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Publisher: Taylor & Francis

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Annals and Magazine of Natural History: Series 8

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/tnah14>

LXXII.—Notes form the Gatty Marine Laboratory, St. Andrews.—No. XXX

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Published online: 08 Sep 2009.

To cite this article: Prof. M'Intosh M.D., LL.D., F.R.S. (1908) LXXII.—Notes form the Gatty Marine Laboratory, St. Andrews.—No. XXX, Annals and Magazine of Natural History: Series 8, 2:12, 524-545

To link to this article: <http://dx.doi.org/10.1080/00222930808692533>

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place between them. Gray, like Kaup, distinguished the Agamidæ from the Iguanidæ chiefly on account of the mode of insertion of their teeth in the jaws; but his then imperfect knowledge of their geographical ranges prevented him from perceiving the fact that the difference in their dental characters coincided with their distribution over the globe. Evidently this fact was first pointed out by Kaup. A. GÜNTHER.

LXXII.—*Notes from the Gatty Marine Laboratory, St. Andrews.*—No. XXX. By Prof. M'INTOSH, M.D., LL.D., F.R.S., &c.

[Plates XII. & XIII. a.]

1. On the Stranding of an Adult Female *Mesoplodon bidens*, Sowerby, at St. Andrews.
2. On an Abnormal Plaice with a Precaudal Fin-frill on the Left Side.
3. On *Orthogoriscus mola*, Bl.
4. On the British *Sphærodoridæ*, *Chloræmidæ*, and *Chaetopteridæ*.
5. On the same Families dredged in the 'Porcupine' Expeditions of 1869 and 1870.
6. On the foregoing Families dredged in the Gulf of St. Lawrence, Canada, by Dr. Whiteaves.
7. On the same Families dredged in Norwegian Waters and in Finmark by Canon Norman.

1. *On the Stranding of an Adult Female Mesoplodon bidens, Sowerby, at St. Andrews.*

For some days in May the fishermen had observed a whale moving between the Castle and the mouth of the Eden about a mile from shore. Then on the afternoon of the 28th May a fisherman-caddie, George Brown, saw what he thought was a horse floundering in the sea about a mile from the Club-house and in shallow water about 150 yards from the edge.

It floundered on parallel with the shore about 100 yards, apparently after having touched the bottom and without being able to turn its head seawards. He and others went out, waded into the water, and found the whale, which was of a brownish-black colour, paler ventrally, still living, and beating the water with its tail. They prevented the receding tide carrying it out, though, perhaps, such was not likely to happen, and it died in ten minutes. When preparing the carcass, which was over 16 feet in length, for a skeleton, A. W. Brown, of the Laboratory, found that the left shoulder and arm were extensively ecchymosed, the muscles and

tissues being infiltrated with blood, and with a tendency to rapid putrefaction. The bruise extended from the scapula to the humerus and the armpit as well as to the hand. The macerated left humerus showed an ovoid depressed surface, 1 inch by half an inch, about an inch from the anterior edge of the head, and somewhat obliquely situated on the front of the bone and near its middle. The only explanation of the injury is that the Fleet had been at gun-practice for some time off St. Andrews Bay, and a spent shot or a fragment of a shell may have struck the animal, rendering it more or less helpless on the left side, and causing it to seek the shallow water.

Nothing occurred in the stomach except mucus and parasites, and the same with the intestines.

Mesoplodon bidens from the ventral surface.

In the accompanying sketch (see figure), which has been made from a photograph by A. W. Brown, the left side is presumed to be partly immersed in the wet sand during a shower of rain, but the flipper and right groove (a) on the throat are shown. The latter seems to follow the trend of the mandible, and ceases before reaching the mid-ventral line.

Notices of the occurrence of this whale are given in Bell's 'British Quadrupeds'* &c., and the skeletons have been dealt with by Sir William Flower and Sir William Turner, the latter of whom has kindly promised to look over the bones of this example.

2. On an Abnormal Plaiice with a Precaudal Fin-frill on the Left Side.

The publication of my friend Mr. Boulenger's † very interesting example of a malformed plaiice from the London

* Second edition.

† Proc. Zool. Soc. 1908, pp. 161-164, text-figs. 28 & 29.

market recalls a similar case included in the Tenth Annual Report of the Fishery Board for Scotland (1892) *. In this the right (coloured) side presents a fairly normal appearance, except that near the caudal an irregularity of the fin-rays—both dorsal and anal—occurs. A few irregular fin-rays are at a different level from the rest when the fish is placed on a flat surface right side up. On the left side the lateral line posteriorly is curved gently to the dorsal edge, and terminates about half an inch in front of a somewhat elevated border stretching between the dorsal and anal interspinous regions. This elevated border is fringed with a continuous series of rays. The first of the irregular series ventrally pass from the anal interspinous bones at a forward angle, and the transverse rays follow in order. The rays joining the dorsal are crowded and almost form a double series at the prominent fold of the region. The interspinous elements show a tendency both at the dorsal and the ventral edge to follow the abnormal transverse or vertical fin, but they appear to be deficient in the central region, though slight folds are visible. The lateral line commences anew from beneath the centre of the transverse or vertical fold, and goes straight back, as usual, to the caudal. The left side is of the normal colour, with the exception of a circular patch of black about $\frac{1}{4}$ of an inch in diameter, which is situated below the lateral line and almost covered by the membrane and rays of the abnormal fin. Above the lateral line is another minute speck. The scales of the caudal region on the right do not appear to differ from an ordinary example, and those on the left do not call for remark.

Mr. Boulenger's specimen agrees with the foregoing in the absence of the fin-frill from the coloured side and in the presence of a deep notch dorsally and ventrally behind the abnormal fin. There are slight differences in regard to the continuity of the marginal fins and the abnormal one, but the condition in each evidently springs from the same cause. He thinks that at an early stage of its existence the fish lost the posterior part of its caudal region at the point now indicated by the truncature on the blind side; "it at once proceeded to repair the injury by producing a secondary terminal fin, viz., the transverse structure connecting the dorsal with the anal . . . But at the same time, or soon after, the true tail asserted its rights, and grew again, alongside the secondary fin, and this regeneration would fall under what Prof. Giard has designated as '*Régénérations hypotypiques*.'"

* Part iii. pp. 298 & 299, pl. xvii. fig. 5.

Such an interpretation is very interesting, but it was not that which suggested itself in former years. A re-examination of the St. Andrews example shows that no trace of regeneration occurs superficially in the fairly normal right or coloured side; that the vertebral column runs normally to the base of the tail; and that no irregularity is visible from the hypural elements forward for more than twenty vertebrae, the skeleton being the same as in other examples, except that a slight dorsal curve is visible a little in front of the fin-frill, an indication, perhaps, of the peculiarity in constitution (dyscrasia) which may be associated with the abnormal fin. Moreover, the condition on the left side is explicable without calling in the loss of the tail in the early condition. The precaudal fin-frill may be a simple abnormality arising from hypertrophy or a hereditary tendency to excess of fin-growth—akin, for instance, to polydactylism or the extra fins of the golden carp.

3. *On Orthogoriscus mola*, Bl.

This fish is occasionally found in the neighbourhood of St. Andrews Bay, especially in the mouth of the Forth, where a small example appeared off Crail on the 9th October, 1908. Such a small form shows the greenish-blue silvery lustre quite as much as the larger. This example had a length of 23 inches and a depth of $14\frac{1}{2}$, whilst across the dorsal and anal fins it measured $32\frac{1}{2}$ inches. The dorsal fin was $9\frac{3}{4}$ inches long and the anal $9\frac{1}{4}$ inches. Like other examples it was swimming leisurely at the surface of the water with the dorsal fin projecting. The stomach was empty and the intestine contained glairy mucus amongst which were several parasites.

Though the examples captured off the shores of Fife do not reach the gigantic size of that shown in the London Fisheries Exhibition of 1883 *, and which measured 12 feet from the tip of the dorsal to that of the anal and 8 feet in length of body, yet some caught in the Forth and in St. Andrews Bay are of considerable size. Thus Day † records one from Pittenween 8 feet across the fins, a body 4 feet long, and it is interesting that they have generally been caught in October or November. Thus one caught on the 4th of October, 1862, in St. Andrews Bay measured 4 ft. 8 in. across the fins, and, in addition to the points indicated in the 'Fauna of St. Andrews' ‡, and quoted by Day, it may be mentioned that its

* 'Scandinavian Fishes,' Fries, Ekström, Sundevall, and Wright, ii. pp. 626 *et seq.*

† Brit. Fishes, ii. p. 275.

‡ P. 183.

respiration was so active that before capture it spouted water from each gill-slit. The circumference was 8 ft. 6 in. In the stomach was a large quantity of greyish mucus with fragments of cestodes. The parasites mentioned subsequently were found not only amongst the muscles, but in the liver, and many pyriform scolex-like forms occurred in the same tissues.

Dr. Wm. Nicoll reports that in the small example he found, in the lower part of the intestine and the rectum, about fifty specimens of *Dihemistephanus lydiæ*, Stossich, one of the spinous trematodes with a peculiar configuration of the cephalic spines. He also found about a dozen examples of the cestode *Anchistrocephalus microcephalus*, Rud., in the intestine. Moreover, besides *Acanthocephalus reptans* (*Gymnorhynchus horridus*, Goodsir) in the muscles, *Acanthocephalus elongatus* burrowed in all directions in the liver. Dr. Calman kindly identified *Cecrops latreillii*, Leach, which was found, as in 1862, infesting the gills, and *Lepeophtheirus nordmanni*, M.-Edw., which occurred in considerable numbers on the skin, the latter not having been present in the larger example in 1862, which, however, had numerous specimens of *Tristoma coccineum* on the surface.

4. On the British Sphærorodidæ, Chloræmidæ, and Chætopteridæ.

The first family is extremely limited both in respect to genus and species, the common form, *Ephesia gracilis*, H. Rathke, being that formerly entered by Dr. Johnston in the Catalogue of the British Museum and by Dr. Allen in the 'Fauna of Plymouth' (1904). The species seems to be everywhere distributed in British waters, from the tidal region to 6 or 15 fathoms or more, the finest examples coming from the deeper water off St. Andrews Bay. It is a form which exhibits only moderate activity, crawling slowly about or throwing itself into coils. It extends to Norway, Spitzbergen, and Greenland.

The foot has dorsally the opaque white globular process which appears to be a modification of a cirrus. It is smooth throughout and has at its outer and upper surface a clavate papilla similar to those on the surface of the body. The conical setigerous lobe occurs beneath, and its surface and tip are hispid with large papillæ of the kind already mentioned. It is supported by a single, strong, translucent, tapering spine, which has a tip simply pointed. The number of the bristles is usually four, and they have a characteristic

shape at the tip, like a billhook. A form from the Channel Islands, however, differs from the foregoing and agrees with *Ephesia antarctica* of the 'Challenger' Expedition in having articulated bristles, the shaft showing the same distinct curve backward at its distal third, a dilated and bevelled end, but with a short tapered terminal piece. Yet some show fusion of the terminal process, and thus transform the bristle into the ordinary type. Whether as knowledge extends the foreign forms as well as the foregoing may be amalgamated with the common type is still an open question. At any rate, so far as general structure goes, *Ephesia* appears to be a near ally of the Syllidæ.

Two British species of Chloræmidæ were included in Dr. Johnston's Catalogue in 1865, viz. *Stylarioides plumosa*, O. F. M., as *Trophonia plumosa*, and *Elabelligera affinis*, Sars, as *Siphonostoma uncinata*, Aud. & Edwards. In the 'Fauna of Plymouth' (1904) no addition has been made to the foregoing meagre list. Besides these, several additional forms have to be noted, some of which are known in Norwegian waters,¹ whilst others do not appear to have been described.

Stylarioides plumosa, O. F. M., is generally distributed in the North European seas, and extends to Greenland and the American shores; and though common between layers of shale and laminated sandstone, or in dark odoriferous mud, yet the cod and the haddock seem to find it out, probably after dislodgment by storms. The stomach of the latter occasionally contains dozens. It is a striking form—with its pinkish palpi, grass-green branchiæ, long resplendent anterior bristles, and its rugose surface. The mouth is a vertical slit below the palpi, with fleshy lips which slowly open and close in the continuous swallowing of water and probably also of muddy sand as food under ordinary conditions. The inner surface of the lips is pale reddish brown. Rarely a hoof-shaped process, with the flat surface pointing ventrally, is thrust out, the anterior or dorsal arch having the eight green branchiæ along its edge, whilst posteriorly are two external lateral, two small median below the mouth, and a larger posterior or ventral process besides the palpi. On an eminence in the centre above the mouth are two brown pigment-spots which may represent eyes. In a partially contracted example—living or dead—the anterior region shows a vertical slit, more or less widened in the centre according to circumstances, and having a frilled margin surrounded by a fringe of longer papillæ. On each side is a

vertical ridge slightly divided into a dorsal and ventral division, and from each of these springs a remarkably long tuft of the characteristic golden bristles which stretch far in front of the animal and refract the light beautifully. From the forward and upward direction of these bristles they would not appear to be of much service on a flat surface, but they would be of use on the wall of a tube or tunnel, as well as protect the branchiæ and palpi. Similar but shorter bristles follow in the dorsal division throughout the body. Moreover, in the fourth segment the ventral series consists of stout spines with a double curve, some of which, however, have slender translucent tips—indicating that the succeeding and more perfect hooks are only modifications of an articulated bristle. Small examples about an inch in length differ from the adults (of 4 or 5 inches) in the smaller number of segments, 47 or 48 instead of 60–80, and in the less dilated anterior region. It is interesting that the type of bristle seen in this form persists in species from the Indian and other oceans, as shown, amongst others, by Prof. Ehlers* in his recent beautiful work on the Annelids of the German Deep-sea Expedition.

The second form, *Stylarioides glauca*, Mgrn., has long been known in Zetlandic waters, where it was first obtained by Dr. Gwyn Jeffreys, and it extends to Norway and Sweden. It is distinguished by its smaller size, clavate outline, the posterior region sometimes forming in the preparations a narrow moniliform appendage of many segments. The general surface is comparatively smooth under a lens, though studded with long clavate papillæ and encrusted with particles of sand which give a dull greyish appearance in life and in a state of preservation, with a dull bluish region from the intestine. The body-wall is thinner than in *S. plumosa* and the fasciculi of the dorsal and ventral longitudinal muscles are visible as separate strands. There are six branchiæ, the two lower with filiform tips and devoid of a pale streak in the centre. Two minute brown pigment-specks occur on the process bearing the branchiæ, the flattened and crenate palpi, and the mouth. The first series of frontal bristles are translucent, pale, iridescent, and, as compared with those of *S. plumosa*, few in number and boldly articulated. The second series inaugurates the arrangement throughout the rest of the body, viz., a longer dorsal tuft of articulated bristles, and ventrally

* "Die bordensässigen Anneliden aus den Sammlungen der deutschen Tiefsee-Expedition auf dem Dampfer 'Valdivia,' " 1908.

a shorter yet conspicuous tuft—proportionally thicker with well-marked articulations and a tapered and slightly hooked tip.

The third species is *Stylarioides arenosa* of Webster, which was procured at low-water mark at St. Peter Port, Guernsey, in 1868—that is, long before it was seen by H. E. Webster between tide-marks, Northampton County, eastern shore of Virginia. Mr. Webster, however, first published a description of the species. The body is about two inches in length, firm and more or less rounded from a dense coating of adherent sand-grains, and in the preparations grooved anteriorly, either dorsally and ventrally, from contraction. It is slightly tapered anteriorly and gently diminished to a blunt tail with the anus in the middle. Segments 60–70, distinct. The first three sets of articulated bristles are longer than the rest, and with the next two directed forward, shorter than in *S. plumosa*, pale yellow and resplendent. The ventral of the third series shows a hooked tip with an adnate secondary process, and in its progress backward the edge of the latter is differentiated into a separate process, either by use or otherwise, and the whole flattened hook becomes shorter and more closely articulated.

The entire surface is closely beset with sand-grains, so that to the touch it resembles a hard sandy tube. The papillæ appear to be more or less cylindrical with a clavate tip, but they exhibit no evident arrangement in rows as in Mr. Webster's American examples. The branchiæ also appear to differ, for Webster states that they "are very numerous, filiform, red at the base, green externally, the inferior shorter than the superior."

As mentioned by the American author, the bristles of the first five segments point forward, but the first three are most conspicuous. The first is the longest, and its bristles are densely coated with parasitic growths, such as thecate Infusoria, algæ, mud, and fragments of bristles. The ventral are a little shorter than the dorsal. Though pale by reflected light they are brownish by transmitted light, taper to a very delicate hair-like tip, and have a series of articulations, which are closer at the base of the bristle, longer in the diminishing tip. The ventral of the second set are considerably shorter, have a double curve, and taper to a less delicate though simple tip which is slightly hooked. The ventral of the third series (Webster says fourth) consist of three bristles, curved at the tip and bifid, the tip indeed resembling that of *Sigalion* and *Sthenelais*. The terminal segment is about

three or four times as long as the adjoining, and ends in a hook with a secondary process in the form of a fixed process beneath—that is, in the concavity. Whilst only three of these organs project externally, seven occur in an even row in the tissues, but four are imperfectly developed. Of the three projecting externally, two are larger and more opaque (brownish), have short segments throughout their lower half, longer segments in their distal half, which is curved. The third bristle is considerably shorter, more translucent, and has long segments throughout its free portion, with short segments at its base in the tissues. The latter apparently represents a developing bristle. The dorsal bristles project upward and inward in a series of short fans to the posterior end of the body, the tips showing a tendency to curve forward. The ventral bristles from the third backward present a gradual modification into stout hooks with bifid tips. Thus at the 10th foot these processes retain a bristle-like appearance with long articulations, which, however, become shorter toward the tip, which tapers to a long terminal joint with a hook and a secondary process differentiated at its free edge, viz., with a thickened rim, but the whole is bound to the concavity of the hook. At the 20th foot a similar condition exists both as regards the bristle-like stem of the appendage, the shortening of the joints toward the tip, and the longer terminal joint with the hook and the fixed secondary process beneath with the marginal differentiation—the whole having the aspect of a Polyzoan avicularian. The hook gradually becomes shorter, broader, and stouter, the articulations more closely arranged, and between the 40th and 50th feet the secondary process has in some lost its web, so that the thickened edge, as it were, forms the mandible below the hooked beak. Toward the tip of the tail the secondary process of the now short hook often disappears and the terminal hook is considerably abraded. The hook is still flattened and has oblique striæ below the translucent tip. The reticulations are also very closely arranged.

Flabelligera affinis, Sars, is a common form all round the shores of Britain from Shetland to the Channel Islands, and is equally well known in Spitzbergen, Greenland, Iceland, and Scandinavia. It generally occurs between tide-marks or in the Laminarian region, though it also extends to the coralline zone. So far as observed, all the British examples are referable to the same species.

The last of the series is *Flabelligera buskii**, with a body about half an inch in length and the outline of a young example of *Flabelligera affinis*, both as regards gelatinous investment and the urn-shaped and clavate papillæ, but the former have a coarser central axis and the latter are smaller and have thicker stalks. The palpi are pale, whilst the body and branchiæ are bright red. The frontal bristles are translucent and delicate, and the articulations wide. The hooks, which are often in pairs, have slender shafts with longer articulations than in *F. affinis*, and the terminal claw is wider towards the base, is longer, and has a smaller angle with the shaft.

The Chætopteridæ were introduced to the British Fauna by Dr. Baird in 1854, and thus only occupied a place in the "Addenda" to Dr. Johnston's posthumous 'Catalogue of the non-parasitic Worms in the British Museum.' No addition to the family has been made in the 'Fauna of Plymouth' (1904), but Mr. Cyril Crossland's † excellent *résumé* of the various species of *Chætopterus* has done much to clear up the confusion in regard to them. Dr. Baird's specimens of *Chætopterus variopedatus*, Renier, came from the south coast of England (Cornwall), but it ranges from Shetland to the Channel Islands, and occurs on both the eastern and western coasts as well as the shores of Ireland. Abroad it would seem to be the common form on the western and southern shores of Europe. The remarkable contour, brilliant bluish phosphorescence, and large tube often covered with zoophytes make it one of the most striking annelids.

The anterior region in the northern specimens of *Chætopterus variopedatus* usually consists of the "head" and nine bristled segments. The so-called "head" forms a broad frill or collar, the great dorsal flaps of which cease at the base of the tentacles, a less conspicuous rim passing on each side to the middle line of the dorsum where fusion occurs. In the preparations of the northern forms, as in life, no anterior frill is present in the mid-dorsal line, and they thus differ from the Neapolitan examples, the dorsal band forming an enlargement and ending bluntly behind the oral rim. In the Neapolitan form the mid-dorsal line has a tendency to differentiation in the shape of a fold or thickening of the rim, and the termination of the mid-dorsal longitudinal band

* Trans. R. S. Edin. vol. xxv. p. 420, pl. xv. fig. 13 a, and pl. xvi. fig. 4.

† Proc. Zool. Soc. 1904, vol. i. p. 270.

is less expanded. The cavity of the collar, which, by the approximation of the dorsal flaps, assumes the shape of a funnel, leads to the mouth and is tinted brown, with a tendency to madder-brown near the oral aperture. It doubtless subserves important functions in alimentation. At its outer edge dorsally, and close to the first foot, springs on each side the large subulate tentacle, which in the preparations is grooved on its inner surface and shows crenations along the groove. Thus the organ resembles a palp, though apparently occupying a different position. In life it is capable of considerable elongation, and occasionally presents a coil or two towards the tip. At its base externally is a transversely elongated black pigment-speck—the eye,—which occupies a pit at the base of the collar and between it and the base of the tentacle. In some the black pigment-specks are separately arranged in a transverse row.

Closely following the buccal segment are the feet and other parts of the region, which has 9 segments in almost all the northern examples. In two specimens from Naples one had 10 on both sides, and the other 10 on the right and 11 on the left. Considerable variability, however, is known to exist in the common species, which may have only 8 bristled segments in this region. The feet are uniramous with the exception of the ninth. Whilst the dorsal surface is distinguished by its narrow median grooved band which is continued on the tenth segment, the ventral surface forms a large, convex, glandular, shield-like area,—somewhat resembling that in *Sabella*,—and in the Neapolitan examples the area is more definitely outlined, probably from the method of preparation.

The next or middle region consists of 5 segments, though the first appears to pertain as much to the anterior region. This (first) segment has dorsally the median grooved band, which is of the same diameter as in front, but at the posterior edge of the wings it diminishes and is continued thereafter as an undivided smooth band. It is in this region, viz. in the eleventh segment, that the cylindrical faecal masses first appear, so that they may be formed in front of it. The inner surface of the gut is here thrown into a complex series of folds or large villi.

The posterior region has 22 or 23 strongly marked segments, each of which has a prominent dorsal division of the foot formed on the plan of the great wings of the tenth segment, viz., a large fleshy lobe somewhat tapered distally and enclosing a series of bristles of the type seen in the tenth bristled segment, tapered at both ends but

most attenuate at the distal end. This process ends in a ventral enlargement carrying on its anterior edge a band of hooks, each of which has about ten fangs. Besides, two flaps on the ventral surface carry hooks with ten or eleven teeth or fangs. Altogether there are thus four rows of hooks in each segment, and the individual hooks vary little in the several rows. The dorsal processes gradually diminish posteriorly and end in two small and somewhat lanceolate processes on each side and below the level of the anus.

The three great lamellæ on the dorsum of the middle region of the body are waved to and fro, as if performing a respiratory function either for blood or coelomic fluid. Their muscularity is considerable, so that a vigorous fanning motion from front to rear is caused.

What apparently is a *Spiochaetopterus* was dredged in Loch Linnhe on the 7th September, 1882, in 35-37 fathoms, and similar tubes come from various parts of the British shores. The tube is rigid, hard, and brittle, breaking under the forceps like the ossific tissue of young teleosteans and in short fragments. Somewhat faint rings encircle the tubes, but the intervals are not quite regular. The anterior end of the annelid is absent. Each segment has dorsally a pair of setigerous processes bearing a group of about four bristles, with long shafts and flattened tapering tips. Two flaps or flap-like processes occur on the side below the foregoing and bear hooks which are exceedingly transparent and the outline of which is difficult to follow. They appear to approach those of *Spiochaetopterus*, a form whose range extends to both sides of the Atlantic.

5. On the same Families dredged in the 'Porcupine' Expeditions of 1869 and 1870.

A species about the size of *Stylarioides glauca* is *Stylarioides flabellata* of Sars (Pl. XII. fig. 1), which was dredged in the 'Porcupine' Expedition of 1870 on the Channel Slope at Station 6, 48° 26' N., 9° 44' W. in 358 fathoms. It is readily distinguished from *S. glauca* by the dense coating of sand-grains, by the ferruginous hue of the posterior region, the stronger frontal bristles, and the conical anterior process with its long papillæ. The body is rounded, about an inch in length in the preparations, slightly enlarged at the anterior third, and gently tapering to the posterior end, which forms a short cone with the anus in the centre.

A. H. W. & W. C. M. del.

J. Green lith.

Anteriorly the dorsal median process bears long papillæ with globular or clavate tips, which give it a characteristic fringe under a lens, and on each side is the long pale bristle-tuft which proceeds forward and very slightly outward and upward, the tips having a ventral curvature. They are finely iridescent, gleaming with a greenish-blue sheen like the long bristles of *Mitraria*. When mounted in Farrant's solution they are brownish by transmitted light, have short articulations at the base, but the greater part of the free portion in each has long joints. They taper to a fine point, show a distinct curvature, and are somewhat stiff. They form an even row or palisade in the tissues, with reserve bristles developing at the base, and make a regular vertical fan-like series internally. The ventral bristles are only a little shorter, the regularly arranged fan being directed slightly outward and forward, the lower bristles having a ventral direction, and the tips curve inward. The angle these bristles make with the body is variable, according to the condition of the basal muscles on immersion in spirit. The bristles of the second foot—which is fused with the first in forming the lateral projection on each side anteriorly—are much shorter and more slender than the first, indeed the dorsal do not appear to be half the length, and the ventral are still shorter. Their direction is also forward and slightly outward and their structure is the same, viz., long, tapering, jointed bristles. The bristles of the third foot leave the body at a different angle—projecting more directly outward and slightly forward. The dorsal series has the same structure, but the ventral differ, for they are long, jointed, flattened, nearly of equal diameter throughout, though really slightly increasing from the base to the end of the shaft, which is a little dilated and curved forward. The tip consists of a gradually diminishing flattened process, ending in a well-marked hook (Pl. XII. a. fig. 1), the whole structure being more conspicuous *in situ* than the slender tapering dorsal bristles.

The posterior hooks are short and knife-shaped with a marked curve at the tip (Pl. XII. a. fig. 2), and have oblique striæ throughout.

Another species, which may provisionally be termed *Stylarioides sarsii*, was dredged in the 'Porcupine' Expedition of 1870 off Cape Sagres in 45 fathoms, on July 28th, amidst what was termed a southern fauna. It somewhat resembles *Stylarioides plumosa*, but has a shorter anterior region, fewer segments, more velvety surface, and stiffer dorsal bristles, the

ventral of the third pair forming long stiff straight bristles, whilst the hooks of the fourth pair are short, broad, flattened knives with a curve at the tip. This form of crotchet continues a short distance and passes into a series of longer, rigid, lever-like spines posteriorly.

So far as the two fragments, apparently of the same animal, show, the shape is generally that of the common species, the entire surface being closely villous from clavate papillæ, which are longest on the first three segments, and especially the first, but no sand-grains are visible. The general colour is a kaki-brown, and the segments are more than 20 in number. The papillæ are smaller on the ventral surface, and, as on the dorsum, they are more conspicuous on the anterior segments. The anterior pit for the emission of the oral organs is triangular and resembles in position that of *S. plumosa*. The first foot has long, pale golden, iridescent bristles, which in the preparation pass forward and inward, so that they cross each other toward the tips, which show only a trace of a curve. They and the next two groups are studded with *Loxosomæ*, which extend likewise on the foot at the base and present buds at various stages. In structure the dorsal bristles (Pl. XII. a. fig. 3) have narrow segments at the base and for a long distance outward; then toward the tip the segments increase in length but irregularly, two, three, or four short segments being followed by a longer one, and so on to the delicately tapered tip. In some instances the smaller segments are incomplete, the lines running inward only partially. The ventral of the first set are a little shorter, but show the same structure. The dorsal and ventral bristles of the second and third groups are shorter, and the ventral of the third have increased in strength, forming a stiff fan of rather long bristles which spread upward and inward, so that much of the fan is seen from the ventral surface. They taper from base to apex, and the segments increase gradually in length toward the tip, which is generally abraded, apparently from use in the tunnel in the mud. The fourth foot has slender dorsal bristles, and ventrally a row of stiff flattened hooks (Pl. XII. a. fig. 4) with closely articulated shafts, and broad flattened tips shaped like a hedge-bill with a well-marked hook. Oblique striæ occur as the transverse lines wane. Besides these is a form simply curved like a tapering spatula and having articulations nearly to the tip. The dorsal bristles form somewhat stiff fans directed obliquely forward and upward to the posterior end of the fragment. The ventral hooks, again, remain only for a short distance of the broad knife-shape,

becoming more elongated posteriorly (Pl. XII. *a.* fig. 5), a typical foot there showing about five ringed hooks with a slight curvature of the shaft and ending in a point, generally abraded, and with only a trace of a curvature near the tip. They would thus act as lever-like spines, whilst the anterior crotchets are more fitted for clinging.

The distinctions between *Brada* and *Stylarioides* do not rest on the absence of the frontal bristles as De Quatrefages states, for the first and second pairs of dorsal bristles, though short, are in *Brada* fairly conspicuous. Moreover, one section of the genus, viz. that represented by *Brada villosa*, H. Rathke, leans closely to *Stylarioides*, especially that group with more or less straight ventral bristles, yet they are distinguished by the papillæ between the fourth and fifth bristled segments in *Brada*—even in the elongated type with 45 segments. The setigerous process for the ventral bristles is more distinct in *Brada*, and may show a circlet of papillæ at its base. The palpi and numerous branchiæ characterise *Brada*, as well as *Stylarioides*. In *Brada* the ovaries form dense clusters in the sixth, seventh, and eighth bristled segments and behind the papillæ.

A variety of *Brada villosa*, H. Rathke, was dredged in the 'Porcupine' Expedition of 1870 at Station 8 on the Channel Slope in 257 fathoms, amidst a northern fauna, and it was also dredged in the 'Knight Errant' on the 17th August, 1880, at a depth of 580 fathoms at Station 8. It measures about 2 inches in length, and is distinguished by its hirsute sandy aspect and the shortness and delicacy of its bristles. The anterior end is bluntly rounded and the feeble development of the frontal bristles is, for instance, in contrast with those of *Stylarioides plumosa* and indicates a difference in surroundings, the present form probably inhabiting soft mud in deep water. The anterior pit has a broad arch superiorly, the margin being papillose, whilst the posterior lip is deeply sinuous ventrally, the whole forming a large opening with a broad projecting rim ventrally. In this aperture lie the two crenate and grooved palpi and above them the slender branchiæ. The body is fusiform, tapered anteriorly and more distinctly posteriorly, where it ends in a bluntly conical tail with the anus in the centre. Three diminishing smooth rings occur behind the last segment bearing bristles. The dorsum is rough with long papillæ and sand-grains, which on the ventral surface are smaller, thus rendering the enlarged anterior region smoother, and the same may be said of the posterior half. Both offer a contrast to

the rough dorsal surface. The bristled segments are in the large example 46 in number. The frontal bristles of the first pair are very slender and inconspicuous, and do not extend forward the breadth of the body. They are pale, tapering bristles, with long joints and very fine hair-like tips. The dorsal bristles of the second series are still shorter and equally slender. Those of the third series agree, but the ventral have assumed the characteristic stout shafts and finely tapered translucent tips seen in rest of the body (Pl. XII. a. fig. 6). They arise from a smooth conical setigerous process with long clavate papillæ at the base. The prominence of the ventral division of the foot throughout the body is noteworthy. Between the fourth and fifth segments ventrally is, on each side, a cylindrical or slightly flattened papilla with a smoothly rounded free end, the lower half apparently having a coating of sand-grains. It varies in length in the females, some having long and others short papillæ.

This form has certain resemblances to the *Siphonostomum villosum*, of H. Rathke*, though his examples were small and short, probably incomplete. The special characters of the ventral division of the foot and the somewhat stellate arrangement of the papillæ around each, when viewed on end, generally correspond. Unfortunately he did not enter into the minute structure of the bristles or figure them. Moreover, it agrees closely with *Trophonia arctica*, Hansen †, from a depth of 20 fathoms in Magdalena Bay. He, however, describes the dorsal surface as uniformly granulated, and the papillæ on the ventral surface as fewer and smaller. On the whole, Hansen's form is smoother.

There are apparently two varieties of *Brada villosa*, viz., the shorter northern form and the more elongated type from the 'Knight Errant.' Both have the dense coating of sand-grains which, with the papillæ, make the dorsum remarkably rugose, yet there are considerable differences in the shorter northern forms from Finmark, some of which are much less covered with sand. Both have the ventral papillæ exactly in the same position and of like shape, yet amongst those from Greenland and from Finmark the length of these papillæ varies, some having short, others long papillæ, so that sexual distinctions in this respect may exist. The number of segments in the shorter northern form is about 23, whereas the specimen from the 'Knight Errant' has 45.

* Beiträge zur Fauna Norwegens, p. 215, pl. xi. figs. 11 & 12.

† Norske Nordhavs-Exped. Annel. p. 39, pl. vii. figs. 17-20.

The bristles of the two series agree in structure, though it must be stated that the long example from the 'Knight Errant' has dorsal and ventral bristles of a more slender character than the northern, and they are paler, and further that the papillæ are longer and more slender both dorsally and ventrally. In this specimen also from the 'Knight Errant' a parasitic Infusorial form allied to *Carchesium* projects from the anterior pit.

6. *On the foregoing Families dredged in the Gulf of St. Lawrence, Canada, by Dr. Whiteaves.*

An example of the Sphærodoridæ, viz. an *Ephesia*, offers certain differences from the ordinary British and northern form (not the southern), in so far as it presents a distinctly articulated tip to its bristles, which, besides, have an enlarged end of the shaft with an oblique continuation, as in the Syllidæ, the terminal piece, which tapers to a sharp point, being frequently lost. It thus presents a close resemblance to *Ephesia antarctica**, McL., from the Antarctic Circle, as first procured by the 'Challenger,' and more recently, described by Prof. Ehlers†, by the German exploring-ship 'Valdivia,' though the bristle shows no spikes on the bevelled margin of the end of the shaft—a condition, however, which is very easily altered by friction.

The Chloræmidæ are well represented by good examples of *Stylarioides plumosa*, O. F. M., one of which had a parasitic crustacean attached to a branchia, the elongated body like an ovisac projecting nearly as far as the tips of the branchiæ. A variety dredged in considerable numbers in 125 fathoms off Cape Rosier Lighthouse has a comparatively smooth surface, for the papillæ are very minute and few or no foreign particles are adherent. This form has normal bristles and hooks, whereas another variety with the roughly papillose dorsal and ventral surfaces has longer and more slender ventral crotchets, whilst the dorsal bristles are also somewhat longer, and in this respect it agrees with a similar variety procured by H.M.S. 'Valorous.' Whether the soft reddish mud of the region favours this tendency to a smoother surface of the first-mentioned is unknown, but the condition is noteworthy. In one instance the body is quite pale throughout and has no trace of the fine reddish mud. *Brada*

* Annel. 'Challenger,' p. 361, pl. xlv. fig. 5, and pl. xxii. A. figs. 22 & 23.

† 'Die bodenässigen Anneliden, &c.' p. 107, tab. xiv. figs. 7-13 (1908).

villosa, H. Rathke, likewise occurs, and an example about $\frac{5}{8}$ of an inch in length is so free from sand that the papillæ are clearly visible on the pale yellowish-brown surface. This species shows considerable variety in external appearance, but the bristles and crotchets remain distinctive. The *Trophonia arctica* of Hansen does not appear to differ materially from this form.

The only example of the Chætopteridæ is the widely distributed *Spiochætopterus typicus* of Sars, tubes of which occur in 96 fathoms in Trinity Bay, Saguenay County, as well as a fragmentary form at Station 4, 1872.

7. On the same Families dredged in Norwegian Waters
and in Finmark by Canon Norman.

The rich collections of Canon Norman from northern waters include examples of *Stylarioides plumosa*, O. F. M., off Bergen, Christiania, and other localities, as well as from Finmark, but they are comparatively small in contrast with the British specimens, the finest of which occur between tide-marks. An abundant northern form is *Stylarioides glauca*, Malmgren, and one still more characteristic of Norwegian waters is *Stylarioides flabellata*, Sars, which is found in great beauty. From Finmark come *Brada villosa*, H. Rathke, *Brada granulata*, Malmgren, and another which differs from both. Average examples of *Flabelligera affinis*, Sars, are not uncommon in the Norwegian Fjords.

A species, *Stylarioides hirsuta*, Hansen, dredged at Stations 74 and 84 in Finmark in 1890, appears to correspond closely, so far as can be made out from the brief description and figures, with *Trophonia hirsuta* of Hansen *. The incomplete body is about half an inch in length, somewhat clavate in outline, and with 17 bristled segments. The colour is dull yellowish or ochre, with the clavate papillæ of the first two segments of a reddish brown and forming two rings, whilst a little of the same pigment occurs on the next six or seven feet. The dorsal surface (Pl. XII. fig. 2) is clothed with remarkably long papillæ, so as to be woolly, especially posteriorly. On the ventral surface the papillæ are comparatively short, especially on the dilated anterior region. About 17 bristled segments are present. The first segment is marked by an ellipse of the reddish-brown papillæ and certain much longer pale papillæ, as well as by the somewhat slender and short tufts of golden

* *Op. cit.* p. 38, pl. vii. figs. 5-8.

bristles, which pass forward and slightly upward across each other in the preparation. They taper from the base to the hair-like tip, the former, however, showing a slight constriction near the skin, and they have very distinct and rather long articulations, the aspect being such as would be caused by a bevelled edge at each articulation. The ventral bristles (Pl. XII. *a.* fig. 7) are not half the length of the dorsal series, but they are considerably stiffer, with narrow segments at the slightly contracted base, and very distinct longer articulations beyond these. They taper to an acute point with a faint hook, probably from the mode of preservation. The next six or seven feet have similar bristles both dorsally and ventrally, the former being directed for the most part upward and forward, the latter often outward and slightly backward. The narrower part of the body is especially hirsute from the long papillæ and the long bristles.

The description and figures of Dr. Hansen agree in the main with the foregoing, though there may be some room for doubt. The brownish colour of the ventral bristles is not conspicuous.

Marenzeller is doubtful whether *S. hirsuta* is not a variety of *S. glauca*, and both have four larger and four smaller branchiæ.

Stylarioides normani.

A form (Pl. XII. fig. 3) distinguished by its comparatively small size, nearly cylindrical body, short papillæ somewhat closely covering the dorsum, well-marked feet with papillæ and the ventral bristles of which are only a little shorter and stronger than the dorsal, comes from Station 49, 1890. The body is pale yellow, and under a lens its surface appears to be devoid of sand-grains, but very minute particles of sand and débris are seen under the microscope on the surface of both body and papillæ.

The anterior end is slightly tapered, abruptly truncated anteriorly, and the edge papillose. The bristles of the first series are of moderate length, slender, and pass nearly straight forward. The dorsal bristles of the third series also remain of considerable length and pass upward and forward. The ventral are shorter and stronger, and form a fan nearly transverse in direction. Behind the foregoing the dorsal bristles do not become shorter, whilst the ventral (Pl. XII. *a.* fig. 8) distinctly increase in length and are directed outward and slightly backward. The transverse articulations of the dorsal bristles are characteristically faint. The clavate papillæ of

the dorsal lobe are longer than those of the ventral. The ventral bristles are distinguished by their greater diameter, stiffness, and slightly deeper yellow as transparent objects. Their transverse articulations are much closer proximally than distally, and the tip is very slender. This may be a well-marked variety of the former.

Another member of the family is *Brada granulata*, Malmgren, from Finmark in 1890. This differs from *B. villosa* in its shorter form in proportion to its breadth, in the less developed bristles, the absence of the ventral papillæ, and in the apparent absence of sand-grains, though under a microscope minute grains are numerous. The body is somewhat fusiform, rather blunt at each end, especially anteriorly, the segments clearly outlined and dotted all over with pustule-like papillæ, the ventral not evidently differing from the dorsal surface in this respect. Segments 24, the first having the trifold pit anteriorly and the last a vertical fissure for the vent. The dorsal bristles are only visible after minute inspection, and they are pale, slender, and capillary, few in number, and with long joints. The first series is inconspicuous. On the other hand, the ventral division has a distinct setigerous process surrounded by a rosette of from seven to eight or more of the pustule-like papillæ. The ventral bristles are long and strong, minutely striated transversely, of a deep brownish colour, and ending in a pale yellow tip with a long curve and a hook-like curvature at the tip (Pl. XII. a. fig. 9).

Brada normani.

A form (Pl. XII. fig. 4) having the outline of *Brada granulata* with the anterior pit terminal and of a triradiate form, and with nearly the same number of segments. viz. 24, differs from it in having a surface quite as rough as in *B. villosa*—that is, covered with coarse sandy papillæ. Posteriorly a dimple which extends to both dorsal and ventral edges has the anus in its middle. The papillæ along the line of the dorsal bristles are large, long, flattened, and conical, with an acute tip (Pl. XII. fig. 5), and therefore of a type quite different from the papillæ usually seen in *Stylarioides*, *Brada villosa*, or *B. granulata*. They have an opaque granular and fibrous core, and it tapers in consonance with the outline of the process and ends in a median terminal strand which passes to the narrow and hollow as well as differentiated tip of the organ. Other and smaller twigs appear to branch into the hypoderm at the base of the narrow

terminal region. The translucent vacuolated hypoderm (or other tissue) surrounds this fibrous axis, and its strands occasionally give a quasi-pinnate aspect to the structure. Some of the papillæ have black pigment-grains scattered near the tip and thinly for some distance downward, but they do not seem to have any definite arrangement. Occasionally a short cylindrical mass is extruded at the tip, the distal end having a globular body within a sheath, and the basal having a central tubular connexion with the tip of the papilla. A thin cuticle envelops all, and it is thicker on the narrow terminal part of the papilla. The cylindrical tip is often truncated, the terminal fibres occasionally projecting beyond it. No other termination to the process has yet been observed. Sand-grains adhere to the bases and sides of these organs, the exact nature of which is still *sub judice*. Other papillæ of the ordinary clavate character and coated with sand-particles are also present on the general surface.

The dorsal bristles are few in number, some bundles consisting of two, inconspicuous and slender. They are pale delicate bristles, with closely arranged articulations at the base, somewhat irregular longer ones in the shaft, whilst the joints increase in length toward the finely tapered tip. These bristles are situated close to the ventral series and in the line of the acuminate papillæ. The dark yellow ventral hooks (Pl. XII. a. fig. 10) are of great length and nearly of equal breadth to the commencement of the pale tip, and crossed by closely arranged striæ which are slightly oblique. These disappear toward the translucent tip, which, as it narrows, bends backward, and then, with a bold forward curve, ends in a hook. The great length and linear arrangement of these organs must give them considerable power, especially when their own muscles and those of the remarkably muscular and tough body-wall are considered. The setigerous lobes supporting the ventral bristles are much less distinct than in *B. granulata*, very few presenting the rosette-like arrangement of the papillæ of that form, the ventral division generally being enveloped by the irregular lobate sandy masses projecting from the surface. This does not seem to be the *Brada inhabilis* of H. Rathke.

The question may be raised as to whether this form is not a variety of *Brada granulata*, Malmgren, but the approximation of dorsal and ventral divisions of the foot and the structure of the tip of the ventral hooks, which in some are peculiarly attenuate, almost probe-like, distinguish it. Again, if the flattened papillæ should, on further investigation, be found to be adventitious, then separation would be less necessary.

EXPLANATION OF THE PLATES.

PLATE XII.*

- Fig. 1. *Stylarioides flabellata*, Sars, from the dorsal surface. Enlarged under a lens.
 Fig. 2. *Stylarioides hirsuta*, Hansen, viewed from the dorsal surface. Enlarged.
 Fig. 3. *Stylarioides normani* (an var. *S. hirsuta* ?), sp. n., viewed dorso-laterally, so as to show the length of the bristles. Enlarged under a lens.
 Fig. 4. *Brada normani*. Enlarged.
 Fig. 5. Peculiar papillæ (?) along the line of the dorsal bristles of the foregoing, showing a central fibrillated core and a peculiarly modified tip. The base of a second papilla lies to the left of the figure. $\times 180$ diam.

PLATE XII. a.

- Fig. 1. Ventral bristle of *Stylarioides flabellata*, Sars. $\times 350$ diam.
 Fig. 2. Posterior hook of the same species. Similarly magnified.
 Fig. 3. Basal portion of dorsal bristle of *Stylarioides sarsii*. $\times 350$ diam.
 Fig. 4. Ventral hooks of the fourth foot of the same form. Similarly magnified.
 Fig. 5. Posterior hooks (ventral) of the foregoing form. Similarly magnified.
 Fig. 6. Ventral bristles of the third series of *Brada villosa*, H. Rathke, var. $\times 350$ diam.
 Fig. 7. Ventral bristle of *Stylarioides hirsuta*, Hansen. $\times 350$ diam.
 Fig. 8. Ventral bristle of *Stylarioides normani*. $\times 90$ diam.
 Fig. 9. Ventral hook of *Brada granulata*, Malmgren. $\times 350$ diam.
 Fig. 10. Ventral hook of *Brada normani*, an var. *B. granulata* (?). $\times 350$ diam.

LXXIII.—On a Collection of Bats from Yola, Northern Nigeria, collected by Mr. G. W. Webster. By GUY DOLLMAN, B.A.

THE British Museum owes to the generosity of Mr. G. W. Webster a collection of bats from Northern Nigeria, and, being the first collection received from this region, it proves of very great interest. In addition to some extremely rare bats, it contains one new species, and there can be little doubt that when the Nigerian fauna is thoroughly worked out many other new forms will be discovered.

1. *Eidolon helvum*, Kerr.

♀. 8. Yola.

2. *Hipposideros caffer guineensis*, K. And.

♂. 10, 12, 13. Yola.

These three specimens are all lighter in colour than any

* I am indebted to the Carnegie Trust for figs. 1-4 in this Plate.