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# BIODIVERSITY OF FRESHWATER MUSSEL AND ITS ROLE IN FRESHWATER ECOSYSTEM

**H. Singh[1] and D. I. Pathan[2]**

[1]Senior Scientfic Officer (Head),MBRS,Ratnagiri
[2]College of Fisheries, Ratnagiri

## Introduction

Freshwater mussels have important effects on their habitats and also effect the survival of other aquatic species. It feed by filtering the water and removing food particles such as algae, bacteria, diatoms and fine particulate organic material. Several studies have shown that they can improve water quality by reducing quantities of excessive algae and nutrients. Freshwater mussels can improve the ability of the water body to create good habitat for other species and for human uses, such as drinking water. They are sensitive and respond to a variety of habitat disturbances, and are also indicators of habitat quality. If they disappearance from a water body, it indicate that something is wrong. If we can protect the populations of mussels, it help in keeping the our freshwater ecosystems healthy enough to serve the human being as well as aquatic communities. Freshwater mussels (order Unionida) belong to the class Bivalvia, and phylum Mollusca. A total of 8 families (Subba Rao, 1989). The order Unionida contains the largest number and diversity of groups with 25 genera, 8 families and 109 species. Within the Unionida, the family Amblemidae is the largest, comprising nearly 52 species within the order (Subba Rao, 1989).. Other families include Unionidae (8 genera, 12 species), Etheriidae (1 genera, 1 species), Margaritiferidae (1 genera, 1 species), Corbiculidae (4 genera, 21 species), Pisidiidae (2 genera, 17 species), Cultellidae (2 genera, 2 species), Solecurtidae (1 genera, 2 species), (Subba Rao, 1989). As the order Unionida is the most diverse, and found throughout the country.

Habitats

Mussels were abundant in most perennials rivers and streams, lakes, pond and reservoir of the country.. Mussels are not usually found in water bodies that observed drying or dry periods of longer period. However, some species can survive in streams that occasionally dry up for short periods of time. The mussels can survive out of water or avoid desiccations by burying themselves in the sediments it varies between species and between habitats. Some species of mussels also survive well in ponds and reservoir, but many species adapted to free flowing rivers and streams are unable to survive in stagnant water after a section of stream becomes impounded.

Ecology and life history of freshwater mussels

Freshwater mussels are long-lived organisms and some species can survive over 100 years (Bauer 1992). It buried in bottom substrate of the water bodies with benthic, sedentary lifestyles. The mussels use their siphons to inhale water and use their gills to filter out food particles, such as bacteria, algae, and other small organic particles. Their benthic, sessile lifestyle, their reproduction dependence on fish hosts, and their distribution as a result of specific habitat requirements all contribute to effect their population. Freshwater mussels have complex life cycles with extraordinary variation in their life history.Male Freshwater mussels are releasing sperm into the water to fertilize the eggs that are retained internally in the females' body (Wachtler et al., 2001). The larvae of Unionids is known as glochidia that are released from a matured female's modified "marsupial" gills where they developed from embryos following fertilization (McMahan and Bogan, 2001). One female mussel can produce up to 4 million or more glochidia and eject them in a sudden and synchronized action (Bauer 1987). If the glochidia are released in the proximity of a suitable host fish, they clamp onto the gills of the host, which then carries the glochidia for weeks or months until they are mature and ready to live freely on the bottom of the river or lake. Because glochidia are heavy, short-lived, non-motile, and carried by the current towards the fish species for further development (Strayer et al., 2004). When a host fish nips at the lure, the glochidia are released into the vicinity of the fish's mouth, thus greatly increasing the odds of the glochidia attaching onto the fish's gills (Haag and Warren, 1999). Other species release large packages of glochidia called conglutinates,which often mimic prey items themselves, that rupture

and release glochidia upon being bitten by potential hosts (Grabarkiewicz and Davis, 2008).

| Character | Unionoidea |
|---|---|
| Life span range | < 6 to > 100 years |
| Age at maturity | 6 to 12 years |
| Reproductive mode | gonochoristic |
| Fecundity | 0.2 – 17 million/female per breeding season |
| Juvenile | Very poor survival |
| Adult | High survival |

(McMahon and Bogan, 2001)

Freshwater mussels can strongly affect both the biotic and abiotic components of the ecosystems in which they live. Loss of unionid biodiversity can result in loss of ecological condtition in those areas where mussels are in decline (Vaughn and Hakencamp, 2001). Due to their suspension feeding habit, Unionids can remove large amounts of phytoplankton, bacteria, and inorganic nutrients from the water column, enhancing water clarity and quality (Strayer etal., 1999). They can also play other important roles in nutrient cycling, such as removing pelagic nutrient resources and depositing them into nearby sediments as faeces orpsuedofaeces (Roditi et al., 1997; Spooner and Vaughn, 2006). Mussels also act as bioturbating the sediment as they move both vertically and horizontally (Allen and Vaughn, 2011). This activity can increase the depth of oxygen penetration in the sediment, homogenize sediment particle size (McCall et al., 1995), and affect the flux rates of solutes between the sediment and water column (Matisoff et al., 1985).

Factors affect the abundance and diversity of freshwater mussel

Dudgeon et al. (2006) describe major contributors to the loss of freshwater mussel biodiversity in general: over-exploitation, pollution, flow modification, and habitat degradation. There is now strong evidence that both global and regional climate change is occurring and will cause an increase in mean air temperature, more erratic precipitation patterns, and more severe floods and droughts. (Bates et al., 2008) These changing patterns pose serious threats to both terrestrial (Thomas et al., 2004) and freshwater (Sala et al., 2000) ecosystems. One group of researchers predicted that up to 75% of fish species could become extinct in rivers suffering from declining flows as a result of both climate change and human withdrawals (Xenopoulos et al., 2005). Most of the research done on the effects of climate change in freshwater systems has focused on fish and other vertebrates, with very little direct study of the effect on unionids. However, it is well known that temperature affects several aspects of mussel physiology and life history, including reproduction, growth, and recruitment of juveniles (Bauer, 1998; Kendall et al., 2010; Roberts and Barnhart, 1999). The change in precipitation patterns could also impact mussel populations through increased flooding and prolonged droughts. Although periodic, low-intensity flooding can have beneficial effects on mussel populations such as flushing fine sediments and pollutants out of substrates (Gordon et al., 1992), extreme storm events can dislodge mussels from the sediment and alter mussel bed habitat (Hastie et al., 2001). As mussels are limited in their ability to move horizontally, they are unlikely to reach refuges in response to complete dewatering of their habitat. Even reduced flows can have negative effects on respiration, feeding, growth, and glochidial recruitment; and can increase predation by terrestrial consumers (Golladay et al., 2004; Hastie et al., 2003).Agricultural and forestry practices, benthic disturbance by sand removing , loss of vegetation, erosion of stream banks, and changes in hydrologic patterns all contribute to unnaturally high amounts of fine particle sedimentation that affects mussels directly by clogging gills and feeding siphons,and indirectly by blocking light necessary for algal production (Brim Box and Mossa, 1999) and reducing visibility needed for fish hosts to find the lures of breeding female mussels (Haag et al., 1995). Siltation can also create a hardpan layer in the substrate, making it unsuitable for burrowing in (Gordon et al., 1992).

Conservation of freshwater mussel

The conservation of freshwater mussel biodiversity may be adopted by reducing pollution, sustainable flows, habitat protection and restoration creating connected freshwater protected areas. If the proper care is not taken the population of freshwater mussels could result in the loss of this important group of animals and freshwater ecosystem