

EXPLANATION OF PLATE XXI.

- Fig. 1. *Halonoproctus ricketti* (p. 209). Lateral view.
 1 a. " " Dorsal view of cephalothorax and abdomen.
 1 b. " " Ventral view of ditto.
 1 c. " " Posterior view of abdomen.
 1 d. " " Eyes.
 2. *Latouchia fossoria* (p. 211). Sternum.
 2 a. " " Eyes.
 3. " *swinhoei* (p. 211). Palp of ♂.
 3 a. " " Anterior view of tarsus and palpal organ.
 4. *Macrothele palpator* (p. 213). Palp of ♂.
 5. " *holsti* (p. 214). Palp of ♂.

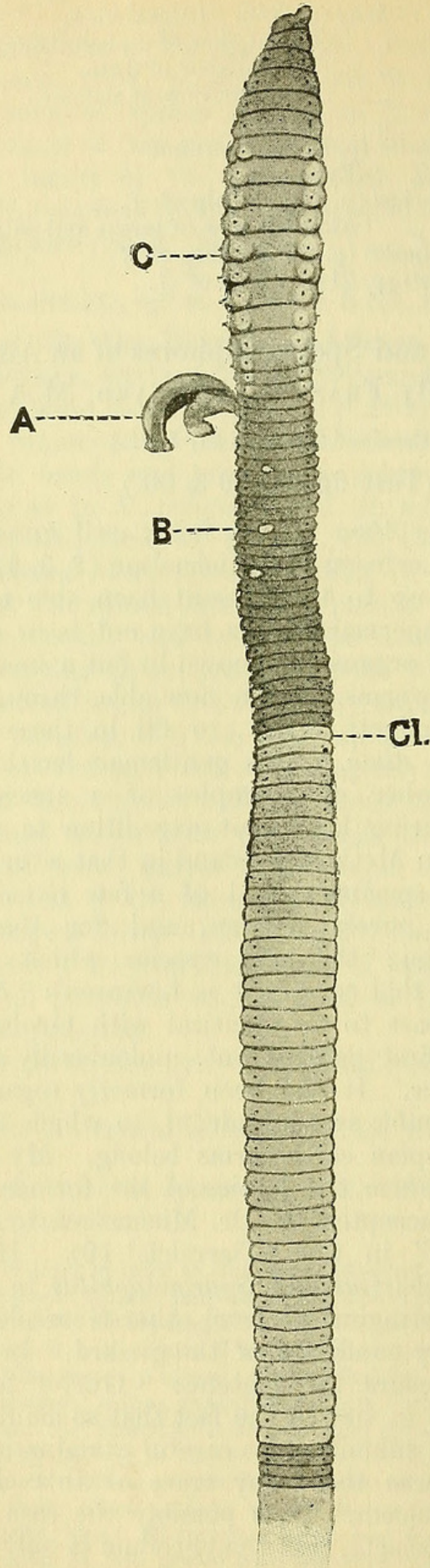
5. On the Clitellum and Spermatophores of an Annelid of the
 Genus *Alma*. By FRANK E. BEDDARD, M.A., F.R.S.

[Received January 31, 1901.]

(Text-figures 59 & 60.)

Although the genus *Alma* is now fairly well known owing to the investigations of Levinsen (1), Michaelsen (2, 3, 4), and myself (5, 6, 7), no one has up to the present been able to detect the clitellum. That the spermatophores have not been found is less surprising, since these organs are known in but a small number of extra-European earthworms. I am now able, through the kindness of Mr. J. S. Budgett, F.Z.S., to fill in these two lacunæ in our knowledge of *Alma*. This gentleman has kindly placed in my hands a number of examples of a species of *Alma* which he collected during his recent expedition to the Gambia. They were gathered on McCarthy Island in that river, and consist of two fully mature specimens and of a few immature worms. The genus itself is purely African, and for the most part "Ethiopian" in range; the only species which reaches the Palearctic portion of that continent is Levinsen's "*Siphonogaster ægyptius*," which appears to be identical with Grube's (8) *Alma nilotica*. It is, as I first pointed out, undoubtedly a member of the family Geoscolicidæ. It had been formerly regarded, though perhaps with some doubt, as an Eudrilid, to which latter family so many of the Ethiopian earthworms belong. My observations upon the clitellum confirm the justice of the former view, which is, indeed, definitely accepted by Dr. Michaelsen in his recently issued "Oligochæten" in the 'Tierreich' (9). He associates it with the genera *Criodrilus* and *Sparganophilus* in a subfamily Criodrilinæ, mainly distinguished from other Geoscoleids by the absence or rudimentary condition of the gizzard. In the generic definition of *Alma* occurs the sentence "Gürtel fehlt (?)," an almost necessary query in view of the fact that so many individuals of the genus had been submitted to careful examination, and that in not a single one was there any trace of this characteristic clitellum of the Oligochæta. It is possibly the case here, as in the aquatic lower Oligochæta, that the clitellum is only periodically developed, and that it is not so continuous a structure as appears

Text-fig. 59.



Anterior end of body of *Alma* sp. inc.
A, penis-like appendages; B, spermatophore; C, glandular thickenings round setæ; Cl., commencement of clitellum.

to be usually the case with full-grown terrestrial forms. And in this connection it should be borne in mind that *Alma* is very largely an aquatic genus itself.

Clitellum.—The Geoscolicidæ agree with the Lumbricidæ, to which they are clearly very closely related, in the fact that the clitellum is often placed very far back in the body. Such a position is especially characteristic of the Madagascar genus *Kynotus*, in four species of which the clitellum commences at the xixth to the xxist segment. There is, however, no Geosolecid where the clitellum commences at a point farther back than the xxiind segment; *Glyphidrilus stuhlmanni* has a clitellum which commences at this segment. On the other hand, in the Lumbricidæ the clitellum is as a rule much farther back than in the Geoscolicidæ, commencing as a rule at a segment between xxii. and xxx. It is to this family that *Alma* shows the greatest likeness. In the specimen before me the clitellum (text-fig. 59, *Cl.*) is exceedingly plain on account of the white and opaque appearance of the integument; the individual segments which are comprised within the clitellum are, however, perfectly distinct, their lines of division not having been obliterated by the glandular modification of the skin. The clitellum does not commence or end at all sharply. The first segment which is fully modified is segment xlvii.; but two or three segments in front of this are slightly invaded by glandular tissue and in an irregular fashion. It is possible therefore that in a more fully mature example the clitellum would be found to have a greater extent than even the very large one which I record here. The last segment of the clitellum which is completely modified is segment lxxxii.; but here again two or three segments after this one are slightly modified. We may regard it as extending from xlv.—lxxxv. The clitellum, where fully developed, is continuous right round the body. This position of the clitellum is, however, much farther back than is the case with the large majority of the Lumbricidæ. There are, indeed, only four species where it commences at or just before the xlth segment. In *Allolobophora robusta* the clitellum extends from xl.—lxii.; in *A. molleri* from xlviii.—lix.; in *A. moebii* from lii.—lxii. *Lumbricus polyphemus* has a clitellum which reaches from xxxix.—xliv. It will be observed therefore that *Alma* is very exceptional in the backward position of this region of the integument, and that in extent coupled with position it is quite unique among earthworms.

Spermatophores.—The existence of these structures can be affirmed for the Lumbricidæ and for *Criodrilus* and *Polytoreutus* alone among the earthworms. As regards the former family, de Ribaucourt has recently added so much to our knowledge of those species among the genera *Lumbricus* and *Allolobophora* which possess spermatophores (10), that his conclusion that their existence will prove to be nearly if not quite universal for the family seems to be reasonable. The spermatophores of *Criodrilus* are much like those of the Lumbricidæ. Those of *Polytoreutus* on the other hand, described by myself, are of a different pattern, and on the whole

more like those of the Tubificidæ, in which family these structures are very general. In the present species of *Alma* the spermatophores (text-fig. 59, B) are dotted about irregularly, but always in front of the clitellar segments. The largest number that I observed were possessed by the most fully mature individual, which had nine of these bodies. They are roundish in outline and very flattened; naturally they are firmly adherent to the integument. These two conditions must be very favourable to an earthworm having to force its way through the ground. It would be difficult to detach the spermatophores—more difficult one might imagine than in many Lumbricidæ, where the cases stand out far from the body. The spermatophores have a thin wall, and the contents are exceedingly striking on account of their chalk-white colour. On a microscopical examination, the contour of the spermatophores is seen to be not perfectly circular; the margins are crenated, the bulgings being due to the abundance of the sperm.

As it is a dangerous proceeding to argue from negative facts, I shall not do more than call attention to the fact that up to the present *Criodrilus*, justly placed by Michaelsen in the immediate neighbourhood of *Alma*, is the only Geoscolecoid in which these structures have been hitherto made known. One matter, however, which may be emphasised is that, on the whole, the spermatophores of *Alma* resemble those of the Lumbricidæ; they are at least more like those of the Lumbricidæ than of other Oligochæta (save of course *Criodrilus*), though possessing distinctive features of their own. Now there has been, since recent discovery, little doubt that among the Lumbricidæ the spermatophores are a product of the tumid lips of the male pore. The suggestion was due to Rosa, who added that in earthworms which copulate in reversed positions the spermatophores are to be found behind the male pores. As a matter of fact this position is by no means constant; and in the species of *Alma* which I describe here they are both in front of and behind the male pores. As, however, *Alma* has no spermathecæ it is clear that the spermatophores cannot be a product of the spermathecæ as has been held; there are, however (see below), tubercula pubertatis which might by their presence confirm the theory of origin for the spermatophores propounded by Fraisse. The flatness and slightly protruding spermatophores of this species are in accord with the very slightly prominent male pores. It seems to be hardly a question now but that the spermatophores are formed by the glandular cells which accompany the external orifice of the sperm-duct.

Some other Anatomical Features.—I was myself disposed at one time to think that but one species of the genus *Alma* had been properly defined. I am now of the opinion of Michaelsen, expressed in his latest work (9), that four forms can be recognized. These species all come from different parts of Africa, with the exception of *A. emini* and *A. stuhlmanni*, which are associated together at Bukoba, Lake Victoria Nyanza. As the species which I describe here was obtained from a locality about fifteen hundred

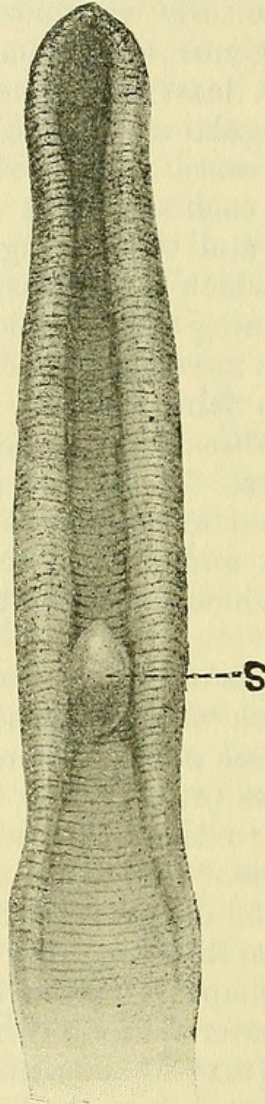
miles away from the locality which produced *A. millsoni*, there is a *prima facie* possibility of its being distinct from that form.

The general aspect is illustrated in the accompanying figure (text-fig. 59, A), and is like that of other species of *Alma*. The "penial processes" are not especially long, measuring as they do about 10 mm. as against a total body-length of 125 mm. These measurements are in all probability fairly accurate; for, though the worms were not in a very excellent state of preservation, they were, as it appeared to me, not unduly softened and presented no appearances of having been pulled out in the course of preparation or of subsequent handling. The square shape of the body both in front of the clitellum and posteriorly was quite well shown, a condition so characteristic of this genus, as of some others (e. g. *Allurus*, *Glyphidrilus*) which are at least sometimes aquatic in habit. To the corners of the quadrangular contour corresponded the pairs of setæ which in the present worm are not closely applied to each other. Throughout the body each seta is at some little distance from its fellow of the couple; and this arrangement persists unaltered to the end of the body, which is the case in *A. millsoni*, but not in any other of the remaining three species of the genus. In *A. millsoni*, however, the setæ are ornamented at the tip. In the present species I did detect a faint trace of ornamentation of the same nature as that of *A. millsoni*, where are denticulate ridges covering the free end of the setæ. The red colour of the setæ which I have referred to in *A. millsoni* was apparent at the imbedded end of the seta, where it is thick and squarely cut off. This end was quite red in several setæ which I noted, the red coloration was not always thus obvious.

The penial appendages of the present species differ at least from those of *A. millsoni* with which I have been able to compare them. They are more like those of *A. stuhlmanni*. In contrast to those of *A. millsoni*, the penes (as they may be termed in the absence of precise knowledge as to their functions and since they bear the male orifice) of the present species are not flattened and riband-like organs, but plumper and deeply excavated on the ventral surface; so deep is the excavation that the process, when viewed from below, is quite boat-like in shape. At the free extremity of the organ the depth is much greater than elsewhere; the part of the penis attached to the body (text-fig. 60), and for a little distance away from this as far as just before the first sucker, is not excavated, but quite flat though still fairly thick. This seems to show that the hollowing out of the organ is not a matter of unequal contraction, but is a real difference serving to differentiate the species at least from *A. millsoni*. Nothing of the kind is to be seen in Michaelsen's figures of *A. stuhlmanni* and of *A. emini*; but Levinsen figures the penes of *A. nilotica* as something like those of the present species. The attachment of the penes to the body-wall appears to present features of difference which may serve to assist in the discrimination of the species. In *A. millsoni*, as I have been able to assure myself by a re-examination of several

specimens, the penes are attached to the ventral surface of both the xviiith and the xixth segments. In the present worm they are as clearly attached to the ventral surface of segments xviii., xix., and xx. This can be ascertained by the presence of lateral couples of setæ corresponding to the ventral area, which is devoid of setæ. There are three pairs on each side, the ventral setæ being missing or probably transferred to the penis, which is simply a pulled-out region of the ventral body-wall.

Text-fig. 60.



Penis-like appendage of *Alma* sp. inc.

S, sucker.

On the ventral surface of the penis are two suckers, which are quite conspicuous. The first is near to the base of the organ, the second at the opposite extremity at the bottom of the deep pit in which the penis ends. There were no suckers in intermediate positions such as are possessed by *A. millsoni*. In the arrangement of these suckers the present species seems to come near to

A. stuhlmanni. The whole organ is very vascular; there are a pair of strong longitudinally running blood-vessels whose cut ends in a specimen from which the two penes were removed were exceedingly obvious. Besides this there is a rich network of capillaries pervading the organ; and there are rich tufts of capillaries penetrating within the epidermis itself. There is thus quite a possibility of the organ serving, as was suggested by Levinsen, a respiratory function. The vascularity of the organ appeared to me to be more marked than in *A. millsoni*. In the latter species, it may be remarked, the penes are much thinner than in the present species. The penes bear setæ which are apparently limited in number to two pairs, as was occasionally found by Michaelsen in *A. stuhlmanni*. The setæ are rather slighter than those of the body generally and end in a fine point. They are nearly straight, and I could not detect any ornamentation. They are not unlike those of *A. stuhlmanni*.

The setæ of segments ix., x., xi., and some of the neighbouring segments to a less extent, are implanted in very conspicuous papillæ, which may possibly play the part of tubercula pubertatis. They are shown in the accompanying drawing (text-fig. 59, C).

I have given a somewhat full description of certain of the external characters of this species, in order to justify my conclusion that it probably belongs to Michaelsen's species *Alma stuhlmanni*. That a West and an East African form should prove to be identical is a little surprising; but less so when it is reflected that this genus *Alma* is at least largely aquatic. I can see at present no grounds for separating the two. The only point of difference which occurred to me is that in *A. stuhlmanni* the genital setæ are much smaller in proportion to the ordinary body-setæ than they are in the worms from McCarthy Island. Until the clitellum of the former is known, one cannot be quite certain. The internal anatomy could not be satisfactorily investigated owing to the condition of the specimens.

I have at least shown that the subject of the present communication cannot be the same as *Alma millsoni* from West Africa.

List of Memoirs referred to.

- (1) LEVINSEN.—“Om to nye Regnormslægter fra Ægypten.” Vidensk. Medd. Kjöbn. 1889, p. 31.
- (2) MICHAELSEN.—“Beschreibung der von Herrn Dr. Fr. Stuhlmann am Victoria Nyanza gesammelten Terricolen.” JB. Hamb. wiss. Anst. ix. 2, p. 8.
- (3) MICHAELSEN.—“Zur Kenntnis der Oligochæten.” Abhandl. Geb. Naturwiss. xiii. p. 7.
- (4) MICHAELSEN.—Die Regenwürmer Ost-Afrikas, in Deutsch-Ost-Afrika, ix. 1896, p. 4.
- (5) BEDDARD.—“On an Earthworm of the Genus *Siphonogaster* from West Africa.” Proc. Zool. Soc. 1891, p. 48.

- (6) BEDDARD.—“Two new Genera and some new Species of Earthworms.” *Quart. Journ. Micr. Sci.* xxxiv. p. 271.
- (7) BEDDARD.—*A Monograph of the Oligochæta.* Oxford, 1895.
- (8) GRUBE.—*Arch. f. Naturg.* 1855, p. 129.
- (9) MICHAELSEN.—*Das Tierreich*, 10th Lief., Oligochæten, 1900, p. 465.
- (10) DE RIBAU COURT.—*Etude sur la Faune Lombricide de la Suisse*, 1896.

March 19, 1901.

Dr. HENRY WOODWARD, F.R.S., Vice-President, in the Chair.

Mr. Sclater exhibited and made remarks on some specimens of Mammals from Uganda recently received from Sir Harry Johnston, K.C.B., who had written to call his special attention to these objects.

The principal specimen was a complete skin and skull of the Chimpanzee of Eastern Africa, concerning which Sir Harry had written to Mr. Sclater as follows :—

“Entebbe, Uganda,
Oct. 18, 1900.

“I have at last succeeded in getting a Chimpanzee from the Uganda Protectorate. I had long heard from the natives that this ape was found in Unyoro and Toru; but although I visited several forests in company with Doggett we never succeeded in getting specimens, though we occasionally thought we heard this animal's peculiar cries. At last, however, the natives succeeded in capturing one . . . a nearly full-grown female . . . which they sent on to me at Entebbe soon after my return here. The animal arrived alive. It was of immense strength and rather savage. After it had been taken out of its temporary cage and had been secured by means of thick wire collars and a heavy chain, it nevertheless managed to wrench itself free and escaped into a tree. There was no time for sentiment, and so I had the animal shot then and there. We have photographed it, and I am now sending you its skin and bones. The animal looks to me slightly different to the West Coast Chimpanzee, the difference being in the much reduced size of the canines (even though it be a female), the larger size of the middle incisors, and the length of the face. The colour of the bare skin of the face and nose when the animal was living was a dark purple-brown, which faded to a dirty yellow after death. It was certainly much darker-skinned when living than the average West Coast Chimpanzee.

“The locality where this animal was obtained is the central or eastern part of the Toru District, about 30 miles east of Ruwenzori, on the Durra River, a small stream which flows into the north end of Lake Ruisamba. Lake Ruisamba is connected with Lake Albert Edward. I have visited the locality where this Chim-

panzee was subsequently captured, and thought I heard the Chimpanzee's cries. It is a dense bit of tropical forest, which, with a few breaks, extends from north to south down the Toru District. This forest is not directly connected either with Ruwenzori or with the Congo Forest. There are wide stretches of grass-covered country between them.

"The Chimpanzee is said by the natives to inhabit the now discontinuous patches of forest which extend from northern Unyoro through Toru into the northern part of Ankole. The Baganda say that at one time the Chimpanzee was found in Busoga and in other forested regions of Uganda, and they have a special name for the animal in their language. If this is true (and I see no reason to doubt it), it would bring the known range of this anthropoid ape a little nearer to the east."

Mr. Sclater remarked that the occurrence of a form of Chimpanzee in Africa as far west as the western shore of Lake Tanganyika had been known since the days of Livingstone, but that, so far as he was aware, this was the first example of the skin and skull that had reached this country.

Other specimens sent to Mr. Sclater by Sir Harry Johnston were flat native skins of the black-and-white *Colobus* which inhabits Ruwenzori, and flat native skins of two Antelopes, which probably belonged to undescribed species. One of the latter was stated by Sir Harry to belong to the genus *Cobus*, and to have been obtained in the Semliki valley north of Lake Albert Edward; the other was a *Cephalophus* of the group of *C. natalensis*, of which the exact locality was not stated.

Mr. Sclater laid on the table a small case of Lepidoptera collected in St. Lucia, West Indies, by Major A. H. Cowie, R.E., F.Z.S. As there appeared to be no published article on the Lepidoptera of this island, Mr. Sclater thought it worth while to record the names of the species, which had been kindly determined for him by Miss E. Sharpe. The following is a list of the species:—

(RHOPALOCERA.)

- | | |
|---|---------------------------------------|
| 1. <i>Colænis delita</i> (Fabr.). | 10. <i>Aganisthos orion</i> (Fabr.). |
| 2. <i>Dione vanillæ</i> (Linn.). | 11. <i>Terias venusta</i> Boisd. |
| 3. <i>Dione juno</i> (Cram.). | 12. <i>Pieris phileta</i> (Fabr.). |
| 4. <i>Pyrameis cardui</i> (Linn.). | 13. <i>Phæbis agrithe</i> Boisd. |
| 5. <i>Junonia genoveva</i> (Cram.). | 14. <i>Callidryas drya</i> (Fabr.). |
| 6. <i>Anartia iatrophæ</i> (Linn.). | 15. <i>Rhabdodryas trite</i> (Linn.). |
| 7. <i>Marpesia peleus</i> (Sulz.). | 16. <i>Aphrissa statira</i> (Cram.). |
| 8. <i>Cymatogramma dominicana</i>
Godm. et Salv. | 17. <i>Papilio xenodamas</i> Hübn. |
| 9. <i>Hypolimnas misippus</i> (Linn.). | 18. <i>Papilio lycophron</i> Hübn. |

(HETEROCERA.)

- | | |
|--------------------------------|---------------------------------|
| 1. <i>Letis mycerina</i> Cram. | 2. <i>Erebus odoratus</i> Linn. |
|--------------------------------|---------------------------------|

Mr. W. B. Tegetmeier, F.Z.S. (at the request of Mr. Rowland Ward, F.Z.S.), exhibited the mounted head and horns of a Sable Antelope (*Hippotragus niger*), the largest on record, the length of the horns on the outer curve being $50\frac{7}{8}$ inches, the girth at the base $9\frac{1}{2}$ inches, and the width between the tips $18\frac{1}{4}$ inches. They had been obtained by Mr. F. V. Worthington in Barotseland, South Africa.

A communication was read from Dr. G. Stewardson Brady, C.M.Z.S., which contained descriptions of a collection of Ostracoda belonging to the Zoological Museum of Copenhagen, most of the species represented in it being new to science. The collection was very varied in character, embracing examples of both marine and freshwater species from widely different localities. A new species belonging to the group *Halocypridæ*, from a North Atlantic Plankton collection, made by Dr. George Murray, F.R.S., was also described in this paper.

This memoir will be printed in full in the Society's 'Transactions.'

The following papers were read:—

1. On the Hymenoptera collected in New Britain by Dr. Arthur Willey. By P. CAMERON¹.

[Received March 4, 1901.]

The Hymenoptera brought back from New Britain by Dr. Arthur Willey are, with the exception of the *Melipona*, all large or medium-sized species. Judging from them, I should say that the islands are likely to prove rich in species. The collection is not extensive enough to enable me to form a definite opinion on the geographical relationship of the Hymenopterous fauna of the island. If it were not for the presence of a species of *Thynnus*², a typical Australian form, I should have said that the affinities of these insects were certainly with the Oriental Zoological Region rather than with the Australian, and, in the main, this is probably the case.

In view of the somewhat fragmentary character of the collection, I have not thought it worth while to draw up, at present, a list of the previously recorded species of New Britain, but have enumerated all those represented in the collection submitted to me.

The specimens were mostly collected in the Gazelle Peninsula, which is the part now known, I believe, as New Pomerania. New Britain itself is now included in the Bismarck Archipelago by German geographers.

¹ Communicated by Dr. D. SHARP, F.Z.S.

² *Thynnus serriger*, Sharp, Willey's 'Zoological Results,' part iv. p. 388.



Beddard, Frank E. 1901. "On the Clitellum and Spermatophores of an Annelid of the Genus *Alma*." *Proceedings of the Zoological Society of London* 1901, 215–224. <https://doi.org/10.1111/j.1469-7998.1901.tb08541.x>.

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