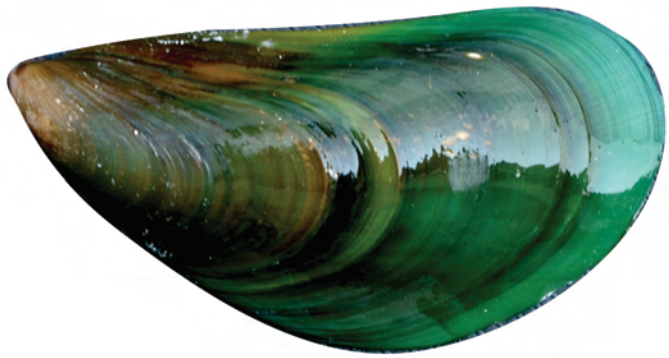
Perna viridis (Linnaeus, 1758)

Biji Xavier

IDENTIFICATION

Order	:	**Mytilida**
Family	:	**Mytilidae**
Common/FAO Name (English)	:	**Green mussel**

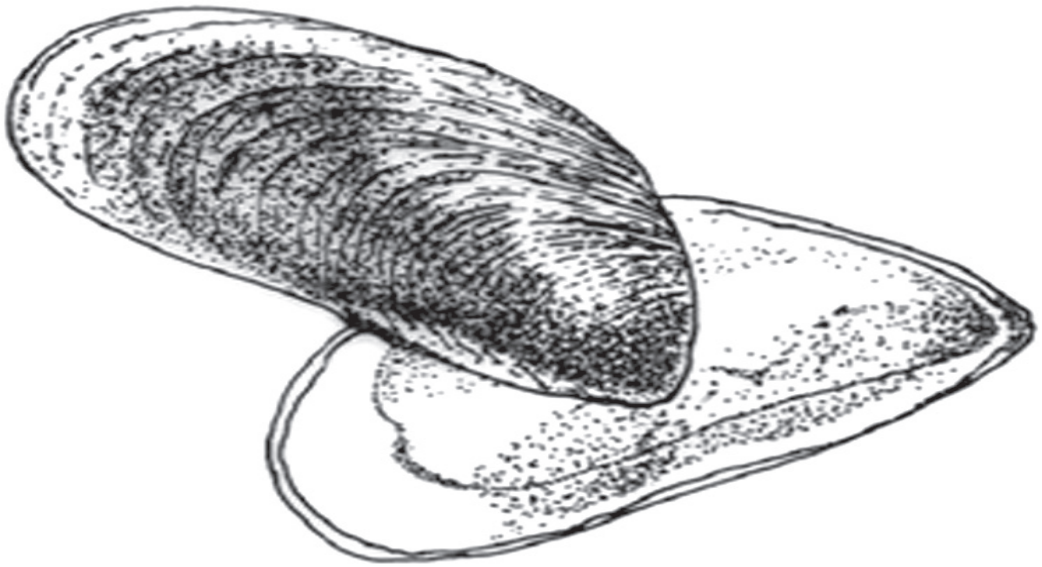


Local names: Kakkai (**Marathi**); Pachali (**Kannada**); Kallumakkai, Kadukka, Chippi (**Malayalam**); Pachai alli (**Tamil**); Alichippalu (**Telugu**)

MORPHOLOGICAL DESCRIPTION

Perna viridis is characterised by an elongate shell with pointed and swollen anterior end and a compressed posterior end. Umbo is tapering sharply at the terminal. Ventral margin is concave and long, whereas anterior margin is reduced. Outer surface possesses concentric growth marks and faint radial lines. The smooth periostracum (outer shell) is thick and dark green, with finely pitted ligamental ridge. Shell hinge has two teeth in the left and one small tooth in the right valve. In adults, the anterior adductor scar is absent. Anterior retractor scar is separate, situated at posterior end of ligament and is elongate-ovate in shape. Younger mussels are bright green and as it ages, the colour becomes darker. It has a large mobile foot and produces byssus, which helps it to attach to its substrate.

Source of image : Molluscan Fisheries Division, CMFRI, Kochi



PROFILE

GEOGRAPHICAL DISTRIBUTION

This species is widely distributed in the Indo-Pacific region. It is native to Malaysia and is reported from Persian Gulf, New Guinea and Japan. It is distributed naturally in the intertidal areas along the Indian coast. Along east coast, it is available in Chilika lake, Visakhapatnam, Kakinada, Chennai, Puducherry, Cuddalore, Porto Novo and Port Blair and along west coast, it is available in Kollam, Alapuzha, Kochi, Calicut, Kasargod, Mangalore, Karwar, Goa, Malvan, Ratnagiri and Gulf of Kutch.

HABITAT AND BIOLOGY

The green mussel typically occurs at shallow depths of 10 m and inhabits intertidal, sub tidal and estuarine environments. It remains mostly attached to submerged marine objects in high densities. It can tolerate a wide range of salinity (18-33 g/l) and temperature (10-35 °C). Sexes are separate and sexual maturity occurs at 15-30 mm shell length. Sexually mature male possesses creamy white gonadal tissue, whereas in female, it is reddish in colour. Fertilization is external. Spawning is closely related to monsoon rainfall. Life span is 2-4 years.

BREEDING IN CAPTIVE CONDITIONS

Water temperature plays a key role in the gonadal maturation and induced spawning. Complete spawning was achieved by the gradual increase of temperature from 20-35 °C @ 3 or 4 °C/5 days. Temperature stimulation resulted in gonadal growth, increase in gonadal index and change in cellular composition of testis and ovary. As the individual matured, gonadal tissue proliferated throughout the mantle region. In males, the mantle tissue turned creamy to milky white in colour whereas, in females it was orange to brick red colour. Chemicals like Tris and hydrogen peroxide were also used to induce spawning.

LARVAL REARING

In Tahiti, larval rearing was conducted in cylindro-conical tanks of 800 l capacity. Larvae are fed with *Monochrysis lutheri* and *Isochrysis* spp. at initial concentration of 25,000 cells/ml. Water exchange was done on every second day. During metamorphosis, *Isochrysis* spp. (12,500 cells/ml), *M. lutheri* (12,500 cells/ml) and *Skeletonema costatum* (50,000 cells/ml) were added daily. Metamorphosis and spat settlement was observed on 10^{th} and 17^{th} day, respectively. The survival from D stage to marketable spat size (7-8 mm and 40 mg) was 10 %.

In India, at Visakhapatnam R. C. of CMFRI, larvae were stocked initially @ 5-10 nos./ml, which was gradually reduced at settlement stage to 2-3 nos./ml. The larvae were fed from second day onwards with *Isochrysis galbana* @ 5,000 cells/larvae/day, with increase in cell density to 8,000 cells/larvae/day at umbo stage and 10,000 cells/larvae/day at pediveliger stage. After settlement, spats were fed with *I. galbana* and *Chaetoceros calcitrans*. The spat settlement rate achieved was 23.5 %.

NURSERY REARING

Information not available

GROW OUT

On-bottom culture and off-bottom culture are the two culture practises in vogue. Off bottom culture involves stake or pole, rack, raft (shallow and intertidal waters) and long line (deeper open waters). In France, intertidal pole culture, known as Bouchot culture, yields annually an average production of 25 kg mussel from each pole. Stake culture practiced in Thailand and Philippines produces 8-12 kg of mussel from each pole. On-bottom culture widely practiced in Netherlands, Denmark and Germany yields 80 t/ha. Rack culture is widely used for farming green mussel in India and Philippines.

FOOD AND FEEDING

Perna viridis is a filter feeder, feeding on zooplankton, phytoplankton and suspended fine organic material. It preferentially feeds on dinoflagellates and diatoms in times of bloom.

GROWTH RATE

Growth rate is influenced by temperature, food availability and water movements. Growth rates vary in the first year from 49.7 mm (Hong Kong) to 120 mm (India). Growth is maximum at 2 m below the surface, where environmental factors are conducive in the form of increased productivity and low fluctuations in temperature and salinity.

DISEASES AND CONTROL MEASURES

Nematopsis sp. infects *Perna viridis*. *Cryptosporidium* protozoan parasites are reported and it acts as a reservoir of *Cryptosporidium* food borne infections.

PRODUCTION, MARKET AND TRADE

PRODUCTION

According to FAO, world mussel production during 2006 was 1.89 million t, valued at 1.2 billion US $. Globally 2,82,000 t was produced through culture in 2005. The total culture production in India was about 17,000 t in 2008.

MARKET AND TRADE

Extracts of *Perna viridis* have medicinal importance as source of anti-HIV activity. Green mussel extract (GMe) (patented product of CMFRI), is an effective green alternative to synthetic non steroidal anti inflammatory drugs, containing 100 % natural marine bioactive anti inflammatory principles. Green mussel is also consumed fresh in India. In the domestic market, green mussel products are popularised and sold through the involvement of women self help groups.

CHALLENGES TO MARICULTURE

Presently culture is fully dependent on natural wild seed collection. However, culture of green mussel will be not sustainable with the seed collected from the wild. Thus there is urgent need to develop the technology for seed production. Though, the seed production technology for green mussel is available on experimental basis, the cost of seed produced by these technologies is very high. For sustaining the green mussel seed production technology, the cost involved in seed production should be brought down, where the farmer can afford to buy and use them for culture. Hence, there is an urgent need to initiate mass scale production of hatchery reared seeds

through mariculture. The main researchable issues, which have to be sorted out for this species in India, are larval rearing protocols with emphasis on bringing down the cost of production.

FUTURE PROSPECTS

Presently mussel seed available from the wild is used for farming which is not sustainable and is not enough to meet the requirements of mussel farmers. So commercial seed production of green mussel is required urgently for assured seed supply for ensuring that green mussel culture is an economically viable venture for mussel farmers.

SUGGESTED READING

AQUACOP. 1979. Larval rearing and spat production of green mussel *Mytilus viridis* Linnaeus in French Polynesia. Proc. World Maricul. Soc., 10: 641-647.

AQUACOP. 1983. Mass production of spat of green mussel *Mytilus viridis* Linnaeus in French Polynesia. Proc. Symp. Coastal Aquaculture, 2: 534-539.

Asokan, P. K. 2011. Biology of Green Mussel. Training on green mussel farming. CMFRI - NFDB., p. 1-3.

Asokan, P. K. and Mohamed, K. S. 2011. Mussel farming methods. Training on green mussel farming. CMFRI - NFDB., p. 8-13.

Chakraborty, K. 2012. Green mussel extract (GMe) goes commercial first neutraceutical by an ICAR institute .CMFRI Newsletter, p. 133.

Laxmilatha, P., Rao, G. S., Pattnaik, P., Rao, T. N., Rao, M. P. and Dash, B. 2011. Potential for the hatchery production of spat of the green mussel *Perna viridis* Linnaeus (1758). Aquacult., 312: 88- 94.

Mitra, D. and Chatterji, A. 2004. Indian green mussel (*Perna viridis*) as a source of anti-HIV activity.US6770302 B2.

Sanil, N. K. and Vijayan, K. K. 2011. Diseases and Parasites of Bivalves. Training on green mussel farming. CMFRI - NFDB, p. 56-61.

Silas, E. G. 1980. Mussel culture in India-Constraints and prospects. CMFRI Bulletin, 29. p. 51-56.

Soon, T. K. and Ransangan, J. 2014. A Review of Feeding Behavior, Growth, Reproduction and Aquaculture Site Selection for Green-Lipped Mussel, *Perna viridis*. Advances in Bioscience and Biotechnology, 5: 462-469.

Sreedevi, P. R., Uthayakumar, V., Jayakumar, R. and Ramasubramanian, V. 2014. Influence of rearing water temperature on induced gonadal development and spawning behaviour of tropical green mussel, *Perna viridis*. Asian Pacific J. Reprod., 3(3): 204-209.

Srisuphanunt, M., Saksirisampant, W. and Karanis, P. 2009. Detection of *Cryptosporidium* oocysts in green mussels (*Perna viridis*) from shell-fish markets of Thailand. Parasite, 16(3): 235-239.