

GENETIC CHARACTERIZATION AND PROTEIN PROFILING OF GREEN MUSSEL (*PERNA VIRIDIS* (Linnaeus, 1758)) AND BROWN MUSSEL (*PERNA INDICA* Kuriakose and Nair, 1976)

Thesis submitted in partial fulfillment
of the requirements
for the degree of

Ph.D. (Mariculture)

by

**DIVYA P.R., M.F.Sc.
(Ph.D. 173)**



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सारांश

भारत में समुद्री शंबुओं की मुख्य दो जातियाँ हैं: *पेर्ना विरिडिस* (लिनेयस, 1758) (हरित शंबु) और *पेर्ना इंडिका* (कुरियाकोस और नायर 1976) (भुरा शंबु). इसके अतिरिक्त, दक्षिण पश्चिम तट पर तीसरे प्रकार के शंबु जिसे पारट मसेल कहा जाता है, भी पाया गया है. वर्तमान अध्ययन में कवच के मोर्फोमेट्रिक्स तथा मोलिक्युलार मार्केर्स उपयुक्त करके पूर्व और पश्चिम तटों के हरे और भुरे शंबु के बीच कोई अलग प्रभव हो तो इस की पहचान और आनुवंशिक विशेषताओं पर अध्ययन किया गया है. स्टॉक की पहचान के लिए, प्रिन्सिपल कम्पोनेन्ट अनालिसिस और कनोनिकल डिस्क्रिमिनेन्ट फंक्शन अनालिसिस द्वारा कवच का मोर्फोमेट्रिक्स और प्रोटीन इलक्ट्रोफोरसिस (नेटीव - पोली अक्रिलमाइड जेल इलक्ट्रोफोरसिस) और रान्डमली आम्प्लिफाइड पोलिमोर्फिक डी एन ए - पोलिमरेस चेइन् रियाक्शन (RAPD-PCR) द्वारा आण्विक तरीके से कवच का आकारमिति परीक्षण किया गया. कवच की मोर्फोमेट्रिक्स और नेटीव पेज और RAPD-PCR प्रोफाइलों से सुसंगत परिणाम निकला और दोनों हरा और भुरा शंबुओं के प्रभव के बीच अधिक रूप से अंतराजातीय समांगता और बहुत कम आनुवंशिक विभिन्नता का संकेत मिला. आर ए पी डी मार्केर्स उपयुक्त करके किए गए आनुवंशिक अभिलक्षण परीक्षण से दोनों जातियों में आनुवंशिक विभिन्नता स्पष्ट रूप से देखी गयी. पारट मसेल हरे और भुरे शंबुओं का संकर है या इन में किसी एक के रंग में हुआ परिवर्तन है या नहीं, इस के स्पष्टीकरण के लिए RAPD, कवच आकारमिति, प्रोटीन इलक्ट्रोफोरसिस (नेटीव पेज, एस डी एस पेज और अलोसाइम्स) और माइटोकोन्ड्रियल (mt) डी एन ए जीन (साइटोक्रोम ओक्सिडेस I) विश्लेषण किया गया. अध्ययन का निष्कर्ष यह है कि पारट मसेल उपर्युक्त दोनों जातियों की संकर जाति नहीं है, बल्कि भुरे शंबु का रंग परिवर्तन है. इन जातियों पर पहले काम किए गए अनुसंधानकारों के अध्ययन में यह वर्गीकरण अस्पष्टता था कि *पी. इंडिका* भौगोलिक रूप से व्यापक *पी. पेर्ना* ही होता है. इस अध्ययन में mt DNA के सी ओ 1 क्षेत्र उपयुक्त करके इस वर्गीकरण अस्पष्टता का खंडन करने का प्रारंभिक प्रयास किया गया है. *पी. पेर्ना* की अपेक्षा *पी. इंडिका* में 5% विभिन्नता पायी जाने के कारण इसे *पी. पेर्ना* के सहनाम के रूप में पदावनत करने की जरूरत नहीं है, यह अलग जाति ही है.

ABSTRACT

The marine mussels of India are mainly of two species: *Perna viridis* (Linnaeus, 1758) (green mussel) and *Perna indica* Kuriakose and Nair (1976) (brown mussel). In addition to this, along the south west coast (Kollam coast of Kerala), a third type of mussel called parrot mussel has also been reported. The present study was undertaken for genetic characterisation and identification of distinct stocks if any, within green as well as brown mussels, from both east and west coast, using shell morphometrics and molecular markers. Stock identification using shell morphometrics were attempted with Principal Component Analysis and Canonical Discriminant function Analysis, whereas, molecular methods used were protein electrophoresis (Native - Poly Acrylamide Gel Electrophoresis) and Randomly Amplified Polymorphic DNA-Polymerase Chain Reaction (RAPD-PCR). The shell morphometrics as well as Native PAGE and RAPD-PCR profiles gave concordant results indicating high intra species homogeneity and low level of genetic differentiation among populations of both green and brown mussels. Genetic characterisation using RAPD markers could bring out the genetic variability within both the populations. Elucidation of the genetic identity of parrot mussel as to whether it is a true hybrid of green and brown mussel, or only a colour variant of any of them was also done using RAPD, shell morphometrics, protein electrophoresis (Native PAGE, SDS (Sodium Dodecyl Sulphate) PAGE and allozymes) and mitochondrial (mt) DNA gene (Cytochrome oxidase I) analysis. The study concluded that the parrot mussel is not a hybrid of the two, but only a colour variant of the brown mussel. An initial attempt to resolve the taxonomic ambiguity of *P.indica* that it is only a synonym of globally distributed *Perna perna*, as suggested by some of the previous workers has also been made in this study using COI regions of mt DNA. As *P. indica* revealed only 5% divergence from *P. perna*, it was concluded that *P. indica* need not be relegated as a synonym of *P.perna*.