The Structure of the Organ of Bellonci of the Syncarid Crustacean, Anaspides tasmaniae (Thomson)*

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Summary. The organ of Bellonci of Anaspides tasmaniae (Thomson) (Crustacea, Syncarida) is described light and electron microscopically, and a few histochemical tests are reported. Located ventrally in the eyestalk below the medulla interna, the organ is composed of a number of cavities. These are similar in structure in their contents and associated cellular components, which include two types of glia cells delimiting each cavity and the terminal parts of a few dendrites. Each dendrite usually bears two cilia, which project into the cavity where they split up into numerous branches. The organ is supplied by three nerve tracts: two from the medulla terminalis and one from the medulla interna. The sensory pore, which is innervated from the medulla interna, is not closely associated with the organ of Bellonci in Anaspides. No marked secretory activity is detectable by histochemical or ultrastructural observations. It is thought that the organ has a sensory function.

Key words: Organ of bellonci (Anaspides tasmaniae) — Crustacea — SPX organ — Receptor — Ultrastructure.

Introduction

The organ of Bellonci has been referred to by a number of names. Beginning with Hanström's term "x-organ" (1931), it has been mentioned as the "pars distalis x-organ" (e.g., Carlisle and Passano, 1953), the "sensory pore or sensory papilla x-organ" (e.g., Knowles and Carlisle, 1956) and the "organ of Bellonci" (e.g., Gabe, 1966). The terms involving "x-organ" implies that it was considered as secretory and suggests that its function is somewhat similar to the neurosecretory medulla terminalis x-organ. It is now apparent from ultrastructural studies (Chaigneau, 1969, 1971a, b; Lake and Ong, in preparation) that this organ is not neurosecretory and is perhaps a receptor. Thus, in the present study, the term "organ of Bellonci" is adopted.

The organ of Bellonci of Anaspides tasmaniae was first described by Hanström (1934) under the name of "x-organ" as a group of "rounded cells" arising out of ganglion cells of the ventral side of the eyestalk. These "rounded cells" are vacuolated (cf. below, Gabe, 1966: vacuoles) and contain eosinophilic secretory material that often shows a rounded concentric configuration (cf. below, Gabe (1966): "stratified figures"). A fine nerve, the Nervus innominatus, connects the "x-organ" with the medulla terminalis. The organ of Bellonci of the related syncarid, Paranaspides lacustris, has been described by Mayrat (1966) as a structure "en grappe de raisin" located near the medulla externa. Ventrally to

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the organ, a small depression of the epithelium marks the sensory pore. Mayrat (1966) described a small nerve from this organ.

Gabe (1966) added further details on the organ of Bellonci of *Anaspides tasmaniae*. He noted that the “vacuoles” contain acidophil homogeneous material, whereas the “stratified figures” are positive to the periodic acid Schiff (P.A.S.) reaction. A fine nerve connects the organ of Bellonci with the medulla terminalis but no product staining with paraldehyde fuchsin was found in this nerve or in the organ itself.

The malacostracan organ of Bellonci has been investigated at the ultrastructural level by a number of workers. The organ of Bellonci (sensory papilla x-organ) of the mysid *Boreomysis arctica* has been described by Dahl and Mecklenburg (1969). In the isopod *Sphaeroma serratum*, Chaigneau (1969, 1971a) has produced evidence for the organ of Bellonci being possibly a receptor. The ultrastructure of the “onion bodies” in the organ of Bellonci (sensory pore x-organ) has been studied in the decapod shrimps, *Paratya tasmaniensis* (Lake and Ong, 1970) and *Palaemon elegans* (Chaigneau, 1971b). It now appears that the organ of Bellonci is not primarily a neurosecretory organ, but perhaps a receptor organ.

It is generally agreed that the Syncarida constitute a relatively primitive group of the Malacostraca and that this group evolved relatively early in the phylogeny of the Malacostraca (e.g., Glaessner, 1957; Siewing, 1963; Brooks, 1962). It was thus considered worthwhile to investigate the ultrastructural anatomy of the organ of Bellonci of *Anaspides tasmaniae*.

**Materials and Methods**

Adult specimens of *Anaspides tasmaniae* were collected from near the summit of Mt. Wellington near Hobart, Tasmania.

For light microscopy, the eyestalks were fixed in either Masson’s Bouin (Foot, 1933) or in neutral 5% formalin. The eyestalks were dehydrated in ethanol, cleared in methyl benzoate plus 1% celloidin (Pantin, 1946) and embedded in “Paraplast” wax (M.P. 56°C). Serial sections (7 μ to 8 μ thick) were cut and mounted on glass slides.

For general histological observations of the eyestalks, serial sections were stained either with the paraldehyde fuchsin technique (Gabe, 1953) or with the Mallory’s Triple technique (Pantin, 1946).

Other staining techniques used in this study were:

- (a) silver impregnation technique of Bodian (cf. Romeis, 1948) for nerves,
- (b) alcian blue technique of Steedman (1950) for acid mucopolysaccharides,
- (c) standard P.A.S. technique for 1,2-glycol groups (cf. Pearse, 1960),
- (d) Mallory’s phosphotungstic acid-haematoxylin technique (cf. Pearse, 1960) for fibrin.

Observations were also made on sections of material of *Anaspides tasmaniae* belonging to the late Professor B. Hanström; these are now kept as a part of a special collection in the Zoological Institute, University of Lund.

For electron microscopy, the eyestalks were fixed in chilled 2% OsO₄ in 0.1 M phosphate buffer adjusted to pH 7.4 with 7% sucrose added. After one hour at 4°C, the eyestalks were left in the fixative for another hour at room temperature. A few specimens were prefixed for three hours in 3% glutaraldehyde in 0.1 M phosphate buffer at pH 7.4, washed in buffer, and postfixed for two hours in 1% OsO₄ in 0.1 M phosphate buffer. The eyestalks were dehydrated through a graded series of ethanol, cleared in propylene oxide, and embedded in Epon 812. Sections of 1–2 μ in thickness were cut with glass knives, stained with methylene blue and thionin according to Rüdeberg (1967), and examined to locate the organ of Bellonci. Silver to pale gold sections were cut on a LKB ultratome 8800, placed on Formvar-coated grids and examined in a Philips E.M. 300 electron microscope.