Polymorphism in Coelenterata

Polymorphism:

When a single organism or species is represented by more than one kind of individual, which differs in form and function, it is said to be polymorphic and the phenomenon is termed **polymorphism**.

Two basic forms:

The colonial Hydrozoa have two basic types of individuals: the **polyps** and the **medusa**. These are functionally similar or homologous and can be derived from each other, but they are different in structural details.

1. **Polyps:** The poly is sessile with an elongated, tubular or cylindrical body. It is a nutritive zooid.
2. **Medusa:** The medusa is free-swimming with an umbrella-shaped body. Its convex side is usually directed upwards and the mouth is located on a tubular projection from the centre of the concave lower surface. Several small tentacles hang down from the margin.

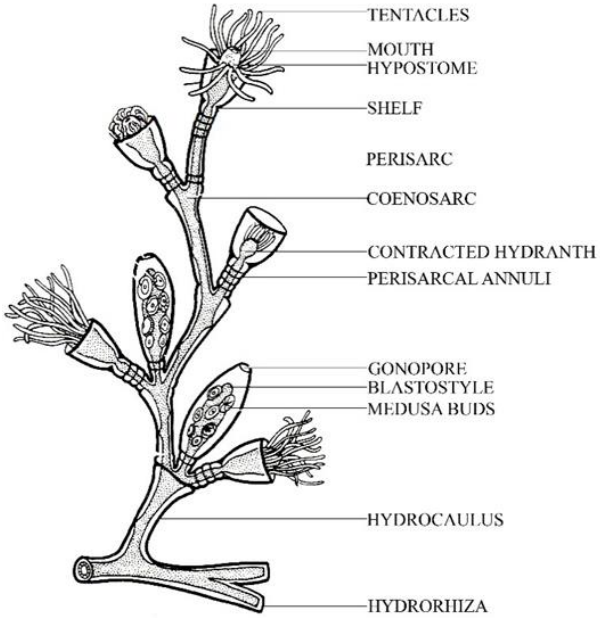
Patterns of Polymorphism

The degree of polymorphism varies greatly in different orders.

1. Order: Hydroida

The simplest and commonest polymorphism pattern is seen in many hydroid colonies, like Obelia, Tubularia etc., with two types of polypoid zooids. Such colonies bearing two types of individuals are called **dimorphic** colonies and the phenomenon is termed **dimorphism**.

Some hydrozoan colonies are **trimorphic**, besides the **nutritive polyps** and **reproductive medusae**, they also have modified polyps called **gonozooids** or **blastostyles**. They are enclosed in gonotheca, and they have no mouth and tentacles.

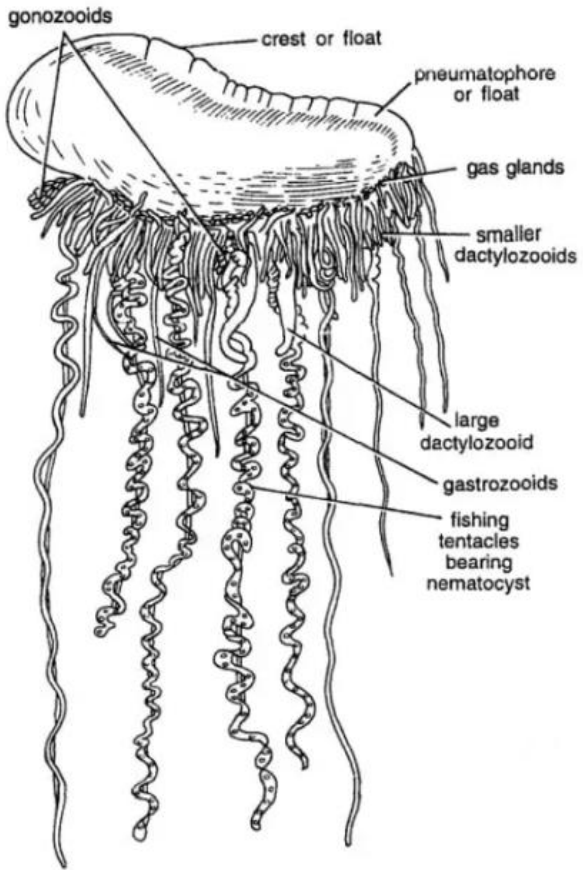


2. Order: Siphonophora & Chondrophora

The members of these order attain the highest degree of polymorphism and present the greatest number of polypoid and medusoid types, strongly modified and specialized for various vital functions. Siphonophora (e.g. *Physalia*) show the highest degree of polymorphism which is not found anywhere else in the animal kingdom. Chondrophora (e.g *Velella and Porpita*) colony seems to be highly organized.

A. **Modifications of polyps:** The polypoid zooids are of three kinds: gastrozooids, dactylozooids and gonozooids.

a) Gastrozooids: The nutritive polyps are called gastrozooids. They have the usual polyp form which may be tubular or saccular. A large mouth is placed at the extremity of the hypostome and a long tentacle. It is provided by batteries of nematocysts.

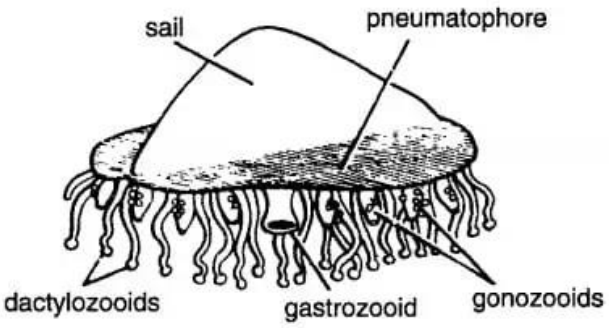


b) Dactylozooids: The protective polyps of the colony are called as dactylozooids. In **Physalia**, dactylozooids become very long filaments extending for great distances into the sea. In **Velella** and **Porpita** the margin of the colony bears long, hollow and tentacle-like fringing dactylozooids.

c) Gonozooids: The reproductive zooids are termed gonozooids or blastosyles. They are devoid of mouth and produce sexual medusoids by asexual budding.

B. Modifications of medusa: The medusoid zooids are of several kinds, including the pneumatophores, the nectocalyces, the bracts and gnonophores. They are concerned with locomotion, floatation and reproduction.

a) Pneumatophores is a gas-filled vesicle or bladder that functions as float and helps in swimming. The pneumatophore is an inverted medusoid devoid of mesoglea. It shows great variation in its structure and size in different siphonophores.



b) Phyllozooids are leaf-like bracts or thick and gelatinous medusoids with an enteron canal. They are protective and shield some zooids of a colony.

c) Nectocalyces are bell-shaped medusoids with velum, radial canals and circular canals, they have no mouth, manubrium, tentacles or sensory organs. The musculature is well developed so that the swimming bells have excellent swimming powers and serve for the locomotion of the colony.

d) Gonophores: The sexual medusoids may occur slightly on separate stalks or in clusters. Most colonies of Siphonophora are hermaphrodite. In *Physalia*, the female gonophore remains medusa-like but the male gonophore becomes reduced sac-like.

Theories of Polymorphism

A number of theories are given to illustrate the origin of polymorphism in Coelenterata. Some of these theories are as follows:

1. **Poly-organ theory**: This theory was proposed by **Huxley** and **Metschnikoff**. According to this theory, a polymorphic colony is supposed to be a single medusoid zooid; its various components are regarded to be the modified organs of this medusoid zooid.
2. **Poly-person theory**: This theory was proposed by **Leuckart** and **Gegenbaur**. According to this theory, a polymorphic coelenterate is supposed to be a colonial form in which various types of zooids have been aggregated to perform different functions. All the zooids of the colony are either polyps or medusae or both.

Significance of Polymorphism:

Polymorphism is essentially a phenomenon of division of labour. Different functions are assigned to different individuals rather than to the parts or organs of one individual. Thus, the polyps are concerned with feeding, protection and asexual reproduction, while the medusae are concerned with sexual reproduction.

Polymorphism and Alternation of Generations

Polymorphism is essentially a phenomenon of division of labour, i.e., different functions are assigned to different individuals.

Polymorphism is intimately associated with life history. In monomorphic forms like Hydra, the polyp reproduces both asexually and sexually, so that the life-cycle remains simple and may be represented by the formula: **polyp-egg-polyp**.

With the advent of polymorphism, reproductive powers are divided. The polyp reproduces asexually to form the medusoid which reproduces sexually to form the polyp. The life cycle may be represented by the formula: *polyp-medusa-egg-planula-polyp*. Thus, the so-called **alternation of generations** or **metagenesis** comes into existence.

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