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EVOLUTION OF FINS IN CHAETOGNATHA*

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ABSTRACT

The inter-relationship between seven genera of the Phylum Chaetognatha is traced. The possibility of the formation of two pairs of lateral fins in the genus *Sagitta* and one pair of lateral fins in the genera *Bathyspadella, Heterokrohnia, Krohnitta, Pterosagitta* and *Spadella* from the lateral fins of *Eukrohnia* is discussed.

INTRODUCTION

AMONG the seven existing genera of the Phylum Chaetognatha, only the species of the genus *Sagitta* have two pairs of lateral fins, whereas the species of the remaining six genera, *Bathyspadella, Heterokrohnia, Krohnitta, Pterosagitta, Eukrohnia* and *Spadella* have only one pair of lateral fins. Out of these seven genera, the genus *Eukrohnia* is considered as a primitive genus and the genus *Sagitta* as an advanced one. An attempt is made here to inter-relate all the existing seven genera of Chaetognatha based on the lateral fins.

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DISCUSSION

By careful examination of the lateral fins, the inter-relationship between the genera of the Phylum Chaetognatha can be understood. The species of the genus *Eukrohnia* have one pair of long continuous lateral fins from the level of the ventral ganglion to the seminal vesicles. Likewise, the species of the genera *Bathyspadella, Krohnitta* and *Pterosagitta* also have only one pair of lateral fins, but the fins are not long as in the species of *Eukrohnia*. The lateral fins of the species of *Spadella, Bathyspadella* and *Krohnitta*, which are located on the trunk and tail segments can be derived from the long fins of *Eukrohnia*, by the loss of a certain anterior portion of the long fins, whereas the lateral fins of *Pterosagitta*, which are located only on the tail segment, can be easily derived from the lateral fins of *Eukrohnia*, by the loss of the entire portion of the long fins on the trunk segment. So it is probable that the single finned species of the genera *Spadella, Bathyspadella, Krohnitta* and *Pterosagitta* might have evolved from the genus *Eukrohnia* by the loss of the anterior portion of the lateral fins (Fig. 1).

Among the remaining two genera *Heterokrohnia* has only one pair of lateral fins and *Sagitta* has two pairs of lateral fins. In the case of *Heterokrohnia*, the lateral fins have a narrowness at about the mid-length margin. The incipient narrow width increases and the

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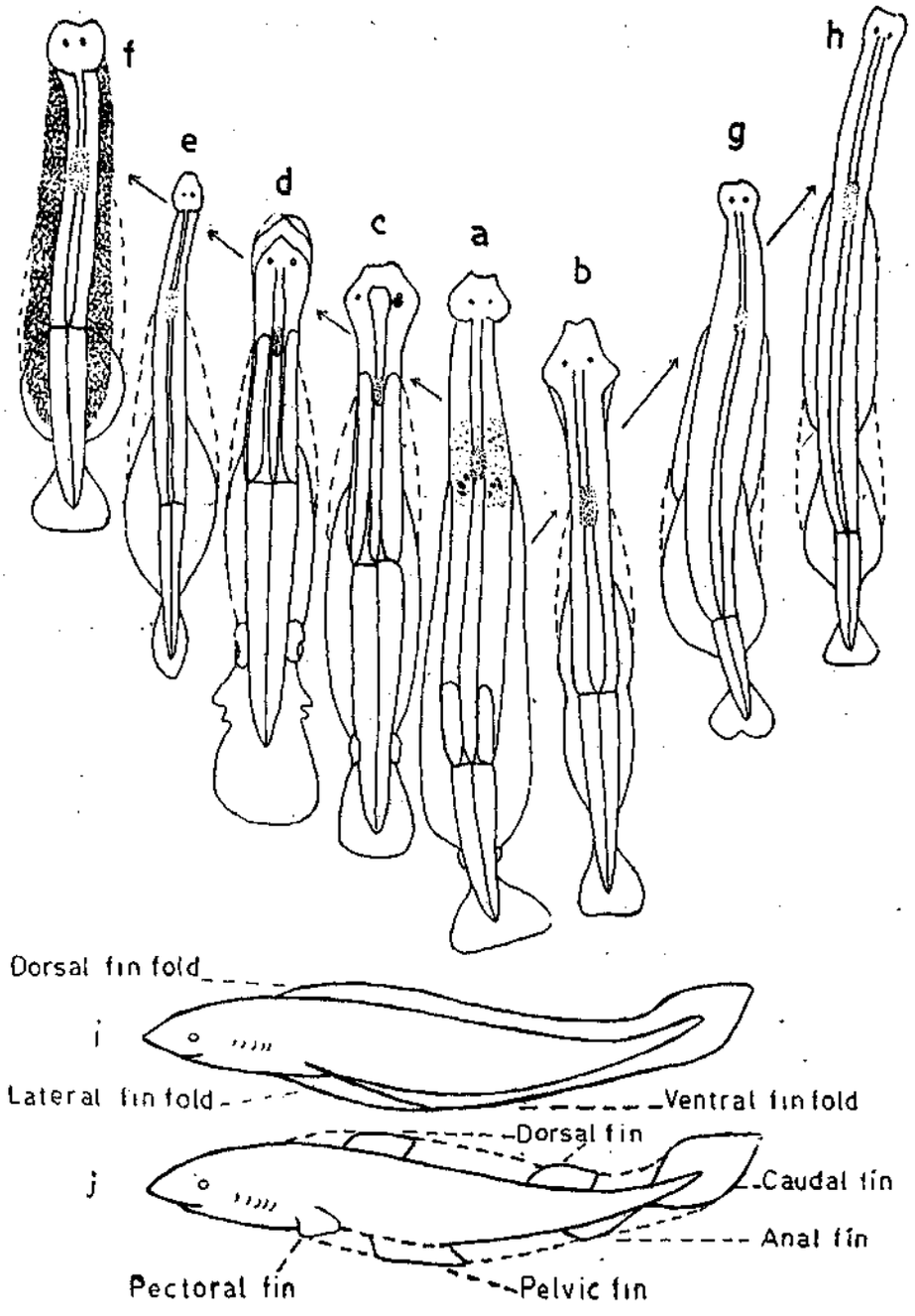

FIG. 1. Hypothetical evolution of fins in Chaetognatha and fishes : a. *Eukrohnia* sp., b. *Heterokrohnia* sp., c. *Bathyspadella* sp., d. *Spadella* sp., e. *Krohnitta* sp., f. *Pterosagitta* sp., g. *Sagitta* sp. 'maxima' group, h. *Sagitta* sp., i. fish with continuous fins and j. fish with median and lateral paired fins.

fins become of decreasing width at about the mid-length reaching a minimum narrowness in the 'maxima' group (Alvarino, 1984, per. comm.). The rayless weak portion of the fins that connects both the anterior and posterior lateral fins can be treated as the advanced condition of the narrowness seen along the mid-region of the lateral fins of *Heterokrohnia*. The rayless portion of the 'maxima' group might have completely degenerated in due course and finally resulted in the formation of two pairs of fins as seen in the species of *Sagitta*. So, the species of the genus *Sagitta*, might have evolved from *Eukrohnia* through *Heterokrohnia* and 'maxima' group on one side and the species of the genera *Spadella*, *Bathyspadella*, *Krohnitta* and *Pterosagitta*, with one pair of lateral fins might have evolved from *Eukrohnia* on the other side by the loss of a certain anterior portion of the long fins (Fig. 1).

The formation of the two pairs of lateral fins in *Sagitta* species can be compared with the formation of lateral paired and median fins from a pair of continuous lateral fin folds in fishes. According to 'Continuous fin-fold theory' of Balfour (1881) the ancient fishes had a pair of continuous lateral fin folds in addition to the median fin fold. The two lateral fin-folds lie on either side of the trunk and extends backwards to unite behind the anus into a single median fin, which continues around the tail and runs along the mid-dorsal line (Fig. 1).

Conclusion

From such a continuous pair of fin-folds the paired fins are supposed to have arisen by a greater enlargement at certain regions and by a greater suppression of the fin-folds at the intermediate regions. Based on this 'Continuous fin fold theory' a hypothesis is proposed here for the formation of two pairs of lateral fins of *Sagitta* from the single pair of lateral fins of *Eukrohnia* by the loss of the middle portion of the long fins and the smaller fins of *Spadella*, *Bathyspadella*, *Krohnitta* and *Pterosagitta* might have evolved from the long fins of *Eukrohnia* by the loss of a certain anterior portion. It is suggested that the two pairs of lateral fins of *Sagitta* and the single pair of lateral fins of other genera might have evolved from the continuous long fins of *Eukrohnia*.

As suggested by Prof. Harding B. Michel (1984, per. comm.), this needs further study on the anatomical features such as the degree of development of longitudinal muscles and extent of collarette and sensory projections to reach a definite conclusion.

References

Balfour, F. M. 1881. Development of skeleton of paired fins of elasmobranchs. *Proc. Zool. Soc. London*, pp. 651-671.