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SCANNING ELECTRON MICROSCOPY OF THE INTEGUMENTAL SURFACES OF ADULT *GNATHOSTOMA DOLORESI* TUBANGUI, 1925, A PARASITE OF PIGS IN THE PHILIPPINES

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ABSTRACT

The integumental surfaces of critically point dried adult *Gnathostoma doloresi* Tubangui, 1925 were studied by scanning electron microscopy.

The presence of structures whose occurrence and distribution appeared to be consistent in all specimens examined were revealed. The head bulb is armed with nine to ten rows of strongly curved and posteriorly pointed hoos arranged around the circumference of the lateral aspect of the bulb.

The body is covered all over with two kinds of spines, single pointed and multidigit. The latter cover the anterior one-third and the former the posterior two-thirds of the body. The multidigit spines consist of two forms and their extent of distribution appear to be consistent. Short broad spines with four to five digits of varying length cover a short area immediately after the neck. Long broad spines with three digits, in which the middle digit is distinctly longer than the lateral ones, cover the remaining anterior one-third. The three digit spines gradually diminish in size towards the posterior.

The pathology of the species as suggested by these structures is discussed. The species is compared with *Gnathostoma hispidium* with which it stands closest and which was also studied by SEM by other authors.

Introduction

Gnathostoma doloresi is a nematode parasite occurring in the stomach of domestic and wild pigs. It was first reported in the Philippines by Tubangui (1925) and subsequently recorded in other countries such as India (Maplestone 1930), Japan (Miyazaki, 1950, 1957, 1960; Miyasaki *et al.*, 1951; Miyazaki *et al*, 1953; Morishita, 1951; Nishida, 1957), Singapore (Sandosham, 1953), Vietnam (Le-Van-Hoa *et al.*, 1965, 1967; Nguyen-Van-Ai, 1965) Taiwan (Chiu, 1959), USSR-Primorsk Region (Pigolkin, 1963), Thailand (Dissamaru *et al.*, 1966), New Guinea (Miyazaki, 1968; Talbot, 1969) and the British Solomon Islands (Talbol, 1969).

The first description (Tubangui, 1925) and subsequent redescriptions (Maplestone, 1930, Miyazaki, 1950, 1954; Ishii, 1956) were all based on light microscopy, including the brief description of seven species of the genus in a review given by Miyazaki (1960). It would be interesting therefore to examine this species under SEM; hence, this study.

Materials and Methods

Ten specimens of *Gnathostoma doloresi* were processed for scanning electron microscopy following the procedure described by Eduardo (1981). Specimens were critically point-dried using carbon dioxide as drying medium and coated with gold. These were examined under a JEOL JSM-35C SEM unit at accelerating voltage of 25 kilovolts.

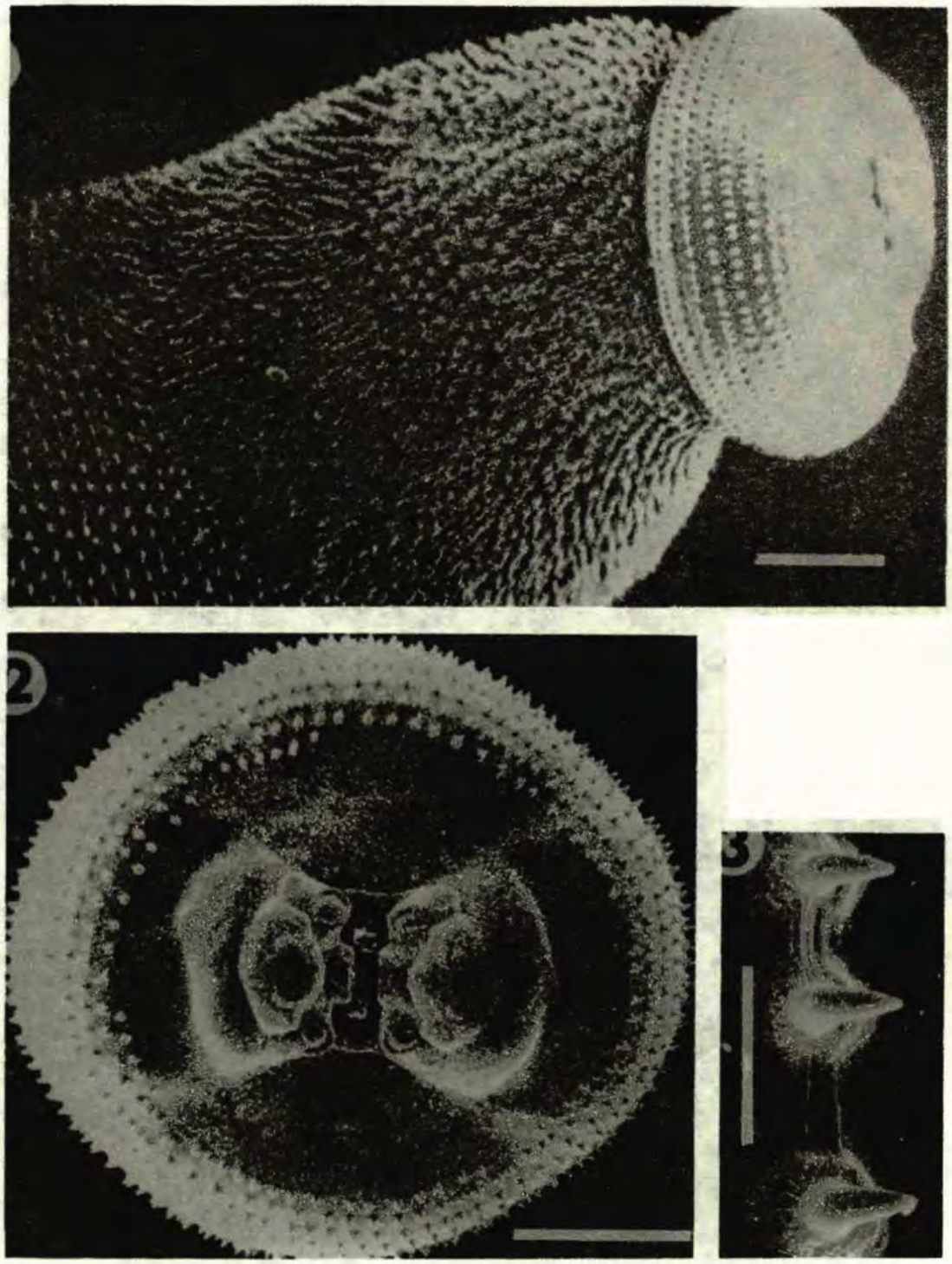
Results and Discussion

As shown in Fig. 1, the head bulb is armed with hooks and the body is covered all over with spines. Although these structures have been observed in light microscopy, their exact details have not been clear. SEM does not only confirm their occurrence and distribution but also sheds light on their exact shape, size and surface details.

The hooks are arranged in nine to ten rows around the circumference of the head bulb (Fig. 2). In three specimens, however, the inner row of hooks appears incomplete, occupying only half of the circumference. Hooks appear strongly curved and posteriorly directed (Fig. 3). These structures and the head bulb, when inflated, enable the parasite to firmly attach itself on the gastric mocusa. Dislodgement of the worm would seem difficult. The sharp ends of the hooks could cause laceration of the mucosa as the parasite moves from one place to another. In a formalin-preserved stomach that harbored this species, holes on the mucosa were distinct, indicating the point of attachment. Attempt to count the number of holes and the number of parasite harbored showed that there were more of the former (about one-and-a-half more) than the latter, suggesting that some worms moved from one place to another.

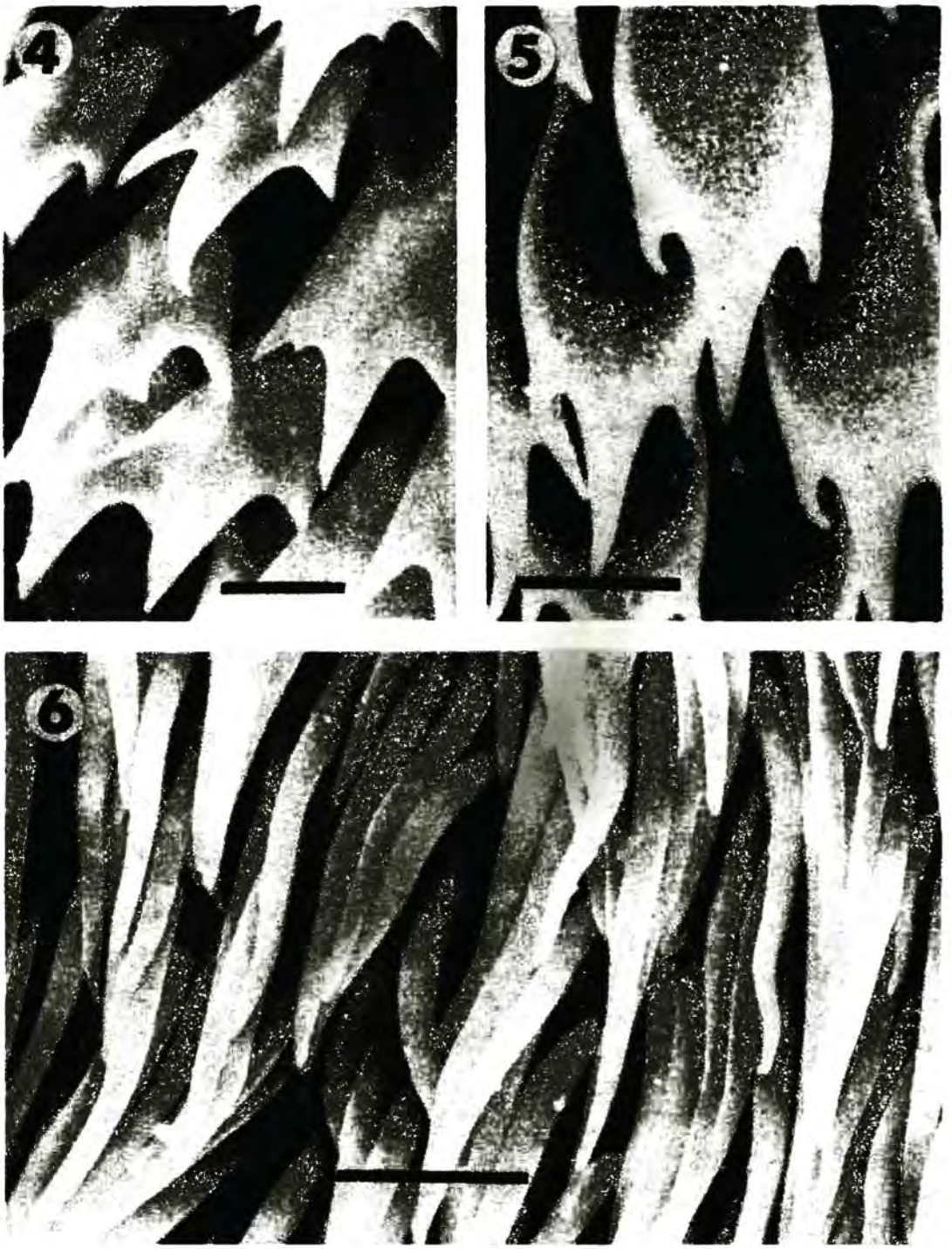
Figure 2 is an *en face* view of the anterior end and shows the mouth guarded by two lips, one on each lateral side. Each lip has a pair of dorsal and a pair of ventral papillae. One of the dorsal and one of the ventral papillae are median (nearer the mouth) and the other dorsal and ventral papillae are submedian (farther from the mouth). Thus, the submedian are within and in between the horizontal fields of the median papillae.

The spines covering the body of *Gnathostoma doloresi* consist of two kinds, single-pointed and multidigit. Save for the digits, the surfaces of these spines appear smooth. These digited spines could also contribute to laceration of the gastric mucosa. Their distribution appears to divide the body into two areas. The anterior third is covered with multidigit spines and the posterior two-thirds with the single-pointed spines. The multidigit spines can be further classified into two forms whose distribution appears to be consistent in all specimens examined. Spines which are short and broad and with four to five digits of varying length (Fig. 4) cover a short area immediately after the neck. They measure 37.7-53.3 microns (to the tip of the longest digit) and 24.4-30.0 microns in width. These are followed by broad and



Gnathostoma doloresi, SEM:

Figure 1. Antero-lateral view. Note hooks on head bulb and spines on body (scale bar = 200 microns); Fig. 2. *En face* view of anterior end. Note lateral lips, papillae and arrangement of hooks (scale bar = 200 microns); Fig. 3. Closer view of hooks on head bulb. Note that they are strong and posteriorly curved (scale bar = 20 microns).



Gnathostoma doloresi, SEM:

Figure 4. Spines on area immediately after the neck. Note four to five digits of spines (scale bar = 40 microns); Fig. 5. Spines with three digits covering remaining area of anterior one-third of the body. Note middle digit distinctly longer than the lateral ones (scale bar = 80 microns); Fig. 6. Single-pointed spines covering posterior two-thirds of the body (scale bar = 40 microns).

longer spines with three digits in which the middle digit is distinctly longer, about twice as long as the lateral digits (Fig. 5). The three digit spines cover the remaining anterior one-third of the body. Those in the more anterior part of this particular area measure 78.8-91.1 microns in length (to the tip of the middle digit) and 30.0-32.2 microns in width. Those on the more posterior part are smaller and measure 37.7-53.3 microns in length and 24.4-30.0 microns in width. The rest of the body (posterior two-thirds), as mentioned earlier, is covered with single-pointed slender spines (Fig. 6). They measure 37.7-46.6 microns in length and 2.8-3.3 microns in width.

Because the body of *Gnathostoma doloresi* is covered all over with cuticular spines, it stands closest to *Gnathostoma hispidium* and is frequently confused with it. SEM comparison on the distribution and characters of the body spines between *G. doloresi* as observed in this study and *G. hispidium* as observed by Kondo *et al.* (1984) and Koga *et al.* (1984) revealed some differences. The spines covering the area near the neck have four to five digits in *G. doloresi* while those in *G. hispidium* have five to ten digits. These are followed in the former species by spines with three digits in which the middle digit is distinctly longer than the lateral ones. In the latter species, there is a discrepancy in the observation of Kondo *et al.* (1984) and Koga *et al.* (1984). According to the former authors, this particular area is covered with a mixture of two-digit and three-digit spines. The digits of the two-digit spines are either equal in length or one is longer than the other. The digits of the three-digit spines are all almost equal in length. According the latter authors, however, this particular area is covered by spines with three digits and then replaced by two-digit spines. The three-digit spines are similar to that observed in *G. doloresi* in that the middle digit is much longer than the lateral ones. However, these spines, as observed by Koga *et al.* (1984) in *G. hispidium*, are longer and more slender than those observed in *G. doloresi*. Further, the middle digits are more than two twice as long as the lateral ones. Two-digit spines, as observed by Kondo *et al.* in their materials, were also observed by Koga *et al.* (1984) but all had digits almost equal in length.

The area covered by multidigit spines also differs in the two species. In *G. doloresi*, it is only the anterior one-third and in *G. hispidium* only the anterior one-fifth of the body. Consequently, the remaining area covered with single-pointed spines in the posterior two-thirds in the former species and the posterior four-fifths in the latter species.

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