

ANTICOMA :

A GENUS OF FREE-LIVING MARINE NEMATODES.

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The first carefully described *Anticoma* was taken by Eberth from the Mediterranean Sea, and it figured in that author's "Untersuchungen über Nematoden" as *Odontobius acuminatus*. Seemingly by a misprint, the neck was stated to be one-third as long as the body. This led Bastian, who was the next naturalist to discover one of these worms, and the first to realise their proper systematic position, to describe as a species distinct from Eberth's, *Anticoma limalis*. Nevertheless Bastian's *limalis* was doubtless identical with Eberth's *Odontobius acuminatus*, as Bütschli has already suggested. Bastian saw the necessity of creating a new genus for his species, and therefore originated the name *Anticoma*. Living with his *Anticoma limalis* Bastian found another worm, to which he gave the name *Anticoma pellucida*. This latter did not differ in proportions from *limalis*, nor much in size. Bastian failed however to discover in it the ventral gland, and this, together with the fact that he failed also to see the pectoral hairs in *limalis*, was doubtless his reason for describing it as a separate species. I think there can be no doubt that it was specifically identical with *limalis*. Bütschli, who afterwards found *limalis* at Kiel, pointed out the position and number of the pectoral hairs, and his figure shows these hairs exactly as given in Bastian's figure for *pellucida*.

The next naturalist to find an *Anticoma* was Villot, but neither Villot's descriptions nor his figures are adequate for the determination of the species which he observed. He saw Bastian's *limalis*, and mentions under the head of *Anticoma* two other species, one of which is certainly not a member of that genus, and the other possibly not.

Later, De Man found an *Anticoma* at Naples which he described and figured under the specific name *tyrrhenica*, remarking that the difference between it and Eberth's *O. acuminatus* might not be very important. There is reason to believe that the worm which De Man had before him was in reality the same that Eberth had described. Eberth's *acuminatus*, i.e. Bastian's *limalis* and *pellucida*, is one of the commonest species along the coast at Naples. During a somewhat careful examination of thousands of free-living Nematodes collected at Naples during the autumn and winter of 1888-9 the writer has as yet observed but a single species of *Anticoma*, namely, Bastian's *limalis*. De Man's specimen measured 1.3 mm. *Anticoma limalis* sometimes, but not often, comes to maturity at that size. These facts, together with the general accord among the figures of Eberth, Bastian, Bütschli and De Man, and the latter's own remarks on *tyrrhenica*, lead me to believe that, up to 1878, the species first discovered by Eberth had been described under four different specific names,—*acuminatus*, *limalis*, *pellucida* and *tyrrhenica*,—and I suggest that henceforth all these names be regarded as synonymous. The species becomes then *Anticoma acuminata*, Eberth (Syn. *A. limalis*, Bast., *A. pellucida*, Bast., *A. tyrrhenica*, D.M.).

Only two other species of *Anticoma* have been described, namely, *A. Eberthi*, Bast., and *A. leptura*, Marion. I here add to the genus its fourth species under the name *A. typica*.

ANTICOMA, Bastian.

A genus of marine Nematodes having the average formulæ $\frac{.2}{7} \frac{10.3}{2} \frac{19.8}{2.7} \frac{46^{38}}{3.2} \frac{89.5}{1.6} 3$ mm. and $\frac{.2}{8} \frac{16.8}{2} \frac{20}{2.6} \frac{M^{30}}{3.1} \frac{90.2}{1.8} 2.6$ mm. Hairs so small as generally to escape notice occur on the cuticula throughout the length of the worm. On the lateral lines, however, and sometimes on others of the six main lines, occur, near the head, longitudinal rows of closely approximated and innervated *pectoral hairs*, which will be rarely overlooked by the careful observer. From the position of these peculiar hairs the genus takes its name. There are ten cephalic setæ; one dorsal, one ventral, and a pair on each

of the four submedian lines. The cuticula is not striated. Lateral organs in the form of slits occur close behind the cephalic setæ. When the head is viewed dorso-ventrally, these openings, which are ordinarily invisible or at most barely glimpsed as transverse lines one-fourth as long as the head is wide, come clearly into view as two narrow passages leading inward and backward. A unicellular ventral gland is present in all the species. Near the nerve-ring, which encircles the œsophagus squarely and is about as wide as the œsophagus at the point encircled, lie six longitudinal masses of nerve-cells, of which the four larger are submedian and the two smaller median. All the known species are eyeless. The pharynx is a mere shallow conoid depression surrounded by three rudimentary lips, which rarely bear papillæ. The œsophagus is conoid and terminates in an obscure cardia, which barely penetrates the thin-walled intestine. The cardiac collum is shallow but distinct. The rectum is equal in length to the anal diameter. The tail is conoid in its anterior part, while the remainder—more than half—is slender and narrowly conoid to the slightly swollen ellipsoidal terminus, which bears a conical outlet for the caudal glands. The lateral fields are usually inconspicuous. The reflexed portions of the two symmetrically-placed ovaries, contrary to the general rule, are nearly cylindrical. Both before and behind the vulva occur unicellular glands. The eggs do not begin segmentation until after being deposited. The male possesses no bursa and none but inconspicuous papillæ. Certain anal hairs, so small that they are readily overlooked, probably serve as male papillæ. A sigmoid, tubular and chitinous accessory organ occurs in the ventral region just in front of the two equal spicula. The anterior straight testicle, directed forward, is invariably somewhat larger than the posterior one, which is also directed forward and presents the peculiarity in most of the species of being reflexed near its free extremity. Of the two testicles, the anterior is connected with the vas deferens by the longer duct. The ductus ejaculatorius is narrow and composed of two rows of cells. The numerous spermatozoa are more or less elongated and each possesses an elongated nucleus. The species live among algæ, and are probably

herbivorous. Now and then diatoms are seen in the alimentary canal.

KEY.

- Porus near the nerve-ring..... 1. *typica*.
 Porus about half way between the nerve-ring and
 head 2. *Eberthi*.
 Porus near the head.
 Pectoral hairs lateral only, few (five)..... 3 *acuminata*.
 Pectoral hairs median (?) and submedian,
 numerous..... 4. *leptura*.

1. *A. typica*, n.sp. $\frac{0}{5}$ $\frac{10.5}{2}$ $\frac{20.3}{2.5}$ $\frac{48.28}{3.2}$ $\frac{86.5}{1.8}$ 137 mm. This is a homocephalous species which may almost be said to be devoid of a pharynx. The neck is slightly convex-conoid, especially in front of the pectoral hairs, which occur in two opposite lateral sets of four each at one-fourth the distance from the mouth to the nerve-ring. The cephalic setæ stand out half way between the anterior extremity and the lateral organs, the latter being a little in front of half way between the anterior extremity and the pectoral hairs. All these particulars are shown in the upper right figure in the adjacent illustration. The œsophagus is about one-third as wide as the neck, except in the posterior third where it gradually becomes one-half as wide as the neck. The tessellated intestine becomes at once two-thirds to three-fourths as wide as the body and is found to be composed of cells of which about fifteen side by side make up the circumference. The ellipsoidal or oblong unicellular ventral gland (as long as the body is wide) is situated just in front of the cardiac collum, and presents the peculiarity of being reflexed and extending forward from the point of juncture with its duct. This latter meanders with somewhat irregular width to the

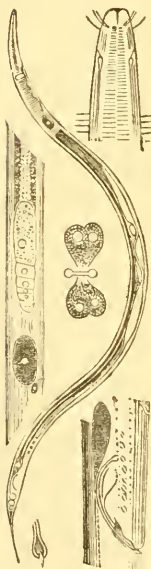


FIG. 1. *Anticoma typica*.

rather conspicuous ampulla, situated just in front of the nerve-ring. Here the excretions find exit through the porus, which is connected with the ampulla by a very short chitinous tube. The ventral gland and its duct are shown black in the illustration. The lateral fields are very inconspicuous, at least in specimens prepared in balsam. Concerning the number of caudal glands I am uncertain. Near the anus, sometimes in front of it (males) and sometimes behind it (females), occurs a unicellular caudal gland of large dimensions, characterised by staining strongly in carmine. I believe there are other caudal glands (probably two), but am unable to give details either as to position or structure. The ovaries extend one-half to two-thirds the way back to the inconspicuous vulva, and are nearly as wide at their blind extremities as elsewhere. The eggs are a trifle longer than the body is wide, and one-half as wide as long. It is rare, according to my observations, to find more than one egg in the uteri, the two ovaries apparently maturing the eggs alternately. (See the left-hand figure in illustration 1.)

$\frac{.0}{.6} \frac{11.4}{21} \frac{21}{24} \frac{.5M^{23}}{28} \frac{87.4}{23} 1.3 \text{ mm.}$ The tail of the male closely resembles that of the female. The uniformly arcuate spicula are twice as long as the anal diameter, and when in action are guided by two enveloping accessory pieces nearly half as long. A casual glance at the spicula would leave the impression that they were of nearly uniform size throughout, but careful study shows the proximal halves to be enlarged. The single small ventral accessory organ is placed in front of the anus at a distance one and one-third times greater than the length of the spicula. (Consult the lower right-hand figure in illustration 1.)

The details of the male generative apparatus are set forth in the illustrations on the following page. Both testicles extend forward, only the blind extremity of the smaller posterior testicle being reflexed. Each empties by means of a narrow duct (necessarily much longer for the anterior one than for the posterior) into the vas deferens. This latter is connected with the exterior by means of a long and slender ductus ejaculatorius, composed of two rows

of cells. In the illustration the development of the spermatozoa is shown by means of the three small figures placed to the left of



FIG. 2. *Anticoma typica*.

♂ Sexual apparatus.

the anterior testicle, each phase of the development being placed opposite the portion of the testicle in which it occurs. The first definite arrangement noticeable in the protoplasm of the blind end of the testicle is a grouping together into spherical masses of certain minute bodies whose number and position are discoverable only through their nuclei. In this stage there seems to be no cell wall. In the second stage each of these agglomerations appears surrounded by a cell wall. Each nucleus now becomes elongated, and all arrange themselves in a radial direction, after which the single multinucleated cell splits up into somewhat pyriform spermatozoa, each possessed of one elongated nucleus. One of these latter is represented in the largest of the three small figures. Illustrations of the histological details of the vas deferens and ductus ejaculatorius are placed opposite those organs in Fig. 2.

Habitat.—Both sexes of this species were found to be common among algae on the coasts of the Island of Ceylon in the winter.

2. *A. Eberthi*, Bast. $\frac{1}{5}$ 6.7 $\frac{12.5}{1.3}$ $\frac{40}{1.8}$ $\frac{95.6}{2.4}$ $\frac{1}{1}$ 6.35 mm. The slightly convex-conoid neck is surmounted by an expanded lip-region. There are at least six cephalic setae. Five pectoral hairs occur on either lateral line just behind the pharyngeal region. The junction of the conoid oesophagus with the tessellated intestine is marked by a shallow but distinct cardiac collum. The rectum is only one-half as long as the anal diameter. The excretory pore is situated 3.6% of the length of the animal from the anterior extremity. The tail is concave-conoid to the slightly swollen ellipsoidal terminus, which is about one-fourth as great in diameter as the base of the tail. Bastian observed two anal glands.

$\frac{1}{5} \frac{6.7}{1.3} \frac{12.5}{1.8} \frac{M}{2.5} \frac{96.2}{1} 5.1 \text{ mm.}$ The tail is somewhat irregularly conoid to near the middle; thence to the slightly swollen terminus it is uniformly as wide as the spicula. These latter are nearly half as long as the tail, and are arcuate, particularly in the distal part. They diminish uniformly in size from the scarcely contrasted proximæ to the acute distal extremities, and are said to be destitute of accessory pieces. The supplementary ventral organ is one-fourth as long as the spicula and is situated in front of the anus at a distance from it equal to the length of the tail.

Habitat.—Roots of coralline, coast of England.

3. *A. acuminata*, Eberth. The following formulæ and descriptions are made up from the notes of Bastian, Bütschli and De Man, with the aid of my Naples material. Bastian observed neither the pectoral hairs of his *limalis*, nor the porus of his *pellucida*, and thus made out two species from specimens belonging in reality to but one,—the one already described by Eberth under the name *Odontobius acuminatus*. De Man's *tyrrhenica* is no doubt a small *acuminata*.

$\frac{2}{6} \frac{9}{2} \frac{20.6}{2.8} \frac{46^{28}}{3.3} \frac{89}{1.7} 2.3 \text{ mm.}$ This is a slightly heterocephalous species, with a small pharynx ending nearly opposite the cephalic setæ. The neck is nearly conoid. The head is rounded in front, and is set off by an almost imperceptible constriction just behind the cephalic setæ. Three lips, without papillæ, are barely distinguishable. A longitudinal row of five closely approximated pectoral hairs is found on either lateral line at a distance from the mouth one-sixth as great as that of the nerve-ring from the mouth. The lateral organs are situated half way between the cephalic setæ and the porus. The conoid cesophagus is one-half to two-thirds as wide as the neck, and a distinct cardiac collum marks its junction with the intestine. The thin wall of the tessellated intestine is composed of a single layer of cells of such a size that seventeen side by side make up the circumference. The unicellular ventral gland is situated just in front of the cardiac collum and is not reflexed as in *Anticoma typica*. It empties by means of a rather wide duct

and a somewhat wider ampulla through a ventral porus situated half way between the mouth and the pectoral hairs (*i.e.* at 8%). The lateral fields are one-third as wide as the body; the median fields are much narrower. The tail is convex-conoid to near the middle, where it is one-fourth to one-fifth as wide as at the anus; thence it narrows gradually to the ellipsoidal and slightly swollen terminus, which gives exit to the secretions of the caudal glands,—in other words the tail is almost exactly like that of *Anticoma typica*. The slightly projecting vulva is accompanied by four unicellular glands, of which two lie in front of it and two behind it. One to three rather thick-shelled eggs, two-thirds as wide as the body and about twice as long as wide, are usually to be found in the uteri. The ovaries reach one-half to two-thirds the way back to the vulva. Next the uteri, the developing ova, of which there are often twenty in each ovary, lie in single file, but farther back (especially near the blind extremities) they are arranged in several parallel rows.

$\frac{.2}{.6} \frac{10.2}{2.1} \frac{21.1}{2.8} \frac{.31^{26}}{3.2} \frac{88.8}{2.1} 1.9 \text{ mm.}$ The tail of the male is much like that of the female. The remarks concerning the anal glands of *Anticoma typica* apply also to this. The testicles also are arranged much as in *A. typica*, and all the remarks made on the histology of these organs in the description of that species may be understood to be repeated here. The spicula are arcuate throughout, though less distinctly so near the middle, and are twice as long as the anal diameter. Unless carefully examined they appear to be of nearly uniform size throughout. In reality they are much larger in the proximal part. The proximæ are not cephalated. The enveloping accessory pieces are inconspicuous. Oblique copulatory muscles occur in the region occupied by the organs of copulation. The ventral supplementary organ is situated a little in front of the spicula and is about one fourth as long as these latter. Opposite the spicula occur four pairs of equidistant submedian hairs, and considerably behind the anus occur two pairs of hairs also submedian.

Synonyms: *A. limalis*, Bast., *A. pellucida*, Bast., *A. tyrrhenica*, De Man.

Habitat.—This species is very common among algæ on the coasts of the European branches of the Atlantic Ocean.

4. *A. leptura*, Marion. $\frac{5}{1.4} \frac{14.8}{2.7} \frac{25.6}{3.5} \frac{50^{.50}}{4} \frac{86.8}{1.8}$ 2 mm. The pectoral hairs are grouped in six rows, four of the rows being submedian and two median. These rows, each about as long as the head is wide, and each consisting of about a dozen closely approximated hairs, are situated on the anterior part of the conoid neck somewhat behind the porus, the median rows growing a little farther back than the submedian. Six (?) long and slender setæ occur on the head. Each of the three (?) lips is surmounted by a large conical papilla. The conoid œsophagus is one-third to two-fifths as wide as the neck and passes the food on to an intestine three-fourths as wide as the body. The excretory pore occurs at 2.5 per cent. The tail is conoid to the slightly swollen ellipsoidal terminus, which gives exit to the secretions of the caudal glands. The lips of the vulva project slightly. The ovaries extend two-thirds the distance back to the vulva, and near their blind extremities are packed with developing ova arranged in several parallel rows. The uteri commonly contain two or three unsegmented eggs as long as the body is wide and less than twice as long as wide.

$\frac{5}{1.4} \frac{14.8}{2.7} \frac{25.6}{3.5} \frac{M}{4} \frac{88.8(?) }{1.8}$ 2 mm. The linear (?) spicula are arcuate in the distal third and present bifurcated proximæ. The short accessory pieces surround the spicula near the anus. The presence of a supplementary organ has not been noted.

Habitat.—Rocks, Pharo, coast of France. Common in February.

EXPLANATION OF FIGURES.

Fig. 1.—*Anticoma typica*. The ♂ is shown in full, $\times 65$: anteriorly are seen the œsophagus (grey), the nerve-ring (white) and the ventral gland (black); through the middle, the intestine (dark) and the sexual organs (light). The upper right-hand figure shows the head in dorso-ventral view, $\times 450$. The lower right-hand figure shows the anal region, $\times 350$: to be seen are the

spiculæ, their accessory pieces, a caudal gland and, higher up, the small sigmoid accessory organ. The form of the end of the tail is illustrated by the smallest of the figures; $\times 350$. A portion of a ♀ is shown at the left, $\times 120$: one half the sexual organs and a portion of the tessellated intestine are shown; an egg lies near the inconspicuous vulva, and this last, with the four adjacent glands, is shown in ventral view in the only remaining figure, $\times 200$.

Fig. 2.—♂ organs of *A. typica*. To the right the entire apparatus, $\times 150$: to be seen are the anterior straight testicle, the posterior testicle with reflexed extremity, the vas deferens (grey), and the long narrow ductus ejaculatorius ending below between the two spiculæ and accessory pieces. To the left above, three phases in the development of the spermatozoa ($\times 900$); each phase is placed opposite the part of the testicle in which it occurs. The two lower left-hand figures show the histological details of the vas deferens and the ductus ejaculatorius at the points opposite which they are placed, $\times 450$.