



# Marine microalgae in finfish and shell fish larval rearing

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Aquaculture system is based on microalgae and their animal consumers. The uptake of microalgae biomass by filter-feeders is very promising from the energetic standpoint. Microalgae are the biological starting point for energy flow through most aquatic ecosystems, and are the basis of the food chain in all most all aquaculture operations. Microalgae are used for rearing larvae and juveniles of many species of commercially important molluscs, crustaceans and fish (marine and freshwater) either directly as a source of feed or indirectly through zooplankton (rotifers, copepod or *Artemia*). In addition, the microalgae are directly introduced in the larval tanks (green water techniques) during marine finfish larval rearing, where they are believed to play a role in stabilizing the water quality, provide nutrition to the larvae and enable microbial control. Thus the management of microalgae population and their culture is considered to be an integral part of hatchery operations.

# Microalgal Species selection for culture

All microalgal species are not equally suitable for culture in laboratory or hatchery. A suitable species or strain of microalgae should be selected depending upon the following criteria:

- i. Species of finfish or shellfish which will feed on the microalgae
- ii. Mass culture potential
- iii. Cell size
- iv. Digestibility
- v. Overall nutritional value

# Common Microalgae and applications in Aquaculture

# Nannochloropsis oculata

It is a small (2-4  $\mu$ m) green algae belong to the family Eustigmatophyceae, rich in EPA. It is used for rotifer culture and as water conditioner in finfish hatcheries. It is also used in reef tanks for feeding corals and other filter feeders.





# Isochrysis galbana

These are small  $(3-5\mu m)$  golden brown flagellates belonging to the family Isochrysidaceae. They are excellent feed for the production of copepods, brine shrimp, oysters, clams, mussels and scallops. Because of its richness in DHA, *Isochrysis* is used for the enrichment of zooplankton (*Artemia*) which has been raised on *Nannochloropsis* and yeast, for improving the DHA/EPA ratio in the live feed

### Chaetoceros calcitrans

It is a marine planktonic diatom belonging to the familyChaetocerotaceae. The cells (diameter 2 - 85  $\mu$ m, length 2 - 45  $\mu$ m) are elliptical in valve view. It is the widely used species in aquaculture, as it is composed of nutritional value suitable for marine filter feeders especially molluscs. It is used in shrimp hatcheries to increase the vitamin levels.

# Chlorella salina

It is a single celled green algae, spherical in shape, 2-10 im in diameter. Used for feeding rotifers in finfish larval rearing.

## Pavlova lutheri

It is a small (3-10  $\mu$ m) golden brown flagellate, belong to the family Haptophyceae. It is a widely cultured species and used in the cultures of oysters, clams, mussels and scallops to increase the DHA/EPA levels in their broodstock. It is a temperate species, used for rotifer enrichment, which is mainly used in cold water fish hatcheries (cod).

#### Tetraselmis suecica

It is a large green  $(4-5\mu m)$  flagellate belonging to the family Chlorodendraceae. This microalgae forms the standard feed for oysters, clams, mussels and scallops. This particular algae is rich source of natural amino acids that stimulate feeding in marine animals and also forms excellent feed for shrimp larvae. It is used in combination with *Nannochloropsis* sp. for rotifer production and also for feeding brine shrimp.

# Thalassiosira weissflogii

It is a large diatom (4-32  $\mu$ m) cylindrical in shape belonging to family Thalassiosiraceae. It is the major species used in shrimp and shellfish larvi-culture. It is the single best algae for shrimp larvae and also good feed for copepods, brine shrimp, and broodstock conditioning of oysters (post set), clams and mussels.





#### Skeletonema costatum

These are diatoms belongs to the family Skeletonemaceae. Cells are short (2-21  $\mu$ m) and cylindrical appearing as long straight chains. It is widely used for extensive and intensive shrimp hatchery systems.

### Dunaliella salina

It is a small green algae (9-11  $\mu$ m); rod to ovoid shaped, belonging to the family Dunaliellaceae. It is mostly used in shrimp hatcheries to increase vitamin levels and also for colouration.



A.Nannochloropsis oculata; B.Isochrysis galbana; C.Chaetoceroscalcitrans;
D.Chlorella salina(source: google); E. Pavlova lutheri (source: google); F. Tetraselmis suecica; G. Thalassiosera weissflogii; H. Skeletonema costatum; I. Dunaliella salina (source: google)





#### Microalgae culture

Microalgae culture is a form of aquaculture involving farming of different species of microalgae in a confined environment. The culture has three components namely, culture medium contained in a suitable vessel; the algal cells growing in the medium and air, to allow exchange of carbon dioxide between medium and atmosphere. An autotrophic alga need light, CO<sub>2</sub>, water, nutrients and trace elements for their growth. Some auxotrophic algae, which cannot prepare biochemical compounds like vitamins through photosynthesis, need additional biochemical compounds to be added in the culture medium.



#### References

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