Quarterly Journal
of Conchology
v. I no. 17 Nov. 18

No. 17.] NOVEMBER, 1878. [Vol. I.

THE

QUARTERLY JOURNAL

OF

CONCHOLOGY.

CONTENTS.

LONDON:
HARDWICKE & BOGUE, 192, Piccadilly, W.
LEEDS: TAYLOR BROS., St. Ann's Street.

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BOOKS RECEIVED.

Intorno alla distribuzione oro-geographica dei Molluschi viventi nel versante settentrionale dell' Apennino dal Tidone alla secchia.—By Prof. Pellegrino Strobel, 1878, 8vo., pp. 135. [The Author.

Saggio sui rapporti esisenti fra la natura del suolo e la distribuzione dei Molluschi terrestri e d'acqua dolce.—By Professor Pellegrino Strobel, 1878, 8vo., pp. 26. [The Author.

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The Naturalist's Leisure Hour and Monthly Bulletin.—Edited by A. E. Foote, No. 6–8, pp. 48, 8vo., 1878. [The Editor.

Nachrichtsblatt der Deutschen Malakozoologischen Gesellschaft.—Edited by Dr. W. Kobelt, 8vo., pp. 16., No. 6, August, 1878. [The Editor.

H. THYROIDES, Say. Very rare. I found on Wyoming Hills 20 or more dead shells, in good condition. They appeared to have hibernated together and the spot became dry during the winter and they all died. I have not found them elsewhere, nor in this locality alive.

H. CLAUSA, Say. Rare here; abundant near DesMoines with *albolabris*. It seems to avoid the islands and seeks damp ravines. It is a fine little shell.

H. PROFUNDA, Say. Rare here in Iowa. Nearly opposite this city in Illinois at one place called Gooseberry Point, I found a few specimens. It is found with *clausa* near DesMoines but rather scarce. A white var. frequently occurs.

H. PULCHELLA, Müll. Not here alive; fossil in Loess in this city.

LIMAX CAMPESTRIS, Binney. Abundant under boards in gardens, in woods; everywhere in damp places where protected from the sun.

CIONELLA SUBCYLINDRICA, Linn. Abundant on R.R. embankment one mile N. of Muscatine; have found it nowhere else. It seems to live just below the surface of a sandy loam under vines.

PUPA PENTODON, Say. Under damp and decaying leaves by old logs in woods.

P. FALLAX, Say. Abundant in one small region. I have found it in a space not more than 10 feet square, by a slight exposure of sandstone in a very damp spot about the roots of a small stump, just on the border of a little prairie. It seems to be entirely confined to this spot.

P. ARMIFERA, Say. Abundant and widely dispersed; prefers sandy loam among grass roots, near old logs in woods. I have not seen it on river bottoms or on islands. Fossil in Loess in this city.

P. CONTRACTA, Say. Abundant along with *armifera.*

P. CORTICARIA, Say. Common with *contracta* and *armifera.* It prefers beds of old leaves not much decayed but damp.

It may be found between the leaves. Some of my correspondents pronounce my *corticaria* to be *Carychium exiguum.* It is certain it never reaches any damper places than the *Pupas,* with which it is associated.

SUCCINEA OVALIS, Gould. Abundant in marshes, by margins of ponds; associated with *Limnæas;* shell fragile.

S. AVARA, Say. Somewhat rare; closely associated with *C. subcylindrica* and found most abundantly in same region.

It prefers rather loamy, loose earth, which it seems to penetrate the same as *C. subcylindrica.* It is abundant as a fossil in Loess in this city.

S. OBLIQUA, Say. Abundant on Geneva Island with *H. multilineata.* They are closely alike in habit.

Shell much stronger than *ovalis;* they do not seem to be hermaphrodite.

Philomycidæ.

TEBENNOPHORUS CAROLINENSIS, Bosc. Rare; about old stumps or decayed logs; a fine mollusk.

Limnæidæ.

LIMNÆA REFLEXA, Say. One variety abundant in swamps with flags or reeds. The typical *reflexa* is scarce.

L. REFLEXA var. ZEBRA. Abundant in this vicinity. This var. is generally marked by white or light bands along the lines of growth alternating with dark or brown of usual color of

shell. It is much shorter and more conical than *reflexa* proper. Another var. of *reflexa* is found near West Liberty, in this county, with a peculiarly inflated or contorted aperture.

This var. approaches *reflexa* in size and general appearance except the aperture.

L. DESIDIOSA, Say. Were very abundant in a small pond near this city. The pond is on Mad Creek bottom and in times of very high water the creek runs through the pond. Two years ago an unusual freshet occurred and seemed to wash away every shell from the pond and I have found them no where else. The specimens I found there are very fine; dark epidermis, which however may not be the real color; 10 mm. long.

L. CAPERATA, Say. Common; foot of animal yellowish, too large to be entirely withdrawn in the shell; light horn color, body-whorl tumid, a sort of open umbilicus, aperture lateral, about 15 mm. long; muddy margins of ponds.

PHYSA GYRINA, Say. Rare. Our *Physas* are so variable in form I am hardly certain about any of them; grassy ponds.

P. HETEROSTROPHA, Say. Abundant along the margins of our ponds. I found a remarkably tumid var. very fragile, crawling about, under and over the ice in the spring.

PLANORBIS TRIVOLVIS, Say. Abundant in all our ponds.

P. EXACUTUS, Say. Abundant in some ponds. Last spring, soon after the ice melted, I found thousands of them floating on the water in what is known here as the Pond-Lily Pond. They soon disappeared and have been difficult to find since. They all look black.

P. DEFLECTUS, Say. Abundant in Muscatine Slough and Keokuk Lake. They are covered with hairs apparently in regular rows. The shell is certainly closely like *P. albus.*

P. BICARINATUS, Say. Common; hard to find alive; seems to spend most of its time on muddy bottoms of nearly all of our ponds.

P. PARVUS, Say. Common in all ponds where Nelumbium luteum grows.

SEGMENTINA WHEATLEYI, Lea. Common, much like *P. bicarinatus* in habitat and habit. I seldom find it alive, but find good specimens floating along margins of ponds.

ANCYLUS FUSCUS, Adams. Muscatine Slough and Keokuk Lake. Not very common; on smooth sticks or logs that have lain in the water a year or more.

Valvatidæ.

VALVATA TRICARINATA, Say. Abundant in our ponds and sloughs in the woods. A well marked var. with spire elevated and rather more robust than the former with a low spire or none. They do not seem to inhabit the same ponds.

Viviparidæ.

VIVIPARA INTERTEXTA, Say. Abundant in Muscatine Slough and found sparingly in several other ponds and sloughs. Young shells covered with short hairs in regular rows and seemingly crossing each other, giving the appearance of a woven fabric; some shells have a slight tendency to bands running with the sutures; mature shells dark-brown, or black.

MELANTHO SUBSOLIDA, Anthony. Abundant in Mississippi river and Muscatine Slough. I find the shells from the ponds and sloughs to differ slightly from those in the river, yet I can hardly believe there is a specific difference. It

appears to me our pond *Melantho* is called by some, *decisa.* It is lighter, more pointed, and whirls not so much shouldered as the river form.

LIOPLAX SUBCARINATA, Say. Common in ponds; some shells are not carinated and can scarcely be separated from the pond *Melantho.* Typical specimens are bluish horn color and strongly carinated.

Rissoidae.

BYTHINELLA OBTUSA, Lea. Rare; in a few ponds in woods; shells all apparently truncated.

SOMATOGYRUS ISOGONUS, Say. Common in ponds or sluggish streams.

AMNICOLA PORATA, Say. Common with *S. isogonus.*

A. CINCINNATIENSIS, Anthony. Abundant with *porata*, and in some ponds where the latter does not occur.

Strepomatidæ.

PLEUROCERA SUBULARE, Lea. Abundant in lower end of Burdett's Slough at time of low water last summer; previously I had found but a few dead shells along the river shore.

Unionidae.

ANODONTA CORPULENTA, Cooper. Common in our sloughs and Keokuk Lake. Rather tumid, short, lower margin quite convex. This species somewhat resembles *grandis* into which I believe it varies.

A. GRANDIS, Say. Abundant in Keokuk Lake. Shell longer, straighter on lower margin, less tumid than the typical *corpulenta.* The young of these two species seem to be much more readily separated than the mature shells.

I have specimens of *grandis* nearly 20 cm. long Shells thin, as all our pond bivalves are.

A. EDENTULA, Say. Common; Mississippi river.

A. FERUSSACIANA, Lea. Very rare here. I have found dead shells along the Mad Creek, but no live one here.

I have good specimens from Honey Creek, Delaware County, Iowa.

A. IMBECILIS, Say. Abundant in all our sloughs.

A. SUBORBICULATA, Say. Common in Keokuk Lake; a fine but fragile shell. This lake is the expansion of Muscatine Slough, a body of water formerly connected with the Mississippi river on the Iowa side in this city, winding away from the river 4–5 miles, and widening some 4 miles S.W. of us into Keokuk Lake, and at a distance of about 18 miles reaches the river again. The lake is 4–5 feet deep, about 2 miles long and 1 mile wide, largely filled with Nelumbium luteum.

MARGARITANA COMPLANATA, Barnes. Common; Mississippi river, and sloughs connected therewith, DesMoines river, Mud Creek, &c.

M. CONFRAGOSA, Lea. Very rare; Mississippi river, DesMoines river.

M. MARGINATA, Say. Rare; Mississipi and DesMoines.

M. RUGOSA, Barnes. Rare; Mississippi and DesMoines.

M. DELTOIDEA, Rare. I find dead shells with *Anodonta ferussaciana* along Mad Creek, and it is found in Honey Creek with the same *Anodonta*. I have not found it alive.

UNIO ÆSOPUS, Green. Abundant; Mississippi river and DesMoines. Shell thick, light color.

U. ALATUS, Say. Common; Mississippi. Young shells are handsome; interior fine nacreous purple. We have a var. somewhat rare, much heavier, longer, little or no dorsal wing.

U. ANODONTOIDES, Lea. Common; Mississippi. Very smooth, salmon color.

U. ASPERRIMUS, Lea. Common; Mississippi. Variable in form, passing one way into *pustulatus*, Lea, and the other into *lachrymosus*.

U. CAPAX, Green. Very rare; Mississippi. Drab color, very tumid, high umbones; a fine shell.

U. CORNUTUS, Barnes. Abundant; Mississippi. Varies greatly in color, some dark green and handsomely marked, others light and not the slightest traces of green or epidermal markings.

U. CRASSIDENS, Lamarck. Rare; Mississippi. Closely related to *ligamentinus*, Lamarck on one side, and *gibbosus*, Barnes, on the other. Purple inside and dark epidermis, 12.7 cm. long.

U. EBENUS, Lea. Abundant; Mississippi.

U. ELEGANS, Lea. Common; Mississippi and Cedar. Varies the same as *cornutus*, also the interior white, rose, &c. Green epidermis beautiful, seems to run into *trigonus*, Lea.

U. ELLIPSIS, Barnes. Abundant; Mississippi. Closely like *higginsii*, Lea.

U. GIBBOSUS, Barnes. Common; Mississippi. Almost always dark purple inside but varies to white, commonly very convex on dorsal edge and concave on ventral, but sometimes straight and difficult to separate from *rectus*, Lam.

U. GRACILIS, Barnes. Abundant; Mississippi and Cedar. Shell generally very thin, epidermis from fine green rays to a light color, interior white to purple, generally a dorsal wing, teeth very light.

U. GRANIFERUS, Lea. Common; Mississippi. Very thick, purple inside.

U. HIGGINSII, Lea. Common; Mississippi. Silky epidermis, dark rays from umbones, interior generally fine salmon color,

male disk elliptical, female quadrate and more tumid. It is probably *orbiculata*, Heild.

U. LÆVISSIMUS, Lea. Common; Mississippi and Cedar. Polished flesh-colored epidermis, thin, purple inside, dorsal wing; seems to prefer sandy bottom.

U. LIGAMENTINUS, Lamarck. Abundant; Mississippi, Cedar, Iowa, and DesMoines. Variable in form and color, epidermis strongly rayed with green, and inside bluish white, red rays equally strong, and inside rose to purple. Shell heavy; some forms difficult to separate from *luteolus*, Lam.

U. LUTEOLUS, Lamarck. Abundant in Cedar and DesMoines but rare here. I have found it in the Mississippi and in Muscatine Slough below Keokuk Lake. Extremely variable in form and color; from long and slender beautifully green rayed to tumid, truncated, yellow. Difference in form is no doubt due in great part to sexes. It seems to vary to *ovatus*.

U. METENEVRUS, Rafinesque. Abundant; Mississippi. A beautiful shell, quite variable in form.

U. MISSISSIPPIENSIS, Conrad. Abundant; Muscatine Slough. Light, dark green to black, sexual difference well marked. Seems to avoid running water. Closely related to *nasutus*, Say.

U. OCCIDENS, Lea. Common; Mississippi. Very tumid, beautifully green rayed, light salmon to pink inside; old shells much eroded. Same form as *capax*.

U. PARVUS, Barnes. Rare; Muscatine Slough, ponds generally; associated with *Anodonta imbecilis* and *Unio mississippiensis;* length 3.7, width 2 cm.

U. PLICATUS, Barnes. Abundant; Mississippi. Very heavy; but two or three well marked folds, folds sometimes almost wanting; purple about posterior adductor scar and along posterior margin; rather globular.

U. PUSTULATUS, Lea. Common; Mississippi. Variable in form, chestnut with dark concentric lines; some almost free from pustules.

U. PUSTULOSUS, Lea. Abundant in Mississippi, found also in Cedar and DesMoines; distinguished from *pustulatus* by green on umbones, this character seems to be very constant.

U. PYRAMIDATUS, Lea. Common; Mississippi. Resembles *trigonus* when young.

U. RECTUS, Lamarck. Abundant in Mississippi, is also in Cedar and DesMoines. Young shells are very beautifully green rayed, old nearly black; interior from salmon, rose, to white. 13.5 cm. long.

U. RUBIGINOSUS, Lea. Very rare; Mississippi, Cedar and DesMoines. It seems to be very closely related to *trigonus*, Lea.

U. SECURIS, Lea. Common; Mississippi. The young are very beautiful, light epidermis with radiating black spots.

U. TRIANGULARIS, Barnes. Common; Mississippi. Sexes well marked.

U. TENUISSIMUS, Lea. Rare; Mississippi. Very thin and fragile, resembles young *gracilis;* sexes quite unlike.

U. TRIGONUS, Lea. Common; Mississippi. Light brown color, inside white to rose, umbones high and curving; thick, somewhat globular, slightly sulcate posteriorly from umbones to margin.

U. TUBERCULATUS, Barnes. Common; Mississippi and DesMoines. Young, fine dark green; shell attenuated posteriorly, thickly covered with tubercles.

U. UNDULATUS, Barnes. Rare here, abundant at DesMoines. Differs from *plicatus* in having more and stronger folds, not so tumid, and umbones scarcely rising above ligament. I am not certain it is found here. It is certainly a var. of *plicatus*, as the latter varies in all the particulars enumerated.

U. WARDII, Lea. Rare here, common in the Cedar and Des-Moines. It is a var. certainly of *metinevrus*. It is a beautiful shell.

U. ZIGZAG, Lea. Common; Mississippi. I do not see clearly the difference between this species and *donaciformis*, Lea.

It may be we have both here; if so one is doubtless a var. of the other.

Corbiculadae.

SPHÆRIUM STAMINEUM, Conrad. Abundant in ponds and slow running water.

S. TRANSVERSUM, Say. Common with *stamineum*.

S. SPHÆRIUM, Anthony. Common in ponds in woods.

PISIDIUM COMPRESSUM, Prime. Rare. In ponds in woods.

Jan., 1878.

NOTE ON THE GEOGRAPHICAL DISTRIBUTION OF TERRESTRIAL MOLLUSCA.

BY W. G. PETTERD.

I have perused with considerable pleasure and instruction the excellent article in the *Q. J. C.* for November, 1877, by C. P. Gloyne, entitled, "Remarks on the Geographical Distribution of Terrestrial Mollusca." Of course it could not be expected in such a wide field as the title offers that the author could go minutely into the details of the peculiarities of distribution in each region. As far as he has gone it is remarkably good; nevertheless I do not think a few additional general remarks concerning the Australasian Province would be altogether uninteresting, or that the author will think me intrusive. A task of this sort must of necessity contain some little deficiences or even errors that it is possible for those who have had local experience to expand or

rectify. With this idea I send these rough notes, which in themselves may not be perfect; I think, however, they will explain a little more.

The Moluccan Region.

D. *New Guinea.* I have visited the southern coast of this great and interesting Island and lived a considerable time on the coast of the great Eastern Peninsula, occasionally penetrating into the interior in the direction of Mounts Owen Stanley and Astrolabe. Generally speaking, I was surprised and disappointed at the comparative barrenness of the country so far as Land Shells are concerned, although the rich tropical vegetation exists in many parts in the same profusion and luxuriance as in the Solomon and other adjacent Islands, but the land Mollusca offer a very marked contrast, both as regards number of species and their profusion individually.

I visited Katow, on the coast opposite to Cape York, the most northerly extremity of Australia, in the "Chevert" expedition. The general aspect of the country here is one universal Mangrove Swamp extending for many miles in either direction, formed by what appears to be the delta of the Great Fly River. On the banks of the rivers a dense, rank vegetation is ever present, while the coasts, and in many instances the banks of the rivers, are invariably fringed with the Malaria-breeding Mangrove. The land shells collected here are described in the "Proceedings of the Linnean Society of New South Wales for 1876," by Mr. J. Brazier, viz.:—*Helix (Thalassia) annulus, H. (Geotrochus) Strabo, H. (Geotrochus) siculus, Helicina Maino.*

At Yule Island on the eastern side by the Gulf of Papua, separated from the mainland of New Guinea by Hall Sound, the following where collected:—*Helix (Thalassia) sappho, H. (Discus) Lomonti, H. (Conulus) Maino, H. (Conulus) Starkeii, H. (Geotrochus) Yulensis, H. (Geotrochus) Brazierœ, Bulimus Macleayi, Tornatellina terrestris, Pupinella Crossei, Helicina Coxeni;* and on

the mainland *H. (Geotrochus) zeno* and *H. Broadbenti.* The latter extends to Port Moresby. The aspect differs greatly from the West of the Gulf of Papua—at Katow there are bold lofty mountain ranges flanked by hills of various altitudes. In fact there is a total change in the aspect, not only as far as the physical appearance, but the natives also differ, for here we have the yellow skinned Polynesian. at Katow and to the west the natives belong to the Black Papuan race.

At Port Moresby about 75 miles south-east of Hall Sound, I made a lengthy stay with three companions collecting specimens of Natural History, visiting the coast villages, and collecting in their immediate vicinity and making short journeys into the interior. The full length of the coast of the Peninsula is traversed by a low range of hills, seldom more than 300 feet in altitude, of modern tertiary origin, covered with the debris of corals and shells apparently of species existing on the coral reefs adjacent; they are consequently very dry and bare of vegetation, except coarse grass and straggling dwarf Eucalypti. In the indentations a few more shrubs and trees struggle for an existence, and here and there in the gulleys where a greater quantity of alluvium has accumulated, a denser scrub exists. On this coast-range land shells are almost totally absent, in fact I could only find, after diligent search, a single dead specimen of a small *Helix*, apparently the widely diffused *Helix rustica* of Australia. Beyond the coast-range the country is a general undulating plain, covered with high coarse Eucalypti and an occasional patch of tropical verdure around water-holes and on the banks of creeks. These plains are also destitute of Land Molluscs, that is so far as I could observe, although a few fresh-water shells exist, viz:—one small sp. of *Unio* bearing a great resemblance to a sort I have collected in the Richmond River, New South Wales; one sp. of carinated *Physa*, one sp. of *Melania*, and one *Amphipeplea* closely allied to a Queensland form.

A high mountain range traverses the centre of the Peninsula, being a continuation of the Great Northern range—the back bone of New Guinea—occasionally reaching an elevation of 17,000 feet. Here a magnificent tropical verdure is ever present, in the deep and extensive ravines and along the banks of the rivers and streams that rush with great velocity through the rugged ranges. The spurs of the hills that abut the mountains are generally sharp and razor-backed, covered with high rank grasses and straggling Eucalypti. On the brows of these the native tracks run, and often in traversing these a single false step would precipitate the unfortunate traveller over 100 feet down into the gorge on either hand. I need scarcely mention that the scenery is grand in the extreme—high precipitous mountains, deep gorges and rushing torrents—but one breathes a pestiferous air that soon reduces the white man to a skeleton and the grave. This is the home of the exquisite Bird of Paradise, Racquet-tailed Kingfishers, Cassowary, the magnificent Goura Pigeon and many other forms of the feathered tribe that have gained for New Guinea a reputation *par excellence* for the beauty of its Natural productions. But here again, the Land Shell collectors would meet with disappointment, although every favourable condition exists Land Shells are of extreme rarity both in variety and numbers. Nevertheless, what I did obtain were very interesting forms. One species of *Helix*, *H. Broadbenti*, has a very striking resemblance to the common *H. Fraseri*, and the four other sorts of *Helices* that I collected, resemble Phillipine Islands' forms to a very marked degree. In these mountains I only got one specimen of an operculate shell, and this is dead. This I sent you for description in the little lot by post.

From this rough sketch it may be seen that although we may expect, as further research proceeds, to have a great augmentation to our knowledge of the Land Mollusca of South-east New Guinea, we cannot expect it to produce anything like the rich

array of lovely forms so abundant and characteristic of the Phillipine Islands or the Solomon Archipelago.

The great drawback to exploration in New Guinea is its deadly climate, and, for the most part, hostile character of the Aborigines; both are formidable drawbacks, the latter particularly, for they are not the low, degraded savage of Australia, but a muscular, stalwart race of formidable opponents. This is instanced by the fierce opposition that D'Albertis lately met with in his collecting expedition to the Fly River, which resulted in the loss of almost all his servants; but I regret to have to add the management of the party casts no creditable reflection on that man, no matter how much our knowledge of the Zoology of that part of the *terra incognita* may be augmented by his collections.

The West Polynesian Region.

A. *The Solomon Islands.* I may state the remarks concerning the richness of this division are quite correct. During a cruise through these Islands I was amazed not only at the great variety of sorts but also the individual abundance of species. The natives brought off to the vessels literally bushels of Land Shells, that are the ornaments of the collector's cabinet, to barter them for pipes, red cloth, tobacco, beads, and such like native wealth, happy to give hundreds of superbly coloured *Helices* for a single common clay pipe. I think it would surprise many English collectors to have seen those nude painted savages with white-washed mops of hair, elaborate ornaments of platted grass and human teeth, with the lobe of the ear stretched nearly to the shoulder and a large plug of carved wood inserted, embellished with any amount of talking and gesticulation, in thin, long, narrow canoes trying to make a bargain for a few beads in exchange for a basket of beautiful land shells. If they could see the original collectors of their treasures in their native home they would be no little surprised.

I have not had the pleasure of visiting the Phillipine Islands, but I can scarcely think that land shells can be in greater profusion there than in these islands, and yet much remains to be done for our knowledge of many of the groups is extremely meagre.

Australian Region.

B. *Tasmania.* This island is much richer in land mollusca than is generally known. The species numerically cannot amount to less than 100. They include a few fine and remarkable forms, besides the *Helix Launcestonensis* mentioned, there is *Bulimus Dufresnii* and *Vitrina Milligani*, both remarkable forms having no representatives on the mainland of Australia, unless the Victorian *Helix atramentaria* can be said to be the analogue of the latter, as it is the Australian representative of the peculiar *H. Busbyi* of New Zealand. Among the minute shells may be mentioned *H. vitrinæformis*, a curious form of a *Vitrina* like appearance, and *H. dispar*, the only species with a tooth in the interior of the aperture, both discovered by me on Mount Wellington, in the southern part of the island. More recently I have found a minute reversed *Helix*, (*H. Weldi*, Tenison Woods, "Proceedings of the Royal Society of Tasmania"); this is the only sinistral species hitherto discovered in Australia, nevertheless the general facies of the smaller species resemble the smaller forms from Southern Australia, and their apparent distinctness may be due to the paucity of collectors in this department in the sister colony of Victoria. I may state that I am now compiling a complete Monograph of the Land Shells of this Island, including descriptions of my new discoveries. This I hope to present to your readers in a short time.

The fresh-water shells have been catalogued by the Rev. Tenison Woods, but the work will require thorough revision. Much also remains to be done, for even since the publication of this list several new forms have been described at the meetings of the Royal Society of Tasmania, including a species of *Gundlachia*,

G. Petterdi and many that were supposed to be restricted in their habitat to the southern part of the Island, have been found to be generally diffused.

In conclusion, I must congratulate the author on the excellence of his paper, and I hope other observers in various parts of the world will take this important matter in hand and still further elucidate the "Geographical Distribution of Terrestrial Mollusca."

May, 1878.

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(From Proc. Lin. Soc., N.S.W., 1876.)

The activity of Mr. Brazier during the voyage of the "Chevert" may be gleaned from the fact that in the four notices of the marine shells obtained, published up to the present, no less than 305 species are recorded.

This rich harvest has not only added in a great degree to our knowledge of geographical distribution in this comparatively unknown region but a number of very interesting and novel species have been discovered and are described by the author, viz. :—

Drillia Mastersi, Spaldingi; Clathurella Ramsayi, Barnardi, Macleayi, tricolor; Murex eximius, Ocinebra confusa, Epidromus Angasi; Marginella lævigata; Anachis clathrata; Amycla mariæ, inscripta, merita, pudica, abyssicola; Astyris læta; Turbonilla Darnleyensis, eximea, aplini, confusa; Odostomia clara, affinis, ecmpta, polita, parvula; and Syrnola pulchra.

In addition to this lengthy and interesting list of new species 24 others are mentioned, of which only single or mutilated pecimens were obtained.

J. W. T.

MOLLUSCAN THREADS.

A Paper

READ BEFORE THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.

By G. SHERRIFF TYE.

"So the spider spins,
And eke the silkworm, pattern'd by ourselves."—HOOD.

Montagu, at the beginning of this century, noticed the habit in *Physa fontinalis* of thread-spinning. He says: "*Physa fontinalis* spins a filament by which it lets itself down from the surface after floating." Later, Mr. Robert Warington* gave an exceedingly interesting account of this thread-spinning by *Limnæa glutinosa*, *L. stagnalis*, various species of *Planorbis* (not named by him), and *Physa fontinalis*. The latter upon one occasion formed a thread so tough that he was enabled to lift the snail seven inches above the surface of the water by it. The author includes in his list of thread-spinners *Neritina fluviatilis*—of this I shall speak further on—and concludes by stating his belief that "all the fresh-water snails are possessed of this power."

Now, after this well-proven fact of spinning, stated upon the authority of so good an observer, you would scarcely expect to find such an observation as this:—"The Physæ, especially *P. hypnorum*, are active in habit, whether swimming foot uppermost, on the surface of the water, holding themselves stationary at different depths in the water, or gliding through it in sudden jerks by an hydraulic action of the foot. By bringing the lateral margins of this organ into contact, the animal constructs a tube for inhaling and suddenly expelling the water either upwards or downwards. Montagu stated, and the statement has been repeated by Jeffreys, that the animal spins a mucous thread for letting itself down in

* *Zoologist*, 1852, pp. 3634-5; 1853, p. 4533.

the water and rising again for respiration; but I have not succeeded in confirming this observatiou, and have great doubts of its accuracy."*

Mr. Reeve does not tell us how he proved his assertion about the "hydraulic action of the foot," and does not seem to have tried to ascertain how they "hold themselves stationary at different depths in the water,"—coolly "doubts" Montagu's statement about the "mucous thread," and does not notice Mr. Warington's observations at all. I may state that a mollusk is only capable of "holding itself stationary at different depths in the water" when attached to a thread, and that no "hydraulic action" of the foot takes place. When a mollusk is forming a thread, the "lateral margins" of the foot are brought together, forming a channel for the natural flow of mucus down the sides of the foot to the tail; thus adding to the thread, which is gradually extended. The existence of a thread may be proved, as stated by Mr. Warington, by passing a rod under the creature, by which means it can be swayed to and fro.

I have taken great interest in this thread-spinning, and long before I had read Mr. Warington's excellent notes I had been observing this seeming phenomenon, and had tabulated the species absolutely seen by myself in the act, and noted the conditions under which mollusks are capable of producing and using a thread.

Let me here explain that the words *thread* and *spinning* are used descriptively, and it must not be supposed that these threads, or the production of them, bear any anology to the spinning of spiders. In the case of the mollusk the thread is gelatinous—in fact, is formed of the slime of the creature, the process of forming it being, to a certain extent, an involuntary act, although it is used for a set purpose; whereas the spider's thread is silken, and its formation is entirely under the control of the creature. Neither are they to be confounded with the byssal filaments of the *Mytilidæ*,

* Lovell Reeve, "British Land and Fresh-water Mollusks," pp. 150-1, 1863.

Pectinidæ, *Dreissena polymorpha*, &c., these latter being of a fibrous nature, and the product of a special organ.

As members of the order *Pulmonobranchiata*—breathers of atmospheric air—spin and use threads oftener than any other of the Gasteropoda, especially the aquatic members of the group, and as their method of using them differs from the *Pectinibranchiata*—water-breathers—we will consider them first.

In order to be better understood, let me describe briefly their process of respiration. On the side of the creature is situated a sac, or branchial chamber, formed by a fold in the mantle, and having an opening outwards, which the animal can open and shut at will. The air in this sack is renewed by diffusion while the mollusk is at the surface of the water, which air oxygenates the blood through the veins, which ramify in an arborescent form over the roof of the cavity. Now it will be obvious to the reader that when this sac is distended with air, the creature becomes of less specific gravity than water; hence it will float, even against its own will, when dislodged from its hold; and, on the other hand, when the air in its branchial chamber is exhausted by natural respiration, or expelled by reason of some annoyance, the creature, becoming heavier than water, at once sinks to the bottom; and on this simple fact hangs the capability of the mollusk to spin an *upward* or *downward* thread.

I have never seen a member of this order *descend* by a thread unless it had first *ascended* by one, in which case it might return upon the same thread. It would no doubt be possible for it to descend by a thread if its air-chamber was sufficiently empty to allow of it sinking; but, atmospheric air being essential to the creature's existence, it very rarely voluntarily descends without a supply, and *never in such a case by a thread*, although it will creep about in the water when the air in its branchial cavity is sufficiently exhausted to allow it to fall to the bottom of the water when loosed from its hold.

As soon as a young Limnæid issues from the egg it appears to be capable of rising to the surface of the water by a thread, its air-sac being no doubt sufficiently charged with air to render it buoyant enough.

The method of anchoring these threads to the surface of water is singular: a minute concavity at the upper end acts like a small boat, and thus sustains the thread.

When one of these mollusks descends by the thread it spun in ascending, it generally carries back the thread with it, gathering it together by a muscular action of the foot, although these threads are sometimes fixed and made to last a considerable time. The longest threads I have seen are those of the Physæ, and I have had in a vessel containing fourteen inches depth of water, a number of them fixed by *Physa hypnorum*, up and down which they were creeping for eighteen or twenty days together. I have no doubt they extend their threads to a much greater length, say three or four feet.

Permanent threads are kept in position and strong enough for use by the addition of a film of mucus each time a mollusk crawls over them; and I may here explain what I wish to convey by saying that the process of spinning is to a certain extent an involuntary act.

When a snail crawls (either a terrestrial or an aquatic species) it leaves behind it a trail of mucus, which is discharged for the purpose of lubricating the foot in its passage over any surface, and if the continuity of this mucus be not ruptured, we have a thread in all respects analogous to those I am speaking of.

In the case of an aquatic species, this trail of mucus is usually invisible; hence it may be supposed that mollusks inhabiting water do not secrete such a copious supply as their bretheren of the land, and that the water itself would act as a sufficient lubricant; but such is not the case, for not only do the bodies of mollusks

require lubricating in their passage through water (as in the case of fishes), but the foot especially, in its passage over the surface of any object. This mucus may readily be seen when fresh water is put into any vessel in which mollusks have been kept for a few days, as the bubbles of oxygen then given off by the plants (*Anacharis alsinastrum* shows it well) adhere to the network of mucus which stretches from leaf to leaf, making it plainly visible: of course the change must be conducted gently. The best plan is to lift out a bundle of Anacharis from the vessel in which the snails are, and drop it gently into a vessel of fresh water.

The Slugs possess this mucus-secreting property to a remarkable degree; each species produces mucus of a color and consistency peculiar to itself, some species being provided with an important slime-gland near the tail. This property is essential to their well-being; having no sheltering shell, it serves to keep the body moist and cool in dry weather. Slugs often *suspend* themselves by a thread, and sometimes use it as a means of *ascent.*

The Pectinibranchs, extracting oxygen from the water as it passes over their comb-like gills, are not capable of altering their specific gravity; I have not seen one spin an *upward* thread; but several species, both fluviatile and marine, often *suspend* themselves from the surface of the water or from a floating object by a thread. The same remarks apply to the Nudibranchs.

Instances of thread-spinning occur among the Lamellibranchiate mollusca.

The late Dr. Lukis, of Guernsey,* whose name is a household word to all lovers of science, and whose kindly heart endeared him to all who ever had the pleasure of his acquaintance, in several most excellent letters to Dr. Jeffreys, which every naturalist may take as models of careful and loving observation, says, in speaking of *Sphærium lacustre*—"When they reach the edge of

* Jeffreys' "Brit. Con.," vol. i, p. 12 et seq.

the water, they take to the surface easily, and creep along slowly, and apparently with caution, as if in search of some floating substance, near which they will rest for hours. . . . The foot during repose is usually retracted, and does not seem necessary for mere floating purposes."* "I have this morning watched one, which had reached the surface, spin its filament and descend to half an inch below the surface, where it remained suspended for some time. It occupied three hours in spinning this short thread. I think it consists of more than a single filament. . . . The surface of the water was again depressed or cupped." He states that the filaments vary from one to four, were far apart in one instance, but rarely could more than one thread be seen; and that the animal has the power of raising itself to the surface again by means of its thread.

M. Bouchard-Chantereux has recorded that the young of *S. corneum* possesses the same power of spinning a thread. I have myself seen the latter anchor itself by a mucus filament. The uses of these threads to the Pulmonobranchs appear to be:—

1st. They enable the mollusk to reach the surface of the water gently when no other means present themselves, and to return to its original station, which it often does, after having ascended to the surface of the water and opened its branchial valve for the entrance of more atmospheric air.

2nd. It is a much easier method of locomotion.

3rd. It is a much quicker mode of travelling; for if the surface traversed be smooth, as the side of a glass vessel, it will take the mollusk twice the time to creep as to float by a thread, while if the surface be uneven, as the sides of a pond or the leaves of a plant, it would be longer still in creeping.

4th. As a great part of the lifetime of the Limnæidæ, especially the Physæ, is spent in floating upon the surface of the water,

* Without doubt they are kept afloat by the mucus cable.

where they feed upon particles of decaying vegetable matter, this property of thread-spinning seems admirably suited to their requirements.

It enables the Slugs to descend from considerable heights, as from branch to branch of a tree, quicker and easier than by the process of creeping.

Messrs. Binney and Bland* describe, I think very correctly, the use of the thread to the *Cyclophoridæ*—"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 *Helicidæ*,† the animal has the power of spinning a short thread, which is attached to the object of support. By this it hangs suspended at pleasure."

Among the Pectinibranchs, it enables the snail to reach the bottom gently, instead of falling roughly or suddenly. It serves the same purpose among the Nudibranchs.‡

The Sphæridæ, through their capability of climbing and floating, in which exercises they are fond of indulging, especially when young, are enabled to enjoy a more extended range of habitat and food; and when during their excursions they desire to rest, this mucus-cable (always short, generally hardly to be spoken of as of any length, but simply a mucous attachment) keeps them safely moored, while, with foot and siphons withdrawn, they take a short period of repose.

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* "Land and Fresh-water Shells of North America, part iii, p. 96, Washington Smithsonian Institution, September, 1865.

† When a *Helix* wishes to attach its shell some distance from the ground, to a wall or tree, its method of procedure is interesting and curious.—Having attained the desired spot, it shrinks itself partly within its shell, leaving only the foot, which is shrunken, projecting; it then exudes mucus from the edges of the mantle, which becomes attached to the object of support and to the edge of the mouth of its shell, it then withdraws further into its shell, leaving only the tip of the posterior end of the foot attached, remaining thus until the film of mucus has hardened, when it withdraws entirely into its shell. I have observed this many times, both in English and North American Helices. I have not seen a *Helix* or a *Bulimus* use a thread in any way.

‡ Alder and Hancock, "Monograph of the Nudibranchiate Mollusca."

Having thus far, I hope, succeeded in indicating the "why and the wherefore" of molluscan threads, I will tabulate the species I have seen spin and those seen by others, commencing with the species that spins oftenest and best, and relate one or two incidents connected therewith.

Pulmonobranchiata.

Physa hypnorum.—As before stated, I have had the young of this species creeping up and down permanent threads for eighteen or twenty days together. In one case I saw three Physæ and a *Limnæa glabra* upon a thread of the former at one time. Often, when two Physæ meet upon the same thread, they fight as only mollusks of this genus can, and the manœuvres they go through upon their fairy ladders outdo the cleverest human gymnast that ever performed. I once saw one ascending, and when it was half way up the thread it was overtaken by another; then came the "tug of war"; each tried to shake the other off, by repeated blows and jerks of its shell, at the same time creeping over each other's shell and body in the most excited manner. Neither being able to gain the mastery, one began to descend, followed by the other, which overtook it, reaching the bottom first. Yet they are not always bent upon war, but pass and repass each other in an amicable spirit. One of the most beautiful sights in molluscan economy is to see these little "golden pippins" gliding through the water by no visible means; and when they fight, to see them twist and twirl, performing such quick and curious evolutions, while seemingly floating in mid-water, is astonishing, even to the patient student of Nature's wonders.

If when one of these mollusks is ascending by a thread, it be disturbed sufficiently to cause it to descend before reaching the surface of the water, it changes the point of attachment of its thread from the tail to the head, by bringing its extremities together, the alteration of position being attained with great dexterity and ease.

Physa fontinalis stands next as a thread-spinner, using the thread in a similar manner but not so often.

Limnæa glabra, although not using this means of locomotion so often, nevertheless spins well and easily.

L. stagnalis is active when young, but its habit of spinning decreases as it grows older.

L. palustris.—The same remarks apply to this species also, although I have not seen it spin so commonly as *stagnalis*.

L. peregra.—This species has been observed to spin by my friend Mr. R. M. Lloyd, but it very seldom uses a thread.

L. glutinosa, recorded as a thread-spinner by Mr. Warington.

Planorbis complanatus, *P. spirorbis*, *P. contortus*.—These species spin very much less often than the foregoing.

Some species of *Cerithidea* inhabiting salt marshes and Mangrove Swamps suspend themselves by a number of glutinous threads out of the water, *e.g.*, *C. decollata*,* L., Borneo.

Mr. Thomas Hoy† seems to have been one of the earliest observers of this method of travelling as practised by the slugs, and he has given an account of one he saw hanging from a Pine tree by a filament four feet long, and travelling towards the earth at the rate of one inch in three minutes. At the same time Dr. Shaw gives an instance (from a memorandum made in 1776) of a slug descending from the roof of an arbor, the extraordinary distance of eight feet, until it nearly touched the ground, when he shook it off.

Limax arborum.—M. Bouchard-Chantereux has seen young individuals of this species descend from branch to branch of a tree by a mucous filament, and he supposes this species to be the *Limax filans*, or spinning slug of some English authors of the

* Woodward, "Manuel of Mollusca," p. 243, 1868.

† Trans. Linnean Soc., vol. i, p. 183 et seq.

last century. Mr. Daniel has also seen this species suspended in couples from the branches of trees during the breeding season*

Mr. Wm. Harte,† F.R.G.S.I., has recorded some interesting experiments he made with *Limax arborum*, causing it to spin a thread and to *reascend* by it, and he believes that from the "perfect ease and regularity with which they do it, that they are well accustomed to it." Mr. Harte also states that if the Slug be "gorged with food," the slime is thin and not able to sustain it; but "if kept overnight without food, it performs well next morning." This is a very interesting fact as shewing that when the creature is in a condition when it would be likely to require the thread most, viz., hungry and in search of food, it is in a condition best suited to produce it; and this further strengthens my belief (contrary to Mr. Harte), that the thread is used as a means of *voluntary* descent, although, as I have endeavoured to explain, the production of it is to a certain extent *involuntary*. When in search of new feeding grounds, during its excursions, it would often come to the edge of an object and launch itself into space upon the chance of finding a landing again soon, or if it did not, returning to its old one.

Dr. J. Gwyn Jeffreys speaks of the use of the thread by *Limax agrestis*, and I have myself seen it use its thread for the purpose of descent.

Limax maximus has been observed to lower itself a distance of three or four feet by a thread.‡ I once saw two fine specimens of this species suspended on a wall by a thread made very strong by the joint exudation of the Slugs, being nearly ⅛-inch in thickness at the base, nine inches long, and capable (as I proved) of bearing a very much greater weight than their own. I have also

* Jeffrey's Brit. Con., vol. i, pp. 136—7.

† Proceedings Dublin N. H. Soc., vol. iv, part ii.

‡ Lovell Reeve, "British Land and Fresh-water Mollusks," p. 26.

seen *Arion hortensis* hang itself by a thread from a twig, and I feel satisfied that it is a habit common to all the Slugs.

The observations of Mr. Binney,* the eminent American Conchologist, upon the Slugs of his native country, are of such interest that I cannot refrain from quoting considerably from them. He says "All the species which have yet come under our notice possess the power of suspending themselves in the air by a gelatinous thread. . . . . During the whole operation the locomotive disc is in active undulatory motion, in the same manner as when in ordinary progression. It appears in this way to guide and force toward the extremity the mucus which is secreted on its surface, and which, collected at its extreme point forms the thread. The Slug often pauses in its descent, and extends its tentacles and its whole body in various directions, as if seeking some object on which to make a lodgment. . . . It is mostly however when they are young, or at least not grown to their full size, that they enjoy this power† . . . They often remain suspended in mid-air for a time, and it is not unlikely that there is some pleasurable sensation in the act, which induces them thus to prolong it. We have seen the descent practised by every one of our Atlantic species." The two American species of the peculiar genus *Tebennephorus*, Binney, are included in his list.

Megalomastoma suspensum, mentioned by Guilding‡ (now called *M. Guildingianum*, Pfr.), derived its first name from its habit of suspending itself from the branches of trees by a thread.

My excellent correspondent Mr. J. S. Gibbons, M.B., to whom I am indebted for much information and many specimens of the

* L. and F.-W. shells of N. A., part i, pp. 8—9, Washington Smithsonian Inst., 1869.

† This is the case with all Mollusks, so far as I have observed.

‡ Guilding, quoted by Woodward, "Manual of the Mollusca," p. 209.

mollusks of South Africa and the West Indies, has given me the names of two species which he has seen suspended by a thread, "very thin but exceedingly strong and silk-like, issuing from between the operculum and outer lip." Their names are *Chondropoma plicatulum*, Pfr., found at Puerto-Cabello, "thread ⅓ to ½-inch long," and *Tudora megacheila*, P. & M., found at Curaçoa, "thread much shorter."

Chondropoma dentatum,* Say, Florida, has the same habit.

Mr. William Nelson, who is an accurate observer of the habits of the mollusca, tells me that Mr. John Dixon, of the Leeds Infirmary, has seen several individuals of *Clausilia rugosa* var. *dubia*, suspended.

Pectinibranchiata.

Bythinia tentaculata.—This snail suspends itself by a thread, after floating, which is usually attached to the surface of the water.

Rissoa parva is well-known to conchologists as a thread-spinner. Dr. J. Gwyn Jeffreys thus pleasantly speaks of it:—"Lying on a rock, by the brink of a seaweed-covered pool left by the receding tide, it is no less pleasant than curious to watch this active little creature go through its different exercises,—creeping, floating, and *spinning*."

The following species of *Rissoa striatula*, *R. cancellata*, *R. abbyssicola*, *R. membrancaea*, *R. vitrea*, *R. pulcherrima*; also *Odostomia Warreni*, *Barleeia rubra*, *Eulima intermedia Cerithium reticulatum*, *Cerithiopsis tubercularis*, and *Pleurotoma nebula*. An account of their different modes of procedure will be found in Dr. Jeffreys' work, under their several headings.

Litiopa, a genus of small mollusks living on the Gulf-weed, are said to use a mucus filament for the purpose of regaining their station, after being swept off the weed. Their method of pro-

* L. and F. W. shells of N. America, part iii, p. 96.

cedure has been described by Dr. Geo. Johntson.*—"The creature spins a thread of the viscous fluid that exudes from the foot, to check its downward fall, and enable it to gain the pristine site. But suppose the shock has severed their connection, . . the thread is still made available to recovery. In its fall, accidental or purposed, an air-bubble is emitted, which rises slowly through the water, and as the snail has enveloped it with its slime, this is drawn out as the bubble ascends; and now, having a buoy and ladder whereon to climb to the surface, it waits suspended until that bubble comes into contact with the weeds that everywhere float around."

If this be correct, we have a water-breathing mollusk using its thread as a means of *ascent* after having spun it downwards. This would be analogous to the use of the thread by the Slugs. I have not myself seen a member of this order use its thread against the laws of gravitation.

With regard to the spinning of *Neritina fluviatilis*. This species is an inhabitant of running streams, and will not live long in confinement. Its structure renders it impossible for it to spin an *upward* thread, as the nature of its habitat alike precludes it, and as it could not float in running water, it could not therefore spin a *downward* thread, as obtains with other members of its order. While making these observations, I do not discredit Mr. Warington's statement, because, although the act of floating is not a normal one with the creature, it might have performed it as mollusks sometimes do,† when placed under circumstances which allow of it, albeit in their natural condition they could not possibly do it; and if it floated, there is no reason why it should not have spun a *downward* thread.

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* Johnston, "Introduction to Conchology," p. 134, 1850.

† For an account of this habit in *Trochus occidentalis*, a deep-sea species, see Jeffrey's "Brit. Con.," vol. 3, pp. 335–6.

Having kept nearly every British species of the Limnæidæ in confinement on purpose to observe their habit of spinning, and not having seen some species use this means of locomotion at all, others seldom, and some often; some when young but less often as they grow older, and others all their lifetime, I have been led to advance a theory whereby to account for this varied use of these threads. To this end I have drawn up the following table. While writing it, I am sensible of its imperfections; but if it only serves as a nucleus to stimulate other observers of the economy of these creatures to frame a more perfect one, I shall be the more satisfied with my attempt.

Doubtless all the *Limnæidæ* are more or less experts in the use of the thread, and in the pellucid stillness of their own domain, when the eye of man is not present to pry into their daily avocations, this beautiful and delicate method of travelling is often used by them.

Planorbis lineatus.†—Inhabiting streams; could not spin a thread in its native habitat. I have not succeeded in keeping it alive long.

Planorbis nitidus,† *P. nautileus,*† *P. albus,*† *P. glaber,*† *P. vortex,*† *P. spirorbis,** *P. contortus,** *Limnæa truncatula.*†—Of these species some spend their lives on vegetation near the surface of ponds or pools, and others inhabit shallow ponds or ditches, which sometimes become dry in summer; hence the necessity for using a thread does not often occur.

*Planorbis carinatus,** *P. complanatus.**—Living in the larger ponds and pools where the water is of considerable depth, this capability of thread-spinning often serves them to good purpose.

*Physa hypnorum,** *P. fontinalis,** *Limnæa glabra*·*—Inhabiting deep ditches, ponds, or pools, and fond of indulging in sub-

* Species I have seen spin a thread.
† Species I have kept, but not seen spin.
‡ Species seen to spin by others.

aqueous excursions, the habit of spinning is essential to their mode of life.

Limnæa stagnalis,* *L. palustris*,* *L. auricularia*,† *L. peregra*,‡ *L. glutinosa*,‡ *Planorbis corneus*.†—When full grown these species, being much larger and stronger than any of the foregoing, are able to traverse more ground in a given time; hence they do not feel the necessity of using a thread so often as the smaller species.

If any of my readers wish to see for themselves this habit of travelling, as used by the mollusca, let them take a few adult *Physa hypnorum*—a species which may be found very early in the spring, and throughout the year, following

> "The melancholy feet
> Of him that is the father of decay,
> Spoiling at once the sour weed and the sweet."

place them in a glass vessel with some small pebbles at the bottom and a little weed, which should lie at the bottom, so as to allow a clear space for the threads between it and the surface of the water, and keep them until they deposit spawn. As soon as the young are free from the spawn mass they will commence spinning, and practice it so often that the process may be seen at any time.

I have only now to add that the nomenclature of the British mollusks named in this paper is that of Dr. Jeffreys (Brit. Con.) Where a foreign species is mentioned the authority is given.

Feb., 1878.

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* Species I have seen spin a thread.

† Species I have kept but not seen spin.

‡ Species seen to spin by others.

DISTRIBUTION OF *CREPIDULA ACULEATA*, GMEL.

By J. S. GIBBONS, M.B.

At page 335 of the *Q. J. C.* Mr. Garrett alludes to the occurrence of this species in several widely separated parts of the world. West Africa, Patagonia, and the East and West Coasts of South America may be added to the list there given of recorded localities. Specimens collected by me in the West Indies and at the Cape of Good Hope do not differ materially from Peruvian shells. It is difficult to account for this great diffusion. Some have suggested that it has been effected through the agency of ships and floating logs, but the depth at which the animals live does away with the possibility of the last being a means, and its abundance wherever found, renders it highly improbable that ships can have produced such results. Another theory, but, so far as I am aware unsupported at present by observed facts, is that of the late Dr. Gray. He is of opinion that the *apparently* large geographical distribution of some members of the genus, is owing to species possessing a similar variety in different localities; the general form of the shell and the structure of its surface being influenced by the depth of water and the character of the substance to which it is attached.

June, 1878.