Physiological functions of the epibranchial organ of milkfish from the point of its ontogeny

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PHYSIOLOGICAL FUNCTIONS OF THE EPIBRANCHIAL ORGAN
OF MILKFISH FROM THE POINT OF ITS ONTOGENY

by

Takeichiro Kafuko and Yukimasa Kuwatani*

Abstract

The epibranchial organ of milkfish was believed for long to be
a respiratory organ similar to that in Anabantoids. Later on, the
structure was considered to be an accessory to the digestive system.
The observations made by the authors on the physiological functions
of the organ supports the latter views. This finding, probably would
provide a new field of research on milkfish.

Introduction

Hyrtl (1863) was the first author to describe and draw a
diagram of the pharyngeal organ of Lutodeira chanos (Chanos chanos )
as a respiratory organ, called "die accessorischen kiemen organe".

Since then many scientists have studied the structure of the
organ mostly in lower teleostean herbivorous fishes such as the
elopiform and clupeiform fishes. They believed that the organ had
a respiratory function similar to that in anabantoids. Heim (1935),
however, corrected this concept by studying the structure of the organ
concluding the organ to be an accessory to the digestive system.

Recently, Bertmar, et. al. (1969) summarized the studies along
this line, and moreover, expanded our knowledge of the Clupeiformes
(Clupeidae and Engraulidae), Conorhynchiformes (Chanidae, Conorhynchidae,
Kneriidae, and Prictolaemidae), Osteoglossiformes, Salmoniformes
(Salmonidae), and Cypriniformes (Characidae, Distichodontidae,
Citharinidae, Curimatidae, Hemiodontidae, Prochilodontidae). They
classified the structures into seven types.

Besides the contribution of Hyrtl, (1863) there are only a
few papers dealing with the epibranchial organ of milkfish such as
(Monod, 1949, 1961, 1963; Kapoor 1954; and Takashi, 1957). Among them, Kapoor attempted detailed studies on the anatomy

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and histology, and came to the same conclusion that the epibranchial organ of milkfish functioning principally as accessories to feeding and digestion. This was based on the finding that the inner surface of the pocket is lined with striated, squamous epithelium carrying a number of mucous cells.

**Observations**

We have observed a speck of food wrapped in mucous in both the organs. We also studied the structures which allow the passage of the food before and after coming to the organ. From these studies we gather the following:

The food accumulated between two rows of gill rakers on each gill arch are sucked into the organ under an automatic movement. The water sucked along with the food into the organ is ejected through the marginal canal which runs from the inner wall of the blind sac to the outer part of the gill rakers in buccal cavity. Then, the accumulated food is conveyed to the oesophagus. Enzyme which might exist in the organ are not yet elucidated. Thus, it appears that the organ is a part of the digestive system.

Surprisingly, the rudimentary epibranchial organ appears before any other parts of the digestive system and is observed in as early stage as 14 mm fry. The relationship between the development of the epibranchial organ and the number of gill rakers was found as follows:

<table>
<thead>
<tr>
<th>Total length</th>
<th>Weight</th>
<th>Number of gill rakers</th>
<th>Epibranchial organ</th>
<th>Length of Intestine</th>
</tr>
</thead>
<tbody>
<tr>
<td>14mm</td>
<td>--</td>
<td>14</td>
<td>rudimentary</td>
<td>about 7mm(straight)</td>
</tr>
<tr>
<td>19mm</td>
<td>--</td>
<td>177</td>
<td>complete</td>
<td>19mm</td>
</tr>
<tr>
<td>62mm</td>
<td>--</td>
<td>250</td>
<td>-do-</td>
<td>(not examined)</td>
</tr>
<tr>
<td>300g</td>
<td>430</td>
<td>-do-</td>
<td></td>
<td>(not examined)</td>
</tr>
</tbody>
</table>

**Remarks**

From the findings as mentioned above, we may attribute, reasons for, higher production in different milkfish culture systems especially because of the existence of this specialized organ and its function. The other words, we consider that the functional study of the epibranchial organ from the point of biochemical and habitual aspects provide a new field on milkfish problems for searching rational culture techniques from fry to adults.
References


Takahashi, N. (1957). On the so called accessory respiratory organ "gill helix" found in some clupeiform fishes, with special reference to its function and geneology. Japan. J. Ichthyol., 5;71-77