

## STUDY ON MORPHOLOGY AND LIFE CYCLE OF CLADOCERA

S. G. Chhaba\*<sup>1</sup> and P. S. Joshi<sup>2</sup>

<sup>1</sup>Smt. Radhabai Sarada Arts, Commerce and Science College, Anjangaon Surji, Dist. Amravati

<sup>2</sup>Shri. Shivaji Arts, Commerce and Science College, Akot, Dist. Akola

\*Corresponding author E-mail: [sangitachhaba@gmail.com](mailto:sangitachhaba@gmail.com)

### Abstract:

Zooplanktons are the group of crustaceans that feed on other planktons and form a link between phytoplankton and higher organisms of the food web. They play an important role to study the faunal bio-diversity of aquatic ecosystems. They include representatives of almost every taxon of the animal kingdom and occur in the pelagic environment either as adults (holoplankton) or eggs and larvae (meroplankton). By sheer abundance of both types and their presence at varying depths, the zooplanktons are utilized to assess energy transfer at secondary trophic level. One of the important groups of Zooplankton is Cladocera. The present study deals with the detail study of morphology and life cycle of Cladocera.

**Keywords:** Cladocera, Morphology, Life cycle, Zooplankton

### Introduction:

Zooplanktons are the group of crustaceans that feed on other planktons and form a link between phytoplankton and higher organisms of the food web. They represent natural feed organisms for many fish species during parts of their life cycle (Dalpadado and Bogstad, 2004). Zooplanktons are myriads of diverse floating and drifting animals with limited power of locomotion. Majority of them are microscopic, unicellular or multicellular forms with size ranging from microns to a millimeter or more (Dabhade and Chhaba, 2019). Ecologically, zooplankton are one of the most important biotic components influencing all the functional aspects of an aquatic ecosystem such as food chains, food webs, energy flow and cycling of matter (Joshi, 2011). Various zooplanktons such as Rotifers, Cladocera, Copepoda, Ostracoda, Tubifex, Artemia etc. are used as a live food for the culture of fishes specially the larvae of the fish. Cladocera is an important group of zooplankton available in small ponds and lakes, which constitutes a number of species which are present nearly in all aquatic habitats (Chhaba and Dabhade, 2021). Cladocerans frequently known as water fleas, the Cladocera is an order of small crustacean and they are abundant in fresh water aquatic habitats but rarely found in sea waters. They are microzooplankton ranging from 0.2 to 3.0 mm in size. They play a vital role in maintaining the balance of the aquatic ecosystem. They move through the water with the series of hops and jumps. It has been noticed that early stages of fish prefer Cladocera because of their spasmodic movement that make them more noticeable. Cladocerans feed on phytoplankton and organic waste and have the ability to tolerate a broad range of temperature with higher reproduction capacities (Das *et al.*, 2010). The Cladocerans are also important in the aquatic

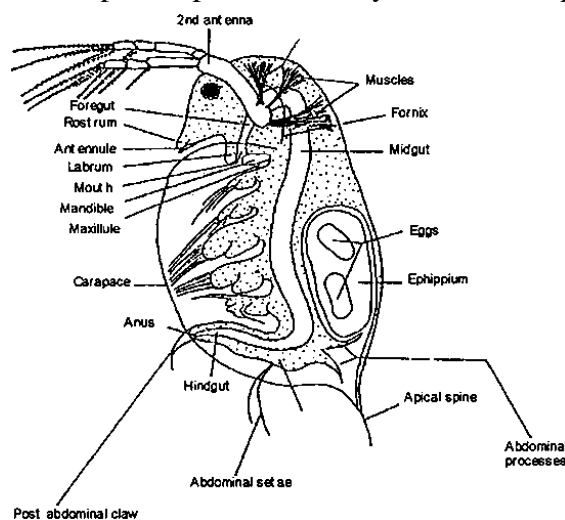
ecosystem as they counter the bacterial content of the water body, which helps to maintain a healthy food web (Martins *et al.*, 2017).

**Classification:**

- Kingdom: Animalia
- Phylum: Arthropoda
- Subphylum: Crustacea
- Class: Branchiopoda
- Subclass: Phyllopoda
- Order: Cladocera

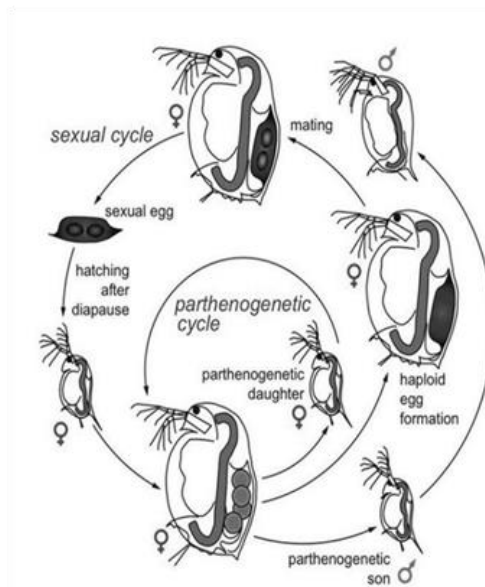
**Morphology:**

Cladocera are also called as water fleas because of their jerky movement in water. Daphnia belongs to the suborder Cladocera which include small crustaceans mostly living in fresh water. Daphnia are small kidney shaped zooplanktons with single compound eye, two double branched antennae. The body of Daphnia is transparent. Their outer covering is called as carapace which encloses the entire trunk except head and apical spines. There are five or six pairs of trunk appendages, they are flat and leaf like structures which carry food particles towards the mouth and they are also helpful in locomotion. The head projects ventrally in a beak like snout. The abdomen and postabdomen bent forward under the thorax. The postabdomen possess special claws and spines to clear the carapace. Male daphnia are smaller than the female. Male possess larger antinules, modified postabdomen. The first leg of the male is armed with a hook which is used for clasping. The average size of the Daphnia ranges between 3mm to 5mm. The adults size shows great variation; under the favorable conditions when food is available in abundance they grow throughout the life span. The adult daphnia may have carapace length twice as that of newly hatched individuals. The life span of Daphnia species varies according to the environmental conditions like dissolved oxygen, temperature and food availability (Pennak, 1978). The average lifespan of Daphnia species is 50 days at 20°C temperature.



**Figure 1: Morphology of Daphnia**

**Life cycle:**



**Figure 2: Life cycle of Daphnia**

Like other zooplanktons Cladocerans also shows two modes of reproduction that is sexual reproduction and parthenogenesis. Under favorable conditions Cladocerans undergoes sexual reproduction in which the male fertilizes the egg and diploid organisms are produced. While under unfavorable conditions the Cladocerans undergoes parthenogenesis which produces haploid organisms. Daphnia Cladocerans completed its life cycle in four stages that is egg, juvenile, adolescent and adult. A single female bears 6-10 eggs. The eggs hatch in the brood chamber of the female and the juveniles which are identical to their adult are released in approximately two days. Juveniles mature into the adult stage through adolescent stage in 6-10 days. Average life span of Cladocera is approximately 50 days but with different peak reproductive periods and to reach their peak reproductive capacities Cladocerans required 14-15 days. Their egg to egg generation time is 7-8 days at 20°C and the total young once produces per adult in its entire life span is 400-600 (Moris and Mischke, 1999).

**Conclusion:**

Cladocera are a diverse group of small crustaceans common in aquatic habitats, ranging from shallow temporary ponds to deep lakes and large rivers. Cladocerans serve as an important food for small fish, aquatic insects, and other zooplankton. Maximum body size ranges across two orders of magnitude, affecting a variety of physiological and ecological characteristics. Most cladocerans reproduce by cyclic parthenogenesis, alternating long periods of asexual reproduction with infrequent sex, and resting egg formation. Populations are dominated by females and can grow rapidly when the conditions are suitable.

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