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Stereoscan observations on the tegumental surface of *Catatropis indicus* Srivastava, 1935

V. Tandon and B. Roy

Department of Zoology, North-Eastern Hill University, Shillong 793022, India

Abstract. Surface microtopographical details of *Catatropis indicus* inhabiting the intestine of *Gallus gallus* dom. have been studied using scanning electron microscope. The elongated body of the fluke is free from any spines; however, tegument surrounding the oral sucker is provided with domed uniciliated papillae. Twelve pairs of gland-like ventral papillae are present on each side of the mid-ventral ridge. Four types of tegumental structures viz., blunt elongated, pointed elongated, scale-like short with round tip, and cilia-like densely packed, are present on the ventral surface. The dorsal surface is free of any papillated structures.

Introduction

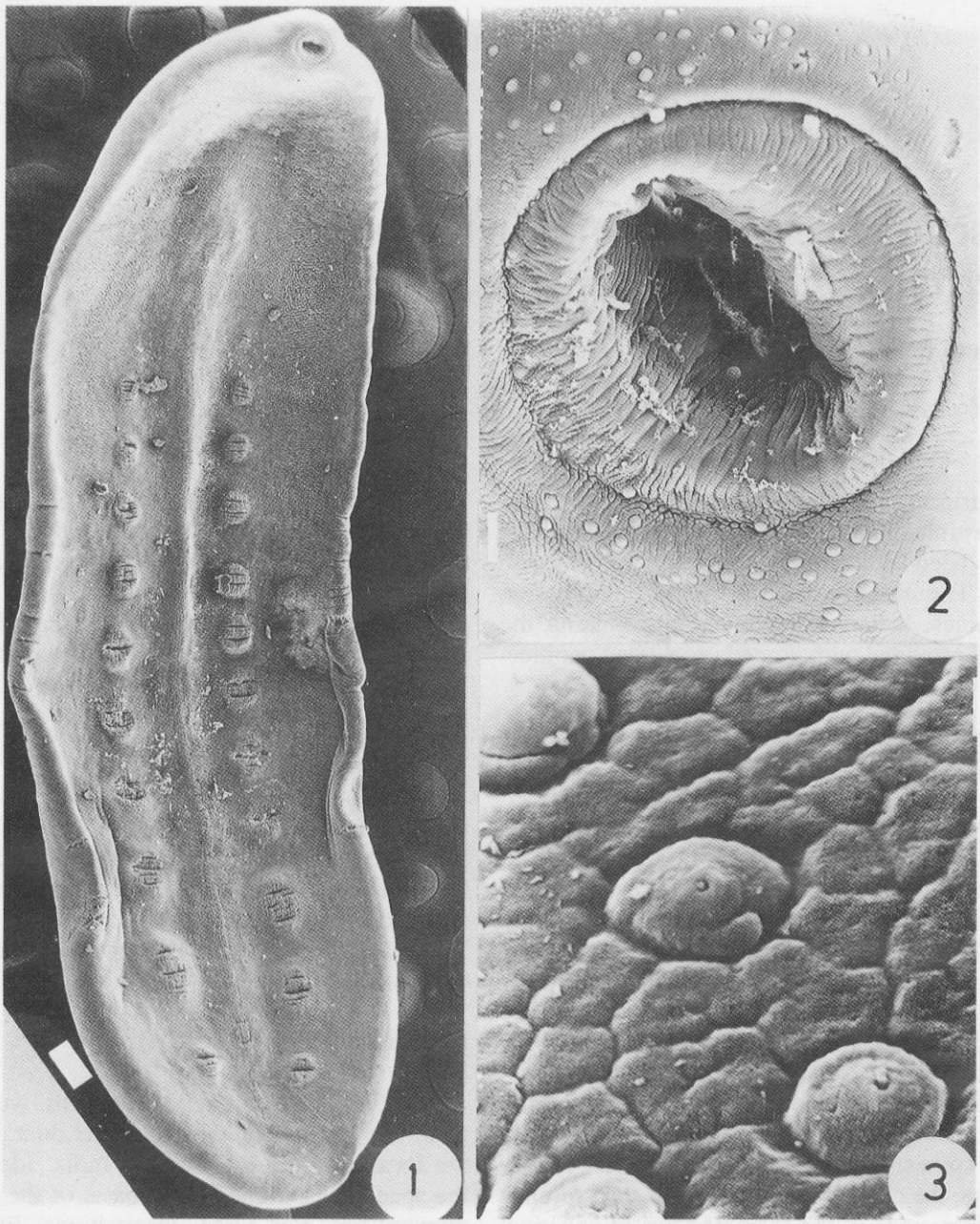
Importance of stereoscan electron microscopical (SEM) studies on the surface topography of trematode parasites for interpreting the morphology in relation to their taxonomy and physiology has been emphasized by several workers (Bakke 1976; Tandon and Maitra 1981; Sey 1984; Roy and Tandon 1989, 1992a, b, c). Most of these works relate to amphistomes, blood flukes or liver flukes and reveal species specific patterns of distribution and orientation of sensory papillae and spines. Among the members of the family Notocotylidae, the characteristic feature is the presence of ventral protrusions in the form of rows of spherical elevations or in the form of longitudinal ridges; ventral protrusions are lacking in *Paramonostomum* Lühe, 1909. Various functions have been suggested for ventral papillae of notocotylids by different workers – glandular (Harwood 1939, Martin 1956), adhesive (Wittrock 1978), respiratory (MacKinnon 1982a, b) or many other (Gorchilova and Kanev 1988). According to Smith (1954), the papillae represent protrusions on the ventral surface caused by infection of the internal organs. While most of these studies pertain to the species of the genus *Notocotylus* or *Quinqueserialis,* scanty literature is available on the nature of the surface tegument of *Catatropis*, belonging to the same family, most species of which have been described on the basis of gross morphological and histological observations. This has led to misinterpretation of the same structures by different workers (Mehra 1980, MacKinnon 1982c, Srivastava 1982). The present communication illustrates the surface architecture of *Catatropis indicus* Srivastava, 1935 which is a common parasite of the caecum of domestic fowl.

Material and methods

Adult *Catatropis indicus* specimens were recovered from the caecum of *Gallus gallus* dom., sacrificed in the local markets in Shillong, India. Identification of the species was done on the basis of the whole mount preparations. For SEM observations, live specimens were washed in 0.85% saline, followed by fixation in 2.5% glutaraldehyde in 0.1 M cacodylate buffer (pH 7.2) at 4°C. The worms were then dehydrated through ascending series of acetone followed by critical point drying using liquid CO_2 as the transitional fluid. A conductive coating of gold was applied to the sample using JFC 1100 (Jeol) ion-sputter coater. The preparations were examined with scanning electron microscope, JSM 35-CF (Jeol) using the secondary electron emission mode at an accelerating voltage of 10 kV.

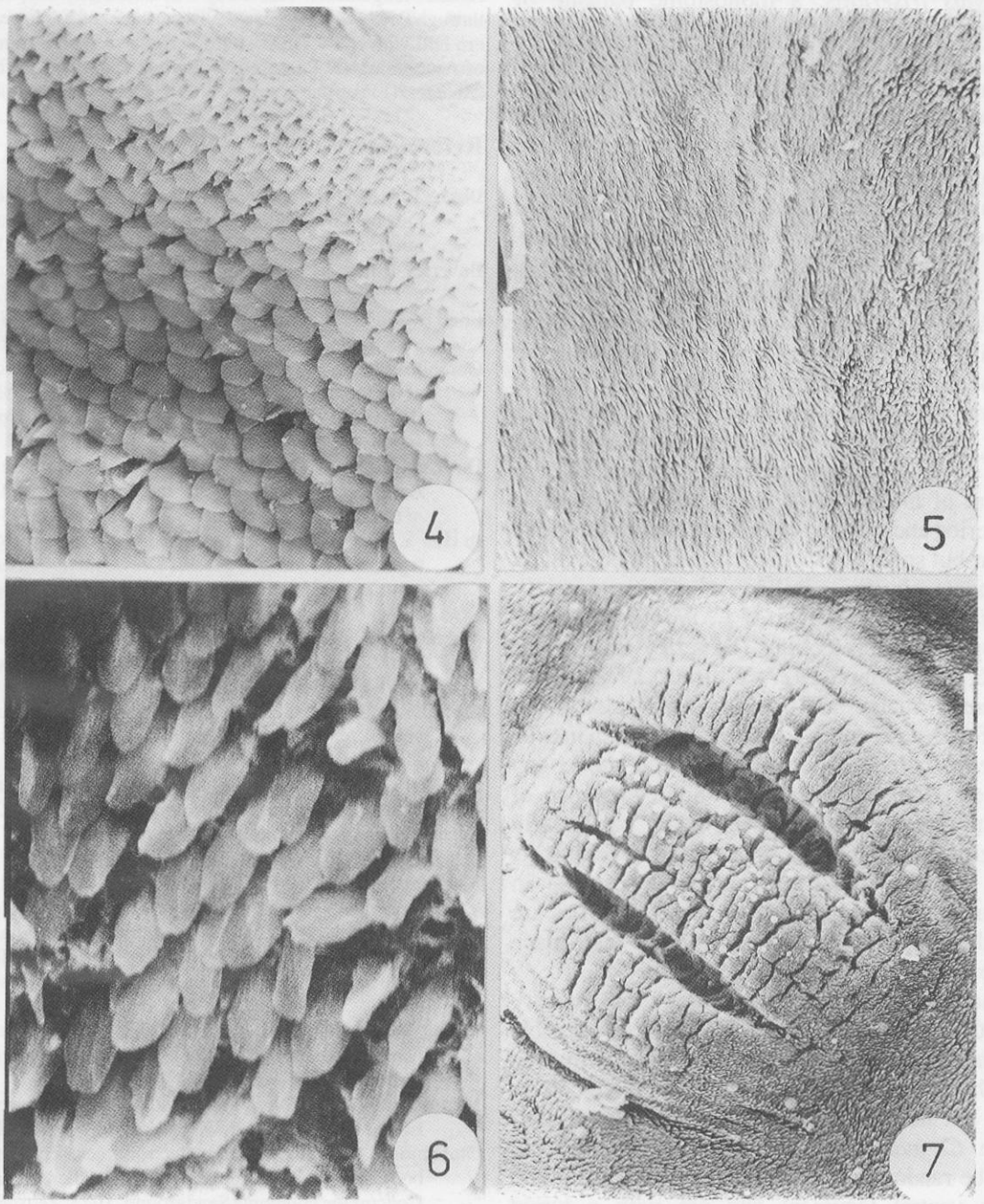
Results

The fluke has an elliptical or linguiform body with lateral edges curved ventrally. The gland-like ventral



Figs. 1–3. Scanning electron micrographs of *Catatropis indicus*: **1** – whole worm, ventral view (scale bar 100 µm); **2** – oral aperture and its surrounding area (scale bar 10 µm); **3** – enlarged view of uniciliated papillae surrounding oral aperture (scale bar 1 µm)

papillae are present in two longitudinal rows comprising 10 to 12 papillae on each side of the mid-ventral ridge (Figs. 1 and 7). The rim of the oral sucker is provided with well developed radially oriented folds (Fig. 2). The tegument surrounding the oral aperture is studded with randomly scattered rounded and uniciliate papillae, each about 2.5 µm in diameter (Fig. 3). Four types of ornamentations abound on the ventral surface of the body. Elongated and broad structures with blunt rounded tips 5 µm long and 3 µm wide, occupy the region from the oral sucker to the level of the genital opening (Fig. 4). Immediately behind the genital opening occur elongated and pointed spine-like structures which are about 2.5 µm long and arranged in 5–6 rows. These gradually merge with scale-like robust structures. The latter are much broader than long (about 3.5 µm long and 5 µm wide) and are arranged in a distinct overlapping fashion (Fig. 6). Cilia-like or filiform thin projections about 2 µm long, form a thick towel-like covering of the tegument from the level of the 1st pair of ventral papillae up to the posterior end of the body (Fig. 5). A closer view of the ventral



Figs. 4–7. Scanning electron micrographs of *Catatropis indicus*: **4** – a portion of the ventral surface below the oral aperture, showing pointed spiny and blunt scale-like structures (scale bar 10 µm); **5** – a portion surrounding the glandular structure showing densely packed cilia (scale bar 10 µm); **6** – enlarged view of blunt scaly structures occupying the region between genital opening and glandular structures (scale bar 10 µm); **7** – enlarged view of a glandular structure (scale bar 10 µm)

papillae reveals a rough, corrugated surface of the domed elevation, with two or more splits in each. There is complete absence of spines or scales which normally cover the non-papillar ventral surface. Minute domed papillae like the ones present in the circumoral region are also observed randomly scattered on the tegument on and in close vicinity of the ventral papillae (Fig. 7).

The dorsal surface of the body is observed to be free from any tegumentary or sensory specializations.

Discussion

Microtopographical observations made on *C. indicus* revealed the occurrence of a variety of tegumental ornamentations having specific orientation and regional distribution. Yamaguti (1971) gave the generic character of *Catatropis* as provided with median ventral glands forming a continuous ridge. In the present observations a continuous mid-ventral rib is evident.

In *Notocotylus triserialis*, a monostome parasite of caeca of domestic fowl, the ventral surface of the fluke is provided with 3 rows of retractable papillae which are round in shape and with transverse slits at the top (MacKinnon 1982a). Only two types of tegumental structures have been described for *N. triserialis* – robust spines present anteriorly and finger-like small projections which abound in the posterior region beyond the level of the second or third most anterior papillae. Finger-like projections also cover the tegumental surface of ventral papillae in *N. triserialis*. In *Notocotylus ephemera* similar to other notocotylids the ventral papilla-like formations have been demonstrated to be morphologically stable structures, their surface being covered with fine spine formations (Gorchilova and Kanev 1988). In *C. verrucosa*, small spine-like projections cover the antero-ventral tegument, whereas the tegument of the posterior ventral surface, papillae and the anterior and postero-lateral aspects of the ridge bears similar but smaller structures (MacKinnon 1982c). The tegument of the papillae of *Quinqueserialis quinqueserialis* resembles that of *C. indicum* in being devoid of spine-like projections (Beverley-Burton and Logan 1976, MacKinnon 1977, Wittrock 1978).

Tegumental scales and spines have also been described for *Notocotylus urbanensis, N. attenuatus* and *N. triserialis* (loc. cit. Beverley-Burton and Logan 1976, Radlett 1980, MacKinnon 1982a). Presence of spines in the anterior region of the body, particularly in the region surrounding the genital opening is suggestive that the spines may help the parasite in clasping during copulation. Even though the flukes are hermaphrodite, reproduction is reported to take place through cross fertilization (Fried 1986).

The shape and basic arrangement of sensory papillae in the circumoral region of *C. indicus* resemble those of *Cancinum epomopis*, a dicrocoeliid trematode inhabiting the pancreas of bats (Otubanjo 1985). However, these are not uniciliated in the latter species, as observed in *C. indicus*. In *N. triserialis* sensillae are reported to be randomly distributed over the papillar and non-papillar ventral tegument and are with a tumid protrusion and no naked cilium; in *C. verrucosa* spherical protrusions similar to those in *N. triserialis* abound over the mid-ventral ridge (MacKinnon 1982a, c). Ciliated round papillae have been reported for the body surface of female *Schistosoma indicum* and also observed to be concentrated near the buccal funnel or oral opening of *Cotylogaster occidentalis*. It is suggested that these have a chemo- or mechanoreceptive function (Ip Hon and Desser 1984, Roy and Tandon 1992a).

Ultrastructural studies carried out so far on notocotylids strongly suggest that the ventral papillae are not glandular structures. Detailed investigation on the ultrastructural aspects of these structures in *C. indicus* is warranted to reveal their functional role.

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