

SCANNING ELECTRON MICROSCOPY OF *SPINOCHORDODES TELLINII* (CAMERANO, 1888), (GORDIACEA, NEMATOMORPHA)

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Summary :

There are many species of Nematomorpha which are deficiently described and therefore pose doubts about their actual taxonomic position. This is the case with *Spinochordodes tellinii* (Camerano, 1888), which was transferred to four different genera and has been recently considered as species *incertae sedis*. A female of *Spinochordodes tellinii* is redescribed in this work under light microscopy and Scanning Electron Microscopy. Cuticle details, shapes and areolar distribution and the features as well as the location of spiniform structures are analysed. The systematic position is discussed.

KEY WORDS : Nematomorpha, Gordiacea, *Spinochordodes tellinii*, redescription.

Résumé : MICROSCOPIE À BALAYAGE DE *SPINOCHORDODES TELLINII* (CAMERANO, 1888), (GORDIACEA, NEMATOMORPHA)

De nombreuses espèces de Nematomorpha sont insuffisamment décrites ce qui pose des problèmes sur leur validité et leur position systématique. C'est le cas de *Spinochordodes tellinii* (Camerano, 1888) qui a été rattaché à quatre genres différents et considéré récemment comme espèce *incertae sedis*. Dans ce travail, une femelle de *S. tellinii* est redécrite en utilisant le microscope optique et le microscope à balayage. Des détails sur la cuticule, la forme, la distribution aréolaire et la localisation des structures spiniformes sont donnés. La position systématique de l'espèce est discutée.

MOTS CLÉS : Nematomorpha, Gordiacea, *Spinochordodes tellinii*, redescription.

The systematic study of Gordiacea is mainly based, specially in male specimens, on the features of the posterior end and on the cuticular structures of the body wall. In the past, the studies on these worms were realised under light microscopy, being among the most important works are Camerano (1897, 1915); Müller (1927); Dorier (1930) and Heinze (1937). Although most of these works are excellent with very accurate descriptions of different species, there are some which pose doubts on the actual existence of some species. Such is the case with *Spinochordodes tellinii* (Camerano, 1888), drawn and described inadequately, with scarce details and therefore considered as an uncertain species by Schmidt-Rhaesa (1997). In this work we study *Spinochordodes tellinii* under light microscopy and scanning electron microscopy which allowed us to analyse details of the cuticular features and of the posterior end. Its systematic position is also discussed.

MATERIALS AND METHODS

The material studied in this paper belongs to the collection of the Muséum national d'histoire naturelle – Biologie parasitaire, Protistologie,

Helminthologie – Paris. Fragments of cuticle from the medial part of the body were extracted from specimens in order to be examined through light microscopy. The cuticle fragments were washed in lactophenol for 24 hours, mounted and observed with Wild Mka 2 microscope after cleaning and removing the remains of muscular tissue.

To examine specimens by scanning electron microscopy (SEM), fragments of worms (mid-body, posterior and anterior end) were dehydrated in an increasing ethanol series. They were critical point dried, mounted on a stub, metallised with gold-argon, observed and photographed with Jeol SLM 1000 SEM.

RESULTS

SPINOCHORDODES TELLINII (CAMERANO, 1888)

Gordius tellinii, Camerano. *Bollettino Musei Zoologia Anatomia Comparata Reale Università Torino*, 1888, 3 (42), 1-10.

Chordodes baeri Camerano. *Annals Musei Zoologia Accademia Imperiale*, St. Petersburg, 1896, 1, 117-125.

Chordodes tellinii Camerano. *Memoire delle Reale Accademia delle Scienze di Torino*, 1897, 47, 339-419.

Spinochordodes tellinii Kirjanova. *Trudy Zoologicheskogo Instituta Akademii Nauk, SSSR*, 1950, 9, 255-280.

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Spinochondodes baeri (partim) Kirjanova. *Trudy Zoologicheskogo Instituta Akademii Nauk. SSSR*, 1950, 9, 255-280

Spinochondodes cameranoi (partim) Kirjanova. *Trudy Zoologicheskogo Instituta Akademii Nauk, SSSR*, 1950, 9, 255-280.

Neochondodes tellinii Heinze. *Zeitschrift für Parasitenkunde*, 1952, 15, 183-202.

Neochondodes baeri Heinze. *Zeitschrift für Parasitenkunde*, 1952, 15, 183-202.

Pantachordodes tellinii Heinze. *Zeitschrift für Parasitenkunde*, 1954, 16, 92.

Redescription

Female: light brown, anterior end thinner towards the apex. The dark ring separating the calotte from the body is not observed. Subterminal mouth, posterior end rounded (Fig. 1), 531 μm diameter. Terminal central cloacal opening surrounded by a smooth cuticle with scarcely scattered bristles. The cuticle, under LM, covered with low and irregular areoles oriented transversally along the longitudinal axis of the body, groups of spiniform projections scattered around. Under SEM, the cuticle shows two areolar types, one type covering most of the body surface and the other forming groups. First type areoles (Figs 2A and 3A) are low (3.1 μm), most of them of irregular shape and others pentagonal or hexagonal, longer than wide measuring ($n = 10$) 9.2-20.5 μm (average 13.4) in length and 5.8-13.2 μm in width (average 9.3). Lateral margins smooth. Areolar surface structured with two different types of bristles, one being small, sharp and pointed and the other longer and blunt ended (Fig. 3). Bristles in the interareolar furrow are rare. The second areolar type (Figs 2B, 4B and 5) is formed by areoles 5.2 μm high forming irregular groups (nine to 20 areoles) scattered among the first type areoles. These areoles are not well defined, with limits very difficult to determine, sometimes resembling a cuticular folding. Their surface shows long bristles ($n = 10$) 4.1-8.5 μm high (average 6.9), 4.7 μm wide or 1.1 μm thin. These disorderly distributed bristles are either lined on the areolar surface or forming a circle in the periphery of the areole superior margin (Fig. 4). Distal ends of bristles (Figs 2, 4 and 5) can be pointed, rounded or bifurcated, some of them with a wide base with branches towards the apex, like a tree. They are hyaline and clearer than areoles.

Material examined: one female 180 mm long and 0.75 mm wide.

Locality: Availles Limorgines, Viena det. Dorier, col. Constanclin. Deposited at the Muséum national d'histoire naturelle. Biologie Parasitaire, Protistologie, Helminthologie. Paris. Boccals 288 No. 40.

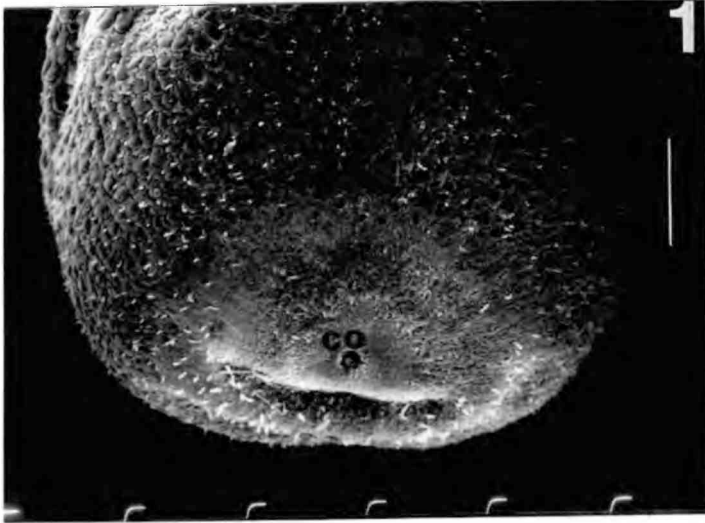
DISCUSSION

Camerano (1888) describes the species *Gordius tellinii* with four female specimens from Rio Forcaria, Italy, noting that the cuticular stratum presents groups of long projections which seem to emerge from modified areoles and considering the cuticle with affinities to the *Chordodes* species. Römer (1896) considers it as an uncertain species on the basis of an insufficient description. Camerano (1897), describes one male and one female specimen from the Caspian Sea region and two males and one female from Scala di Giacca, Sardinia. He considers that these specimens, together with the Italian specimens, due to the features of the cuticle and of the posterior end of males, not lobulated (as in *Gordius*), but rounded, should be transferred to the genus *Chordodes*. However, the description he makes on the cuticular structures of the specimens from the Caspian Sea region, as regards areole shape and distribution of tubercles or bristles, differs from the description of the specimens from Italy and Sardinia. In the same study *Chordodes baeri* Camerano, 1896 is synonymized with *C. tellinii*. Kirjanova (1950) describes the genus *Spinochondodes* and considers *S. tellinii* as a type species probably on the basis of the specimens from Italy and Sardinia. Likewise, she includes the female specimen of *C. baeri* and the female of *C. tellinii* from the Caspian Sea region under the name of *S. baeri* and the male specimens of *C. baeri* and *C. tellinii* also from the Caspian Sea region, under a new species, *S. cameranoi*.

Heinze (1952), probably unaware of Kirjanova's work, separates and relocates these species (*C. baeri* and *C. tellinii*) in a new genus: *Neochondodes*, even though he considers that they are very similar and therefore it is difficult to separate them. In 1954, Heinze, after recognising his mistake when designating his new genus as *Neochondodes*, a name that had been previously used by Carvalho (1942) to describe an American genus, changes it to *Pantachordodes*.

Our studies under SEM lead us to agree with the diagnostic characters described by Kirjanova (1950) for *Spinochondodes* and with the trasference of the specimens cited within this genus. *Spinochondodes* has cuticular characteristics different from *Chordodes* because *Chordodes* show various well defined areolar types where crown areoles with long spiniform processes arising from the areolar centre (de Villalobos & Miralles, 1997) stand out.

On the other hand, the cuticle in *S. tellinii* has two types of areoles that are not well defined, with bristles never arising from the areolar centre but disorderly distributed. Kirjanova (1950) describes the cuticular features of *S. baeri* (Camerano, 1896) and *S. cameranoi* (Kirjanova, 1950) which differ from the features of



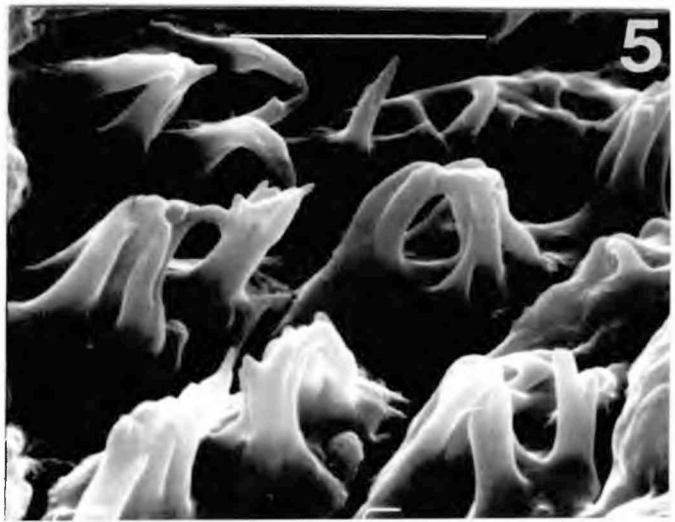
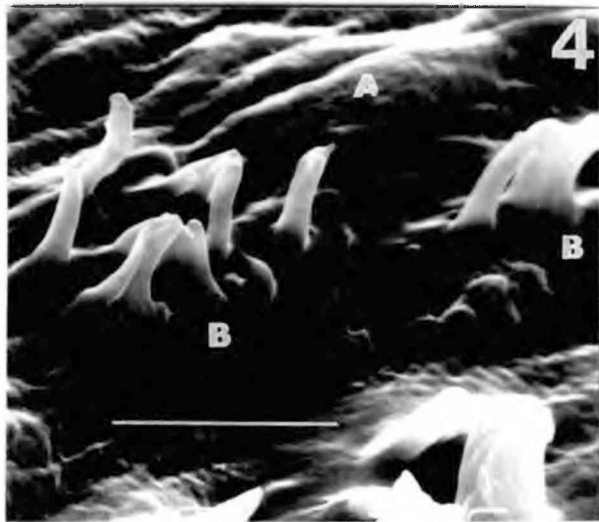
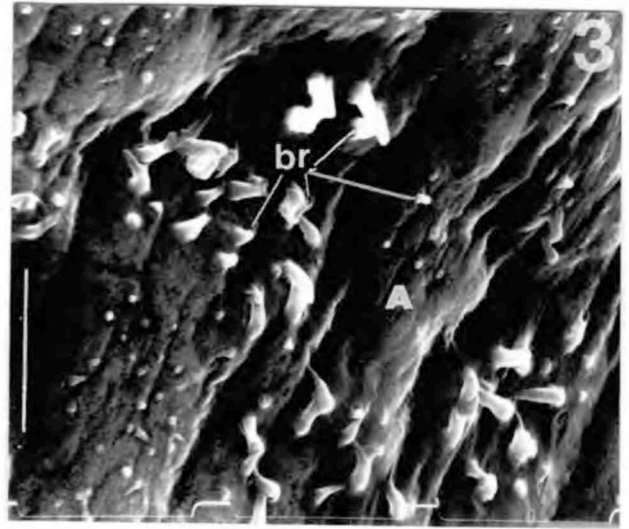
Figs 1-5. – Scanning electron micrograph of *Spinochordodes tellini*.

1. Posterior end of the female. Bar = 100 μ m.

2. General view of the cuticle. Bar = 100 μ m.

3. Detail of different types of bristles on the areoles of first type surface. Bar = 10 μ m.

4-5. Lateral view of the areoles of the second type showing different distribution of the bristles. Bars = 10 μ m. A: areoles of the first type, B: areoles of the second type, br: bristles, co: cloacal opening.



S. tellinii, by two well defined areolar types. In *S. baeri* the first type areoles are low and covered by numerous bristles. The second type of areoles forms groups of three, four, six, or seven high areoles with a superior border with granule or small spines on its edges in a circular shape. These areoles have a slight, long projection which can be found in the middle of the groups or outside, among the first type areoles.

S. cameranoi has high first type areoles, polygonal and elongated, two times longer than wide, with six to 10 small bristles on their surface. The second type areoles are very high, forming groups of 15-20 to 35 areoles although some of them can be found isolated. They have very long projections with a truncated apex.

The female from Viena that we have described has the same features as the females from Rio Forgaria, Italy, so we consider that it belongs to *S. tellinii*. We also enlarge the distribution of this species for Europe.

We consider that further ultrastructural studies are necessary on *S. baeri* and *S. cameranoi* in order to compare them to *S. tellinii* and thus confirm its real status.

ACKNOWLEDGEMENTS

We greatly appreciate the help of Jean-Lou Justine from Muséum national d'histoire naturelle – Biologie parasitaire, Protistologie, Helminthologie – Paris, France for loaning the specimen of *S. tellinii* and giving permission to prepare this material for SEM. We like to thank P. Sarmiento from Electron Microscopic Service, Museum of Natural Sciences, National University of La Plata for preparation of the material.

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Reçu le 21 juin 2001

Accepté le 19 décembre 2001