On: 05 February 2015, At: 10:52
Publisher: Taylor & Francis
Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK

Annals and Magazine of Natural History: Series 4

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/tnah10

XXVIII.—On a new species of Sagitta from the South Pacific (S. tricuspidata)

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Published online: 19 Oct 2009.

To cite this article: Wm.S. Kent F.Z.S. F.R.M.S. (1870) XXVIII.—On a new species of Sagitta from the South Pacific (S. tricuspidata), Annals and Magazine of Natural History: Series 4, 5:28, 268-272, DOI: 10.1080/00222937008696152

To link to this article: http://dx.doi.org/10.1080/00222937008696152

characters, and has now been found attached to a jaw the surface-ornament of which perfectly accords with that of the above-mentioned remains. However it may be with *Rhizodus*, it would therefore seem impossible not to adopt the conclusion that all these specimens belong to one and the same fish; and the tooth proves that they can have nothing to do with *Rhizodus*. For this fish, then, so characterized, and which seems to us to be generically as well as specifically new, we propose the name *Archichthys sulcidens*.

We must add, before concluding this note, that the teeth of our new fish sometimes measure two and a half inches in length and are upwards of an inch wide at the base, and that upwards of a score of specimens of it have occurred at Newsham. It is therefore pretty certain that they never attain the dimensions of those of *Rhizodus*, from which they can always be distinguished by their rotundity, the total absence of cutting-edges, and the fine striation of the surface, though they are folded at the base in a manner similar to those of that great enigma.

We may also add that thirteen opercular plates have been found, some being quite perfect and in excellent condition. The scales, too, are not by any means rare in the same locality. The remains, then, of this fish being so abundant, the non-occurrence of the large *Rhizodus*-tooth is very significant.

XXVIII.—*On a new Species of* Sagitta *from the South Pacific* (S. tricuspidata). By Wm. S. Kent, F.Z.S., F.R.M.S., of the Geological Department, British Museum.

Some months since, Mr. T. J. Moore, the able Conservator of the Free Public Museum, Liverpool, received from the South Pacific, in company with *Leptocephali* and an infinite number of other oceanic forms (the produce of surface-dredging on the high seas), certain organisms of such a fish-like outward appearance, that they were consigned to the hands of a celebrated ichthyologist for identification. The peculiar armature of their cephalic region plainly indicated, however, that, if fish, they were very aberrant representatives of the class.

The privilege of examining them having been afforded me, the idea at once suggested itself that they belonged to that interesting group, most closely approximating to the Annelida, designated by Professor Huxley the Chætognatha, and of which *Sagitta* constitutes the single genus.

Subsequent investigation substantiated the correctness of the inference primarily arrived at, and at the same time de-

monstrated that this form, while presenting all the characters essential to *Sagitta*, possessed others which seemed to entitle it to be ranked as a species distinct from all those that had been previously described.

The most recent and exhaustive synopsis of this genus is given in the pages of the 'Quarterly Journal of Microscopical Science' for 1856, by Prof. Busk. In this synopsis Mr. Busk gives the characters of seven distinct species; with none of these, however, have I found it possible to associate the form to be here introduced.

This species, for which I shall here propose the name of *Sagitta tricuspidata* (for reasons to be hereafter explained), is of large dimensions, measuring very little short of an inch and a half in its entire length; in regard to size it approaches *S. lyra*, but it is found, on closer comparison, to be very distinct from that species. In *Sagitta lyra* the two pairs of lateral fins are described as being apparently continuous with each other, while at the same time the portions belonging to the anterior set are much larger than those belonging to the posterior ones, and extend far forward. In *S. tricuspidata*, on the other hand, the two pairs of fins are distinctly separate, and the anterior ones do not extend beyond the posterior half of the lateral margin of the animal's body, and are of smaller dimensions than the two hinder ones. In this respect it seems more closely to resemble *Sagitta bipunctata*; but in the armature of the cephalic region, which forms the most striking and important character of this species, it is found to differ essentially, not only from the two species already referred to, but from all *Sagittæ* that have been hitherto described.

In all these this armature is described as consisting of two elements:—in the first place, of an outer series of large curved corneous hooks or "falces," which are transversely movable, and bound the lateral margin of the head on either side; and, in the second place, of an interior set of smaller hooks or "denticles," disposed in two series, one behind the other, on either side of the median line, and immediately in front of the buccal orifice.

In *S. tricuspidata* the large lateral falces are greatly developed, as indicated in the accompanying woodcut; but the interior series or denticles are almost entirely aborted, or, at most, represented in a very rudimentary condition—the only structures in any way homologous to these being, first, three stylate setæ set on a slightly raised prominence situated on either side of the anterior portion of the head (see fig. 2, *a*), and, again, a single solitary seta occupying a position

midway between these and the large lateral falces (fig. 2, *b*); and it is in reference to the first-mentioned of these structural peculiarities that the specific name of *tricuspidata* has been applied to it.

This peculiar armature of the head, just described, is the more easily appreciated when compared with that of *Sagitta bipunctata*, represented in fig. 3, and sharply separates it from that or any other recorded species.

Fig. 1. Fig. 2. Fig. 3.

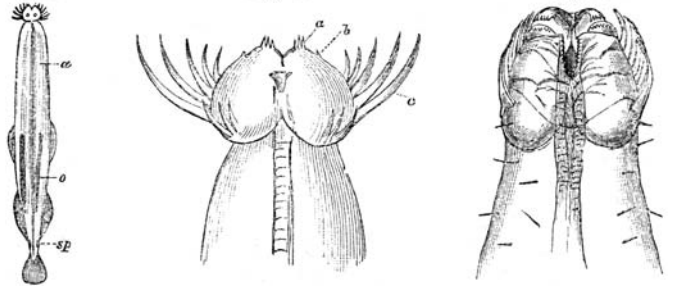

Fig. 1. *Sagitta tricuspidata*, nat. size: *a*, alimentary track; *o*, an ovary; *sp*, orifice of one of the spermatic cavities.

Fig. 2. Head of the same, viewed from beneath, considerably enlarged: *a* & *b*, the modified denticles; *c*, the lateral falces.

Fig. 3. The same region, under like conditions, of *Sagitta bipunctata*. (After Busk.)

In technical language, the characters of this new form may be briefly drawn up as follows:—

Sagitta tricuspidata, sp. nov.

Body long, somewhat stout. Caudal region one-fifth of the length of the entire body, exclusive of the head. Lateral fins distinctly separate from one another; the anterior pair smaller than the posterior. Caudal fin moderately large. Falces bounding the lateral margins of the head, eight in number on either side, those occupying a median position being much the largest. The anterior margin of the head bearing a slight prominence on either side of the median line, and in which are inserted three stylate setæ, a similar solitary seta also occupying a central position on each side between these and the lateral falces.

Entire length of the body 36 millims.; greatest breadth of the same 5 millims.

Habitat. The South Pacific.

The integument of this species, as preserved in spirit, was smooth and very transparent, and appeared to be quite devoid

of the fine setæ scattered over its surface or arranged in fascicles which have been observed in *Sagitta bipunctata* and other allied species; it is possible, however, that these latter were present when the animal was alive, their extreme tenuity and their slender attachment to the surface of the integument rendering them exceedingly liable to become detached. One specimen, when submitted to dissection, exhibited most clearly the peculiar and characteristic nervous system described by Professor Huxley, and which induced that eminent comparative anatomist to refer this aberrant genus to the Annulose section of the Invertebrata, and to consider it most closely allied to the Annelida in that section. This nervous system consists essentially, in the first place, of a single ganglion lying in the abdominal region, from which proceeds both forwards and backwards a pair of lateral chords, the posterior ones terminating separately in fimbriated extremities, and the anterior ones uniting with each other above the œsophagus so as to form an hexagonal cerebral ganglion, which gives off two processes, said by Krohn to terminate in the muscles which effect the motion of the falces, and two others which, passing backwards for a short distance, dilate at their extremities and form the optic ganglia.

The ovaries in the specimens examined were very large and distinct, measuring in one instance one-third of the entire length of the animal's body, and demonstrated moreover that the animal had arrived at its adult condition.

Since Mr. Busk published his monograph of the genus, already referred to, he has also recorded, in the pages of the same journal (1858), the particulars of the development of this interesting genus, as elucidated by the researches of Gegenbaur, but which had previously been involved in much obscurity. That astute naturalist, by confining pregnant individuals of *S. bipunctata* and other species from the Mediterranean in glass receptacles, obtained ova which were found to develope immediately into the adult form without undergoing any metamorphosis. These ova or spawn were enclosed in a common gelatinous investiture, and in this respect likewise showed their affinity to the Annelida rather than to the Mollusca, of which latter class, in the earlier part of their history, the *Sagittæ* had previously been looked upon as aberrant representatives.

Subjected to a high power of the microscope, the edges of the falces of *S. tricuspidata* are found to be perfectly smooth and entire, and this in contradistinction to those of *S. serrato-dentata*, of which the inner edges are described as being serrated for about one-half of their length.

As regards the systematic position and significance of the species here introduced, it would seem, in the modification of its denticles, to indicate a slightly closer relationship to the ordinary forms of the Annelida than the other representatives of the genus, stylate setæ set in elevated prominences being of such general occurrence throughout the *Errantia* and *Tubicola*.

XXIX.—*On the Pairing of Zoospores, the Morphologically Fundamental form of Reproduction in the Vegetable Kingdom.*

By N. Pringsheim*.

The author states that he has previously shown, from observations on some genera of the *Zoosporeæ*, that those reproductive cells which had been considered resting-spores are the female reproductive organs. The male organs in some genera have the form of small bodies more or less differing from the zoospores; in other genera they are so like the zoospores that they appear to be only smaller forms of the latter.

The views thence derived with regard to the multiplication and reproduction of these plants might be assumed to be applicable to all those *Zoosporeæ* in which two forms of zoospores are known, and in which the existence of resting-spores is known or suspected.

But in most genera of Algæ in which zoospores exist, resting-spores have not yet been discovered; and in those genera in which two forms of zoospores are known, it has been assumed that both kinds are of the same nature, and that they germinate without any sexual act. The author has shown that in some genera which have two kinds of zoospores and no resting-spores, the small zoospores, passing into a state of immobility, become themselves resting-spores, and that these resting-spores, produced by the so-called microgonidia, reproduce the mother plant.

These different views must admit of being reconciled, unless it be assumed that essential differences in the mode of increase and reproduction exist in such nearly allied plants. If it be not assumed that all the plants without resting-spores are asexual, it must follow either that their resting-spores remain to be discovered (which is improbable), or that in the *Zoosporeæ*, and in their already known organs, the sexual act takes place in a special manner not yet discriminated. The

* From the 'Monatsbericht of the Royal Academy of Sciences of Berlin, Oct. 1860.