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Opinion

Evolutionary Tendencies Parasitic Copepods of Fish

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Abstract

Parasitic copepods inhabit invertebrates and vertebrate's animals. They have changed under the influence of parasitic life. Changes affected the body form, the reduction of segments and limbs. They have neoplasms (horns, tree-like processes, bullae, suckers, lamellar lobes, etc.).

Keywords: Parasitic Copepods; Evolution; Invertebrates; Vertebrates; Oligomerization; Plesiomorphic; Apomorphic; Appendages

Opinion

Parasitic copepods have subdued huge number of species hosts among invertebrates (coelenterates, annelids, crustaceans, mollusks, echinoderms etc.) vertebrates (fish, amphibians, mammals). Parasitic copepods have mastered sea and fresh water, but most species live in marine environment. The abundance of marine host species allowed them to implement expansion, because in the marine environment, they found greater number of environmental niches. Among copepods there is wide range of forms, standing at different stages of adaptation to parasitic life. Here we see copepods little changed in parasitic life. There are copepods heavily modified. Parasitic copepods underwent changes aromorphosis transformations, it has allowed them to conquer new habitats (ecto-, meso- and endoparasitism). Among the copepods there is a wide range of forms, stages of adaptation to parasitic life. Here we see copepods little changed in a parasitic life, whose family ties can be easily established. On the other hand, there are species strongly modified by parasitic life in which it is impossible to recognize copepods. There are examples where parasitic copepods are referred to worms or mollusks. At the same time, there are huge number of copepods occupying an intermediate position between these extreme morphological types of structure. In the process of evolution, parasitic copepods underwent oligomerization, reduction of legs etc. At the same time, they have new structural forms (horns, tree-like processes, bullae, suckers, lamellar lobes, etc.).

Under the influence of parasitic life morphological changes occur in copepods, for example, swimming legs disappear (Lernaeopodidae), They lead sedentary lifestyle. This life leads to reduction of appendages.

The next direction in the evolution of parasitic copepods is the disappearance of segmentation partial or complete (e.g., Lernaeopodidae, Pennellidae, Sphyriidae and others). The immobile lifestyle of parasitic copepods requires the organs of attachment to the host: hooks (Caligidae, Pandaridae, Lernanthropidae etc.), bullae (Lernaeopodidae), horny processes (Pennellidae, Sphyriidae). In parasitic copepods there is process of replacing the functions of various limbs, for example, the second antenna in free-living copepods performs a locomotor function, and in parasitic copepods, a fixative function. In parasitic copepods there is process of replacing the functions of different appendages, for example, the second antenna in free-living copepods performs motion function, and in parasitic copepods - fixative function. In this connection, it undergoes various changes in different groups of copepods, for example, in Pennellidae it is transformed into false claw. By the way, other appendages take the form of false claw (maxilliped) also. Among free-living copepods their size are 1-12 mm. The parasitic life leads to an increase the size of copepod body. For example, representatives of families Sphyriidae and Pennellidae reach length of 10 or more centimeters. The increase of body size is connected with an increase in the reproductive capacity of parasitic copepods. Genital complex of many species copepods is increased (Caligidae, Sphyriidae, Pennellidae, Lernaeopodidae and others).

Pennellidae is unique among parasitic copepods in the sense that its representatives have intermediate hosts in the

life cycle. After fertilization, males die, and females attach to the final host and undergo metamorphosis. Common ancestry form must recognize the form like the female pennellids before metamorphosis. Plesiomorphic distinctive feature should appear during the development of the parasite before the apomorphic ones. Plesiomorphic features are linear body shape and a rounded attachment organ, absence of processes or lobes on the body, straight egg sacs. Apomorphic features are the sigmoid body form, attachment organ with simple or branching processes, presence of processes on the body, spiral egg sacs. Evolutionary trends in the family are:

A. reduction of abdomen

B. complication of attachment organ

C. torsion of body

D. spiral egg sacs

E. reduction of swimming legs

Plesiomorphic features of Eudactylinidae are:

a) presence of exopodite on second antenna

b) presence of palp on mandible

Sphyriidae is strongly modified group of siphonostomatoids copepods. Representatives of the family parasitize on cartilaginous and bony fish. According to structure of posterior processes of trunk, genera fall into two groups:

a. weakly developed or missing posterior processes of trunk (Norkus, Paeon, Tripaphylus, Opimia)

b. well-developed posterior processes of trunk (Periplexis, Paenocanthus, Lophoura, Sphyrion)

In the first group, genus Norkus has processes of cephalothorax, but genera Paeon, Tripaphylus and Opimia do not have processes of cephalothorax. In second group, genera Periplexis and Paenocanthus have unbranched posterior processes of trunk, but Lophoura and Sphyrion have branched posterior processes of trunk. The first group confined to cartilaginous, and the second to bony fishes. These groups have differed ecology: first lives in epipelagic, second in the mesopelagic-bathipelagic, so they have a common ecological origin, their ancestors were pelagic animals. Chondracanthidae females are changed more than males, for example, females of Juanettia have two pairs of swimming legs, and small males have six pairs. Males of this family are pygmy and have a cyclopoid body form, but females are giant size and have chondrakantoid body form (Kazachenko [1,2]). Thus, Chondracanthidae males bear more primitive features of structure than females. Long-necked copepods (Therodamas, Lernentoma, Brachiochondria, Mecaderochondria, Pennella, Lernaea, Sphyrion, Therodamasidae, Pennellidae, Lernaea and etc.) demonstrate convergence. Flat body in the caligoid body form (Pandarus, Dissonus, Caligus, Lepeophtheirus etc.) demonstrate convergence either.

References

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