

## ART. III. CONTRIBUTIONS TO THE NATURAL HISTORY OF THE BERMUDAS. BY J. M. JONES, F.L.S.

## PART I. MOLLUSCA.

To the naturalist, the little islands, known as the Bermudas, present many points of interest, and although they cannot boast of a single form peculiar to them, yet as illustrative of the great question of geographical distribution, a knowledge of their fauna cannot fail to prove an addition to that already treated of in volumes pertaining to Natural Science. Their marine zoology is, as far as I have been able to ascertain, West Indian, but from comparison of specimens, I find the 'Mudian forms much smaller than those of that district. The shells are particularly so, and will hardly bear comparison with the well developed types from the Caribbean Sea.

To those who may not be acquainted with the precise position of the Bermudas, I may say that they lie in  $32^{\circ} 15'$  north latitude, and  $64^{\circ} 51'$  west longitude, the nearest land being that of Cape Hatteras, in North Carolina, distant six hundred miles; while from Sambro Island to St. David's head, the north-eastern extreme of the islands, the distance is seven hundred and thirty miles. The appearance they present on the approach of the voyager, is by no means striking, for the land in no part rises more than 250 feet above the sea level, and the whole are more or less clothed to the water's edge by a verdant mass of the scented cedar (*Juniperus Bermudiana*). The group, we may almost say, owes its existence to the presence of the reef building coral zoophytes, of the genus *Meandrina*, *Astræa* and *Madrepora*, which, at this position, the most northern they are known to thrive in, where the temperature of the ocean sinks as low as  $64^{\circ}$ , form barrier reefs of great extent all around the islands, which act as a breakwater to stay the fury of the tremendous seas which in stormy weather dash on these reefs, and cover the waters around with a mass of seething foam.

As may naturally be supposed, the labours of the shell collector are confined *within* the reefs, for apart from the ocean swell outside being too great for dredging operations, the water is far too deep. The whole of the bottom between the outer reefs and the land is dotted over with patches of coral, rising from the foundation to within a few feet of the surface in places, while the inter-

vening space presents a pretty even surface of sand, broken shells and coral. By far the greater number of marine shells are found on the reefs, and it is a curious fact that the dredge rarely brings up any variety of forms when dragged along the open sandy bottom, its collection consists chiefly of broken coral mixed with white sand and chalky mud, and dozens of the small purple *echinus*. The best way to collect marine shells in the Bermudas is to search the rocky shores and rock pools at low water, especially at neap tides, when not only shells but thousands of other forms in nearly every department of marine zoology may be obtained. Many of the recent shells may be found in a semi-fossil state in the shore rock, shewing how rapid has been the formation of the sandstone in these islands; and the process of such formation may be witnessed daily, where sea shells, broken coral, sand, and gulf weed, are thrown up into a mass at high water, and left to harden by natural process. There are no fossil shells found, however, which have not their living representatives at the present day, although I must confess that some specimens of a large *Helix*, which I found in a mass of hard rock at Tucker's Town, would favour the presumption; but as they resemble in some particulars the common *Helix Bermudensis*, they may only prove exaggerated individuals of that species, and a more extended search may reveal their representative in some unfrequented part of the islands. The list I have been enabled to make out up to the present time includes some hundred and twenty species, which are as follows:—

CLASS.—CEPHALOPODA.

Fam. SPIRULIDÆ. Gen. SPIRULA.

*S. Peronii*.—This fragile little shell is very common without its cephalopod, on both north and south shores of the Bermudas. It is borne amid the vast masses of gulf weed (*Fucus natans*) which are carried from the Caribbean Sea to this latitude by the ocean current, and is cast upon the beach after heavy gales. Some specimens are nearly perfect, but the majority generally suffer damage in their transit. Specimens have been collected at Sable Island, and also on the south-west coasts of England and Ireland, having taken the course of the Gulf Stream.

## CLASS.—GASTEROPODA.

## Fam. STROMBIDÆ. Gen. STROMBUS.

*S. gigas* (“King-conch” of the fishermen).—This fine species, so well known to the cameo and porcelain makers of England, is common in the Bermudas. The fishermen generally take it with a baited hook, and after capture, allow the mollusk to decay inside, when they intend to preserve the shell. The shell is frequently used to call the labourers to meals; the spire having been broken off, the mouth is applied to the orifice in the usual way, and on blowing hard a sound like that of a horn is produced, which may be heard some distance.

## Gen. HEMI-FUSUS.

*H. morio*, Linn —Rare.

## Fam. MURICIDÆ. Gen. PISANIA.

*P. bilivatum*, Reeve.—Rare. Harris’s Bay, Smith’s Parish.

*P.* ————— ?—Rare. South shore rock pools.

## Gen. TRITON.

*T. lanceolatus*, Kiener.—Rare. Only one specimen, dead, taken on south shore.

*T. pilearis*, Lam.—Rare. Only one specimen collected.

*T. variegatus*, Lam. (“Queen-conch”).—Common about the reefs. It is difficult to obtain a clean shell, nearly all being coated with a limy concretion.

*T. chlorostoma*, Lam.—Rare. In a rock pool at Harris’s Bay. The mollusk was absent.

## Gen. FASCIOLARIA.

*F. distans*, Lam.—Rare. I only obtained a specimen in a semi-fossil state, partly imbedded in the sandstone rock.

## Fam. BUCCINIDÆ. Gen. NASSA.

*N. ambigua*, Mont.—Common under stones at low water.

## Gen. PURPURA.

*P. deltoidea*, Lam.—Common on the rocks at low water mark.  
Syn. *P. triserialis*, Smiths. Cat.

*P. undata*, Lam.—Common on the rocks at low water mark. Some specimens are much brighter than others. Cuming makes this and *bicostalis* to be one and the same species; but Reeve, Tristram, and others, separate them. I am inclined to Cuming's opinion; for I have only found this and the former species after diligent search.

Gen. DOLIUM.

*D. perdix*, Linn.—Not uncommon. Usually of small size; but one taken, by the Rev. J. B. Freer, at the Flatt's, was a remarkably fine specimen.

Gen. COLUMBELLA.

*C. mercatoria*, Linn.—Very common. There are two or three varieties of this shell; one of an orange colour, very pretty. At Gibbons' Bay and Shelly Bay, dozens may be picked in a short time, but these are all dead shells.

*C. cribraria*, Sow.—Very common on sandy beaches in sheltered bays, dead.

Gen. OLIVA.

*O. reticulata*, Lam.—Not uncommon in sandy bays.

*O. bullula*, Sow. ("Rice Shell").—Common on the sandy beaches Gibbons' and Shelly bays, Flatt's harbour, &c.

Fam. CONIDÆ. Gen. CONUS.

*C. mus*. Linn.—Dead on the beach, south shore.

Fam. VOLUTIDÆ. Gen. MARGINELLA.

*M. arena*, Val.—Common on sandy beaches, in similar situations with *oliva bullula*.

Fam. CYPRÆIDÆ. Gen. CYPRÆA.

*C. cinerea*, Linn.—Paget Sand Hills; semi-fossil in rocks. On the beach in the Somerset bays.

*C. quadripunctata*, Gray.—Dead specimens are very common in sandy bays. Children gather them in cups for sale.

*C. cervus*, Linn.—Dead specimen; on the beach at Cox's bay, Devonshire parish. The mature shell attains a much larger size, nearly three times as large as this. Mr. Bartram of Mullet Bay, who possesses a very fine specimen, informs me that they are only

found during the hottest months of summer. This species is very common at Turk's Island, Bahamas.

## Gen. OVULUM.

*O. gibbosum*, Linn.—Not uncommon; on the stems of *Gorgonas*, and on the reefs. Lieut. Slessor, of the Royal Artillery, procured a fine specimen at the North Rock. This specimen was taken on a sea fan at Cox's Bay. The mollusk itself has its mantle of a most lovely colour, variegated with markings of red, orange, green, and yellow.

## Fam. NATICIDÆ. Gen. NATICA.

*N. canrena*, Linn.—Dead on the beach. Not common.

*N. Marochiensis*, Lam.—Sandy bays. Not common.

## Fam. CERITHIADÆ. Gen. CERITHIUM.

*C. nigrescens*.—Very common in rock pools on south shore, as well as at the Flatt's at low water.

*C. ————*?.—In great abundance in rock pools on south shore, where these shells are tenanted by a minute species of soldier crab (*Pagurus*).

*C. eriense*, Val.—Very abundant in rock pools at low water, where they may be taken up in handfull. It is very similar to *C. nigrescens*, but is darker in colour.

*C. literatum*, Barn.—Not common. Among the rocks at low water.

## Gen. PYRAZUS.

*P. albivittatum*, Ad.—Very common at low water in the sand and on the stones, Flatt's harbour.

## Fam. TURRITELLIDÆ. Gen. VERMETUS.

*V. Knorrii*, Say.—Very common in sandy bays, but generally much broken.

## Gen. SCALARIA.

*S. coronata*, Lam.—Not common: sandy bays.

## Fam. LITTORINIDÆ. Gen. LITTORINA.

*S. muricata*, Ad.—Very common in crevices of rocks, above high water mark. Some specimens are coated with a dull stone-coloured epidermis, like the rocks on which they rest, while others are of a

handsome bright cream, mingled with a cast of blue. The apex of this bright-coloured variety is generally very perfect, the dull variety, not. I have never observed the shell *close to* the water. In the vicinity of Tucker's Town, on the south shore, I have taken it in abundance on the sandy cliffs, some twenty feet above high water mark.

*L. dilatata*, Ad.—Very common, and of the same habits as *L. muricata*, but not usually found together on the same rock. It is, if anything, more common than that species, and is particularly abundant in the vicinity of Harris's Bay, in Smith's parish. Some specimens are more spinose than others.

*L. zigzag*, Lam.—This shell is by no means common, although six or eight specimens may be obtained in an hour's search. It frequents the same situations as *L. muricata* and *L. dilatata*, viz., holes in the rocks; but it appears to approach nearer the water than those species. It is gregarious in habit, four or five being generally together.

*L. scabra*, Linn.—Common among the mangroves in a bay at Port Royal.

*L. mauritiana*. Very rare. Rocks on south shore.

Gen. MODULUS.

*M. lenticularis*, Chem.—Common; under stones at low water, south shore.

Gen. PHORUS.

*P. agglutinans*, Linn.—“Carrier shell.” Rare. This specimen was taken from a cavernous hole, some feet below the surface, while cutting Queen street, Hamilton. Presented by Dr. Higgs.

Gen. LITIOPA.

*L. atlantica*, Rang.—Very common; under stones at low water, Gibbons' Bay.

Gen. RISSOINA.

*R. micans*, Ad. Common; under stones at low water, Gibbons' Bay.

Gen. TRUNCATELLA.

*T. succinea*, Ad.—Common; under stones in the cedar grove at Spanish Rock, Smith's parish. Woodward, quoting Lowe, says that the *Truncatellæ* frequent stones and seaweed between tide marks.

These specimens I took under stones at Spanish Rock, some hundred feet above the sea.

Fam. NERITIDÆ. Gen. NERITA.

*N. peloronta*, Linn.—“Bleeding Tooth,” or “Bleeding Gum.” Not common; south shore rocks about high water mark. I observe that the largest specimens have not the red markings so distinct as the medium sized ones. Very small specimens are marked as brilliantly as the larger. These shells command a ready sale among strangers, and the coloured children soon realize a few shillings by the traffic. They are also prized in England as curiosities. The mollusk is gregarious in habit.

*N. versicolor*, Lam.—Common on rocky shores about high water mark. Some specimens are brighter than others. The mollusk is gregarious in habit. This and the preceding species are frequently found together.

*N. tessellata*, Gmel.—Probably more common than any other shell in the Bermudas. In rock pools at low water, and under ledges of rocks, where they keep together in masses. To every mass of these shells there are generally two or three of the latter species. Some specimens are much duller in colour than others, and have the apex much eroded. It occurs abundantly in the Bahamas.

Gen. NERITINA.

*N. viridis*, Lam.—Under stones; not uncommon.

Fam. TURBINIDÆ. Gen. TURBO.

*T. pica*, Linn. *Trochus pica*, d’Orb.—This shell, as far as I am aware, has not been found with the living mollusk, but it occurs in such vast abundance on the beaches and sand hills, as to prove beyond all doubt that it does exist in the ’Mudian waters, somewhere. It must be a handsome shell in a living state.

Gen. IMPERATOR.

*I. calcar*, Linn. *Turbo inermis*, d’Orb. *Calcar magus*, Chem. *Trochus calcar*, Gmel.—Not common. A dead specimen on south shore.

Fam. HALIOTIDÆ. Gen. IANTHINA.

*I. communis*, Lam.—Abundant, particularly after a continuance of southerly gales. In April 1861, after a heavy gale from that

quarter, the bays and inlets of the south shore were visited by thousands of these shells, some with their rafts attached, and others separated from them. In company were countless myriads of the *Valella vulgaris*.

*I. globosa*, Swains.—Nearly as common as the preceding species on the same occasion.

Fam. FISSURELLIDÆ. Gen. FISSURELLA.

*F. Barbadosis*, Lam.—Very common on the rocks.

*F. firmata*, Reeve.—Very common in the sand at Shelly Bay, &c.

Fam. PATELLIDÆ. Gen. GADINIA.

*G. mamonillaris*, Linn.—Rare.

Gen. SIPHONARIA.

*S. brunnea*, Han.—Very common, adhering to the rocks at low water. These shells appear to take the place of the *Patellæ* of northern climes. There are three varieties of this species.

Fam. CHITONIDÆ. Gen. CHITON.

*C. squamosus*, Linn.—Very common; south shore at low water, under stones and in holes of the rock where the surface is smoothed by the action of water. In January 1860, I procured the largest specimen I have seen, at Cox's Bay, Devonshire parish. It was five inches in length, by 2 inc.  $3\frac{1}{2}$  lines in width. If touched at all while on the rock, these chitons immediately "suck the rock," as the 'Mudians say, and adhere so tenaciously to it, that if forced from the position, the shell will come away, leaving a portion of the flesh behind. The larger specimens are generally covered with limy concretions, and those inhabiting exposed situations have the shells worn down and smoothed.

ORDER.—PULMONIFERA.

Fam. HELICIDÆ. Gen. HELIX.

*H. Bermudensis*, Pfr.—Quite as common as the garden snail (*H. aspersa*) is in England, and frequenting similar situations, holes in trees, old walls, &c. The finest specimens are about  $\frac{3}{4}$  of an inch in diameter, and richly banded with dark brown; others have irregular longitudinal stripes of dark brown on each whorl, while others again are of a transparent yellow tinge.



*H. circumfirmata*, Redf.—Common in sheltered places, under old walls, &c.

*H. microdonta*, Desh.—This is by far the most common land shell in the Bermudas, and covers the ground in multitudes. The living shell found under stones, old bones, and boards, has a rich brown colour, while the dead ones are bleached quite white.

*H.* ————?—Under stones; not common.

Gen. SUCCINEA.

*S. Texasiana*, Pfr.—On the roadside near Smith's parish church. Common. When the mollusk inhabits the shell, the latter appears of a mottled muddy green colour; but when the mollusk is removed, the shell assumes a light orange hue. This species occurs in several places, and is found bleached, by exposure on the ground, among the cedar groves and sage bushes.

*S.* ————?—On a rock near "Spanish Rock."

Gen. BULIMUS.

*B. ventrosus*, Ferr.—Very common; in crevices of trees and sheltered places. Sir William Jardine informed me that it occurs in Madeira, and it is also included in the "List of shells of the Canaries," by M. d'Orbigny.

Gen. PUPA.

*P. chrysalis*?—This specimen, presented to me by Lieut. Jardine, R. N., was obtained on one of the Bahama Islands, where the M. S. "Conqueror" was lost; but it is identical with those found by Mr. Marrett on the Port Royal Hills.

*P.* ————?—Not common. On an old tree in the grounds at Hermitage; under stones at "Spanish Rock."

Fam. AURICULIDÆ. Gen. MELAMPUS.

*M. Redfieldii*, Pfr.—Common under stones on side of mangrove swamps, Hungary Bay.

*M. flavus*, Gmel.—In same position as the preceding species, and equally as common.

Fam. CYCLOSTOMIDÆ. Gen. HELICINA.

*H. subdepressa*, Poey.—Very common; on roadside near Smith's parish church, at David's Island. This species seemed partial to

the stems of the young cedar trees that were springing up above the road, as I picked several in that position. It is amphibious, for I observed it upon the grassy weeds under water at “Peniston’s Pond.”

ORDER.—OPISTHO-BRANCHIATA.

Fam. BULLIDÆ. Gen. BULLA.

*B. physis*, Linn.—Rare.

*B. nitidula*, Lister.—Common; among sea weed at low water.

*B. punctulata*, Ad.—Dead shells very common in muddy bays.

Fam. APLYSIADÆ. Gen. APLYSIA.

*A.* ——— ? (“Sea Cat.”)—Very common; crawling upon the reefs of the south shore at low water. Its habits are those of a slug, crawling slowly along, precisely like that terrestrial mollusk. It appears to feed principally upon a species of red *algæ*, as I find its excrement is almost entirely composed of this marine plant. When roughly handled it emits a violet coloured fluid, which tints a large quantity of water, if the creature is thrown into it.

SECTION.—NUDI-BRANCHIATA.

Fam. DORIDÆ. Gen. DORIS.

*D.* ——— ?—Not common; on coral; sides of rock pools, &c., south shore.

CLASS.—CONCHIFERA.

Fam. OSTREIDÆ. Gen. PLACUNOMIA.

*P.* ——— ? Attached to a shell of *Meleagrina placunoides*.

Gen. PECTEN.

*P. zigzag*, Linn. (“Scallop.”)—Very common. This is the common edible scallop of the Bermudians; David’s Island, Crawl, Harrington Sound, and other places. It is difficult to procure perfect specimens of this shell from the fishermen: for their taking them with the “nippers”—an instrument constructed on purpose—generally breaks off some portion of the outer rim of each valve. They vary much in colour, some having the flat valve prettily marked with yellow, brown, and white, in zigzag form, while others have it of a rich dark brown, with a few yellow spots. The con-

cave valve, again, is sometimes wholly brown, even over the umbo, but is generally white at that point.

*P. Gruneri*, Reeve.—A young individual; among the sand at Baylis's Bay.

Gen. LIMA.

*L. fragilis*, Sow.—Rare; under stones at low water.

Gen. SPONDYLUS.

*S. ustulans*, Reeve.—Not uncommon. Reefs in Harrington Sound, &c.

*S. ericinus*, Reeve.—Not uncommon; in the same positions.

Fam. AVICULIDÆ. Gen. AVICULA.

*A.* ———?—Rare. Attached to a frond of the "sea rod" (*Gorgonia*) brought up from the bottom; Harris's Bay.

Gen. MELEAGRINA.

*M. placunoides*, Reeve. ("Oyster.")—Very common in muddy bays; Flatt's Harbour, &c. Attaches itself in bunches to old roots and sticks. It is eaten by the 'Mudians as an oyster, but the taste is rather sickening. The interior shell is always very pearly.

Gen. PERNA.

*P. ephippium*, Linn.—Very common. Attaches itself by the byssus to roots of trees growing in the water, crevices of the rocks, &c. The shell is very heavy for its size. I have not observed this species on the south shores of the islands.

Gen. PINNA.

*P. rudis*, Linn.—Common; in mud, Somerset bays; Long Bird Island.

Fam. MYTILIDÆ.

*M. Domingensis*, Lam. ("Black Shell.")—Very common, particularly on the south side of the islands, where it fills the cavities of the rocks in clusters at low water. Some specimens have the umbo widely separated and curved upwards. It is frequently used as bait for fishing, when better cannot be procured. The fishermen mash a quantity together and tie on the hook.

Gen. MODIOLA.

*M. tulipa*, Lam.—Very common; in the sand of the beaches; Flatt's harbour; Spanish Point.

Fam. ARCADÆ. Gen. ARCA.

*A. Noæ*, Linn.—Very common; crevices of rocks, and under stones at low water; Flatt's harbour, and north and south shores generally. Always coated with a limy concretion.

*A. Americana*, Gray.—Very common; sandy beaches; Flatt's harbour.

*A. gradata*, Brod.—Common; under stones.

Fam. CHAMIDÆ. Gen. CHAMA.

*C. macrophylla*, Linn.—Common; under ledges of the rocky shore, west side of entrance to Flatt's harbour.

*C. lingua-felis*, Reeve.—Very common; usually found in masses of several individuals; Flatt's harbour, &c.

Fam. CARDIADÆ. Gen. CARDIUM.

*C. serratum*, Linn.—Very common; in sandy beaches, where it is found some inches below the surface. Its habit is similar to that of the common edible cockle (*Cardium edule*) of England. Some specimens are much larger than others.

*C. cygnorum*, Desh.—Rare; one valve only.

Fam. LUCINIDÆ. Gen. LUCINA.

*L. tigrina*, d'Orb.—Very common; sandy beaches. Fine specimens are obtained at Spanish Point. I have observed this species in a semi-fossil state, in the shore rocks at Point Shares.

*L. domingensis*.—Fossil. Only one specimen; shore rock at Point Shares.

Gen. LORIPES.

*L. chrysostoma*, Menscke.—Rare. One valve only, on the beach at Scour Inlet, Somerset.

Fam. VENERIDÆ. Gen. VENUS.

*V. cancellata*, Linn.—Rare. One valve only. Occurs also in a semi-fossil state, in the Somerset shore rock.

*V. crenifera*. Sow.—Rare. One valve only.

Fam. TELLINIDÆ. Gen. TELLINA.

*T. lævigata*, Linn.—Very common; sandy beaches, a few inches below the surface at low water. Dead valves abundant in sandy bays.

*T. magna*, Speng.—Common ; sandy beaches, a few inches below the surface at low water. Dead valves found with those of the former species, in sandy bays.

*T. radiata*, Linn.—Common ; in similar positions.

*T. interrupta*, Wood.—Not uncommon ; in similar positions.

Gen. CAPSA.

*C. spectabilis*, Hanley.—Very common ; Flatt's harbour ; at low water.

Gen. SEMELE.

*S.* ————— ?—Very common ; Flatt's harbour.

*S.* ————— ?—Rare. One valve only ; found on sandy beaches.

Fam SOLENIDÆ. Gen. SOLECURTUS.

*S.* ————— ?—Common ; Somerset bays.

Fam. PHOLADIDÆ. Gen. PHOLAS.

*P. striata*, Linn.—In pieces of drift timber.

Gen. TEREDO.

*T.* ————— ?—On the reefs and rocks under water ; Harrington Sound ; tubes standing upright above the rocks.

NOTE.—Supply omission at commencement. (*Read December 7, 1863.*)

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ART. IV. ON THE WATERS OF THE MINERAL SPRINGS OF WILMOT, N. S. By Prof. How, D. C. L., *University of King's College, Windsor, N. S.*

[*Read January 4, 1864.*]

IN a paper "On some Mineral Waters of Nova Scotia," read before the Natural History Society of Montreal, last summer, and published in its journal, "*The Canadian Naturalist*," for October last, I put together nearly all the information in my possession respecting the Mineral Springs of this Province ; and though I had the tolerably complete analysis of two only of the waters (published in newspapers here and in Cape Breton at the time they were made) to present, I was enabled by means of these and by general descriptions in other cases, to show that the waters of Nova