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OBSERVATIONS ON THE ULTRASTRUCTURE OF THE ATTACHMENT PLATE OF *ICHTHYOBODO* SP., FROM ATLANTIC SALMON, *SALMO SALAR* L., REARED IN THE MARINE ENVIRONMENT

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The bodonid flagellate *Ichthyobodo necator* (Henneguy, 1883); Pinto (1928) *Costia necatrix* is a widespread ectoparasite of fresh water fish, which can become prevalent particularly among cultured salmonid fry and fingerlings. Extensive infections often result in a diffuse gill hyperplasia and inflammation followed by rapid and heavy losses (Ellis and Wootten, 1978; Robertson, 1979). In recent years there have been some reports of a marine form of this protozoan affecting both juvenile and sexually mature non-salmonid fish. Bullock and Robertson (1982), found *Ichthyobodo* on plaice, *Pleuronectes platessa* L., and Cone and Wiles (1984) noted a form of the parasite on the winter flounder, *Pseudopleuronectes americanus* (Walbaum).

It is unclear however, whether these observations of *Ichthyobodo* on marine fish are parasites with a fresh water origin, or that they represent a separate marine species. Morrison and Cone (1986) suggested that a separate species of *Ichthyobodo* infects marine fish and this interpretation was supported by Diamant (1987). Recently, (Bruno, 1992) demonstrated that the *Ichthyobodo* occurring on farmed Atlantic salmon, *Salmo salar* L., some six months post-transfer to sea water were persistent and significantly different in size from previous descriptions of *I. necator* from fresh water fish (Ellis and Wootten, 1978).

Gill lamella from Scottish farmed Atlantic salmon smolts (mean weight 260 g) heavily infected with *Ichthyobodo* were dissected and fixed in 2.5% glutaraldehyde in Millonig's buffer, post fixed in 1% osmium tetroxide and subsequently processed for electron microscopy.

An examination of the cytostome process or plate of individual parasites from these sea-reared Atlantic salmon demonstrated that this structure at the host-parasite interface was smooth along its entire length (Figs 1 and 2). This finding is supported by the work of Roubal and Bullock (1987), who also discussed this feature as a possible means of differentiating fresh water and marine forms of *Ichthyobodo* sp., as the attachment disc from parasites of fresh water salmonids they examined had ridge-like projections along much of the length of the cytostome process. Similarly, Diamant (1987) commented that the surface micro-ridges of the cytostome process of *Ichthyobodo* from the purely marine fish, the common dab, *Limanda limanda* L., were reduced or absent. Earlier work, however by Joyon and Lom (1966) and Schubert (1966) indicated that I. necator from fresh water fish possessed a smooth cytostome process. Overall, it appears that marine forms of *Ichthyobodo* can be distinguished from the fresh water species *I. necator* by examining the attachment structure with aid of the electron microscope.

Summary

An electron microscopical study of the gill lamella from Atlantic salmon post smolts infected with *Ichthyobodo* sp., demonstrated that the cytostome process of individual parasites at the host-parasite interface was smooth along its entire length. This feature distinguishes it from the fresh water species *I. necator* where the cytostome process has ridge-like projections along its length. Therefore there is ample evidence to consider this marine form as a new species.

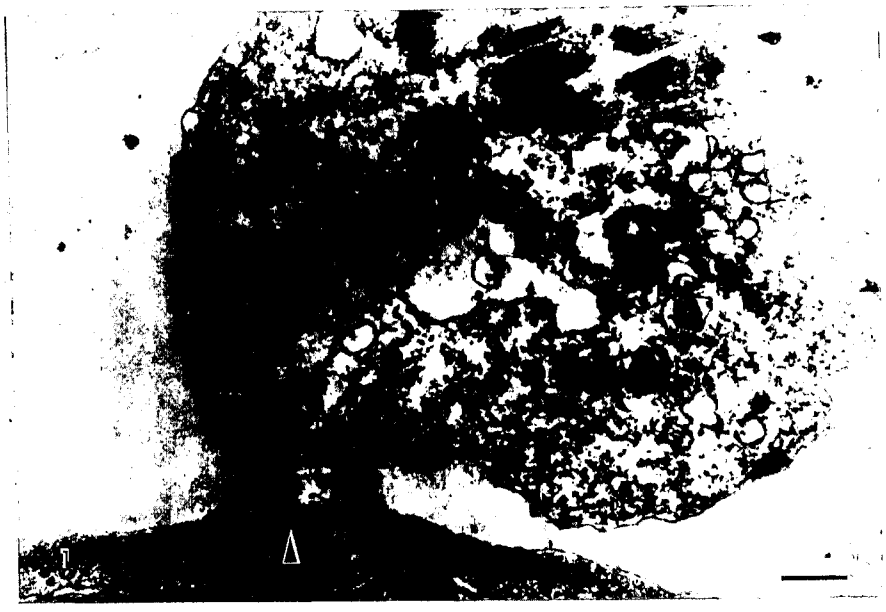

Fig 1. Electron micrograph of *Ichthyobodo* sp., attached to the gill epithelium of Atlantic salmon, *Salmo salar* in sea water. The attachment disc is arrowed. Bar = 0.47 µm

Fig 2. Electron micrograph of *Ichthyobodo* sp., attached to the gill epithelium of Atlantic salmon. At the host parasite interface the attachment disc (arrowed) is smooth along its entire length. Bar = 0.1 µm.

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