

the quills are more marked with black. The first four quills are edged outwardly and tipped with black, their inner webs being for the most part of that colour; the fifth to seventh less so by degrees, with the white tip, not visible on the first and second, gradually increasing in size. Bill black. Feet dark brownish red.

This species is very common during winter at Amoy, ascending the river in large parties at fall of tide, and pouncing on small fish and crustaceans left exposed by the receding water.

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April 4, 1871.

Robert Hudson, Esq., F.R.S., V.P., in the Chair.

The following papers were read :—

1. On some new and little-known Species of Madreporæ, or Stony Corals, in the British Museum Collection. By W. SAVILLE KENT, F.Z.S., F.R.M.S., of the Geological Department, British Museum.

[Received March 18, 1871.]

(Plates XXIII.—XXV.)

Last year while engaged in arranging, naming, and preparing a Catalogue of the Stony Corals contained in the National Collection, numerous new and little-known forms fell beneath my notice, some of which, with Dr. Gray's kind permission, I shall now proceed to describe.

#### Section APOROSA.

#### Family TURBINOLIDÆ.

ACANTHOCYATHUS SPINIGER, n. sp. (Plate XXIII. figs. 1, 1 a, b, c.)

Corallum turbinate, straight, slightly compressed; attached when young. Calice oval, the lateral extremities somewhat angular, its fossa deep. Primary and secondary costæ very prominent, the former conspicuous from the base, and each bearing spinous prolongations, those situated on the two lateral costæ the most developed. Septa 48 in number, forming four complete cycles, much exsert, more especially the primaries; their lateral surfaces granulate, their internal edge slightly flexuous. Columella elongate, formed of two or three twisted lamellæ. Pali slender, twelve in number, situated opposite the septa of the third septal cycle. External surface of the theca finely granulate.

*Hab.* Japan.

B.M.

This species differs from *Acanthocyathus grayi* (M.-Edw.), the only recorded existing form, in the straight instead of curved contour of its corallum, in its prominent costæ bearing spinous processes on others besides the two lateral primary ones, and in its more particularly exsert primary septa.

Its costal peculiarities seem to demonstrate its being more closely allied to *A. hastingsæ* (M.-Edw.), a species occurring as a fossil in the Miocene deposits of Malta.

Figs. 1 *b* and 1 *c* of Plate XXIII. illustrate various stages of development of *A. spiniger*; the extra spines present in fig. 1 appear to be characteristic of the adult condition. Though all the specimens examined are free, each exhibits traces of an early attachment.

**FLABELLUM MATRICIDUM, n. sp.** (Plate XXIII. figs. 2, 2 *a*, *b*, *c*.)

Corallum elongate, almost cylindrical, attached by its base. Calicular fossa circular, very deep. Theca exceedingly slender, invested by a complete epitheca. Septal cycles four in number, the last cycle incomplete. Primary and secondary septa scarcely exsert; lateral surfaces of septa granulate, their inner edge delicately flexuous above, thickened inferiorly, and becoming lost in the trabecular elements of the rudimentary columella. Costæ even, distinct throughout.

*Hab.* Japan.

B.M.

The mode of increase in this species is exceedingly remarkable, resulting from internal gemmation at the expense of the parent calyx in the following manner:—The adult condition being arrived at, a bud makes its appearance immediately within the margin of the calyx, and, rapidly increasing in size, becomes confined by the opposite wall of the parent; this, owing to its tenuity and the pressure exerted upon it, fractures and falls to pieces, the young bud still remaining attached to the portion from which it originated.

Family OCULINIDÆ.

**AMPHIHELIA INFUNDIBULIFERA, nobis.** (Plate XXIV. figs. 4, 4 *a*, *b*.)

*O. ramosissima, subflabellata*; ramulis ultimis minimis flexuosis; stellis infundibuliformibus, interne striatis; margine crenulato.

*Oculina infundibulifera*, Lamarck, Hist. des Anim. sans Vertèb. p. 286, 1816.

*Allopora (Stylaster) infundibulifera*, M.-Edw. Hist. des Corall. t. ii. p. 131, 1857.

Specimens in the British Museum, collected at Formosa by Consul Swinhoe, are evidently identical with the species described as above by Lamarck; but the entire absence of a columella and the unequal development of the septal cycles preclude its being referred to the group of the Stylasteraceæ, as proposed by Milne-Edwards. These characters, when added to the alternate distal mode of increase of the calices, and the remarkable development of the basal

cœnenchyma, indicate its true position among the representatives of the genus *Amphihelia* of the same author, to which genus I here refer it while proposing the following more exhaustive specific diagnosis:—

Corallum arborescent, irregularly branching, subflabellate. Cœnenchyma faintly striate, frequently coalescing, somewhat fistulose; greatly developed in the trunk and main branches, but almost entirely wanting in the ultimate ramifications. Calices infundibuliform, increasing by alternate distal gemmation, two gemmæ, however, occasionally springing, as in *Cyathohelia*, opposite each other from the margin of the same calice. Septa 24 in number, forming three complete cycles; the primaries more exsert than the secondaries, and the latter slightly more so than the tertiaries, projecting but little into the calicular fossa, to which they consequently give the "internal striate" appearance observed by Lamarck. Costæ only visible superiorly. Height of corallum several inches. Diameter of calices  $\frac{1}{12}$  inch.

*Hab.* Formosa, Indian seas.

B.M.

*STENOHELIA MADERENSIS*, nobis. (Plate XXIV. figs. 3, 3 a, b, c.)

*Allopora maderensis*, J. Y. Johnston, Proc. Zool. Soc. 1862, p. 196, figs. 1, 2, 3.

*Stenohelia maderensis*, W. S. Kent, Ann. & Mag. Nat. Hist. v. p. 120, 1870.

I avail myself of the opportunity of giving here an illustration of this interesting species, first introduced by Mr. Johnston, but whose characters and structure are by no means satisfactorily explained or displayed in the description and figures accompanying his communication.

Since the publication of my paper above quoted, in which I make this form the type of a new genus, I have, through the kind courtesy of Prof. Du Bocage, examined additional specimens belonging to this same species contained in the Lisbon-Museum collection, obtained from the Cape-Verde Islands, and having the ampullæ, present in the British-Museum example, still more highly developed. A fragment in illustration of this is represented at Plate XXIV. fig. 3 a.

*STYLASTER AMPHIHELOIDES*, n. sp. (Plate XXIV. figs. 1, 1 a, b, c.)

Corallum branching, subflabellate; basal cœnenchyma often fistulose and coalescing, its surface smooth. Calices increasing by alternate distal gemmation; calicular fossa deep. Columella styli-form, echinate, deeply immersed. Septa even, twelve to sixteen in number, projecting but little into the calicular fossa, often coalescing laterally, and so forming an inner tube, and giving the interseptal chambers a punctate appearance, as in *S. erubescens* (Pourtales) and various species of *Allopora*. Ampullæ rudimentary, represented by a few raised points scattered irregularly over the surface of the cœnenchyma, but more particularly in the neighbourhood of the ultimate ramifications.

Height of corallum one or two inches; diameter of the calices  $\frac{1}{16}$  inch.

*Hab.* Cape of Good Hope.

B.M.

I had premised that this species might possibly prove to be identical with *Allopora bella* (Dana); but Count de Pourtales, who is familiar with the type examples of that form, assured me, during his recent visit to England, of its distinctness. In the character of its basal cœnenchyma it closely resembles the genus *Amphihelia*.

Verrill has proposed to make this *Allopora bella* the type of a new genus, bestowing upon it the name of *Cyclopora* ("Synopsis of Corals &c. of North Pacific Exploring Expedition," Proc. Essex Institute, July 1866). He considers it to be intermediate between the genera *Stylaster* and *Distichopora* in the structure of its septal system, which assumes that "pit-like" character dominant in *Distichopora*, and common to both *Stylaster* and *Allopora*. The remaining characters agreeing entirely with those of *Stylaster*, it cannot be naturally separated from that genus.

*STYLASTER ASPER*, n. sp. (Plate XXIV. figs. 2, 2 a.)

Corallum arborescent, flabellate; surface of the cœnenchyma finely echinate throughout, the minor ramuscles often springing from the preceding ones in a regular pinnate order. Calices very minute, increasing by alternate distal gemmation. Columella immersed, stylate, echinate. Septa about twelve in number. Ampullæ conspicuous, hemispherical, sometimes echinate, solitary or in clusters, scattered principally over the cœnenchyma of the secondary branches.

Height of corallum several inches; diameter of the calices  $\frac{1}{23}$  inch, of the ampullæ  $\frac{1}{20}$  inch. Colour pale pink.

*Hab.* Unrecorded. ?Indo-Pacific

B.M.

This species most nearly approaches *Stylaster sanguineus*, but is distinguished from it by its echinate cœnenchyma, and by the minute size of its calices. In this last character it most closely approaches *S. gracilis*.

*STYLASTER EXIMIUS*, nobis.

*S. elegans*, Michelotti, Suppl. au Mém. sur les Corall. des Antilles, Mem. della Reale Acad. d. Scienze di Torino, tom. xxiii. p. 162, pl. ix. fig. 4, 1866.

*Elegans* having been already employed as a specific name for a representative of the same genus by A. E. Verrill, in 1863 (Bulletin Mus. Comp. Zool.), *eximius* is here proposed in substitution to distinguish the form more recently described by Michelotti.

*ALLOPORA*, Ehr.

This genus is characterized by Milne-Edwards, in his 'Histoire des Coralliaires,' as differing from *Stylaster* in its irregular mode of gemmation, and in the complete absence of "ampullæ," or vesicular inflations of the cœnenchyma; at the same time he expresses doubts

whether the characters given may prove sufficient for the recognition of two distinct genera on other species becoming known. *A. oculata* (Ehr.) was the single form referred to the genus *Allopora* by Milne-Edwards in his work just quoted. Recently Count de Pourtales has discovered a second species, off the coast of Florida, which he describes in the Bulletin of the Museum of Comparative Zoology, Cambridge, U. S. for 1868, under the name of *Allopora miniata*; and my examination of the collection in the British Museum has resulted in my detecting three other distinct and undescribed species, undoubtedly referable to this same genus.

The mass of evidence now accumulated demonstrates that *Allopora* and *Stylaster* constitute two natural and easily defined genera. The character of the presence or absence of ampullæ, however, as shown in the following description of *A. explanata*, is not trustworthy even for the purpose of making specific distinctions. The whole and great difference must be based on their widely separated mode of development or gemmation, which is easily recognized on reference to figs. 1a and 2a of Pl. XXV., and fig. 1a of Pl. XXIV. accompanying this communication.

In *Allopora* the corallum is aborescent, more or less massive, and has the calices distributed irregularly throughout its surface, this last character being likewise applicable to the mode of their first appearance at the extremities of the branchlets. In *Stylaster* the corallum is wanting in that massive and robust mode of growth characteristic of *Allopora*, and the gemmation is invariably alternate distal, as in *Amphihelia*, *Lophohelia*, and other Oculinidæ, and which, though sometimes disguised by the increase of the cœnenchyma in the basal portions of the corallum, is always apparent at the growing termination. Even in the former parts the peculiar primary mode of gemmation is betrayed by the more or less regular disposition of the calices in a linear series on either side, rendered sessile by the outgrowth of the cœnenchyma. This distinction makes easy our appreciation of the, at first sight, somewhat obscure characters of the form referred to the genus *Allopora* by Dr. Duncan, to be presently referred to. In *Allopora* this latero-linear distribution of the calices is altogether absent.

#### ALLOPORA NOBILIS, n. sp.

Corallum arborescent, the main stem and branches very massive, slightly flattened; the branchlets subflabellate, thick, terminating obtusely. Surface of the cœnenchyma smooth to the unassisted eye, but presenting a delicate shagreened appearance when examined with the pocket-lens. Calices densely distributed throughout the surface of the corallum, slightly prominent; very minute, scarcely exceeding one-third of a line in diameter. Septa varying in number from three to seven, more usually six; their inner edges joining laterally a little below the entrance to the calice, and forming minute pit-like interseptal chambers, within each of which, as in *Stylaster erubescens* (Pourtales), is enclosed a vertical fringe of small points resembling hairs. Columella deeply immersed, cylindrical, its apex

pointed. Colour of the trunk and main branches dull rose, lessening still more in intensity towards the branchlets, the ultimate ramifications of which are nearly white. No ampullæ detected on the single specimen observed.

*Hab.* Unrecorded.

B.M.

The unique specimen above described measures nearly a foot in height and nine inches in breadth, while the diameter of the most massive portion of the stem exceeds two inches, dimensions greatly surpassing those of any hitherto recorded representative of the Stylasteraceæ. Both this and the species next introduced appear to be closely allied to *Allopora miniata* (Pourtales); but in this last form the calices are larger, are distributed on one surface only of the branches, and become entirely obsolete on the main stem.

*ALLOPORA EXPLANATA*, n. sp. (Plate XXV. figs. 2, 2 a, b, c.)

Corallum branching, flabellate; the main stem and branches massive, slightly flattened; the branchlets attenuate. Surface of the cœnenchyma shagreened as in the preceding species. Calices prominent, distributed with moderate density throughout the corallum; half a line in diameter. Septal system very irregular, the septa being sometimes entirely wanting, or varying in number from one or two to as many as six or seven; when present frequently meeting within the margin of the calice, and enclosing a vertical fringe of points, as in *Allopora nobilis*. Columella deeply immersed, cylindrical, echinate, its apex pointed. Height and breadth of corallum five or six inches; diameter of the main trunk three-quarters of an inch. Colour of the surface of the sclerenchyma closely resembling that of the species last described, but of a still brighter hue; the distal extremities of the branchlets alone are yellowish white. Ampullæ present or absent.

*Hab.* Unrecorded. <sup>New Zealand.</sup>

B.M.

As a species this form differs from *A. nobilis* in the flabellate mode of growth of its corallum, in the more rudimentary development of the septal system, and in the more widely scattered calices.

Of the two examples in the British-Museum collection, the one has large, smooth, vesicular ampullæ, nearly a line in diameter, distributed amongst the calices of the branchlets and younger branches, while in the other a few slight and very minute prominences are the only visible traces of these excrescent structures, illustrating what little dependence is to be attached to them even for the purpose of specific comparison.

*ALLOPORA SUBVIOLACEA*, n. sp. (Plate XXV. figs. I, I a.)

Corallum branching, flabellate; the main stem and branches massive, compressed. Surface of the cœnenchyma less delicately shagreened than in *A. nobilis* and *explanata*. Calices slightly prominent, scattered throughout the surface of the corallum. Septa varying in number from three or four to as many as eleven (two cycles almost complete); never coalescing laterally, and forming

pit-like interseptal chambers, as in the preceding species. Columella deeply immersed, cylindrical, echinate, its apex pointed. Surface of the main stem and the origins of the branches delicate rose-madder, the ultimate ramifications almost white. Length and breadth of entire corallum of the single specimen examined three and a half inches; diameter of the main stem half an inch, of the calices half a line. Ampullæ rudimentary, in the form of minute vesiculæ, distributed among the calices throughout the branches, though in greatest profusion towards their distal extremities.

*Hab.* Unrecorded. Sir E. Belcher's Collection.

B.M.

The form referred to this genus as *A. oculata* by Dr. P. M. Duncan, in his description of the 'Porcupine' Expedition (Madreporaria, Proc. Roy. Soc. p. 295, 1870), is a true *Stylaster*, closely allied to *S. gemmascens* (M.-Edw.), *Madrepora gemmascens*, Esper (Pflanzenhiere, t. i. pl. 55, 1797), inhabiting the Indian seas. The gemmation in this species, though at first sight apparently irregular, is, on close examination, found to exhibit the alternate distal terminal gemmation and more or less attendant latero-linear arrangement of the calices on the main branches characteristic of *Stylaster*. Some time back Dr. Duncan kindly favoured me with a small specimen of this interesting coral, and since then he has permitted me to examine the whole series collected; but it being the property of the above expedition, I leave it to him to furnish the name and specific diagnosis.

Comparison with the figures of *A. oculata* in the 'Annales des Sciences Naturelles,' tom. xiii. pl. 4. fig. 4, 1850, shows that this species possesses altogether different characters.

#### DISTICHOPORA ROSEA, n. sp.

Corallum arborescent, branches nearly cylindrical. Calices occupying deep and occasionally irregularly interrupted lateral furrows; margins of the furrows very prominent. Columella attenuate, stylate, echinate, very deeply immersed, made visible by fracture of the corallum. Height of corallum one or two inches; diameter of the calicinal furrows  $\frac{1}{20}$  inch, of the branches  $\frac{1}{4}$  inch. Colour of the cœnenchyma bright rose-pink.

*Hab.* East coast of Australia.

B.M.

As already shown by Count de Pourtales, the structure of the calices in *Distichopora* is identical with what obtains in *Stylaster* and *Allopora*, with the exception that the calices are confluent. In this respect *Distichopora* bears much the same relation to the two genera just mentioned as *Lithophyllia* and *Dasyphyllia* do to *Mussa* and *Symphyllia* among the Astreidæ. In *Distichopora* isolated calices are occasionally met with; and it is then that their similarity to those of other Stylasteraceæ become most apparent. I must differ with Count de Pourtales in considering this genus to be more closely allied, individually, to *Stylaster* than to *Allopora*, the latero-linear disposition of the calices indicating their development from primary alternate distal rather than from an irregularly scattered gemmation.

## ERRINA, Gray.

*Millepora* (pars), Esper, Pflanzenthier, t. i. p. 106, 1797.

*Errina*, J. E. Gray, Proc. Zool. Soc. p. 85, 1835.

Non *Errina*, Pourtales, Bulletin Mus. Comp. Zool. Cambridge, U. S. p. 116, 1867.

The essential characters of this genus, with its natural affinities not having been very satisfactorily determined, the following, drawn up from the type specimens of *E. aspera* in the British Museum, is here proposed for its diagnosis.

Corallum branching, flabellate. Sclerenchyma compact. Surface of the cœnenchyma beset with nariform verrucæ, these most abundant towards the distal extremities of the branches. Calices pit-like, circular, for the most part scattered among and concealed by the prominent verrucæ. Septal system entirely absent or rudimentary. Columella immersed, stylate, and echinate, almost entirely filling the calicular fossa.

## ERRINA ASPERA.

*Millepora aspera*, Esper, *l. c.* *Millepora*, pl. xviii. figs. 1-4.

*Errina aspera*, Gray, *l. c.* p. 85.

The characters above given are also diagnostic of the species. To this it may be added that the corallum attains a height and breadth of several inches, is opaque white or cream-coloured, and is met with in both the Mediterranean and northern European seas.

The ultimate ramifications are terete; the diameter of the calicular fossæ about  $\frac{1}{50}$  inch.

The two forms referred to this genus by Pourtales as *E. cochleata* and *glabra* evidently belong to a distinct genus, as must also be said of the examples referred to it and described as *E. aspera* (Gray) by the same writer, contained in the Museum of Comparative Zoology, Cambridge, U. S. Count de Pourtales at once recognized this on my showing him the typical specimens; and a modified description of his new species will shortly appear.

*Errina* proper, on account of its compact sclerenchyma and the form of its columella, is clearly referable to the group of the Stylasteraceæ, while in its irregular gemmation it most nearly approaches the genus *Allopora*. Connected with this mode of increase, however, there is a feature not observable in the last-named genus: instead of being simply terminal, gemmation also frequently occurs on the older portions of the corallum, young calices making their appearance on the surface of the out-growing cœnenchyma.

The rudimentary condition, or it may be said the entire absence of any recognizable septal system or intermesenteric calcifications, is the full development of a feature observed as exceptional in describing *Allopora explanata*. The very minute size of the calices at once suggests that septal elements would be of but little service in the economy of the individual polypes.

The prominent nariform and almost tubular verrucæ have, as is not to be wondered at, been mistaken by early writers for the orifices



of the polype-cells, and in miniature they bear a certain resemblance to the nariform calices of various species of *Madrepora*; their true relationship, however, is probably identical with the many-patterned intercalicinal developments peculiar to the genera *Montipora* and *Stylocenia*.

Subfamily STYLOPHORINÆ.

PENTALOPHORA, n. gen.

*Reussia*, Michelotti, Mém. sur les Corall. des Antilles, p. 63, 1860.

This new generic name is proposed in substitution for that of *Reussia*, in consequence of the latter having been used by Presl in 1838 to distinguish a genus of fossil ferns.

McCoy, 1850  
Crust  
17

The single species referable to this genus, *Reussia lamellosa* (Mich.), is remarkable for its septal system being composed of a multiple of five, each calice being furnished with ten evenly developed septa, which are united internally to the stylate columella. The constant quintuple arrangement of the septal elements isolates this form from all known Madreporaria; in other respects it is closely allied to the genus *Stylopora*.

Family ASTREIDÆ.

TRIDACOPHYLLIA ALCICORNIS, n. sp. (Plate XXIII. fig. 4.)

Corallum slender, elevated; margins of thecæ produced into elk-horn-like prolongations. Columella absent. Septa forming three or four cycles, their internal edge dentate or laciniate, their lateral surfaces granulate. Costæ prominent, echinate. Epitheca rudimentary; endothecal dissepiments little developed.

*Hab.* San Cristoval, Solomon Islands. B.M.

This species differs from those previously described in the branching instead of foliaceous character of the walls of the thecæ.

TRIDACOPHYLLIA ECHINATA, n. sp. (Plate XXIII. fig. 3.)

Corallum infundibuliform, foliaceous; margins of thecæ bidentate, little elevated. Columella moderately developed, trabecular. Septa forming four or five cycles; the primaries and secondaries prominent and equally developed, having their internal edge remarkably thickened, coarsely tuberculate and echinate; the remaining septa little developed, denticulate or slightly echinate. Costæ not prominent, almost even, finely granulate. Epitheca moderately developed. Endothecal dissepiments of large size at the base of the corallum.

*Hab.* San Cristoval, Solomon Islands. B.M.

This species is at once recognized by the anomalous character of the primary and secondary septa.

OXYPORA\*, gen. nov.

This name is proposed in place of *Trachypora* of A. E. Verrill

\* ὀξύς, sharp, cutting.

(Bulletin Mus. Comp. Zoology, Cambridge, U. S. p. 53, 1863), which has been already adopted by Milne-Edwards for a genus of the Cyathophylliidae. He separates it from *Echinopora* on account of the echinate and coarsely costate character of the lower surface of the corallum. *T. lacera* and *aspera*, Verrill, are the species referable to this genus.

#### Family FUNGIDÆ.

##### LEPTOSERIS STRIATUS, n. sp.

Corallum suborbicular, explanate and undulate, slightly revolute. Calices remotely scattered; the excentral ones slightly elevated. Columella rudimentary. Septa evenly developed, not prominent, rather thickened; their external edge subentire, their lateral surfaces granulate, for the most part continuous from the centre of the calice to the margin of the corallum, to the whole surface of which they give a waved and striate aspect. Inferior surface evenly and finely costulate. Diameter of the corallum 2 inches, of the central calice  $\frac{1}{8}$  inch.

*Hab.* Borneo. Collected by Sir E. Belcher.

B.M.

This form differs from the species hitherto described in the explanate and slightly convex instead of infundibulate contour of its corallum, as also in its evenly developed septa and in its exceedingly sparsely scattered calicinal centres.

#### Section PERFORATA.

##### Family MADREPORIDÆ.

BALANOPHYLLIA IMPERIALIS, n. sp. (Plate XXIII. figs. 5, 5 a, b.)

Corallum curved, slightly compressed, attached by a slender base. Calicinal fossa elliptical, very deep. Columella well developed, trabecular. Septa forming five complete cycles, much exsert, more particularly those of the first three orders, which are of almost equal size, and have their inner edge entire and their lateral surfaces granulate; those forming the first and second orders entirely equal, and having their internal edge thickened in the vicinity of the columella, as in *Endopachys*. The internal edge of the septa of the fourth and fifth cycles lacinulate, more especially those of the fifth.

Septa of the sixth and eighth, and seventh and ninth orders coalescing with those of the fourth and fifth, and continuous to the columella in the form of a single septum. Costæ stout, conspicuous from the base to the margin of the calice, their surface echinate; united laterally by coarse trabeculæ. No epitheca. Height of corallum nearly 2 inches; longer diameter  $1\frac{1}{3}$  inch, of the shorter one  $\frac{3}{4}$  inch.

*Hab.* Singapore.

B.M.

This species surpasses in size and in the beauty and symmetry of its internal structure any representative of the genus yet recorded\*.

\* Through an accident one of the septal systems in the specimen figured has become slightly distorted.

*BALANOPHYLLIA MALACCENSIS*, n. sp.

This form closely resembles *B. floridana* (Pourtales), but may be distinguished by its well-developed and spongy instead of papillose columella, and by the freedom from granulation of the lateral surfaces of the septa.

*Hab.* Malacca.

B.M.

*TURBINARIA PARVISTELLA*, n. sp.

Corallum massive, convex. Cœnenchyma abundant, very porous. Calices small, superficial, their apertures even with the surface of the cœnenchyma, not exceeding a line in diameter. Columella well developed, spongy. Septa of equal size, varying from twelve to eighteen in number.

Described from a specimen in the Oxford Museum, and of which a small fragment has been placed in the National Collection.

*Hab.* Unrecorded.

The non-prominent calices isolate this species from those hitherto described, and would seem to separate it from the genus *Turbinaria* of Milne-Edwards, which he characterizes as possessing prominent calices. In *T. cinerascens*, however, it frequently occurs that while the greater portion of the calices project considerably, the remainder are on a level with the surface of the cœnenchyma; and hence the character quoted, though dominant, cannot be considered essentially diagnostic of the genus.

*Turbinaria parvistella* in the massive form and yet extremely porous texture of its corallum, and in the entirely sessile character of its calices, shows its affinity to the genus *Astreopora*, from which it differs only in the possession of a well-developed columella.

## EXPLANATION OF THE PLATES.

## PLATE XXIII.

- Fig. 1. *Acanthocyathus spiniger*, enlarged 2 diameters, showing the spinous prolongations of the primary costæ.
- 1 a. The same from above, illustrating the interior of the calice.
  - 1 b, c. Early conditions of the same form.
  - 2 & 2 a. *Flabellum matricidum*. Two young specimens, nat. size, showing their mode of gemmation from the parent calice.
  - 2 b. Longitudinal section of an adult example of the same coral, enlarged 2 diameters, exhibiting the septal arrangement and the rudimentary condition of the columella, a portion of the parent calice still remaining attached.
  - 2 c. A calice of the same species viewed superiorly.
  3. *Tridacophyllia echinata*. Corallum, nat. size, viewed from above.
  4. *Tridacophyllia alcornis*, nat. size, viewed laterally.
  5. *Balanophyllia imperialis*, nat. size, lateral aspect.
  - 5 a. Calice of the same, from above, enlarged  $1\frac{1}{2}$  diameter.
  - 5 b. Diagrammatic illustration of a single system of the same coral, showing the relationship and arrangement of the septal elements.

## PLATE XXIV.

- Fig. 1. *Stylaster amphihecloides*, nat. size.
- 1 a. A small ramuscule of the same, magnified 3 diameters, and illustrating the alternate distal mode of gemmation.

- Fig. 1 *b*. A single calice, fractured longitudinally, and exposing the deeply immersed and echinate columella,  $\times 16$  diameters.
- 1 *c*. A calice viewed from above, displaying the "pit-like" interseptal chambers produced by the lateral coalescence of the septa.
2. *Stylaster asper*, nat. size.
- 2 *a*. Portion of a branchlet, enlarged 4 diameters, and exhibiting the thickly scattered ampullæ.
3. *Stenohelia maderensis*, nat. size. Specimen from Madeira.
- 3 *a*. A small branch of an example from the Cape-Verde Islands, exhibiting thickly scattered "ampullæ."  $\times 2\frac{1}{2}$  diameters.
- 3 *b*. Two terminal calices from the Madeiran example, viewed laterally, and showing an ampulla on the lower surface of the proximal one.  $\times 5$  diameters.
- 3 *c*. A calice viewed from above, showing the tendency of the lower edge to encroach upon and conceal the calicular fossa, a character which indicates its affinity with the genus *Cryptohelia*.
4. *Amphihelia infundibulifera*, nat. size.
- 4 *a*. Three calices, viewed laterally,  $\times 6$  diameters.
- 4 *b*. A calice viewed from above, illustrating the relative proportions of the septal elements. This figure is diagrammatic.

## PLATE XXV.

- Fig. 1. *Allopora subviolacea*, nat. size.
- 1 *a*. Portion of a branch with calices,  $\times 5$  diameters.
2. *Allopora explanata*, nat. size.
- 2 *a*. Portion of a branch bearing calices and ampullæ,  $\times 5$  diameters.
- 2 *b*. A single calice,  $\times 25$  diameters, exhibiting the pit-like interseptal chambers enclosing minute echinate secondary septa.
- 2 *c*. Portion of a calice in perpendicular section, displaying the stylate and echinate columella.

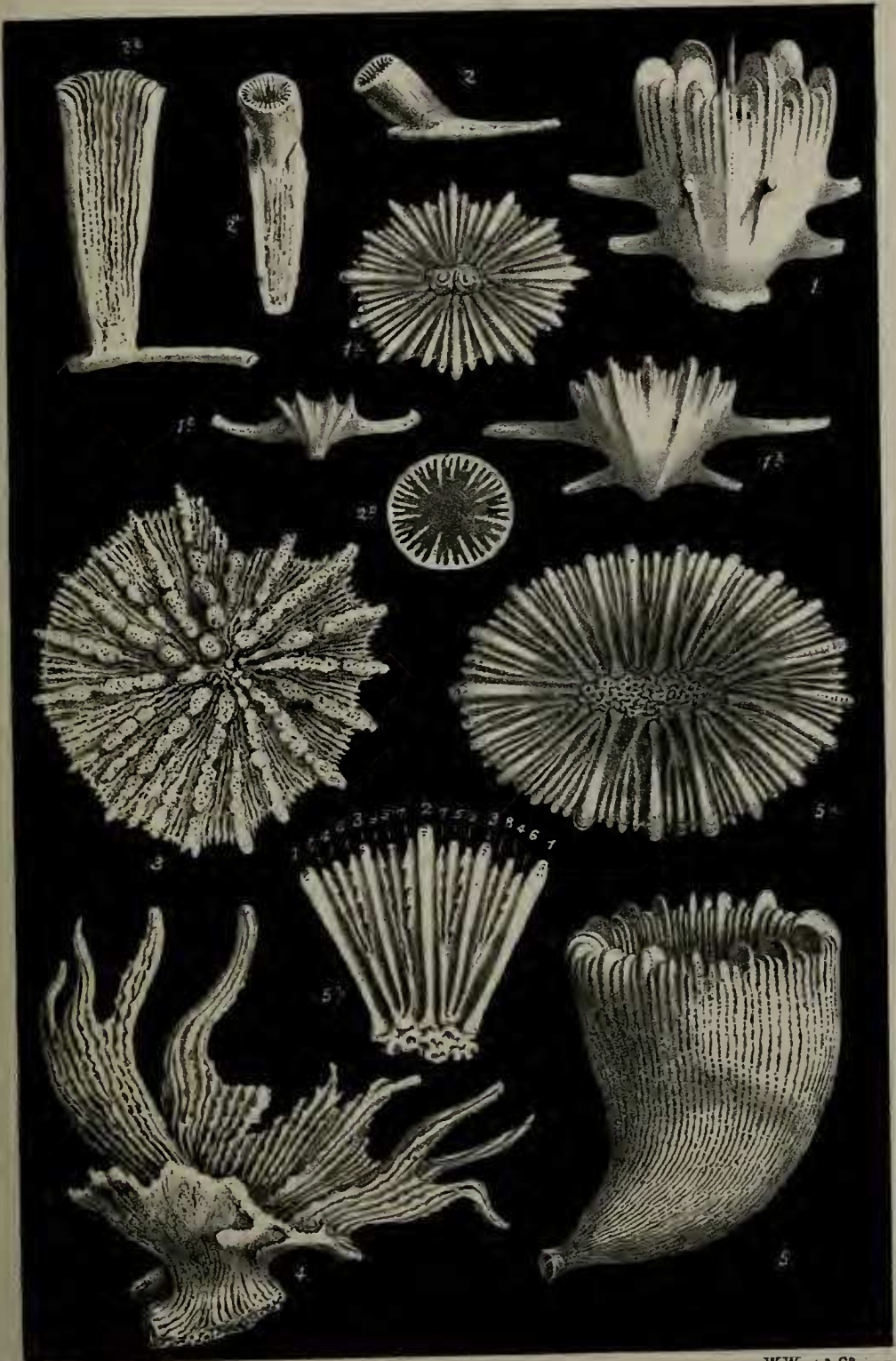
## 2. Notes on Indian Siluroid Fishes.

By Surgeon FRANCIS DAY, F.Z.S., F.L.S.

[Received March 20, 1871.]

Amongst variations in the form of certain organs in fishes, the air-vessel furnishes some remarkable examples. In the genus *Poly-nemus*, amongst the Acanthopterygians, one species, the *P. indicus*, possesses this organ and appendages of such a size that it is collected in India for the isinglass it furnishes; whilst the *P. tetradactylus* does not possess even the vestige of an air-vessel. The existence of this organ in the marine and estuary forms of the Siluroid family is of some consequence in a commercial point of view, as most of the isinglass or fish-sounds exported from India to China comes from this source. The extensive order Physostomata of Müller is chiefly based upon the existence of a communication between the air-vessel, when present, and the pharynx.

Having lately had the opportunity of examining many species of freshwater Siluroids, or those forms which ascend long distances from the sea, I have made the following observations as to the presence or absence of air-vessels, and also the form they assume. In the 'Proceedings of the Zoological Society' for 1869, p. 309, I

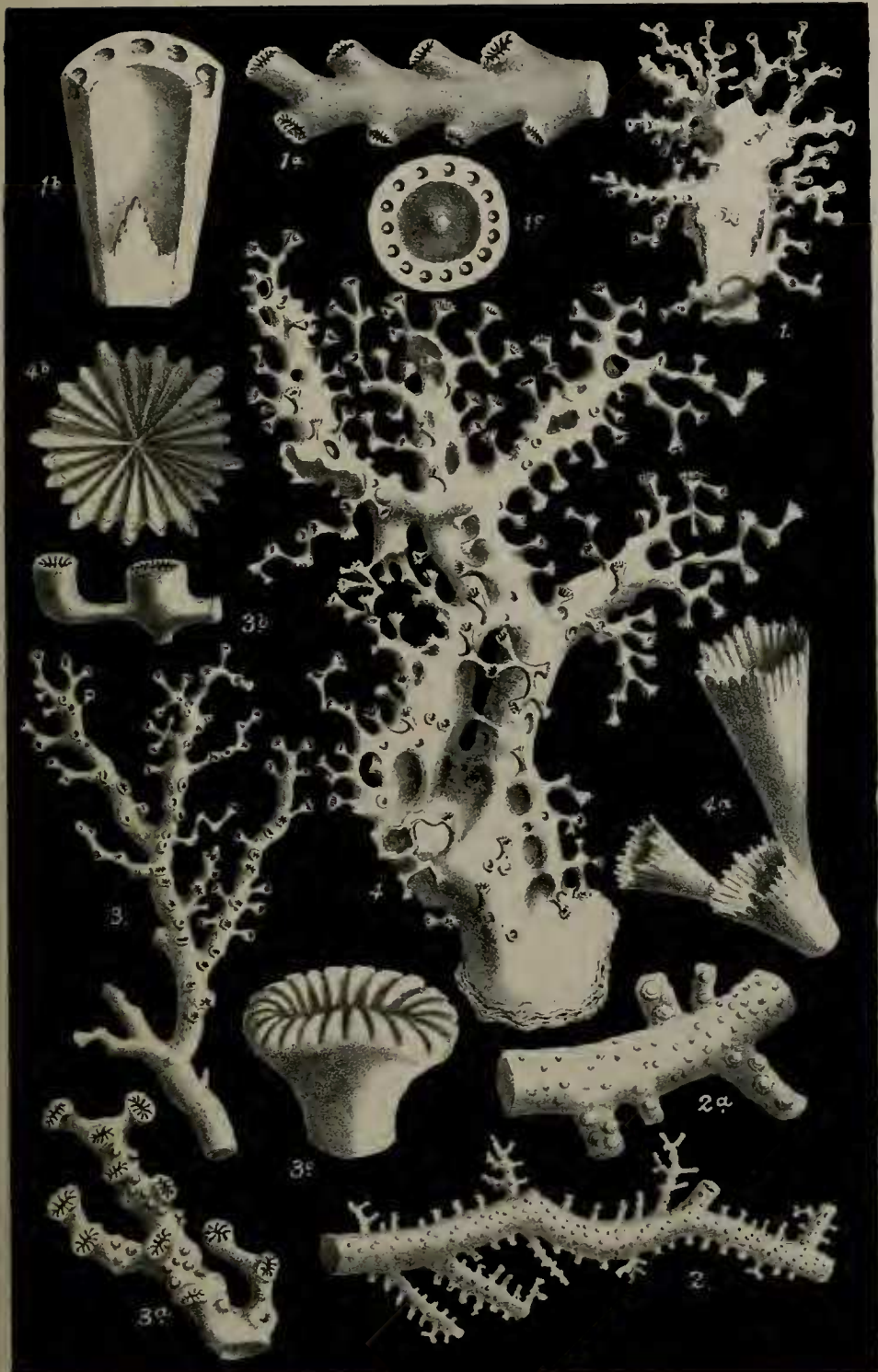


G. R. DeWilde lith.

W. West & C<sup>o</sup> imp

New Madrepores.





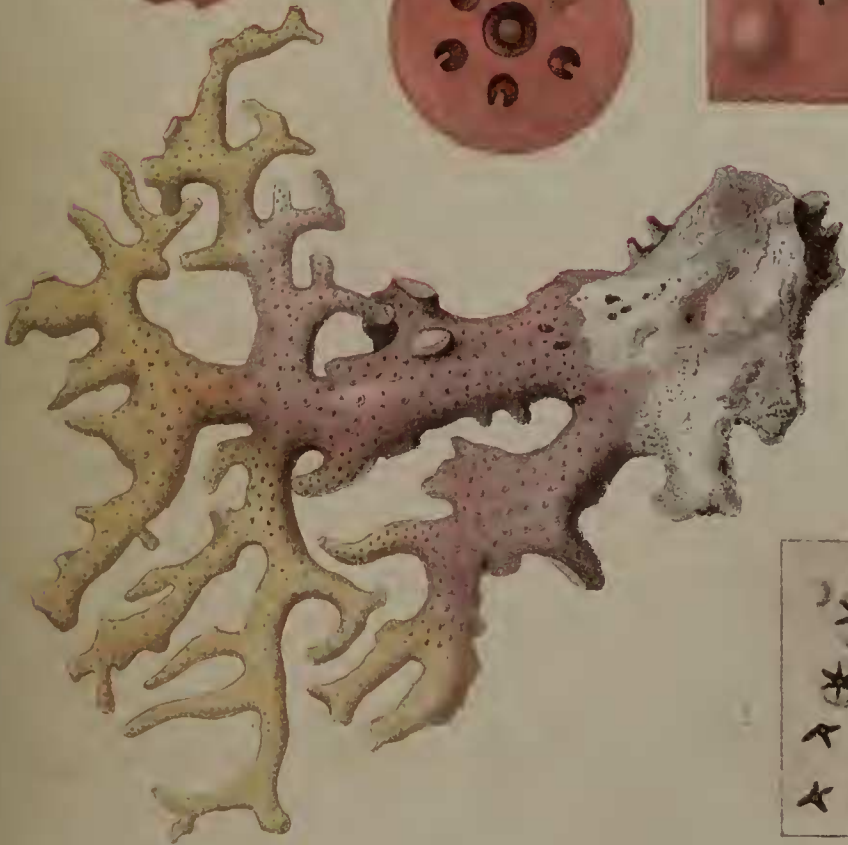
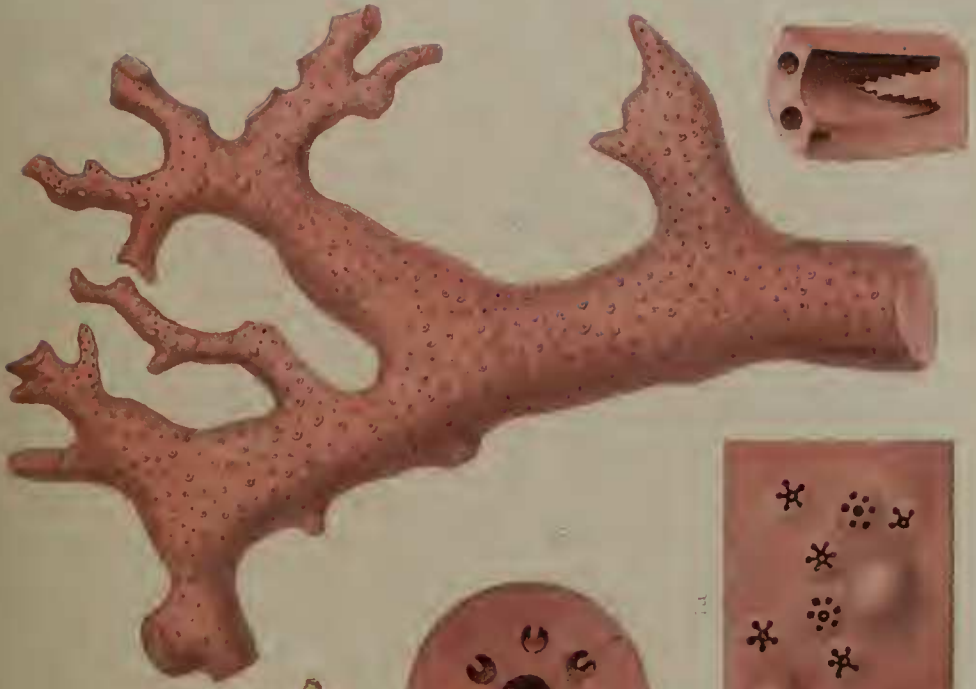
G. R. De Wilde lith.

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commented upon the air-vessel of the *Gagata typus*, Bleeker; and it then occurred to me how few inquiries appeared to have been instituted respecting this matter amongst the Siluroid fishes of India, and that what had been made referred chiefly to the genera *Clarias*, *Plotosus*, *Saccobranchus*, *Wallago*, *Callichrous*, and *Arius*.

#### Genus EUTROPIICHTHYS.

In the *E. vacha*, Ham. Buch., the air-vessel is in the form of a tube rather enlarged at either extremity, its diameter being equal to about one-half of that of the vertebral column posterior to it. It closely embraces the body of the third vertebra, lying across it and the large vessels. It then curves backwards and upwards, in the first portion of which course it is slightly protected by a projection on the body of the second vertebra. In the last portion of its extent it is protected by a wide concave expansion of the lateral processes of the first and second vertebræ. This expanded portion of the vertebræ, in which the air-vessel lies, is about equal in width to that of the body of a vertebra.

#### Genus AILIA.

In the *A. bengaliensis*, Gray & Hard., the air-vessel is of the same description as in the *E. vacha*, with the exception that it is rather more dilated at either extremity.

I would here remark upon a curious specimen of this species,  $6\frac{1}{2}$  inches long, which I procured at Delhi. It has more or less distinct spines along the whole course of its back, most prominent midway between the eye and the base of the caudal fin.

#### Genus PSEUDEUTROPIUS.

In the *P. garua*, Ham. Buch., the air-vessel is contained in the abdominal cavity, but is small, somewhat heart-shaped, with a short prolongation on either side anteriorly. It is firmly attached to the anterior vertebræ, embracing their bodies, and being a little extended laterally on either side.

#### Genus PANGASIUS.

In the *P. buchani*, Cuv. & Val., the air-vessel is contained in the abdominal cavity; it extends from opposite the base of the pectoral fin to as far as the end of the anal. A slight contraction exists between its anterior third and the remainder of the organ.

#### Genus SILUNDIA.

In the *S. gangetica*, Cuv. & Val., the air-vessel is also contained in the abdominal cavity. It is large, and with very thin walls.

#### Genus MACRONES.

In the *M. cavasius*, Ham. Buch., the air-vessel is contained in the abdominal cavity, but not loosely as in the *Pangasius*. It is of a

round or oval form, situated in the anterior part of the abdomen, and resting against the almost horizontally expanded lateral processes of the first two vertebræ, to which it has also tendinous attachments.

MACRONES NANGRA, Ham. Buch.

D.  $\frac{1}{8}$ |0. P.  $\frac{1}{9}$ . V. 6. A.  $\frac{2}{8}$ . C. 17.

Length of head  $\frac{2}{9}$ , of caudal  $\frac{2}{9}$ , height of body  $\frac{2}{11}$  of the total length.

*Eyes* rather high up, situated in the anterior half of the head, and  $1\frac{1}{4}$  diameter from the end of the snout.

A wide and deep superior longitudinal furrow extends from the snout to the posterior end of the occipital process, which latter is above half longer than broad at its base. The basal bone of the dorsal fin is extended laterally as well as anteriorly, where it meets the occipital process, there being no separate interneural bone. The width of the head at the opercles equals its length.

*Mouth* wide, cleft shallow, the upper jaw much longer than the lower. Nasal barbels slightly longer than the head, the maxillary ones reach the vent, the external mandibular ones extend to the base of the ventral, the internal ones to the base of the pectoral.

*Teeth* villiform, in an uninterrupted crescentic band.

*Fins.* Dorsal spine weak, smooth, half as long as the head; pectoral spine moderately strong, nearly as long as the head without the snout, and having nine strong denticulations internally. Length of base of adipose dorsal equals the distance the fin commences from the termination of the base of the first dorsal, and is as long as that of the anal. Caudal deeply forked, lobes of equal length and pointed.

*Colours.* Muddy, slightly clouded in places.

*Hab.* Allahabad, in the Ganges, attaining  $1\frac{1}{2}$  inch in length, and not uncommon.

#### Genus RITA.

In the *R. crucigera*, Owen (if differing from the *R. kuturnee*, Sykes, which appears doubtful), the air-vessel is in the abdominal cavity; it has a strong white tendinous covering, which sends down partitions subdividing it into three portions, the one being anterior, the other two posterior and lateral, whilst their walls are very thin.

#### Genus HEMIPIMELODUS.

In the *H. cenia*, Ham. Buch., the air-vessel is laterally divided into two lobes and entirely enclosed in bone, as in the majority of the Loaches (*Cobitidina*).

GLYPTOSTERNUM TELCHITTA, H. Buch.

D.  $\frac{1}{6}$ |0. P.  $\frac{1}{8}$ . V. 6. A.  $\frac{1}{10}$ . C. 15.

Length of head  $\frac{1}{5}$ , of caudal above  $\frac{1}{5}$ , height of body  $\frac{2}{13}$  of the total length.

*Eyes* small, situated in the commencement of the posterior half of the head.

*Head* longer than broad; occipital process three times as long as wide at its base. Free portion of tail twice as long as high. Thoracic adhesive apparatus lozenge-shaped.

*Lips* roughened, not fringed; maxillary barbels reach to below the posterior margin of the orbit, the nasal ones short, the outer mandibular pair do not reach the gill-opening, but they are longer than the internal mandibular pair.

*Fins.* Dorsal nearly as high as the body, its spine slender, its osseous portion being two-thirds as long as the head; base of adipose fin as long as that of the first dorsal, and equalling two-fifths of the distance between the two fins. Pectoral spine broad and strongly denticulated, extending two-thirds of the distance to the base of the ventral. Caudal deeply forked.

*Air-bladder* in two rounded lateral portions, very thin, and entirely enclosed by bone.

*Colours.* Blackish brown. Fins yellowish, with black bands. Caudal black, with yellow margins.

The *G. trilineatum*, Blyth, is distinct from this species, and apparently identical with that described by Dr. Günther. The specimens in the Calcutta Museum do not appear to have comprised Mr. Blyth's typical example; but a *G. trilineatum* has lately been received from Rangoon.

### 3. A Review of the *Cypridinidæ* of the European Seas, with Description of a new Species. By GEORGE STEWARDSON BRADY, C.M.Z.S.

[Received March 29, 1871.]

(Plates XXVI. & XXVII.)

Dr. G. O. Sars, in a memoir published in 1869\*, expressed his belief that two well-known Cypridinidæ, heretofore considered as belonging to entirely distinct genera, are in fact merely the male and female of the same species,—*Philomedes longicornis* (Lilljeborg) representing the male, and *Bradycinetus brenda* (Baird) the female. He also, in the same place, propounded a similar view as regards *Cypridina mariæ* (Baird) and *C. teres* (Norman). The latter proposition seemed to present no very great difficulty; but as regards the former several almost insurmountable obstacles presented themselves to my mind. Thus a male form of *Bradycinetus brenda*, quite distinct from *Philomedes longicornis*, and nearly approaching in shape to the female, had already been described by Sars himself; so that the new theory involved the supposition of two distinct males; then the structure and shape of the shell in *B. brenda* and *P. longicornis* are widely different; and, lastly, while (the male) *P. longi-*

\* Undersøgelse over Christianiafiordens Dybrandsfauna anstillede paa en i Sommeren 1868 foretagen Zoologisk Reise.

*cornis* is at some seasons abundant on certain parts of the British coast, *B. brenda* has never been met with, except very sparingly, and in only two localities.

The following is a brief abstract of Sars's remarks on this subject :—“I had long remarked that all the individuals of *Philomedes longicornis* appeared to be males ; there were no egg-bearing females ; but it did not occur to me to look for the female in so different a form as *C. globosa* (*brenda*), especially as I had already found what appeared to be the male of that species. But we find in other Crustacea (*Apeudes anomalus* and certain Cumacea) two forms of males,—one and much the commoner form being very similar to the female, the other and scarcer differing in many important details, especially in the great development of the eyes and antennæ. The parts of the Cypridinidæ which appear to be least liable to alteration are the mandible-palp, the last pair of jaws, the ringed appendage (“oviferous foot”), and the postabdominal lamina ; and these parts are all alike in *Cypridina globosa* and *Philomedes longicornis*. A further confirmation of the truth of my view is, that I have found a similarly formed male of a closely allied species, *P. lilljeborgii*. This differs from *P. longicornis* in having the postero-inferior spine of the shell more strongly developed, the ringed appendage showing also the same distinctive marks as does that of the female, in having only about nine spines instead of thirty as in *C. globosa*.”

Among a number of Ostracoda dredged at various depths in the Fosse de Cap Breton (Bay of Biscay) by M. le Marquis de Folin, and sent to me for identification, were several specimens of a very remarkable undescribed species, one of which was so far different in size and form from the rest, though retaining the same characters as to shell-sculpture, that I immediately took it to be the male of the more abundant female form. And on further examination the smaller example proved to have all the anatomical characters of Lilljeborg's genus *Philomedes*, while the larger ones belonged to *Bradycinetus*, Sars. The shell-structure is here of so novel a type (no similar deep excavation and ribbing having heretofore been noticed among the Cypridinidæ) that I could no longer doubt as to the sexual relations of *Philomedes* and *Bradycinetus* in this instance ; and I was therefore disposed to regard Sars's case as proved with respect also to *P. longicornis* and *B. brenda*. This conclusion, however, I had adopted too hastily, as will presently appear ; for in the same gathering (Cap Breton) were found several examples of a *Philomedes* (Pl. XXVI. fig. 1) agreeing in general aspect with “*P. longicornis*,” but rounder in lateral outline and more tumid, having also a reticulated shell-structure exactly the same as that of the common form, but differing constantly in the presence of two well-marked sharp spines on the postero-superior and postero-inferior angles of the shell. Anatomical investigation showed that this was in fact the true female of *P. longicornis*, the only appreciable differences consisting in the shortened filaments of the upper antennæ, and the smaller development of the eyes, mandibular feet, and secondary branch of lower antenna, the vermiform appendage and abdominal

laminæ being the same in both sexes. The structure is, in fact, entirely that of a female *Bradycinetus*. Further, on examining a specimen of *Asterope grænlandica*, Fischer, taken in the same locality, I found that its characters were those of a male *Bradycinetus*; and on comparison of the shell with that of *B. brenda*, the points of resemblance appear so striking that I entertain no doubt of its being the male of that species. And I may here mention that although Sars appears to have found the excessive spinous armature (spines nearly thirty in number) of the vermiform appendage of *B. brenda* reproduced in "*P. longicornis*," I have myself never been able to see more than eight or nine spines in the latter species; while in "*A. grænlandica*" they number about thirty as in *B. brenda*. Adopting these views, the genera of European Cypridinidæ may be briefly characterized as follows:—

#### CYPRIDINA (M.-Edwards).

Shell smooth, thin, and flexible; notch shallow; its posterior extremity only slightly exerted. Superior antennæ seven-jointed; setæ of moderate length; natatory branch of inferior antenna nine-jointed, bearing moderately long setæ; secondary branch very small, subulate. Basal joint of mandibular feet bearing an entire subconical and densely hairy process; penultimate joint much elongated and beset on the interior margin with numerous ringed setæ; last joint very short and almost obsolete.

#### BRADYCINETUS (G. O. Sars).

Shell much denser than in *Cypridina*, punctate; notch deep. Superior antennæ six-jointed; the apical setæ of moderate length, subequal, rather longer in the male than in the female; inferior antennæ nearly as in *Cypridina*; length of joints nearly alike in both sexes; filaments very short in female, rather longer in male; secondary branch of the inferior antenna in the female biarticulate, very small, in the male larger and triarticulate. Mandibular feet in the female armed on the basal joint with a strong bifurcate process, in front of which are three toothed spines; in the male bearing on the basal joint a large densely setose triangular process, and having the last joint very much elongated; second pair of jaws having a strong mandibular appendage consisting of two robust tooth-like processes. Eyes of the female small and pale-coloured, of the male large, deep-red, and multilenticular.

#### PHILOMEDES (Lilljeborg).

Shell of moderate strength and density. Superior antennæ six-jointed; in the female short and thick, and bearing several subequal terminal setæ of moderate length; in the male more elongated, two of the terminal setæ of excessive length, the antepenultimate joint bearing a stout and densely setose auditory filament. Natatory branch of lower antennæ nine-jointed; in the female having the first joint very long, the rest short and subequal; in the male the first

and third joints long, the second much shorter, the rest short and subequal: secondary branch in female indistinctly jointed, setose; in the male long, three-jointed, cheliform. Mandibular feet nearly alike in both sexes; in the female armed, as in the female *Bradycinetus*, with mandibuliform processes and spines, in the male bearing on the basal joint a small tubercle with two short hairs; second pair of jaws in the female armed with mandibuliform processes. Eyes as in *Bradycinetus*.

ASTEROPE\* (Philippi).

Shell subcylindrical, beak not at all produced. Upper antennæ as in the preceding genus. Second joint of the natatory branch of the lower antennæ in the male elongated, in the female scarcely longer than the succeeding joints; secondary branch in the male robust, subchelate; terminal joint slender, curved upwards; in the female simple, triarticulate, last joint setiform. First maxilla consisting of a broad subquadrate or crescentic lamina, densely clothed on its distal margin with long bristles; second swollen at the base, narrowed at the apex, where it bears six plumose setæ, basal portion setose along its convex margin; third maxilla narrow, elongated, setose along the inner margin. Abdominal laminæ broad and short, subtruncate at the extremity.

1. CYPRIDINA NORVEGICA, Baird.

*Hab.* Norway, Shetland.

2. CYPRIDINA MESSINENSIS, Claus.

*Hab.* Mediterranean.

3. BRADYCINETUS BRENDA, Baird, sp. (Plate XXVI. fig. 6.)

*Cypridina brenda*, ♀, Baird, 1850.

*Cypridina globosa*, ♀, Lilljeborg, 1853.

*Bradycinetus globosus*, ♀, G. O. Sars, 1865.

*Bradycinetus brenda*, ♀, Brady, 1868.

*Asterope grælandica*, ♂, Fischer, 1854.

Two specimens of a form exactly conforming to Fischer's description of *Asterope grælandica* occurred in M. de Folin's dredgings from the Fosse de Cap Breton. The shell differs from that of the female *B. brenda* in being less tumid and slightly more angular in outline; it is also quite smooth and free from villosity. The swimming-filaments of the upper antennæ are a little longer than those of the female, and more decidedly plumose. There is also a stout auditory seta; the natatory branch of the lower antenna is nearly alike in both sexes, but the secondary branch in the male is largely developed and triarticulate. The mandibular foot is much elongated (Plate XXVI. fig. 6), and bears on its basal portion a large and strong

\* This genus might perhaps with more propriety (on account of the widely different structure of the maxillæ) be made the type of a distinct family. It is identical with *Cylindroleberis* (Brady), a fact of which I was not aware when that name was proposed.