further than what is contained in the above copy of the original description and figure.

SPURIOUS SPECIES OF NERITELLA.

Neritina striata, Besleri, from New Orleans is quoted in the synonymy of *Neritina zebra*, Brug., of Cayenne, by Recluz, in Journ. de Conch. I, 152, and

Neritina zigzag, Sowerby, from Florida, as a synonym of *Neritina lineolata*, Lam., of Cayenne. I can find no description or further information regarding the former, or any authority for the habitat given of the latter.

FAMILY HELICINIDAE.

Lingual membrane long, narrow, with numerous longitudinal series of teeth, arranged 00, 5, 1, 5, 00; see description of *Helicina orbiculata*, on p. 108. Head proboscidiform; tentacles subulate, with the eyes at their outer bases. Foot elongated. Operculum non-spiral, annular, semi-oval or subtriangular, with concentric elements, thick and testaceous, or thin and horny. Shell with the aperture semilunar.

HELICINA, Lam.

Animal long, heliciform, tentacles slender, drooping, eyes at their external base; proboscis truncated. Operculum non-spiral, somewhat semioval, membranous or testaceous. Shell heliciform, turbinate, globose or depressed, base callous around the columella, which is somewhat flattened, and rather straight; aperture tri-

Fig. 214.

(PAGE 108)

angularly semioval, entire; peristome simple, straight, or thickened, often widely expanded. No horny jaw. Lingual mem-

(FIG. 216.)

brane with teeth arranged 00, 5, 1, 5, 00. Centrals small, apex broad, reflected; first and second laterals broader, rounded at base, apex recurved, denticulated; third lateral suboval, apex recurved, denticulated; fourth lateral long, narrow, irregularly shaped, apex recurved, denticulated; uncini long, narrow, apex recurved, denticulated.

SUBGENUS OLIGYRA, Say.

Shell subglobose or conic; spire equalling or excelling the last whirl, whirls ecarinate; peristome expanded.

Helicina orbiculata, Say.--Shell subglobose, acute at apex, solid, smooth, very delicately striated; coloryellowish, brownish, or ash-colored, with a linear, pale zone at the periphery, which passes up the spire at the suture, and makes it white; there are also in many specimens numerous capillary zones, and some specimens are mottled with pale spots; whirls five, well rounded, suture well impressed; aperture rather large, semilunar; peristome white, moderately reflexed, and often greatly thickened and protruded by age; columella short, joining

Fig. 217

(PAGE 109)

the peritreme at nearly a right angle, and forming thereby a denticular protruberance; base delicately enamelled. Diameter 9, height 6 mill.

Helicina (Oligyra) orbiculata, Say, Journ. Phila. Ac. I, 283; Nich. Encycl. ed. 3; Am. Conch. 5, pl. xlvi, f. 1-3; ed. Binney, 36, pl. xlvi, f. 1-3; ed. Chenu, Bibl. Conch. III, 58, pl. xv, f. 2, 2*a*, 2*c*.--Gray, Zool. Journ. I, 70.--Binney, T. Moll. II, 352, pl. lxxiii, lxxiv, f. 3. --DeKay, N.Y. Moll. 82 (1843).--Chemnitz, ed. 2, 74 (1846), pl. x, f. 32, 33.--Pfeiffer, Mon. Pneum. Viv. I, 375; II, 199 (excl. *H. rubella*).--Gray & Pfeiffer, Brit. Mus. Phan. 272 (not of Sowerby).--W. G. Binney, T. M. IV, 193, pl. lxxv, f. 18-20.

Helicina tropica, Jan in Chemnitz, ed. 2, p. 37, pl. iv, f. 9, 10.--Pfeiffer, Mon. Pneum. Viv. I, 375; II, 199.--Gray & Pfeiffer, Brit. Mus. Phan. p. 271.--W. G. Binney, T. M. IV, 194.--Troschel, Gebiss d. Schn. p. 81, pl. v, f. 9.

Helicina ambeliana, Sowerby, Thes., Tab. 8, pl. i, f. 19 (1842), not Roissy.

Helicina castanea, Sowerby, l.c., 13, pl. i, f. 31, 32.

Helicina vestita, Guilding in Sowb., *l.c.*, p. 14, pl. i, f. 42.

Helicina minuta? Sowerby, *l.c.*, f. 40, 41.

Texas to Georgia; Tennessee to Florida. Also in the post-pleiocene of the Mississippi Valley.

Animal (see Fig. 214): Head and tentacles black, the other parts of the body dark. Tentacles long and slender, tapering to a point. Eyes black and prominent. Motion gliding as in *Helix*. Operculum horny, turning back upon the columella as if upon a hinge.

This species seems to be distributed over a very wide extent of territory, and also to be subject to great variations in size and coloring. From specimens collected in company, within a very small area, individuals might be selected differing so widely from each other that no one would hesitate to regard them as very different species, unless their history were known.

Binney, p. 109

Cat. No.; No. of Sp.; Locality.; From whom received. Remarks.

8443 5 Texas. G. Wurdemann. .....
8444 1 ....
8445 3 St. Simon's Island, Ga. Dr. J. Lewis.
8539 3 ..... W. G. Binney. Cabinet series.
8446 75 Texas. Lieut. Couch. *(H. tropica.)*
8447 22 Indianola, Tex. ..... "
8448 44 Tamaulipas, Mex. Lieut. Couch "
8449 " " "
8538 5 Texas. W.G. Binney. " Cab.
8809 300? " " " ser.
8962 .. Hot Spr., Ark. Dr. B. Powell .....

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Helicina hanleyana, Pfr.--Shell globose-conic, rather solid, marked with impressed concentric, rather spaced lines; scarcely transparent, shining, reddish horn-colored; spire shortly conic, obtuse; whirls five, scarcely convex, the last rounded, slightly descending before; aperture slightly oblique, sub-semicircular; columella very short, denticulated without, with a diffuse, light white callus; peristome white, scarcely expanded, thickened within, ending in a basal columellar denticle. Greater diam. 7½, less 6½, height 5 2/3 mill.

Fig. 218.

Helicina hanleyana, Pfeiffer in Proc. Zool. Soc. 1848, 122; Mon. Pneum. Viv. I, 376. --Chemnitz, ed. 2, 45, pl. ix, f. 7, 8.--Gray and Pfeiffer, Brit. Mus. Phan. 302. --W. G. Binney, T. M. IV, 192, pl. lxxv, f. 14, 16.

Near New Orleans.

Helicina chrysocheila, Binney.--Shell broad conic, or pyramidal, thin, shining, pale yellow, with the surface finely shagreened with microscopic, punctured lines; spire elevated, whirls five, moderately convex, the last one somewhat flattened at base and indistinctly angular at the periphery; aperture large, very oblique, semioval, the diameters about equal; the peristome broadly everted, especially at its middle portion, narrow and simple at its columellar junction, of a golden-yellow color; parietal callus extended, of a deep orange color. Diameter 10, height 8 mill.

Fig. 219.

Binney, p. 110

Helicina chrysocheila, Binney, Ter. Moll. II, 354, pl. lxxiv, f. 4.---W. G. Binney, Terr. Moll. IV, 192.---Pfeiffer, Mon. Pneumon. II, 197 (not of Shuttleworth).

Texas and Tampico in Mexico.

Cat. No.; No. of Sp.; Locality; From whom received. Remarks.

8535 1 Texas. G. Wurdemann. Cabinet series.
8536 .. Tamaulipas, Mex. Lieut. Couch. "

Helicina subglobosa, Poey.--Shell globose-conic, solid, lightly striate, rather shining, uniformly white, or marked with two red bands, one broad near the suture, other narrow, near the periphery; spire convex-conic, rather sharp; whirls six, the upper ones flattened, the penultimate

(PAGE 111)

more convex, subtriangulate, the last subcarinate, rather convex below; columella short, arched, dilated, marked with a white line. and covered with a light callus; aperture rather oblique, irregularly semioval; peristome wide, angularly spreading, sub-excavated, narrowing at each extremity. Greater diam. 10, lesser 8½, height 7 mill. *(Pfeiffer.)*

Fig. 220.

Helicina subglobulosa, Poey, Mem. I, 115, 120, tab. xii, f. 17-21.--Pfeiffer, Malak. Blatt. 1854, 107; 1856, 146; Mon. Pneum. Viv. II, 209.--W.G. Binney, T.M. IV, 195, pl. lxxv, f. 17.

Fort Dallas and Key Biscayne, Florida. Also Cuba.

The specimens received may, perhaps, be referable to *Hel. subdepressa,* Poey.

Cat. No.; No. of Sp.; Locality.; From whom received.

8540 1 Fort Dallas, Fla. W. G. Binney. Cabinet series.

SPURIOUS SPECIES OF HELICINA

Helicina fastigiata and *plicata* of DeKay, N. Y. Moll. 82, are respectively *Helix fastigans* and *Helix hazardi.*

Binney, p. 111

FOSSIL SPECIES OF HELICINA

Helicina occulta, Say.--Shell small, rather solid, low conical, acute at apex, cretaceous, obviously striated; spire of five nearly plane whirls, the last of which is angular at the periphery, and this angle continuing up the spire adjacent to the suture, makes it appear double; the aperture is small, semilunar; the peristome is scarcely reflexed, but is thickened internally; the columella is very short, and joins the peristome by a slightly waving curve, without forming an angle. Diameter 6, height 5 mill.

Fig. 221.

Helicina occulta, Say, Transylv. Journ. of Med. IV, 528 (1831); Descr. of New Terr. and Fluv. Shells (from the Diss.), p. 15 (1840); Am. Conch. V, pl. xlvi, f. 4-6 (1832); ed. Binney, p. 37, pl. xlvi, f. 1-3.--Binney, Terr. Moll. U.S. II, 356, pl. lxxiv, f. 1, 2.--DeKay, N.Y. Moll. 82 (1843). --Pfeiffer, Mon. Pneum. Viv. I, 347. --Chemnitz, ed. 2, 18 (1846), pl. iv, f. 11, 12 (1850).--Gray &

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Pfeiffer, Brit. Mus. Phan. 250.--W. G. Binney, T. M. IV, 193.

Helicina rubella, Green, in Doughty Cat. II, 291 (1832).

Very plenty in the postpleiocene beds of the West.

Cat. No.	No. of Sp.	Locality.	From whom rec'd.	Remarks.
8442	1	Sheboygan, Wis.	I.A. Lapham.	Fossil. color remaining.
8537	2	-----	W. G. Binney Cab. ser.	"
8805	1	-----	W. Stimpson.	"

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APPENDIX TO VIVIPARIDAE, ETC.

Since the first portion of the preceding pages was printed the following additional species have been received:-

Binney, p. 113

Pomus depressa. (Page 3.) Fig. 222.

I am now able to give a figure of the jaws of this species.

Valvata pupoidea, Gould. (Page 13.)

A better view of this species than Fig. 19 is here given. Fig. 223.

Page 14. The description of *Valvata humeralis* should have been accredited to Say.

Vivipara contectoides. (Page 23.)

The figure of this species here given is to be substituted for that given on page 23, which incorrectly shows but three revolving bands. There are invariably four on all the specimens I have examined. Fig. 224.

I neglected to state in the text that I did not adopt *linearis* as the specific name in this case, because it was probably a typographical error for *lineata* in Küster's monograph, and because it does not apply to the shell in question.

Vivipara inornata.--Shell minutely perforated, globose-conic, thin, smooth, polished, lines of growth extremely delicate on the body whirl, imperceptible above; color uniformly greenish or plae olive, unadorned with any revolving lines; the suture impressed, spire short, conical;

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apex acute, distinct, not truncated; whirls regularly increasing, inflated, the last globose, equalling aboit two-thirds of the shell's length; aperture oblique, rounded, large; lip continuous in one plane; peristome thin, acute, continuous; columellar extremity appressed to the body whirl, almost entirely concealing a minute umbilicus; parietal wall of the aperture covered with a thin, shining, colorless callus. Length of axis 19 mill., breadth 17 mill.

Fig. 225.

Vivipara inornata W. G. Binney, Am. Journ. Conch. I, 49, 1865, pl. vii, f. 1.

Near Chopatilo, Mexico.

Binney, p. 114

It is after a very careful examination of the specimens brought from Chopatilo, that I have decided to propose for them a specific name. Having submitted them to several experienced Conchologists, I find my decision approved by them. It can be compared with no known American form.

The smooth, polished surface, unbroken by revolving lines, the ale olive color and acute apex, are the more prominent features of it.

About a dozen specimens were brought. On one is an obtuse, ill-defined carina on the middle of the body whirl.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9168	1	Near Chopatilo, Mex.	.....	Type.
9218	2	"	.....	.....

MELANTHO. (Page 35.)

Fig. 226.

Bowditch thus describes and figures *Melantho* as a subgenus of *Melania* (Elem. Conch. 1822, p. 27, pl. iv, f. 15):--

Peristome incomplete, not effusive; very thick; white. Subgl,obular. Msrine.

Melantho decampi, Currier.--Shell ovate, oblong, imperforate, rather thick, irregularly roughened by occasional coarse wrinkles of growth, decussated by delicate revolving and longitudinal striae; greenish olive, with revolving dark broad lines when young, darker when old; suture impressed, spire elevated, but truncated; remaining whirls three, of which the two upper are flattened, the lower subconvex, with a median obtuse

(PAGE 115)

carina, reaching to, and modifying the peristome; aperture higher than broad, roundly lunate, produced below; bluish within; peristome simple, acute, sinuous, angular above at the termination of the carina. Greater diameter, including aperture, 22 mill., length 35 mill.; length of the aperture 20 mill., diameter 10 millimetres.

Fig. 227.

Binney, p. 115

Operculum horny, concentric.

Fig. 228.

Melantho decampi, W.G. Binney, Am. Journ. Conch. I, 49, 1865, pl. vii, f. 2, 3.

Huntsville or Stevenson, Alabama: Dr. W. H. DeCamp, 1st Michigan Vol. Engineers.

This species was given me by Mr. A. O. Currier, of Grand Rapids, Michigan, who suggested its bearing the name of its discoverer.

About a dozen specimens were collected. All but the one drawn in Fig. 227 could not be distinguished from *Melania* without the presence of the operculum, thus furnishing another example of the impossibility of ascertaining from the shell alone the generic position of some species. It is probable that other species of *Melantho* have been described as *Melaniae*.

Fig. 229.

Fig. 227 was photographed from nature on wood. It represents the largest and oldest specimen. Fig. 229 is drawn from a younger individual.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9309	2	Huntsville or Stevenson, Ala.	Currier.	Type. Fig. 227-9

Gillia -----?

From Stephenson, Ala., and Powel's River, Tenn., has lately been received a new species of *Gillia*, here figured.

Fig. 230.

On page 63. *Paludina altilis* should have been referred to *Gillia*.
Paludina pallida, subglobosa, fontinalis, and *isogona* to *Somatogyrus isogonus*.
Paludina lustrica to *Pomatiopsis*.

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Fig. 231. Helicina -----?

The Smithsonian Institution has just received from Mr. Xantus a specimen of

Binney, p. 116

Helicina from the Sierra Madre. I do not propose a name for it, as it may already have been described in Europe. A figure is here given, almost twice the natural size, and a figure of the lingual dentition.
(FIG. 232.)

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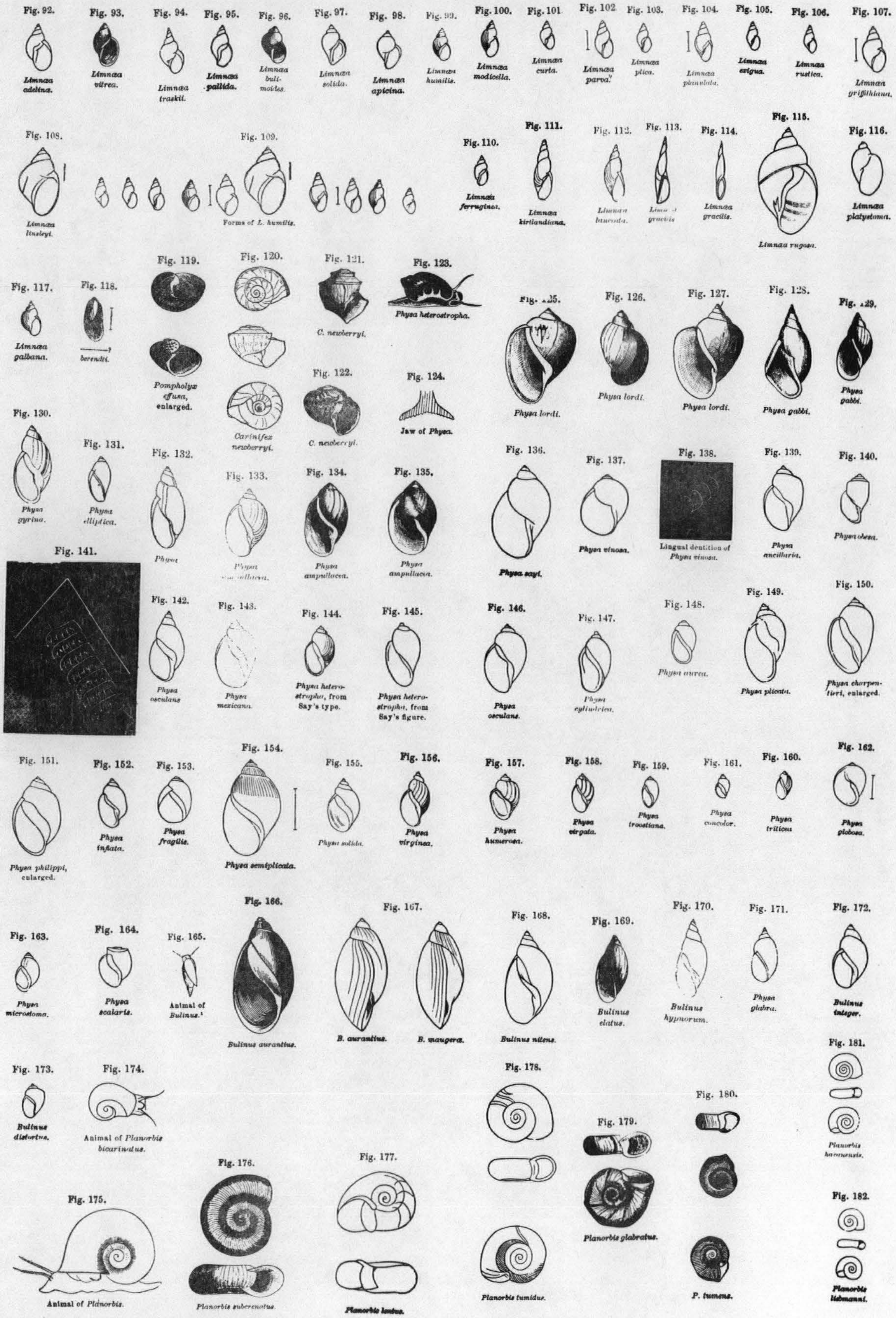
ILLUSTRATIONS

The figures in the original were inserted throughout the text close to the description of the species illustrated. They have been gathered together into plates in this reprint in order to reduce reproduction costs. The first two plates for Part II appeared in STERKIANA 23, September, 1966. The two plates on the following pages complete the illustrations for Part II. Those for Part III will be printed in later numbers of STERKIANA.

The work of photographing the figures and assembling the plates was done by Mr. David Bickel.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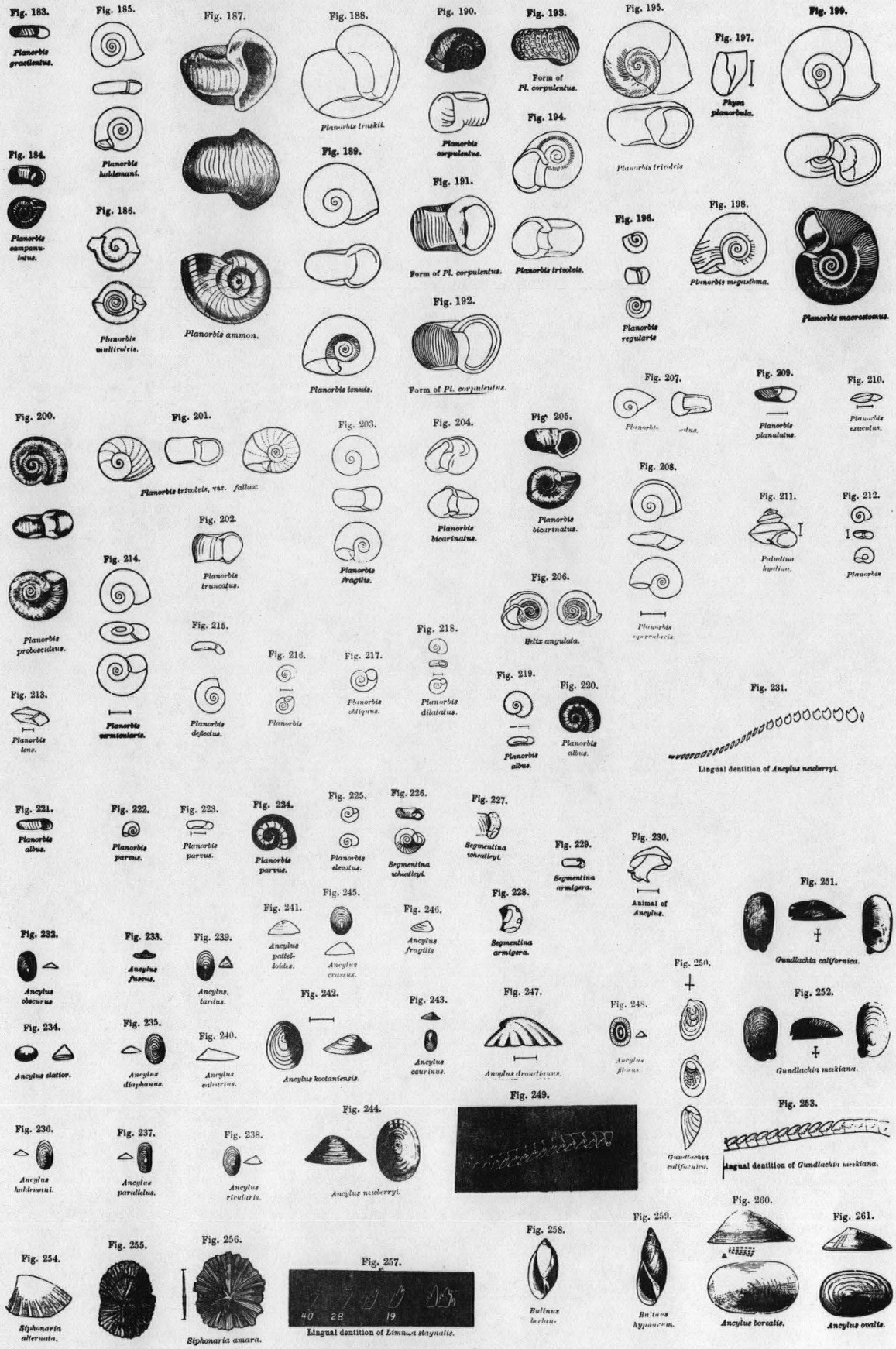
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SMITHSONIAN MISCELLANEOUS COLLECTIONS.

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LAND AND FRESH-WATER SHELLS

OF

NORTH AMERICA.

PART IV.

STREPOMATIDÆ

(AMERICAN MELANIANS).

BY

GEORGE W. TRYON, JR.

WASHINGTON:

SMITHSONIAN INSTITUTION.

DECEMBER, 1873.

ADVERTISEMENT.

THE Smithsonian Institution, realizing the lack of knowledge in reference to the land and fresh-water shells of North America, issued a circular, several years ago, to its correspondents and the friends of science generally, asking contributions of specimens from as many localities as possible, with a view of publishing a report on the subject. In the course of a few years a gratifying response was made to this appeal from all parts of the continent, in the form of extensive collections of specimens, embracing not only the several species, but those illustrating geographical distribution.

The specimens thus obtained were placed by the Institution in the hands of specialists, for the preparation of a series of monographs to bear the general title of "Land and Fresh-water Shells of North America." This was subdivided into: I, *Pulmonata Geophila*, terrestrial univalve shells, breathing free air; II, *Pulmonata Limnophila* and *Thalassophila*, free air breathing univalves, but usually living in or near fresh waters (*Limnophila*) or the sea (*Thalassophila*); III, all the operculated land and fresh-water mollusks (excepting the *Strepomatidæ* or American Melanians) and embracing the *Ampullariidæ*, *Valvatidæ*, *Viviparidæ*, *Rissoidæ*, *Cyclophoridæ*, *Truncatellidæ*, *Neritidæ* and *Helicinidæ;* IV, the *Strepomatidæ;* V, the *Corbiculadæ;* and VI, the *Unionidæ*.

Of these monographs, Parts II and III, by Mr. W. G. Binney, were published in September, 1865. Part I, by Mr. Binney and Mr. T. Bland, in February, 1869; and Part V, by Mr. Temple Prime, December, 1865. An elaborate monograph of the *Hydrobiinæ*, a subfamily of *Rissoidæ*, treated in less detail by Mr. Binney in Part

III, from the pen of Dr. Wm. Stimpson, was published in August, 1865.

Of the two remaining monographs, Part IV is given in the following pages, as prepared by Mr. G. W. Tryon, Jr., and will, it is hoped, tend to facilitate the study of a very intricate group, little understood. No special arrangement has been made by the Institution in reference to a monograph of the *Unionidæ* (which would form a Part VI) since the many illustrated papers and synopses of the group, published by Mr. Isaac Lea in the Memoirs of the Academy of Natural Sciences, and of the American Philosophical Society, as well as printed privately, render this less necessary. The present work by Mr. Tryon, therefore, completes the series of works on "Land and Fresh-water Shells of North America," as originally contemplated by the Institution.

JOSEPH HENRY,

Secretary Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, December, 1873.

PREFACE.

THE following pages contain the results of several years' study of one of the most interesting and difficult branches of American Conchology. My MS. was completed in 1865, and I find, upon freshly taking up the subject, that I am inclined to question many of the conclusions at which I had then arrived. A more enlarged acquaintance with fresh-water shells convinces me that a much greater reduction of the number of species than I have attempted must eventually be made; but until the prolific waters of the southern states have been systematically explored and a great collection of specimens obtained, which shall represent every portion of those streams and include as many transitional forms as can be procured, a definitive monograph of our Melanians cannot be written. I am indebted to several kind friends for assistance in preparing this work; first of all, to Dr. Isaac Lea, who not only gave me constant access to his noble collection, but on many occasions aided me by comparing specimens and elucidating knotty questions in synonymy. Mr. John G. Anthony, Prof. S. S. Haldeman and the late Dr. Aug. A. Gould, with great liberality, sent to me their types; and in these collections and that of the Academy of Natural Sciences of Philadelphia, I also found types of many of the species described by Say and Conrad. Most of my synonymy is derived from the direct comparison of these typical shells, and to this extent I believe my work will prove to be reliable.

G. W. T., Jr.

November, 1873.

LAND AND FRESH-WATER SHELLS

OF

NORTH AMERICA.

IV.

PRELIMINARY OBSERVATIONS ON THE

Family STREPOMATIDÆ.*

1. *Classification.*—Swainson, who may be considered the originator of the modern system of classification of the families and genera of Mollusca (as he was the first general conchologist who, breaking through the trammels of Lamarckian nomenclature, inaugurated the work since so boldly and successfully continued by Dr. Gray and Messrs. H & A. Adams), had, unfortunately, very little knowledge of the affinities with the other Mollusca, of the so-called Melanians inhabiting both America and the Old World, since he has confounded them with marine shells under his family *Turbidæ;* but, notwithstanding this error in the disposition of the whole group, he had the sagacity to separate into numerous, and generally well-characterized, genera, the incongruous material which Lamarck had allowed to remain under one generic name,—*Melania.*

Messrs. H. & A. Adams† approach more closely to the present ideas of conchologists relating to this subject, by separating from, but placing in close neighborhood to, the *Cerithiadæ*, their family *Melaniidæ*, of which they admit two subfamilies, *Melani-*

*Reprinted from the American Journal of Conchology, Vol. I, No. 2, 1865.

†Genera of Recent Mollusca, I, 293.

STERKIANA NO. 24, DECEMBER 1966

inæ including those shells with "aperture simple in front, without a distinct notch," = various genera of Melanians; and a second subfamily, characterized by a notched aperture to the shell, including *Melanopsis*, Lam. Dr. Gray, the only other recent systematist who has investigated the subject,* adopts a family *Melaniadæ*, including the subfamilies *Rissoaina*, *Melaniaina*, *Triphorina*, *Scalarina*, and *Litiopina*, with a heterogeneous assemblage of marine and fluviatile genera; the *Melaniaina* comprising all the genera of American and exotic Melanians, the Cerithians, and the shells which I recently separated under the family name of *Amnicolidæ*.

It is strange that neither European nor American conchologists who have studied this family have availed themselves until quite recently of the obvious differences, both in shell and animal, between the American and Oriental forms, for their complete separation, notwithstanding the fact that Prof. Haldeman showed our Melanians to have a plain or entire mantle-margin, whilst the Oriental species have the mantle-margin fringed, thus allying the latter more closely with the Cerithians than with the so-called American Melanians.†

Dr. Brot, a gentleman who has devoted much attention to the Melanians, remarks‡ that the generally adopted classification of the family is very confused and uncertain, but does not attempt to propose a new one.

Mr. Lovell Reeve, who has published an elaborate monograph of the family,§ in his preface assigns to the animals of *all* the species a fringed mantle-margin.

Prof. S. S. Haldeman was the first naturalist who detected the difference between our own and the

*List of the Genera of Recent Mollusca.—Proceed. Zool. Soc., London, 1847.

†The American species are oviparous, the oriental species ovoviviparous; a more important distinction first pointed out by Dr. Wm. Stimpson in Am. Jour. Sci., xxxviii, July, 1864.

‡Cat. Syst. des Espèces qui composent la Famille des Melaniens.

§Conchologica Iconica,—*Melania*, *Anculotus*, *Io*, *Melatoma*.

Oriental Melanians;* but he did not at that time apply the results of his examinations to their obvious separation into two families.

Mr. Isaac Lea in 1862 proposed a new genus of Melanians, *Goniobasis*,† which, with other genera previously admitted, and *including Melania*, Lam., he still continued to regard as belonging to the family *Melaniidæ*, although in a foot-note he writes, "I very much doubt if we have a single species in the United States which properly belongs to this genus."

Mr. Theodore Gill, in a recent paper on the classification of our fluviatile Mollusca,‡ assigns the following characters to the family *Melaniidæ*:—

"Teeth of lingual membrane, 3·1·3; gills concealed; rostrum moderately produced and entire or simply notched; foot not produced beyond the head; branchiæ uniserial; lateral jaws present.

"Aperture of shell acuminate behind; generally channelled at front; size moderate.

"The family of *Melaniidæ* is here restricted to exclude *Faunus*, Montford (= *Pyrena*, Lam.,) *Melanatria*, Bowditch, *Melatoma*, Sw. (= *Clionella?* Gray), *Melanopsis*, Lam., *Vibex*, Oken, and *Hemisinus*, Sw. These appear to belong to a distinct family, equally distinguished by the projecting foot of the animal and the notch of the aperture of its shell.

"The family may be named *Melanopidæ*.

"The other genera or subgenera that have been proposed scarcely appear to exist in nature. * *

"The American *Melaniidæ* form a peculiar subfamily—*Ceriphasinæ*."

Subsequently, in a foot-note,§ Mr. Gill mentions the reason which caused him to make the above

*Amer. Jour. Science, xli, 1, 21. Icon. Encyc. (Am. Ed.), ii, Mollusca, p. 84.

†Proceed. Acad. Nat. Sciences, May, 1862.

‡Systematic Arrangement of the Mollusks of the Family Viviparidæ, and others, inhabiting the United States.—Proc. Acad. Nat. Sci., p. 33, Feb., 1863.

§*Ibid*, p. 35.

subfamily. "The American *Melaniidæ*, so far as I know, have not a fringed mantle, and, consequently, belong to a different group." We readily admit the propriety of separating the *Melanopidæ* from *Melaniidæ*, as a distinct family, and only wonder that Mr. Gill did not make a *family* of *Ceriphasinæ*, as the distinctive characters of the animal, so far as known to us, and of the shell undoubtedly, are quite as important as those which he assigns to his *Melanopidæ*. When we come to consider the geographical distribution of the two groups, the reasons for this separation are still more obvious. We find the *Melanopidæ* distributed over both hemispheres, while the *Ceriphasinæ* are entirely restricted to North America, to the exclusion almost entirely of the *Melanopidæ*, and totally of the fringe-mantled *Melaniidæ*. We find them inhabiting this faunal province in immense numbers of species, exuberantly varied in form, size, weight and color, presenting a number of genera—in fact, exhibiting all that redundancy of character and isolation of position which are the sure indications of a primordial separate existence.*

*It has become fashionable lately to disparage the value of the *mere* shells as a means of distinguishing generic and family groups, and to rely wholly on such differences as may be found in the animals. Without denying the great importance which should properly be accorded to the latter, we would insist that, in general, the *expression* of these differences may be observed in the shell, and that at least very few generic distinctions have been made from the study of the animals which have not been also indicated plainly enough by the shells. The study of Malacology is yet in its infancy, and those who figure in it are very apt to give undue importance to the characters on which they rely for building up their systems. To investigate how many characters of form or function have successively been called forth as the most important to stand godfathers at the baptisms of new genera, would be curious, but lamentable.

One thing is certain, that genera founded on the shells alone are always found to be corroborated by the study of the animals, while many genera founded on differences in the animal have remained unverified, and will continue so, owing to the undue importance given to the difference of form relied on for the generic distinction.

We do not regard the differences, so far as discovered, in the animals of our so-called Melanians from the Oriental *Melaniidæ*, as alone of sufficient importance to justify their separation; we are contented to separate them upon considerations connected with the shell also, and with geographical distribution, believing, however, that other and more important distinctive characters will reward the industry and skill of some future malacologist.

The publication of Mr. Gill's paper redirected Prof. Haldeman's attention to the subject, which he had left unfinished in his investigations at an earlier period; and the result is the publication of a short but important paper in the Proceedings of the Academy of Natural Sciences, September, 1863, entitled, "On Strepomatidæ as a Name for a Family of Fluviatile Mollusca usually confounded with Melania," wherein he finally separates our species as a distinct family, remarking that the Oriental Melanians are not so nearly allied to ours as they are to the *Cerithiadæ*—with which conclusion we cordially agree.

We have, therefore, adopted the name *Strepomatidæ* as indicating a distinct family, in preference to the prior name of *Ceriphasinæ*, the adoption of which would still leave our species in connection, as a subfamily, with shells to which they are not at all closely related.

In endeavoring to eliminate, from the rather confused synonymy, generic and subgeneric groups of *Strepomatidæ*, some difficulty is encountered at the threshold, on account of the various opinions held by the different naturalists who have studied them, regarding the relative importance which should be assigned to various characters of the shell, in constituting these divisions.

The genus *Hemisinus*, Swainson (*Basistoma*, Lea), belongs to Mr. Gill's family *Melanopidæ*. The little *Paludomus brevis*, D'Orb., of the West Indies, is apparently the American representative of an exotic genus; the large tuberculate Melanians of Central America, and the smooth Pachycheili of that country and of Mexico, probably do not belong to our family *Strepomatidæ*.

Thus the range of the species of the family may

be considered as restricted within the borders of the United States.*

Swainson formed the following curious generic system for the shells under consideration:†

Family TURBIDÆ.

(Subfamilies *Ampullarinæ*, *Melanianæ*, *Turbinæ*, *Janthinæ*.)

Subfamily MELANIANÆ.

Genus PALUDOMUS, Swainson.

Subgenus ANCULOSA, Say.

Genus MELANIA, Lam.

Subgenus HEMISINUS, Swainson.

Genus MELANOPSIS, Lam.

Subgenus MELAFUSUS, Swainson.

Subfusiform, the base contracted, and the aperture and spire nearly equal. 1 species. America. (= Io.)

Fig. 1.

Subgenus MELATOMA, Swainson.

Fusiform, longitudinally ribbed; a deep sinus at the top of the outer lip; base contracted, channel wide. *M. costata.* (This species, mistaken by some for our genus Schizostoma, is actually an exotic marine shell = genus *Clionella.* A copy of Swainson's figure is subjoined (fig. 1).

Genus CERITHIDEA, Swainson.

Clavate, cerithiform; aperture subemarginate.

Subgenus CERITHIDEA, Swainson.

Shell light, decollated; outer lip semicircular, dilated by a flattened border; aperture emarginate. *C. lineolata*, Griff. –Cuv., t. 14, f. 4. *C. fragilis*, *Ibid*, t. 32, f. 12. (= POTAMIDES.)

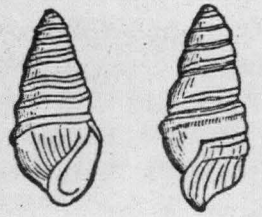
*Three or four are extra-limital, inhabiting Cuba and Mexico; but these do not constitute one per cent. of the whole number of species.

†Manual of Malacology, 1840.

Subgenus CERIPHASIA, Swainson.

Cerithiform; outer lip thin, dilated at the base; aperture small, slightly emarginate, without any internal groove; inner lip thin. *C. sulcata*, Sw., fig. 38 (figs. 2 and 3 of this work). Founded on certain Ohio shells resembling *Cerithidea?*

Fig. 2. Fig. 3.



It will be noticed that in the above classification *Melafusus* is a subgenus of *Melanopsis*, which belongs to the family *Melanopidæ*, while *Ceriphasia* is a subgenus of *Cerithidea*, which includes shells belonging to the family *Cerithiidæ!*

Dr. Gray (Proceed. Zool. Soc., London, 1847, p. 153) makes the following division of his subfamily *Melaniaina*, which in many respects is very correct. He separates the exotic genera from the American, and of the latter quotes the following:

ANCULOTUS, Say, 1825.

Anculosa, Swains., 1840 — *A. præmorsa*, Say.
Melanopsis, sp., Moricand — *M. crenocarina.**
Anculosa, sp., Anthony — *Anc. rubiginosa.*
Melania, sp., Say — *Melan. obovata.*

MELATOMA, Anthony, 184–? not Swains., 1840.

Melat. altilis, Anthony.

Io, Lea, 1832.

Fusus, sp., Say, 1825. } *Fusus fluviatilis*, Say.
Melafusus, Swains., 1840. }
Melania, sp., Say—*Mel. armigera*, Say.

CERIPHASIA, Swains., 1840.

Gray, Syn., 1844.

Melania, sp., Say—*Ceriphasia sulcata*, Swains.
? Telescopella.
Melania, sp., Say—*Mel. undulata*, Say.

GLOTELLA, Gray.

Melania armigera, Say.

*= *Verena*, H. & A. Adams; certainly not an *Anculosa*.—T.

Messrs. H. & A. Adams (Genera of Recent Mollusca) propose the following classification:*—

"Ceriphasia, Swainson (i, p. 297.)

Shell subfusiform, whorls transversely sulcate, the last angulated; spire acuminated; aperture small, produced in front, with a small groove-like canal at the fore part; outer lip thin, posteriorly sinuated.

Syn. *Telescopella*, Gray.

Ex. *C. canaliculata*, Say, t. 31, f. 6.

The shell of *Ceriphasia* is covered with a dark-green epidermis, and is more like that of *Io* than any other of this family; it may, however, be distinguished from *Io* by the beak being shorter, and by the whorls being sulcated and not spiny."

acuta, Lea.
Alexandrensis, Lea.
annulifera, Conr.
canaliculata, Say.
elongata, Lea.
exarata, Lea.
Haleiana, Lea.
Kirtlandiana, Lea.
lugubris, Lea.
luteosa, Gould.
Ordiana, Lea.
regularis, Lea.
spurca, Lea.
subularis, Lea.
sulcosa, Lea.
symmetrica, Hald.
Vainafa, Gould.
Virginica, Gmel.†

"Genus Pachycheilus, Lea (i, 298.)

Operculum suborbicular, of several whorls. Shell subfusiformly conical, smooth, solid; aperture ovate, entire anteriorly; columellar lip thickened posteriorly; outer lip thick.

The chief peculiarity of this genus is the thickened outer lip; it differs from *Melanopsis* in having no sinus at the fore part of the aperture, and from *Melania* in having a callous columella.

* We quote the full lists of species given by Messrs. Adams, in order that the insufficiency of their genera may become more apparent from the incongruous assemblage of shells of which they have composed them. Prof. Haldeman writes (Proceed. Acad. Nat. Sciences, p. 274, Sept. 1863): "The groups of Messrs. H. & A. Adams often indicate merely sections; and sectional names given as generic are scientifically erroneous, because they erect certain species into genera and subgenera only when they belong to extensive groups, requiring numerous specific names, whilst the same amount of character goes for nothing in groups which have but few species."

† The species here assembled are principally *Goniobases*, but are included in *Ceriphasia* evidently because they are "transversely sulcate." *M. Virginica* and its synonyme *multilineata* are again introduced in *Juga*, a subgenus of *Vibex*, Oken!

M. canaliculata, Say, is introduced, but *undulata*, Say, does not appear, while *filum*, Lea, a very closely allied species, is placed in *Elimia*, a subgenus of *Io*.

The operculum has the nucleus subcentral, and is composed of two or three spiral revolutions.

dubiosus, Say. *ferrugineus*, Lea. *simplex*, Say.*

"Subgenus Potadoma, Swainson (i, 299.)

Shell ovate, solid; spire short, whorls smooth; inner lip somewhat thickened; aperture produced in front; outer lip acute, simple.

depygis, Say.
gracilis, Lea.
inornatus, Anth.
lævigatus, Lea.
Niagarensis, Lea.
Ocoeensis, Lea.
ovoideus, Lea.
rufescens, Lea.
sordidus, Lea.
subcylindraceus, Lea.
subsolidus, Lea.
Warderianus, Lea.†

"Genus Io, Lea (i, p. 299.)

Shell subfusiform, whorls spinose; aperture large, ovate, dilated anteriorly, produced in front into a grooved beak; outer lip simple, acute.

Syn. *Melafusus*, Swains., *Glotella*, Gray.

Ex. *I. fluviatilis*, Say, t. 31, f. 8. Operculum, f. 8, *a*, *b*.

The species of *Io* inhabit the rivers of North America; the shells, like those of most of the *Melaniidæ*, are covered with a brown, black or olivaceous epidermis, and are remarkable for the peculiar elongation of the axis anteriorly, and for the spinose nature of the last whorl.

armigera, Lea.
Duttoniana, Lea.
Florentiana, Lea.
fluviatilis, Say.
fusiformis, Say.
nobilis, Lea.
pagodula, Gld.
pernodosa, Lea.
plicata, Lea.
robulina, Anthony.
spinigera, Lea.
spinosa, Lea.
tenebrosa, Lea.
tuberculata, Lea.‡

"Subgen. Elimia, H. & A. Adams (i, p. 300.)

Shell fusiformly ovate; whorls reticulate or nodulose, carinate in the middle; aperture greatly produced anteriorly; outer lip thin, simple, acute.

* The genus *Pachycheilus* was instituted by Mr. Lea to comprise a certain form of shells attaining their greatest numerical development in Central America. There are no shells inhabiting the United States which are congeneric with these; and Messrs. Adams have entirely mistaken the scope of the genus in including such species as *simplex*.

† = *simplex*, Say, which Messrs. Adams place in the genus *Pachycheilus* as typical!

‡ Among the species here enumerated are *Angitremæ*, *Anculosæ*, *Lithasiæ*, *Strephobases*, *Goniobases*, and *Pleuroceræ*. *I. pagodula* is an exotic species, and does not belong to the genus.

acuticarinata, Lea.
apis, Lea.
bella, Conrad.
Boykiniana, Lea.
caliginosa, Lea.
cancellata, Say.
carinocostata, Lea.
catenaria, Say.
catenoides, Lea.
elevata, Lea.
filum, Lea.
Holstonia, Lea.
nodulosa, Lea.
Potosiensis, Lea.
spinalis, Lea.
torta, Lea.

"Melania, Lamarck.

Subgen. Melasma, H. & A. Adams (i, p. 300.*)

Shell solid; spire elevated, whorls smooth, longitudinally plicate; aperture produced anteriorly; inner lip simple, thin; outer lip acute, simple.

blanda, Lea.
brevispira, Anthony.
clavæformis, Lea.
Comma, Conr.
concinna, Lea.
costulata, Lea.
crebricostata, Lea.
Curreyana, Lea.
Deshayesiana, Lea.
Edgariana, Lea.
laqueata, Say.
Lecontiana, Lea.
nitens, Lea.
plicatula, Lea.
plicifera, Lea.

"Genus Hemisinus, Swainson (i, 302.)

Shell subulate; whorls smooth, simple, numerous; aperture ovate, anteriorly contracted, canaliculate and emarginate in front; outer lip thin, crenulated at the edge.

Syn. *Tania*, Gray, *Basistoma*, Lea.

Ex. *H. lineolatus*, Wood, t. 32, f. 2, *a*, *b*.

This genus comprises many fine species of fresh-water shells, principally from South America, though a few have been regarded as inhabitants of other countries.

bulbosus, Gould. *symmetricus*, Conr. *lineolatus*, Wood.†

"Genus Vibex, Oken (i, 303.)

Shell turreted; whorls tuberculated, spirally ridged or muricate; aperture subcircular, produced, and broadly channelled in front; outer lip thin, simple.

Syn. *Claviger*, Hald., *Melania*, Swains., not Lamarck.

"Subgenus Juga, H. & A. Adams (i, 304.)

Shell thin; whorls rounded, transversely lirate or furnished with elevated transverse lines; aperture produced anteriorly; outer lip simple, acute.

*This genus = the plicate species of *Goniobasis*. *M. brevispira*, however, is never plicate, although included with the species.

†The first two enumerated do not belong to this genus, nor have they the slightest affinity with any of its species.—G. W. T., Jr.

Buddii, Say.*
circincta, Lea.
exilis, Hald.
multilineata, Say.
obruta, Lea.
occata, Hinds.
proteus, Lea.
proxima, Say.
Schiedeana, Phil.
silicula, Gld.
striata, Lea.
Troostiana, Lea.
Virginica, Say.

"Genus Gyrotoma, Shuttleworth (i, 305.)

Shell ovate, turreted; whorls transversely sulcate; aperture oblong; inner lip thickened, with a posterior callosity; outer lip thin, with a deep, narrow, posterior fissure.

Syn. *Schizostoma*, Lea, not Bronn, *Melatoma*, Anthony, not Swainson, *Schizocheilus*, Lea.

Ex. *G. ovoidea*, Shuttleworth, t. 32, f. 4, *a*, *b*.

The fissure in the outer lip is wanting or obsolete in the subgenus *Megara*, the species of which in other respects closely resemble those of *Gyrotoma* proper. Both groups are American in their geographical distribution.

altilis, Anthony.
Babylonica, Lea.
Buddii, Lea.
conica, Say.
constricta, Lea.
curta, Migh.?
curvata, Say.
cylindracea, Migh.?
excisa, Lea.
Foremani, Lea.
funiculata, Lea.
incisa, Lea.
laciniata, Lea.
ovoidea, Shuttl.
pagoda, Lea.
pyramidata, Shuttl.†

"Subgenus Megara, H. & A. Adams (i, p. 306.)

Shell ovate, solid; whorls transversely sulcate; aperture ovate-oblong, subcanaliculated anteriorly; outer lip thin, simple, acute.

alveare, Conr.
arctata, Lea.
auriculæformis, Lea.
basalis, Lea.
brevis, Lea.
crebristriata, Lea.
harpa, Lea.
Haysiana, Lea.
Hoeydei, Lea.
impressa, Lea.
lateralis, Lea.
lima, Conr.
oliva, Lea.
olivula, Conr.
ovalis, Lea.
pumila, Lea.

*Should read *Buddii*, Lea. *M. exilis*, Hald., and *proxima*, Say, certainly do not belong here. I have already remarked upon *M. Virginica* and *multilineata*.

†Mr. Anthony never described *Gyrotoma altilis*, ranked among these species. *G. conica*, Say, is the young of *Pleurocera canaliculata*. There are, besides, frequent mistakes in all these lists, in misquoting authorities.—T.

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solida, Lea.
torquata, Lea.
undulata, Say.
Vanuxemiana, Lea.*

"Genus LEPTOXIS, Rafinesque (i, 307.)

Shell ovate or globose, solid, subperforate; spire very short? aperture oval; inner lip with a posterior callosity, often anteriorly callous and produced; outer lip thin, sinuous with a posterior, ascending canal.

Syn. *Anculotus*, Say, *Anculosa*, Swains., *Ancylotus*, Herm.

Ex. *L. prærosa*, Say, t. 32, fig. 6, *a*, *b*.

The species of this genus are peculiar to the North American rivers; the spire of the shell has a truncated, eroded apex, and, in the typical species, the shell is solid and subglobose, with the aperture simple in front.

abrupta, Lea.
angulata, Conr.
crassa, Hald.
flammata, Lea.
fuliginosa, Lea.
fusca, Hald.
fusiformis, Lea.
gibbosa, Lea.
globula, Lea.
Griffithsiana, Lea.
Hildrethiana, Lea.
integra, Say.
melanoides, Conr.
Nickliniana, Lea.
nigrescens, Conr.
obtusa, Lea.
picta, Conr.
pilula, Lea.
pisum, Hald.
plicata, Conr.
prærosa, Say.
pumilis, Conr.
rubiginosa, Lea.
squalida, Lea.
subglobosa, Say.
tæniata, Say.
tintinnabulum, Lea.
trivittatus, DeKay.
Troostiana, Lea.
turgida, Hald.
variabilis, Lea.
virgata, Lea.
viridis, Lea.†

"Subgenus NITOCRIS, H. & A. Adams (i, 308.)

Shell thin, subglobose; whorls angulated, often carinate; inner lip subtruncate, or ending in a tubercle.

carinata, Lea.
costata, Lea.
dentata, Couth.
dilatata, Conr.
dissimilis, Say.
ebena, Lea.

*Here we find shells belonging to several groups, as *pumila*, Lea, *alveare*, Conr., and *torquata*, Lea, to *Strephobasis*; *lima*, Conr., and *solida*, Lea, to *Lithasia*; *undulata*, Say, to *Pleurocera*. *Hoeydei*, Lea, was never described. Can it be intended for *Hydei*, Conr.? The species are generally, however, the ponderous *Goniobases* of Northern Alabama.

†In the species of this genus there are several errors, some quite elongated forms being included; also, a species of *Lithasia*.

inflata Lea.
Kirtlandiana, Anth.
monodontoides, Gld.
occidentalis, Lea.*
Rogersii, Conr.
subcarinata, Hald.

"Subgenus LITHASIA, Lea (i, 308).

Shell thick, solid, ovate; whorls gibbose or tuberculated at the hind part; aperture subcanaliculated and produced in front; inner lip with a callus posteriorly, subtruncate anteriorly.

genicula, Hald.
neritiformis, Desh.†
obovata, Say.
salebrosa, Conr.
semigranulosa, Desh."

Chenu (Manuel de Conchyliologie) principally follows the arrangement of Messrs. Adams.

Lovell Reeve monographs separately *Io*, *Hemisinus*, *Anculotus* and *Melatoma*, and treats all the species not included in those genera as *Melaniæ*. He says, "Advantage might have been taken of the labors of systematists to have distributed them into further genera; but more materials are needed for their elucidation than we at present possess.‡

R. J. Shuttleworth (Mittheil. der Nat.-forsch. Gesellsch. in Bern., No. 50, p. 88) proposed, July 22, 1845, a new American genus of fluviatile shells, which he characterized as follows:—

*= in some respects *Mudalia*, Hald., and *Somatogyrus*, Gill.

† *Neritiformis*, Desh., is an *Anculosa*, and is a syn. of *A. prærosa*, Say.

‡It is very much to be regretted that Mr. Reeve did not make some kind of a division, however arbitrary, of the immense material entering into his magnificent monograph of *Melania*, as he *has* published it. Species from all countries, without regard to external resemblances, are, in many cases, grouped on its plates indiscriminately, rendering the identification of shells by its aid exceedingly difficult. Even several of the species are duplicated in description and illustration in the monographs of *Melania*, *Io* and *Anculotus*.

While on the subject of Mr. Reeve's monograph we cannot refrain from condemning the substitution of new descriptions of the species for those originally given. The descriptions of Mr. Reeve in numerous cases entirely neglect the most important specific characters. The plates frequently do not represent the species for which they are intended; but in this Mr. Reeve has been undoubtedly deceived by wrongly-named specimens.

It is a strange fact that, notwithstanding the length of time which has elapsed since very many of our *Melanians* and *Unios* have been described, and the large number which have been sent to Europe in scientific exchanges, European conchologists are still to a great extent ignorant of the most prominent and important specific characters.

"GYROTOMA.—Shell turreted; columella incurved, above callously thickened; aperture oval, subeffuse at the base; lip simple, acute, narrowly profoundly fissured above.

"Animal.—Operculum corneous, spiral."

This forms one of the most distinct of the genera of *Strepomatidæ*. Mr. Lea, however, anticipated Mr. Shuttleworth's discovery.

Dr. Brot, in his admirable "Systematic Catalogue of the Melanians," proposes, instead of the genera of H. & A. Adams, a series of sections, which are generally excellent, for the arrangement of the species. The following is his plan:—

1. *Operculum concentric.*

Genus PALUDOMUS, Swainson.

2. *Operculum spiral or subspiral.*

* *Aperture entire.*

Genus LEPTOXIS, Raf.

(*Anculotus*, Say; *Anculosa*, Conr.)

Genus MELANIA, Lam.

Group *a*, type *canaliculata*, Say.
" *b*, " *curvilabris*, Anth.
" *c*, " *Haysiana*, Lea.
" *d*, *a*, type *Virginica*, Say.
b, " *costulata*, Lea.
c, " *perangulata*, Conr.
d, " *simplex*, Say.
e, " *Warderiana*, Lea.
" *e*, " *nupera*, Say.
" *f*, (European.)
" *g*, *a*, " *lævissima*, Sowb.
b, " *glaphyra*, Morelet.
c, " *nigritina*, Morelet.

(All the other groups of this section, thirteen in number, are exotic.)

** *Aperture produced in front.*

Genus Io, Lea.

*** *Aperture truncate in front.*

(MELANOPSIS, HEMISINUS.)

**** *Aperture posteriorly sinuate.*

Genus GYROTOMA, Shuttlw.

***** *Aperture sinuate in front and posteriorly.*

(PIRENA, Lam.)

Passing to American authors, we find Mr. Say was the first to eliminate a native genus from the genus *Melania*. In his description of *Melania prærosa*, he says, "This shell does not seem to correspond with the genus to which I have for the present referred it; and, owing to the configuration of the base of the columella, if it is not a *Melanopsis*, it is probable its station will be between the genera *Melania* and *Agathina*. I propose for it the generic name of *Anculosa*.

He also remarks, in his subsequent description of *M. subglobosa*, "It is a second species of my proposed genus *Anculotus*."

Mr. Say never *described* his genus; but the above citation and description of two species, both of which are well known, and whose identity with his descriptions has never been questioned, entitle his generic name to be received as authority.

Rafinesque published the following genera, which have been referred to *Strepomatidæ*:—

"*Pleurocera*, Raf. (Jour. de Phys. Bruxelles, vol. lxxxviii, p. 423, 1819). Shell spiral, oval, or pyramidal, of numerous convex volutions. Aperture obliquely oblong, the base prolonged and twisted, sharp above. Outer lip thin, the inner lip appressed, twisted, without umbilicus. Animal with a membranaceous operculum.

"Head proboscidiform, inserted on the back; tentacles two, lateral, subulate, sharp, with eyes at their exterior bases.

"Family of *Neritacea*. Species numerous, of which I have already twelve, all fluviatile, from rivers and creeks, as well as the following genera."*

*Rafinesque previously described *Pleurocera* in a short paper published in the American Monthly Magazine and Critical Review, iii, p. 354, 1818 (Binney & Tryon's edit. of Rafinesque, p. 22), as follows:—

"Shell variable oboval or conical, mouth diagonal crooked, rhomboidal, obtuse and nearly reflexed at the base, acute above the connection, lip and columella flexuose entire. Animal with an operculum membranaceous, head separated from the mantle inserted above it, elongated, one tentaculum on each side at its base, subulate acute, eyes lateral exterior at the base of the tentacula."

This description was doubtless intended for all the elongate species of Melanians from the Ohio River then known to him, but he afterwards amended it as above.

In his "Enumeration and Account" (Binney & Tryon, p. 67), Rafinesque describes several species of *Pleurocera*, and remarks, "My G.

By some strange mistake, this genus is referred by Messrs. H. & A. Adams to *Vivipara*.

Rafinesque published several species; one of which, *P. verrucosa*, is identical with *Lithasia nupera*, Say, and therefore belongs to an entirely different group. Others, however, are evidently closely related to *M. canaliculata*, Say, and *M. elevata*, Say. The genus is certainly well characterized, and clearly includes those shells which Mr. Swainson has subsequently distinguished as *Ceriphasia*, and Mr. Lea as *Trypanostoma*.

In the same Journal (p. 26), Rafinesque described a genus "*Leptoxis*" as follows: "*Leptoxis*. Differs from *Lymnula* by an oval shell, inflated, the spire of two or three whorls; aperture oval, almost as large as the whole shell. Eyes exterior. About four species, fluviatile, lacustrine and palustrine."

There can be no doubt that this description was *intended* for *Anculosa*, Say, as is proved by a manuscript work by Rafinesque ("Conchologia Ohioensis") in the possession of the Smithsonian Institution, in which there is a rude pen-and-ink drawing of the animal and shell of a *Leptoxis*. The name has been adopted by Prof. Haldeman and others. But as the *published* description refers equally well to species of *Amnicolidæ* or *Viviparidæ*, and as manuscript authority is not recognized in questions of priority, we are compelled to throw aside this name and adopt that given by Say.

In the manuscript quoted above, occurs the description of a new genus called *Strepoma*, together with the figure of a species; which appears to represent a section of *Pleurocera*. It is unnecessary to quote the description, as it was never published:

Pleurocera, 1819, is perhaps a S. G. of *Melania*, but the animal is different, with lateral feelers; the shell is always conical oblong, with the opening oblong oblique acute at both ends, columella flexuose twisted;" and, further, "I leave the name of *Melania* to the shells with the opening obtuse at the end; or they may form the S. G. *Ambloxis*."

it is only mentioned here because Prof. Haldeman adopts it as a generic name in a late paper on the classification of these shells.*

For the same reason we do not adopt the genus *Ambloxis* described in the American Monthly Magazine, p. 355, 1818:—

"Univalve.—Shell thick oboval, mouth oval, rounded at the base, obtuse above, with a thick appendage of the lip, columella flexuose, a small rugose umbilic."

This, the only description, would apply equally well to a *Paludina*, *Anculosa* or a *Goniobasis* of Lea, and in 1831 (Enum. and Account), although he renders it plain that he intended the latter, still he does not adopt the name for his species there described, and seems disposed to doubt the value of his former division.

The three following genera were published in Journal de Physique, Bruxelles, tome 88, p. 423 *et seq.*:—

"*Ellipstoma*, Raf.—Shell thick, oval, obtuse. Mouth oblique, narrow, elliptic, lips thickened, united and obtusely decurrent posteriorly. A narrow, oblong umbilicus, half covered by the interior lip. Animal unknown. Fluviatile genus of 4 species, *E. gibbosa*, *E. vittata*, *E. zonalis* and *E. marginula*.

"From the Ohio, Mississippi, etc."

"*Oxytrema*, Raf.—Differs from *Pleurocera* by an oval oblong or ventricose shell, less number of whorls, the last forming nearly the whole; mouth sharp on both sides, and anteriorly prolonged into a long, sharp point. 3 fluviatile species."

"*Campeloma*, Raf.—Shell oval; mouth oval, base truncated, lip reflected, united in a posterior point. No umbilicus. Animal unknown. I have only one species, found in the Ohio, —*C. crassula*. Four whorls of the spire reversed, apex acute, shell thick, mouth more than half the total length."

Messrs. H & A. Adams, with *very* doubtful propriety, refer this genus to *Melanopsis*. Prof. S. S. Haldeman, in an article on Mollusca, contributed by him to the American edition of Heck's Iconographic Encyclopædia, II, p. 84, remarks that:—

* Proceed. Acad. Nat. Sciences, p. 274, September, 1863.

"Say's *Melania armigera* (and also Lea's *M. Duttoniana* and *M. catenoides*) belongs to Rafinesque's genus *Pleurocera*, in which there is a short, straight canal anteriorly, and when this canal is lengthened, as in *Fusus*, the genus *Io*, of Lea, is the result.

"*Strepoma* of Rafinesque (or *Ceriphasia* of Swainson) are slightly different forms, in which the aperture and the vertical plate formed by the anterior portion of the whorls, bear some resemblance to the same parts in *Cerithium telescopium*."

In October, 1840, Prof. Haldeman published a supplement to his "Monograph of the Limniades," containing, among other matter, the following proposed

"Subgenera of ANCULOSA.

"*Anculosa*, Say.—Substance of the shell thick and heavy, labium much thickened.

"*Lithasia*, Hald.—Shell heavy, having protuberances; aperture with a notch in the nacre above and below.

"*Paludomus*, Swains.—Shell smooth, margin of the outer lip crenated, labium very thick and enamelled.

"*Hemimitra*, Swains.—Like *Paludomus*, but with coronated whorls.

"*Mudalia*, Hald.—Shell smooth, thin in texture, labium without enamel."

In his description of a species of *Anculosa* published upon the same occasion, Prof. Haldeman refers to "*Paludina* (*Mudalia*) *dissimilis*, Say," so that there can be no doubt as to the section of *Anculosa* indicated by the subgenus *Mudalia*. On the cover of No. 2 of the monograph (January, 1841) is the description of "subgenus *Angitrema*. Shell spinous, aperture subrhomboidal, with an anterior sinus. Ex. *Melania armigera*, Say."

I adopt *Angitrema* as a *genus*, with *Lithasia* as a subgenus of it. *Mudalia* cannot stand in the system, because its characters are not constant, *Anc. dissimilis* having frequently a heavy deposit of nacre on the columella.

Mr. Lea has described several new genera of shells eliminated from the American *Melaniæ*. He early recognized in Mr. Say's genus *Anculosa* a good

natural genus, and adopted it in his descriptions. In Philos. Trans., VIII, p. 163, he proposed to separate the species of *Melania* according to certain obvious, external (by no means generic) characters, for facility in their determination. He described a large number of species under the following divisions:—

"1. Smooth.	4. Sulcate.	7. Granulate.
2. Plicate.	5. Striate.	8. Cancellate.
3. Carinate.	6. Tuberculate.	9. Spinose."

Perhaps this division of the species suggested to Messrs. Adams the genera which they have adopted in their classification.

In Philos. Trans., IV, p. 122, Mr. Lea proposed to institute a new genus, *Io*, for the *Fusus fluvialis* of Say. His description is, "Io.—Shell fusiform; base canaliculate; spire elevated; columella smooth and concave."

In his description of *Melania excisa*, and *Anculosa incisa*, published in Philos. Proc., II, p. 242, Dec., 1842, Mr. Lea suggested the name *Schizostoma* for those species having a pleurotomose sutural slit in the outer lip. The genus thus proposed, and which bears the same relation to *Goniobasis* as *Schazicheila* does to *Helicina*, was sometime afterwards characterized by Mr. Shuttleworth, from independent observation, under the name of *Gyrotoma*.

In Philos. Proc., Aug., 1845, and in the Transactions, X, p. 67, 1853, Mr. Lea published the following description of his genus:—

"SCHIZOSTOMA, LEA. Shell conical or fusiform. Lip fissured above. Aperture ovate, columella smooth, incurved. Operculum.—

"No operculum has come under my notice; but I can scarcely doubt that it will be found to be horny, and to resemble, in other respects, that of *Melania*."

Subsequently (vol. X, p. 295), Mr. Lea says, "When I proposed the name of *Schizostoma* for a genus of *Melaniana* with a cut at the superior por-

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tion of the aperture, I was not aware that M. Bronn had already used that name for a fossil genus. I now propose to substitute *Schizochilus*."

In the Proceedings of the Academy of Natural Sciences of Philadelphia, 1860, p. 53, Mr. John G. Anthony makes some lengthy remarks on this genus, as follows:—

"*Gyrotoma*. As some confusion exists regarding the name of this genus, the following notes are given:—

"The genus *Melatoma* was established by Swainson, and first given to the world in 1840, in his 'Treatise on Shells and Shell Fishes,' published in London, founded, as he says (p. 202), 'upon a remarkable Ohio shell sent him many years before by his old friend, Prof. Rafinesque.' 'It has,' he remarks, 'the general form of a *Pleurotoma* and of a *Melafusus*, with a well-defined sinus or cleft near the top of the outer lip, while the inner, though thin, is somewhat thickened above.' The other characters named by him are such as are generally considered rather specific than generic, and the pleurotomose cut in the outer lip, as applied to a fluviatile univalve, is altogether insufficient to indicate a new genus. The specimen alluded to by Swainson, and from which his generic description was drawn, was an imperfect one; and the species has not since been identified by American naturalists. This is less to be wondered at when we consider how very local the genus has always been, and how few specimens have found their way into our collections. The waters of Alabama have, as yet, monopolized this interesting genus; and it is probable that even there it is confined almost if, not quite, exclusively to the Coosa and its tributaries.

"On p. 342 Swainson gives the following generic description, adding a figure:—

"'Fusiform, longitudinally ribbed; a deep sinus at the top of the outer lip; base contracted; channel wide.'

"Mr. Swainson's figure is quite unsatisfactory. His genus *Melatoma* is referred doubtfully to *Clionella* by H. & A. Adams, and has not prevailed for this genus in America or Europe. I have, therefore, decided not to make use of it in this case.

"Subsequently this genus has been noticed by various authors, and other names have been applied to it. In 1841 or 1842, Dr. J. W. Mighels sent me specimens of one species, under the name of *Apella scissura;* but his generic name was never published, and his species, if not identical with any which Mr. Lea afterwards described, seems to have been overlooked and forgotten.

"On the 14th of December, 1842, Mr. Lea read a paper before the American Philosophical Society, in which he describes *Melania excisa* and *Anculosa incisa*. In his remarks upon these species he alludes to the pleurotomose cut in the superior part of the upper lip, and at the time suggests the necessity, in consequence of this character, to construct a new genus, which he proposed to call '*Schizostoma*.' Mr. Lea, finding his name '*Schizostoma*,' preoccupied in palæontology, changed it to '*Schizochilus*' (March 5, 1851, Obs., v, p. 51). In a paper read May 2, 1845, Mr. Lea, in a foot-note to p. 93, first indicates the generic characters of *Schizostoma*, as follows; 'Testa vel conica vel fusiformis; labrum superne fissura; aperture ovata; columella lævis, incurva,'—and describes six additional species.

"In the above concise definition of the genus, it will at once be noted that the fissure at the upper part of the outer lip is, after all, the *essential* character; and Mr. Lea himself seems to be aware of this, since, of the six species then described, he states the aperture to be elliptical in five cases and rhomboidal in the other, although his generic character is 'aperture ovate.' Indeed, in the species described by him, but a single one has the aperture ovate, and that one is described as an *Anculosa*.

"It may be doubted whether Mr. Lea's first name will not eventually prevail, since, before he published *Schizostoma*, Bronn's genus of the same name (Lethea Geogn., I, 95, 1835–37) had been called a synonyme of *Bifrontia* (*Omalaxis*) of Deshayes. (Vide Desh. in Lam., IX, p. 104.) Indeed, H. & A. Adams (Gen. Rec. Moll., I, 305) do not appear correct in giving preference to *Gyrotoma* over *Schizostoma*, Lea, on account of *Schizostoma*, Bronn, since (on p. 244) the latter is placed in the synonymy of *Omalaxis*.

"Another generic name *Schizostoma* is quoted in Hermannson's Index. I have not obtained access to the work containing this description; but its date is said to be anterior to Mr. Lea's description.

"Mr. Lea's second name, *Schizochilus*, had been previously used in Coleoptera, but withdrawn after Mr. Lea's description was published.

"Mr. Shuttleworth, in July, 1845 (Mittheilungen der Naturforschenden Gesellschaft in Bern, p. 88), gives another description of the genus under the name of *Gyrotoma*, founded on two species from the Coosa River, descriptions of which are also given.

"The generic name of Mr. Shuttleworth has been adopted in H.& A.Adams' Genera of Recent Mollusca (I,p.305, Feb., 1854).

"Dr. Gray also (Guide to Mollusca, I, p. 103, 1857) adopts Shuttleworth's name.

Such being the confused state of the synonymy of the genus, we have decided to adopt, at least temporarily, the earliest name concerning which no doubt exists."

To the above, Mr. Lea made the following reply, upon occasion of describing some new species belonging to the genus, in Proc. Acad. Nat. Sciences, Philada., May, 1860: —

"Genus SCHIZOSTOMA.

"It will be observed that I have here adopted my first name (*Schizostoma*) for the division of those *Melanidæ* which have a cut or fissure in the upper portion of the last whorl. This name I proposed in December, 1842. Subsequently, finding that it was used by Bronn in 1835, I abandoned it, and proposed the name of *Schizochilus* as a substitute (Obs. on the Genus Unio, v, 5, p. 51, 1852, and Trans. Am. Phil. Soc., 1852). I am now satisfied that Bronn's name was applied to the same genus — *Euomphalus* — which Sowerby established in 1814 (Min. Conch., tab. 45). This evidently liberates my original name, and Hermannsen, in the appendix to his "Generum Malacozorum," very properly restores it. It was supposed that this was the *Melatoma* of Swainson, and Mr. Anthony adopted this name. But it is evident that Mr. Swainson's *Melatoma* is not my *Schizostoma*. By reference to his figure (Malacology, p. 342, f. 104) it will be observed at once that there has never been observed in the United States any of the group of which that figure is the type, while it is known that they exist in the islands of the Indian Ocean. Mr. Swainson says (p. 202), that his *Melatoma* was 'founded upon a remarkable Ohio shell' sent by Rafinesque. Now, as no member of the family *Melanidæ* with a cut in the lip has ever been found in the Ohio, where such hosts of active collectors have since pursued their investigations, it is perhaps beyond the bounds of possibility that the specimen sent by Rafinesque, so eminently careless and reckless as he always was, should ever have been found there. Indeed, if the specimen figured was sent by Mr. Rafinesque to Mr. Swainson, then the question would arise whether it had not been obtained by Mr. R. from some dealer or collector, who may have obtained it from Asia. I have no doubt of the *Melatoma costata*, which Mr. Swainson has figured, being exotic, and belonging to a group probably from the Philippine Islands. Mr. Anthony says, page 64, Proc. A. N. S., 1860, that 'it may be doubted whether Mr. Lea's first name will not eventually prevail, since, before he published *Schizostoma*, Bronn's genus of the same name had been called a synonyme of *Bifrontia*, Desh.' And that 'H. & A. Adams (Gen. Rec. Moll., 1, 105) do not appear

correct in giving preference to *Gyrotoma* over *Schizostoma*, Lea,' &c. Notwithstanding this, Mr. Anthony in this paper, where he describes nine supposed new species of this genus, adopts the generic name of *Gyrotoma*. It may be added here, that Dr. Gray, in his *Genera of Recent Mollusca*, gives *Melatoma* to Mr. Anthony, not to Swainson, while he does not notice the name of *Schizostoma*. Mr. A. does not pretend to claim it, of course, but adopts *Gyrotoma*, Mr. Shuttleworth's name, proposed in 1845, which, being three years later, cannot have precedence.

"The genus *Schizostoma* seems to be capable of being divided into two natural groups in the form of the *fissura*, the cut in the lip. In one group this fissura is deep and direct, that is, parallel with the suture or upper edge of the whorl; in the other it is not deep and is oblique to the suture."

In the same Journal (April, 1862), was published a new genus, with the following name, description and remarks: —

"Genus TRYPANOSTOMA, Lea.

"Shell conical; aperture rhomboidal, subcanaliculate below. Lip expanded. Columella smooth, twisted below. Operculum corneous, commencing spiral.

"The enormous number of species in the genus *Melania* has made it very desirable to eliminate as many as possible, by founding new genera, where well characterized groups can be established. With this view I proposed, in the Proceedings of the Academy, in April last, the genus *Strephobasis*. The genus now proposed under the name of *Trypanostoma*, will include all the well known *Melania* with an *auger-shaped aperture*, the type of which may be considered to be Mr. Say's *Melania canaliculata*, a very common and well known species from the basin of the Ohio River. It will include a number of large species; indeed, nearly all of the large and ponderous species of the United States. Many new ones will be found in this paper. Objections may be raised against now increasing the number of genera without the aid of the examination of the soft parts. But there is no validity in this objection, from the fact that, in the present condition of the science of Malacology, we are becoming acquainted with a vast number of new and interesting forms, without the hope at present of seeing the organic portion of the animals. These may at some future time, and no doubt will, be examined and carefully described by zoologists who may dwell near the waters where these numerous and highly-developed species reside. Until this takes place, we can only group them upon the characters which are presented by their outward hard portions which are accessible to us now.

"In proposing this new genus, I am aware that European Zoologists have made many genera and subgenera in this Family, but none have made groups of our numerous species by which they can be properly divided. They have mixed them up, with all the time and care they have bestowed upon them, in a manner so as to make great confusion.

"Mr. Swainson, in his 'Treatise on Malacology,' proposed a subgenus of *Melania* under the name of *Ceriphasia*, and gives a figure, page 204 (*C. sulcata*), stating that it came from Ohio. It is evident, on looking at this figure, that it does not represent any Ohio species, neither in the aperture nor in the revolving ribs. Dr. Gray and Messrs. Adams adopt the genus, and the latter give a figure (pl. 31, fig. 6) of *canaliculata*, Say, as the type, which I do not think answers to the description or figure of Mr. Swainson. Dr. Gray, in his excellent 'List of the Genera of Recent Mollusca,' in the Proc. Zool. Soc., expressed a doubt whether his *Telescopella* may not be the same with *Ceriphasia*."

In April, 1861, Mr. Lea proposed another genus, as follows:—

"*Strephobasis*, Lea.—Shell cylindrical; aperture subquadrate; columella thickened and retro-canaliculate below.

"Operculum commencing spiral, corneous.

"The mollusk, for which I propose this genus, was sent to me by Wm. Spillman, M. D., of Columbus, Miss., and I have before me over a dozen specimens from a third to nearly an inch in length. The very great number of species of the genus *Melania* makes it desirable to eliminate any group, with characters sufficiently distinct to permanently recognize it. The very remarkable retrorse callus at the base of the column, causing a lateral sinus, is characteristic of this genus."

Next, we have the genus *Goniobasis*, intended to include most of the vast residue of species not previously eliminated. This genus, proposed in Proc. Acad. Nat. Sciences, May, 1862, is described as follows:—

"*Goniobasis*, Lea.—Shell conical or fusiform. Aperture subrhomboidal, subangulate below. Columella thickened somewhat above. Operculum commencing spiral, corneous.

"In my paper on the genus *Trypanostoma*, proposed by me (Proc. Acad. Nat. Sci., 1863, p. 169), I mentioned the importance of eliminating as many species as possible from the genus *Melania*, which is so enormously extended as almost to prevent the possibility of finding suitable names for the species. In the Proceedings of the Academy, Dec., 1861, I stated that

Prof. Haldeman's genus *Lithasia* formed a very excellent group. In working up a very large number of the family *Melanidæ*, obtained from the Southern and Western States, I have, notwithstanding the divisions which had been made, found myself embarrassed with that form of aperture which is quite different from the auger-mouthed (*Trypanostoma*) species and the *Lithasia*, to which latter they are most nearly allied. I mean those which usually, though not always, have a slight thickening of the upper part of the columella and no callus below, and which are also without the notch of *Lithasia*, although subangular at base. In this subangular character they differ from *Melania* proper, which are round or loop-like at the base. For this group I propose the name of *Goniobasis*,* which will give us for our American *Melanidæ* the following genera, all of them having opercula:—

"*Melania*, † Lam., *Anculosa*, Say, *Io*, Lea, *Lithasia*, Hald., *Schizostoma*, Lea, *Strephobasis*, Lea, *Trypanostoma*, Lea, *Goniobasis*, Lea, and *Amnicola*, Gould and Hald.

"They may be known by,

"*Melania* having a regular loop-form aperture.

"*Anculosa* having a rounded aperture and a callous columella.

"*Io* having a greater or lesser elongate channel or spout at the base.

"*Lithasia* having a callus on the columella above and below, and a notch at the base.

"*Schizostoma* having a cut in the upper part of the outer lip.

"*Strephobasis* having a retrorse callus at base, and usually a squarish aperture.

"*Trypanostoma* having an expanded outer lip and an auger-shaped aperture.

"*Goniobasis* having usually a subrhomboidal aperture, subangular at base and without a channel.

"*Amnicola*‡ having a round mouth and no callus."

In Proc. Academy of Nat. Sciences, January, 1864, Mr. Lea proposed the following:—

"*Meseschiza*.—Shell fusiform, imperforate. Aperture rhomboidal, below canaliculate. Lip expanded, slit in the middle. Columella smooth, incurved. Operculum corneous, spiral.

* Adams' *Elimia* takes in part of this genus.

† Cuvier describes *Melania* as having long tentacula, the eyes being on the exterior side about the third of the length. The eyes of *Melania Virginica*, Say, are at the base of short tentacula. I very much doubt if we have a single species in the United States properly belonging to this genus, of which Cuvier considered *amarula* as the type, and Lamarck, *asperata* as the type.

‡ *Amnicola*, although much like *Paludina*, is more nearly allied to the *Melanidæ*. The operculum is spiral, and, therefore, very different in this character from *Paludina*.

"The little shell which I now propose as a new genus, has so distinct a character in the incision of the middle of the outer lip, as to mark perfectly its place in the *Melanidæ* of the United States. It differs entirely in the character of the cut from that in *Schizostoma*, which has, in all the many species I have seen, a more or less deep incision immediately under the suture. The living soft parts have not yet been observed. They may, when examined, prove to have some characteristics quite different from *Schizostoma*."

Eurycælon.—In remarks on *Goniobasis umbonata* (Proc. Acad., p. 3, Jan. 1864), "This is the fourth species of a natural group which I have described and which have a large ear-shaped aperture. If they be not entitled to a generic place, they may at least be considered a subgenus, for which I propose the name of *Eurycælon*, the aperture being larger than in the *Melanidæ* generally. All the species of *Eurycælon* have a callus on the collumella above, but not below, as in *Lithasia*, and the base is more or less angular, which is not the case with *Anculosa*. Those which we have considered as varieties of *Anculosa prærosa*, Say, which have an angular base, properly belong, I think, to *Eurycælon*, as well also *Anthonyi*, Redfield, *turbinata*, and *tintinnabulum* (nobis), and some others. When the soft parts shall be examined, they will, I think, be found to differ from *Goniobasis*, *Trypanostoma* and *Lithasia*, to which genera they seem nearest allied. The operculum of the only one I have seen is the same as *Goniobasis*, and the *Melanidæ* generally." *

Dr. James Lewis (Proc. Acad. Nat. Sciences, Dec., 1862, pp. 588–90) describes the soft parts of *Melania subularis* and *Melania exilis*, and remarks in conclusion, that "the following features of the two species above considered may suffice for placing them apart in subgenera: —

"1. The presence of a sinus or fold in the sides of the foot and neck of *M. subularis*, and its absence in *M. exilis*.

"2. The extension of the anastomosing black lines from the margin of the lateral portions of the foot upwards along the side of the neck in *M. subularis*, and the restriction of these lines to a narrow zone along the lateral portions of the foot of *M. exilis*.

"3. A well-defined dark band around the tentacle in *M. exilis*, not observable or at most only faintly indicated in *M. subularis*."

*Mr. Lea probably did not intend to include his *tintinnabulum* in *Eurycælon*, but did so inadvertently. I would add to the description as given above — shell generally obovate, longitudinally humped or angled; columella truncate below. The genus may be placed between the *Lithasiæ* and *Goniobases*.

Dr. Lewis endeavors, by these differences, to indicate respectively the genera *Trypanostoma* and *Goniobasis* of Mr. Lea; but, unfortunately, the only *important* character of distinction mentioned by him, is only a sexual difference.*

And now, having cited all that has been done in the classification of these animals by American and foreign naturalists, we will first ascertain the *sequence* of the genera, and then give their names and limitation as we propose to adopt them.

Swainson commenced with the species having an entire aperture, then he described genera possessing a truncated aperture (*Hemisinus*, *Melanopsis*), and, finally, those with a more or less developed channel at the base.

Dr. Gray's arrangement does not differ essentially; he *adds*, however, *Glotella*, an intermediate form between the *Trypanostomoid* and *Goniobasic* groups.

Messrs. Adams *commence* with the canaliculate species, but not with the highest developed type of that form, *Io*. They give the preference to *Ceriphasia*, Swainson, and next give *Pachycheilus*, which is certainly more of a *Goniobasic* form, and *then* give *Io*.

Dr. Brot's "Groups" represent nearly the following value and sequence in genera: *Leptoxis*, *Trypanostoma*, *Goniobasis*, *Lithasia*, *Pachycheilus*, *Io*, *Melanopsis*, *Gyrotoma*, *Pirena*.

Mr. Lea, in remarks on his description of *Goniobasis*, gives the list of genera (which we have quoted), but apparently in the order of their publication.

The sequence of genera in the foregoing examples, can certainly be much improved; *Io* may be considered as the highest development of the canaliculate shell, and is also the largest in size; we find, moreover, as Mr. Lea has justly remarked, the most ponderous species among the *Trypanostomæ* (*Pleuroceræ*). I would then commence with *Io*, and proceed thus: *Io*, *Pleurocera*, *Angitrema*, *Lithasia*,

*See Stimpson "On the Structural Characters of the so-called Melanians of North America," Am. Jour. Sci., xxxviii, July, 1864.

Strephobasis, Eurycælon, Goniobasis, Schizostoma, Meseschiza, Anculosa.

We thus proceed from a long canaliculate aperture to one in which the aperture is entire, we also commence with the largest and close with the smallest species. *Pachycheilus* is not included in the above, because it represents an extra-limital group, and will probably be found to belong to another family or subfamily. The same may be said of *Hemisinus* and *Paludomus*.

With regard to nomenclature, we will examine —

1. *Io*, Lea.—We find this genus universally recognized European authors, however, do not seem to understand its true limits, and include species of *Lithasia*.

2. *Pleurocera*, Raf.—Nothwithstanding Mr. Lea's assertion that Swainson's figure of *Ceriphasia sulcata* does not represent a species of this genus, nor his description correspond to it, I believe that *Ceriphasia* was certainly intended for that group of *Trypanostomoid* shells represented by *canaliculata*, Say, and that the figure represents some such shell as *T. moriforme*, Lea. Gray, also, in 1847, proposed *Telescopella* for *Melania undulata*, Say, which belongs to the same group.

Thus, Mr. Lea's *Trypanostoma* is unquestionaoly a synonyme.

Pleurocera, Rafinesque, is the same shell, and having priority over all the other names, I adopt it without hesitation.

Strepoma, Raf., manuscript, applies to the same genus, and *Oxytrema*, Raf. (Jour. de Physique) may be intended for some immature form of *canaliculata*, or its allies, which possesses the sharp-pointed aperture described,—as *Io variabilis*, Lea, for instance.

Messrs. Adams adopt *Ceriphasia*, but they separate certain species, reticulate, or nodulosely carinate in the middle, to form their genus *Elimia*. Their *Megara*, also, consists of species of this genus.

Of course these names are not founded on generic characters, and, at best, can only be used to designate groups.

3. *Lithasia*, Haldeman.—This genus is recognized by Messrs. Adams, but Mr. Reeve and Dr. Brot confound its species with *Io*. Prof. Haldeman first proposed it as a subgenus of *Anculosa*. "Shell heavy, having protuberances." This character applies only to certain species; but the genus is now recognized by American naturalists to include all the species with the columella thickened above and below.

Prof. Haldeman's subgenus *Angitrema* is synonymous with, and has priority over, *Glotella*, Gray, both adopting *Melania armigera*, Say, for their type. As this subgenus really exhibits the highest development of the species, I have concluded to adopt it as a genus, using *Lithasia* as a subgenus for the smaller, smooth forms.

4. *Strephobasis*, Lea.

5. *Eurycælon*, Lea.

6. *Goniobasis*, Lea, May, 1862.—This genus will retain Mr. Lea's name. *Potadoma*, Swainson, as understood by Messrs. H. & A. Adams, embraces certain species only. These gentlemen take some species of this, *Strephobasis* and *Pleurocera*, to make their *Megara*, a subgenus of *Gyrotoma* (*Schizostoma!*)

They make of the plicate group, *Melasma*, and of the striate species they form *Juga*. These names may be retained as sections of the genus, possessing no really generic characters.

7. *Schizostoma*, Lea, Dec., 1842.—Messrs. Adams, Brot and Anthony, adopt *Gyrotoma*, Shuttleworth, July 22, 1845, because *Schizostoma* was preoccupied.

Mr. Lea was himself of the same opinion, and changed the name to *Schizochilus* (also preoccupied). He subsequently reclaimed the original name, and I give him the genus as first published, having

two and one-half years' priority over Shuttleworth. I entirely agree with Mr. Lea, that *Melatoma*, Swainson, represents an exotic, and not an American, group. Mr. Anthony is ignorant how *his* name came to be used in connection with *Melatoma*. It was first so used by Dr. Gray* (perhaps through inadvertence), and afterwards by Mr. Reeve.

8. *Meseschiza*, Lea.

9. *Anculosa*, Say.—*Leptoxis*, Rafinesque, as already mentioned, is not described definitely enough to justify its substitution for Say's name. Prof. Haldeman, with the aid of Rafinesque's manuscript work, identified the genus and used the name. He has been followed by Messrs. Adams, Brot, and Binney, while Messrs. Lea, Conrad, Anthony, and Reeve, have adhered to the old name. I think that *Ellipstoma*, Raf. (Jour. de Phys.) really applies to this genus much better than *Leptoxis*, and might be readily taken to represent such a form of it as *crassa*, Hald.

Prof. Haldeman proposed a subgenus *Mudalia* for certain thin species without enamel on the labium, and probably *intended* to include such globose forms as *altilis*, Lea, &c., but the only species which he *cites* under the name, are *dissimilis*, Say, and *turgida*, Hald., both *carinate* shells. I am convinced, from studying numerous examples, that the characters of *Mudalia* are not persistent. The *globose* form of so-called *Anculosæ*, represented by *altilis*, does not belong to the family. Mr. Gill has proposed for it the generic name *Somatogyrus*, and it is now included in *Amnicolidæ*.

These same Virginia and Ohio thin species, together with the dentate forms, compose the subgenus *Nitocris*, H. & A. Adams, a synonyme, anyhow, and otherwise of no value. Mr. Anthony proposes to me to call such shells as *Anculosa monodontoides*,

*Mr. Anthony never described such a shell as *Melatoma altilis*, Anth., referred to by Dr. Gray.

"*Spirodon*," but the toothed columella is not even a constant specific character.

The characters assigned to *Io*, *Pleurocera*, *Angitrema*, *Lithasia*, *Strephobasis*, *Eurycælon*, *Goniobasis*, *Schizostoma*, *Meseschiza* and *Anculosa*, are by no means of equal value. I regard the first five as members of the *Trypanostomoid* section of the family, of which *Io* is a genus, with *Pleurocera* for a subgenus. *Lithasia* should, perhaps, be considered a subgenus only of *Angitrema*, which is the highest development of this form, having the thickened columella.

Strephobasis occupies a position between *Lithasia* and *Goniobasis*, but I think that it, also, might be considered a subgenus of *Angitrema*.

Goniobasis, *Schizostoma* and *Anculosa*, are certainly distinct genera; the first two approximate, forming the *Goniobasic* group or section;* and the last forms a section by itself, characterized by an entire aperture.

Yet this arrangement is liable to exception, as *all* the species of a genus do not fulfil the ideas here conveyed. Some species, on the contrary, remind one of genera which do not immediately succeed or precede them. Moreover, anatomical researches will enable us probably to separate the *natural* genera of this family much more sharply than we are now doing, and may enable us to seize on *corroborative characters* of the shell, which are now overlooked, or whose importance, in this connection, has been thus far under-estimated.

**Eurycælon* will be retained as a genus in this work although I suspect now that the species should merge into *Goniobasis* and *Anculosa*. *Meseschiza*, as I am convinced, represents an abnormal condition of growth in very young shells from a single locality. Unlike *Schizostoma*, there is in *Meseschiza* every evidence that injury to the shell causes the slit in the body whorl. In this case also I retain the genus, simply because otherwise I should not know where to place its single species.—*May*, 1872.

SYNOPSIS OF GENERA OF STREPOMATIDÆ.

I. Aperture produced into a more or less obvious canal in front.

Trypanostomoid Section.

1. Shell fusiform inflated on the periphery. Spire and canal produced; columella without deposit of nacre.—[Fig. 4.] Io, Lea.

2. Shell conical, or oval, canal not so much produced.—[Figs. 5, 6.] Subgenus Pleurocera, Raf.

Shell oval, or turbiniform, or fusiform, with a revolving row of nodules on the periphery, canal short. Columella callously thickened above and below. [Fig. 7.] Angitrema, Hald.

Shell oval or oblong, smaller, either smooth or adorned with nodules around the upper portion of the body whorl.—[Fig. 8.] Subgenus Lithasia, Hald.

Canal retrorse.—[Fig. 9.] Subgenus Strephobasis, Lea.

II. Aperture merely angulated in front, with no canal, and the columella not twisted, frequently callously thickened above.

Goniobasic Section.

3. Shell obovate, heavy, nodulosely angled, aperture ear-shaped; columella oval, truncate.—[Figs. 10, 11.] Eurycælon, Lea.

Fig. 4. Fig. 5. Fig. 6.

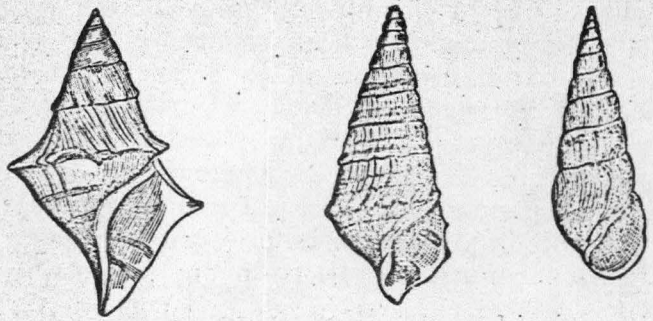
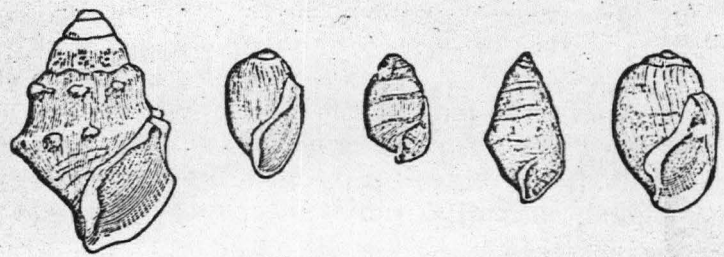


Fig. 7. Fig. 8. Fig. 9. Fig. 10. Fig. 11.



4. Shell heavy, oval, truncate, oblong, or turreted; aperture entire above.—[Figs. 12, 13.] Goniobasis, Lea.

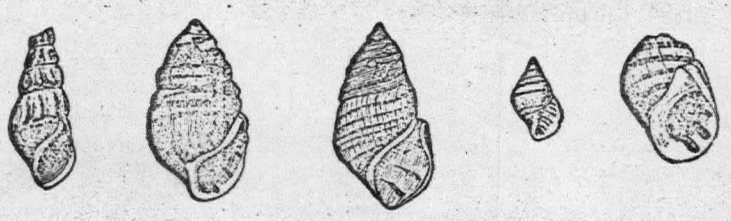
5. Aperture with a sutural, pleurotomose slit above.—[Fig. 14.] Mesesch iza, Lea.

6. Lip slit in the middle.—[Fig. 15.] Schizostoma, Lea.

III. Aperture entire and rounded in front.

7. Shell oval, heavy; columella callously thickened above.—[Fig. 16.] Anculosa, Say.

Fig. 12. Fig. 13. Fig. 14. Fig. 15. Fig. 16.



2. *Geographical Distribution.*—We have, in North America, nearly five hundred recognized species of the shells belonging to the various genera of *Strepomatidæ*. So considerable a moiety of these are found to be inhabitants of the upper Tennessee River and its branches in East Tennessee and North Alabama, and of the Coosa River in the latter State, that we quite agree with Mr. Lea in regarding that region as the great centre of this kind of animal life. We have ascertained that, leaving out the species inhabiting the Pacific States and those which in the descriptions have their habitats designated by States only,* of the remainder, fully two-thirds belong to the above two streams; including three entire genera, nearly all the species in several others, and a *majority* of the species of every genus except one (*Meseschiza*) of a single species.

The *Strepomatidæ* do not appear to flourish in the neighborhood of the sea, and nowhere have the

* As the localities of nearly all of these are "Tennessee" or "Alabama," the most of *them* also were probably obtained from the Tennessee and Coosa Rivers.

species been found numerous within a hundred miles of our coasts; nor do they approach the more northern latitudes of the Middle and Western States, very few species being found so far north as the Ohio River.

The Mississippi River also, seems to have formed, from the junction of the Ohio until its mouth, an insurmountable barrier to the geographical dispersion of these shells.

Thus, we find the district of our country, which they inhabit in such profuse numbers of species and individuals, to be really of somewhat limited extent, and may give its boundaries as follows:—*North*, the Tennessee River and tributaries. The Cumberland Mountains prevent the dispersion of the species of this river to the northward until its course is directed into Alabama. Here the character of its species (which we shall again allude to further on) changes, and they become gradually less numerous and of greater geographical dispersion, as the river runs towards the west. *East*, the mountain range of the Blue Ridge, running southwestwardly into the interior of Northern Georgia. Thence, the Chattahoochee River and tributaries, to within about a hundred miles of the Gulf. *South*, the species are restrained from spreading by the influence of the Gulf of Mexico. *West*, the Alabama, Cahawba and Black Warrior Rivers and their tributaries, those of the latter reaching almost to Florence, on the Tennessee River, which may represent the northwestern point of our boundary.

These limits are necessarily imperfect, but nevertheless include at least three-fourths of our species within an area of three hundred miles extent, either north and south, or east and west.

Of course, where the rivers alone form the boundaries, many of their species have spread into the adjacent streams; but in East Tennessee, southwestern Virginia, western North Carolina and northwestern Georgia, where several parallel mountain ranges completely enclose the valleys of the rivers, almost all the species inhabiting them appear to be confined within their limits. And here, a space of one hundred and fifty miles in length, by fifty in breadth, will include the waters occupied by probably more than a hundred and fifty species of *Strepomatidæ*.

The following table, representing the arrangement of the *Strepomatidæ* followed in my "Synonymy" of the species, published in the Proceedings of the Academy of Natural Sciences, 1863–4, will show both the *total* number of species, and the absolute and relative strength of the genera. A few species since published have not all been included, as we are not sufficiently well acquainted with them:—

NUMBER OF SPECIES OF STREPOMATIDÆ.

1. *Trypanostomoid Section.*

IO		5
smooth	2	
spinose	3	
PLEUROCERA		84
tuberculate	7	
sulcate	8	
striate, angulate	12	
carinate	8	
plicate	2	
smooth, angulate	15	
smooth, not angulate	32	
ANGITREMA		12
with a coronal of tubercles	4	
with two rows of tubercles	1	
with a central row of tubercles	7	
LITHASIA		17
large, oval, inflated	5	
small, compact	7	
obliquely flattened	2	
subcylindrical	3	
STREPHOBASIS		8
ovate conical	3	
cylindrical	5	

2. *Goniobasic Section.*

EURYCÆLON		6
GONIOBASIS		274
spirally ri ged	1	
tuberculate	18	
plicate	85	
angulate	16	
bi-multi-angulate	11	
carinate	4	
smooth, short	26	
smooth, elevated	43	
striate, elevated	8	
compact, ponderous	62	
SCHIZOSTOMA		26
fissure narrow	14	
fissure wide	12	
MESESCHIZA		1

Third Section.

ANCULOSA		31
nodulous	1	
sulcate	2	
striate	3	
angulate	4	
subglobose, or campanulate	21	

Total in 1st section	126 species,	464 species in all.
" 2d "	307 "	
" 3d "	31 "	

We find that, while some groups of species extend over a very wide territorial space, other groups are extremely restricted, and yet are frequently characterized by as great variation in form, size, ornamentation, etc., as the former. The *Goniobasic Group* occupy the entire extent of our country, represented by the sole species of our Northern Atlantic States, the very few forms of the great Northern Lakes and the species of the Pacific States, while they also occupy the entire southern country, with one or two species in Mexico and Cuba.

The *Trypanostomoid Section*, on the contrary, is very much more restricted, being confined principally to the streams tributary to the Mississippi and the Gulf of Mexico. The Mississippi appears to form their western boundary.

While the *Trypanostomoid* forms attain their maximum development in size and number in the Tennessee River, they are, to a very great extent, replaced by the *Goniobasic* forms in the Coosa River, which is undoubtedly the metropolis of the latter. The most striking genus of each of these groups is absolutely confined to the respective streams in which the groups had their origin. Thus, *Io* and *Schizostoma* are inhabitants, the first of the Tennessee and branches, the second of the Coosa, and neither of them is elsewhere found.

Assuming the Ohio River as a dividing line, we find that ninety-five per cent. of all the species originate south of it. Even a smaller proportion inhabit the rivers east of the Alleghany, and west of the Rocky Mountains. In the west, no species of *Strepomatidæ* have been discovered in higher latitudes than the northern boundary of the United States, while in the east, the St. Lawrence River and tributaries appear to be the northern limit of the family.

We thus find the *Strepomatidæ* to be distributed almost exclusively within the limits of the United

States, a distribution coextensive with our *Viviparidæ* and other families of Mollusca; clearly indicating that our country constitutes a distinct faunal province. For, as the *Viviparidæ* are replaced in Mexico by *Ampullaria*, so, for the *Strepomatidæ*, are substituted the more ponderous *Pachychili*. Between the former and the latter extend the broad plains of Texas, with rivers devoid of species, forming a barrier to the intermingling of the two groups. Besides this, the Mississippi River, from the junction of the Ohio to its mouth, appears to have formed a barrier to the westward progression of the *Strepomatidæ*, which but very few species have been able to surmount. We believe that one species only,—the *Goniobasis sordida*, of Lea,—is common to *both* sides of that great stream, while several forms, all of *Goniobasis*, are found inhabiting the western tributary streams exclusively.

Of course, our great river does not interpose such a formidable barrier in the northwest, where its volume is much less, and we here find the species of the great lakes not only inhabiting its waters in abundance, but extending into its western branches.

The species of the great lakes, though few in number and small in size, are very numerous in individuals, yet they fade out as completely on approaching the Ohio River as do the southern species; we are, therefore, compelled to admit in this case the plausibility of the theory of a separate creation of a small group of species, adapted to withstand the rigors of a climate which effectually forbids the introduction of the meridional species.

We may discover in the paucity of species, their small size and scant ornamentation, but multiplicity of individuals, and in their very extended distribution, a striking parallelism with the distribution of boreal marine Mollusca. Like the *Unionidæ*, the *Viviparidæ*, the *Amnicolidæ* and the *Limnæidæ*, of the same latitudes, the intercommunication afforded

by our waters has induced the plentiful distribution of the same species from Iowa and Wisconsin to Western New York, and even into Lake Champlain.

We have already alluded to the total separation of the species of our West Coast States. The barrier of the Rocky Mountains has, of course, proved with them even a greater obstacle than with our *Helices*. We find, accordingly, that the few species (all *Goniobases*) mostly partake of two common type characters, being either plicately ribbed* or spirally striated. The *Strepomatidæ* are entirely absent from the waters of the New England States, the exclusion being due probably not only to the severe climate, for they inhabit streams in even higher latitudes, but probably also their proximity to the sea. There is no *natural* method by which the species of the lakes could extend into the head waters of the New England rivers, and none of the species have as yet been transported by accident across the intervening land.

That the proximity of the sea exercises a great disturbing influence on the very few species which are exposed to and able to endure it, is proved by the great mutations of form which characterize *Gon. Virginica* and *Anc. dissimilis* in the Atlantic, and *Gon. plicifera* in the Pacific States.

The very great influence which our two great chains of mountains has exercised, in restricting the distribution of our species, may be inferred from what has already been said, and requires no further allusion.

The following observations on the geographical distribution of the various genera and smaller groups, will exhibit some very curious facts.

* Which strangely enough, equally characterizes a group of *Goniobases* of East Tennessee. Our West Coast Helices are all of different species and generally of quite distinct groups; *Vivipara* is excluded, and the *Amnicolidæ* belong to different genera from those of the Atlantic States, yet the same species of *Physa*, *Lymnæa* and *Planorbis*, abound equally in either section!

10.

Of this genus, the type of the *Trypanostomoid* form, there are five species, two of which are smooth and three spinose; they are of extremely localized distribution, being confined to the head waters and tributaries of the Tennessee River, and principally to the Holston, in Southern West Virginia and East Tennessee. They are very numerous in individuals, as Mr. Anthony, during a visit made to this region several years ago, selected and brought home several thousand specimens. Prof. Haldeman also was very successful in collecting them.

PLEUROCERA.

Of the eighty-four species, only thirteen are found so far northward as the Ohio River, and only five of them originate in that stream or its northern tributaries. The Tennessee River and branches claim thirty-three species, of which twenty-one appear to be confined to its waters. The Cumberland River contains four species identical with those of the Tennessee, and about a dozen that are not found in the latter stream. The Alabama River contains fourteen species, three of which seem to be peculiar to it. These species are generally confined, however, to those portions of the Coosa and branches that approach to East Tennessee. A few species also inhabit the Tombigbee, of Mississippi.

About a dozen species have the simple habitat "Tennessee" stated; nine have "Alabama," and two "South Carolina." I doubt very much whether the latter is correct.

There is very good reason to believe that *all* the large tuberculate, sulcate and angulate species inhabit the Tennessee River, the most ponderous ones extending from the Coosa, through Middle and West Tennessee, to the Ohio River. Among the angulate forms two, *trivittatum* and *tortum*, are

reported only from the Tombigbee and Chattahoochee Rivers respectively. None of the carinate group — inhabitants of Tennessee River — extend northward to the Ohio; but, strangely enough, the North-western States furnish two peculiar species,— *P. subulare* of Niagara River, and *P. Lewisii* of Illinois River.

But two plicate *Pleuroceræ* have yet been discovered, although this form is so very common to the *Goniobases* inhabiting the same region. These shells are found in the Clinch and Cumberland Rivers.

Of the smooth species, several extend to the Ohio River.

ANGITREMA.

The four species of the first group are inhabitants of the Tennessee River. *A. salebrosa* has been gathered in the Holston, in East Tennessee, and in the Tennessee at Florence, Alabama.

A. Jayana inhabits Caney Fork, Tennessee.

The five species of the third group are, with the exception of *A. rota*, very closely allied.

A. armigera has an extensive distribution. It was described from the Ohio River, and has since been found in the Wabash, Indiana, along with several other nodulous and plicate species, whose range is otherwise confined to more southern rivers.

Kentucky and Tennessee are also given as habitats for this species; and in the latter State it doubtless originated. *A. Duttoniana* and *Stygia* are both reported from Cumberland River, and the former inhabits the Tennessee. The fourth group contains two species not easily distinguished, but differing very much in their range of habitat; for, while *A. lima* is confined to the *lower* waters of the Tennessee, *A. verrucosa* has a range coextensive with that of *armigera*. It occurs in the Holston River and the whole extent of the Tennessee, the

Cumberland, the lower parts of the Ohio, and is very plentiful in the Wabash.

LITHASIA.

While the typical *Angitremæ* are essentially a Tennessee group, the subgenus *Lithasia* extends further southwards. Its large inflated species, five in number, all occur in the Tennessee River at Florence, Alabama, and vicinity, while the more numerous, compact, heavy species, approaching in form to the typical *Goniobases*, are almost confined to the Coosa and Cahawba Rivers. The exceptions are a small group of three species, of which *obovata* is the type, which inhabit the Ohio River and its Kentucky and Indiana tributaries, and one singular subcylindrical species reported from the Cumberland.

Mr. Anthony assigns Tennessee as the habitat of his *nucleola;* but I think he is mistaken, as I have specimens from the Coosa.

STREPHOBASIS.

Several of the species are reported only from East Tennessee, while two of them occur in the branches of the Alabama River. One of these is found in both rivers. Prof. Haldeman is in error in assigning Ohio River as the habitat of his *St. curta*. It has never been found there, but is one of the most plentiful shells of the Tennessee River, and as such, is in all our cabinets.

Goniobasic Section.

These shells constitute three-fifths of the species of *Strepomatidæ*. They are naturally divided into two type forms: the first, heavy, compact, with large subcylindrical body and short spire is eminently characteristic of the Coosa River; while the second, containing narrow, elongated species, with high spires of many whorls, although more extensively distributed, is still very characteristic of the waters of the Tennessee River and branches.

To the first of these forms undoubtedly belongs *Eurycœlon*, a new genus, which probably includes more species than have yet been assigned to it;— and *Schizostoma*. Of the six species of the former, one is from the Holston, another from the Cumberland, and the balance from the tributaries of the Alabama River.

SCHIZOSTOMA.

This genus, embracing twenty-six species, divided into two distinct groups of nearly equal respective numbers, inhabits the Coosa River only, and in this limited space exhibits all the range of variation in form, size and ornamentation, belonging to genera which possess a more extended geographical distribution.

MESESCHIZA

Contains at present only the type species. It is a very small, fragile shell, inhabiting the Wabash River, and does not appear to be of mature growth:*

GONIOBASIS.

This very large and widely-extended genus embraces over two hundred and fifty species — more than half of all the *Strepomatidæ* — and includes the only representatives of the family west of the Rocky Mountains, or south of the United States.

One species, beautifully ridged with sharp, revolving ribs — the *G. proscissa*, of Anthony — is reported simply from northern Alabama. There are eighteen tuberculate species; the heavy, compact ones being principally from the branches of Alabama River, while the elongated ones are found in the Tennessee.

In the latter is included a very distinct group, typified by *Postellii*, of Lea, belonging to the tributaries of the Tennessee, in Northwest Georgia. Two or three allied species are found in Florida.

*The validity of the genus is doubtful. No specimens have been collected since the type series, and they all appear to have been injured.

Among the tuberculate species, I have included *G. occata*, Hinds, — a California shell, of very doubtful generic character.

The plicate species number eighty-five, of which about half inhabit the Tennessee River. A few of these extend into the Cumberland, and one or two to the Green River, of Kentucky.

On the other side, a very few (five only) of the plicate species are found also in the Coosa and Black Warrior Rivers. Five species occur in Oregon and California. One species is reported from South Carolina, and two from Florida. The Ohio and Illinois Rivers each possess a species; and several occur in the Flint and Savannah Rivers, of Georgia.

G. suturales, Haldeman, reported from Ohio, is more likely a Georgia species, identical with one recently described by Mr. Lea.

Twenty-seven angulate species are about equally distributed in the Coosa and Tennessee Rivers. One of them, *sordida*, Lea, occurs both in the Cumberland and in Saline River, Arkansas.

G. Potosiensis, Lea, is found in St. Francis River, Missouri.

G. proxima, Say, occurs in the Holston and Santee Rivers.

G. bicincta, Anth., inhabits the Cahawba, Chattahoochee, Savannah, Roanoke, and is also reported from North Carolina and Arkansas!

Mr. Anthony's habitat, "Ohio," for his *G. tecta* is an error; the shell is known to come from the Coosa River.

It is also very doubtful whether the specimens of Mr. Lea's *G. Spartanburgensis*, from the Ohio River and from South Carolina, really belong to the same species. In such cases the authority for the alleged habitats should be rigorously investigated.

Of the twenty-six short, clavate, smooth species, a small group, with dark-colored, inflated shells, is quite characteristic of East Tennessee and southern

West Virginia. Five species are found in the Ohio River and the Lakes, and two, both of which will probably be found to be sometimes plicate, occur in the rivers of the Pacific States.

There are forty-three smooth, elevated *Goniobases*, of which about one-fourth inhabit the Tennessee, and the same number the Alabama River. Seven or eight occur in the Ohio River and Great Lakes, and two are found in California.

Three species inhabit Louisiana, and are the only *Strepomatidæ* reported from that State. Neither of them occurs east of the Mississippi.

G. semicarinata, one of the species of this division, extends from Tennessee and Kentucky, throughout all the Western States and the Lakes, and rejoices in twelve synonymes!

There are eight striate species, of which one, *G. Virginica*, Say, is the only *Goniobasis* inhabiting the rivers of New York, Pennsylvania and Maryland. Through the Erie canal it is extending to the Western Lakes.*

Very close relatives to this shell are *latitans*, Anth., and *sulcosa*, Lea, the former from Green River, Kentucky, and the latter from Tennessee.

There are over sixty species in the group which I have designated as "compact, ponderous," for want of a better name. They are essentially a distinct group from the other *Goniobases*, and *all the species, except three, are peculiar to the branches of the Alabama River.*

ANCULOSA.

Thirteen species inhabit the Coosa River, three of which are common to the Tennessee, and one of them, *A. prærosa*, extends northward to the Ohio. Two others are peculiar to the Tennessee. Three species are found in the Dan, Roanoke and Tar Rivers.

* *Vide* Dr. James Lewis, Proc. Acad. Nat. Sci.

A peculiar group of shells, possessing an inflated form and much lighter texture, is found in the Potomac and Susquehanna Rivers, the Kanawha and the upper Ohio. They are—*A. dissimilis, dilatata, costata* and *trilineata.*

Concluding Observations.

In studying the species of *Strepomatidæ*, especial care must be taken not to consider young shells to be adult species. All of our conchologists who have described species of this family have fallen into this error. The aspects assumed by young or half-grown shells are frequently so very different from their appearance when mature, as to be liable to mislead experienced naturalists.

All quite young shells are characterized by a thin texture, very light color, and very sharp acuminated spire, and in most cases by the base of the aperture being acuminate also.

Nearly every species, even when smooth in its adult state, presents the first few whorls either sharply carinate, or plicate, or striate. Occasionally they are either one or the other *in the same species*. Hence, in describing shells as carinate, or plicate or angulate, the appearance presented by the adult only should be thus described.

In some of the species, however, these lines, plicæ or carinæ, are persistent in the old shell, under favorable circumstances, but in most specimens are not seen. This is *one* difficulty which has caused the multiplication of synonymic names, generally unavoidably, on account of the scarcity of specimens, known to be from the same locality, for comparison.

When a specimen exhibits a perfect spire in the adult state (rare among the *Strepomatidæ*) and the initial whorls are plicate or carinate, they cannot be regarded as affording reliable data for specific discrimination. And it is only when these marks

extend quite, or more than half-way, to the body-whorl, that the species should be regarded as plicate or carinate. Whether species not usually *plicate* do not in some localities *become so*, from the absence of disturbing influences of the waters, is a question that we cannot as yet definitely decide; its decision in favor of such occasional development of plicæ would affect the validity of many species which are now regarded as established.

The development of carinæ or tubercles on the body-whorl of the adult shells is not nearly so constant a character as would, at first sight, appear to be the case, and several species are in doubt on this account. *Generally*, however, these may be regarded as more permanent characters when developed on the body than on the spire, as an *adult* shell is not subject to the same mutations of form as a juvenile individual.

Of course, the relations of size and texture are applicable to adults only; and *then* the former is subject to much variation from external influences. Texture is an important, because a tolerably permanent, discriminative guide.

Color, external or internal, generally should not be much relied on, nor the presence or absence of bands, or maculations; but in exceptional cases it is *very* characteristic, as in *P. viridulum*, Anth., for instance. Perhaps color in the *interior* is a more reliable feature than epidermal or *external* hues.

In *some* species, however, the presence or absence of bands forms a prominent distinctive feature.

Form, though subject to variation, may be relied on as one of the best characteristics; the length, number, and the convexity of the whorls, relative size of the aperture to that of the entire shell, shape of the outer lip and of the columella, are all *generally* reliable.

To repeat; in distinguishing a species of *Strepomatidæ*, of course the first step is to ascertain

whether it is *adult*. The signs of juvenility are — sharp extremities, thin texture, *particularly* the outer lip, which is frequently, on this account, broken, the very light color in the quite young and the absence of callosity upon the columella.

A comparison of shape, angle of divergence of the whorls, etc., with specimens of adult shells, or with figures and descriptions, will generally suffice to detect half-grown shells.

Many of the ponderous Alabama *Goniobases* are *bulbous* in the half-grown state; the spire at first narrowly acuminate, then suddenly and very convexly expanding, resembling the growth of certain West India *Cylindrellæ*. As with these terrestrials, the subulate portion invariably disappears in the adult, leaving a somewhat pupæform shell.

We thus find that no one character (with very few exceptions) can be relied on in specific discrimination; but rather a *combination* of characters, with a general idea of the necessary allowance for variation pervading other species of the same general type, or contiguous locality.

58 STERKIANA NO. 24, DECEMBER 1966

(CONTINUED FROM P. 6)

Description de quelques espèces d'Ammonites nouvelles des terrains jurassiques et crétacés (Rev. et Mag. Zool., t. VIII); 1856.

Notice analytique sur les travaux de Géologie, de Paléontologie et de Zoölogie de M. Alcide d'Orbigny; 1856.

En outre, de nombreux articles dans le *Dictionnaire universel d'Histoire naturelle* de Ch. d'Orbigny.

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THE portrait which accompanies this paper is from my personal copy of the Voyage pittoresque dans les Deux Amériques, (1836) not *listed by Fischer and published commercially.*