A REVIEW ON USE OF FRESHWATER MUSSELS (BIVALVIA: UNIONOIDA) AS A BIOLOGICAL AND WATER QUALITY INDICATOR

***Smt. S. R. Varpe**

***Dept of Zoology, K.K.W. Arts, Science And Commerce College , Pimpalgaon Baswant**

ABSTRACT

Urbanization is the important contribution to the environmental pollutants specially freshwater habitat. Water pollutants are a number one cause for the pollution of environment, surroundings and human fitness. Molluscans are maximum crucial among of invertebrates in a surroundings with regard to biomass, range, spatial or tropic relationships. Freshwater mussels (Bivalvia: Unionoida) are critical aspect of ecosystems and used as a biological indicator for water pollution. This is due to the unique feature capabilities that makes them as an amazing organic indicator. They are greater touchy to the toxins and heavy metals such as, copper, zinc, cadmium and many others. The buildup pollution and heavy metal inside the shell and organs of freshwater mussels indicating the contaminant nature of the water bodies

Key words: Water pollution, Heavy metals, Bioaccumulation, Mollusca, water quality

Introduction

Freshwater mussels (Bivalvia: Unionoida) belong to a group of invertebrate live in freshwater consisting of lakes and streams. Freshwater mussels are key components of freshwater ecosystems, and feature international huge ecological and financial importance. Clean water mussels are *Bivalve molluscs* and as such have traits not unusual with marine species including the quahog, oyster and blue mussel. They may be disbursed nearly global, inhabiting every continent on this planet except Antarctica. Freshwater mussels play a critical function in aquatic ecosystems. As sedentary suspension feeders, unionoids eliminate a effect of materials from the water column, which include sediment, natural matter, micro organism, and phytoplankton. Siphoned fabric is either transferred to the mouth for digestion or sloughs off the gills and exits via the ventral margin of the shell (pseudofeces). Digested fabric is either used as fuel for numerous lifestyles techniques or excreted as feces. (Vaughn and Hakenkamp, 2001). At the same time as the siphoning sports of mussels are regularly left out, they provide an indispensable aid link between pelagic and benthic habitats (Nelapa et al., 1991; Howard and Cuffey, 2006). Juvenile mussels have verified the potential to pedal feed by using sweeping their foot to collect meals debris from sediments.

Freshwater Mussels as Biological Indicators

Freshwater mussels have their own special traits characteristic that make them as a organic indicator (Bedford et al., 1968; Simmons and Reed, 1973; Imlay, 1982; Neves, 1993; Naimo, 1995). This at tribute is authorized people to feature as "environmental logbooks," efficaciously document the adjustments in water habitat over the years. Freshwater mussels are commonly called "precise" signs of biological integrity and water pleasant by using scientists. Kearns and Karr (1994) used mussels from the genus Epioblasma and three snail genera as an illiberal metric while growing a BIBI (Benthic Index of Biotic Integrity) for the Tennessee Valley. Pip (2006) evaluated water satisfactory and mollusc groups on different locations and said that mussel richness become undoubtedly correlated with general dissolved solids and negatively correlated with lead. She additionally pronounced that sizeable reduction in mussel species variety in water our bodies and it became cautioned that this transformation was due to oxygen depletion, algal toxins, sewage and agricultural spills and habitat adjustments.

Sensitivity to Toxic Contaminants

The concentration and exposure of toxic contaminant from a particular species may vary from pollutant to pollutant. Additionally, the toxicity of a particular pollutant may be influenced by a number of variables, including concentration and exposure route, frequency, and duration. Mussel population are severely reduced or destructed due to the toxic contaminants throughout the world (Baker, 1928). Early of the 20th century, industrial stream pollution tells dyestuff discharges from knitting mills causing widespread destruction (Clark and Wilson, 1912) and rivers acting as a sole material of sewage and manufacturing waste. More recently, assessments of unionoid populations have cited toxic contaminants as a contributor to wide spread faunal declines (Havlik and Marking, 1987; Bogan, 1993; Neves et al., 1997). Freshwater mussels exhibit a variety of sensitivi ties to toxic contaminants based on species, life stage (glochidium, juvenile, or adult), and environmental conditions. For example, Wang et al., (2007a) reported that glochidial Oyster Mussel (Epioblasma capsaeformis) and Scaleshell (Leptodea leptodon) were far more sensitive to copper than other.

Shells as Indicators

Freshwater mussel shells used as an indicators of ecological integrity and environmental stress since the early 1900s (Coker et al., 1921). However, recently, researchers have started to collect quantitative information from the shell material (Imlay, 1982; Ravera et al., 2005; Brown et al., 2005). Mussel shells consist of five primary layers: the periostracum, prismatic layer, peripheral layer, laminar layer, and inner nacreous layer (Imlay, 1982). The periostracum is mainly proteinaceous in nature. Other four layers are comprised of calcium carbonate, in the form of calcite or aragonite. Metals may be present in shell material due to surface adsorption or as metabolic analogues of calcium. The metal content of shell material often var ies greatly from what is found in soft tissues. For example, Anderson (1977) reported that the metal concentrations were higher in soft tissues compared to the shell material. In particularly zinc concentration was accumulated to level of 10-40 times found in shell material. Ravera et al., (2003) reported shells contain higher concentrations of Ca, Cr, Mn, Ni, and Mo than the soft tissues, however, concentrations of As, Cd, Cu, Ni, and Pb was lower in shells than soft tissues. Considerable variation was also observed in heavy metal concentrations between different species. Raveraet al., (2005) analyzed shell material from a pair of Italian lakes to document the changes in the metal concentrations over two distinct time periods. Using recently collected shells and preserved valves from a museum, researchers were able to analyze metal concentrations from 1928-1934 and 1995-2000. Several metals significantly differed in concentration between the two periods, which also varied greatly between the two lakes.

Biological Indicator of freshwater Molluscs

Some of the molluscan species such as *Alasmidonta Sp. EpioblasmaSp, Fusconaia Sp, Lampsilis Sp, Lasmigona, Pleurobema, Quadrula, Medionidus conradicus* are worked as a valuable indicators of habitat and water quality and indicating the toxic and other biological contaminant in water bodies (Grabarkiewicz and Davis, 2008).

Water and sediment quality

Because of filter feeders' adult mussels are sensitive to water borne contaminants such as those carried in agricultural runoff and in municipal and indus trial wastewater. On the other hand, Juvenile mussels may be particularly sensitive to the chemistry of the sediments in which they live and feed. Thus, possible influences on mussel communities might include not only the chemical quality of stream water but also the chemical quality of streambed sediments, which is particularly prone to storing trace metals and organic chemical compounds. Water and sediment quality can be evaluated from a combination of onsite measurements of water quality and collection of water and sediment samples for laboratory analyses (Beth et al., 2004).

Water body monitoring process

The large size of as macro-invertebrates and re mobility are more important advantageous over the other organisms for bio monitoring. The reduction in density and diversity of freshwater mussels suggests that insubstantial changes in water quality characteristics can have pervasive effects (Beth et al., 2004). The advantage of using bio indicators over chemical and physical tests to evaluate water quality is that the presence of living organisms inherently provides information about water quality over time.

Bioaccumulation

Fresh water mussels are sedentary, benthic and gregarious invertebrates. They filter water continuously and feed on phytoplankton. The water current is taken by the inhalant siphons that pass through the gills, labial palps, and mantle, and is finally ejected by the exhalent siphon. During this process the suspended soil particles, excess algal blooms and metal ions (Cu, Zn, Ni etc.) are removed from the water. They accumulate both essential (Na, Ca, Mg) and non essential (Hg, Cd, Pb) metals in higher concentrations than the ambient water. Through their filter feeding and respiratory mechanisms, they are also taking up other pollutants such as hydrophobic organic contaminants, poly aromatic hydrocarbons, metallothionein and organochlorines (Ravera et al., 2003). The accumulation of contaminants from the water column by bivalves is referred to as 'bioconcentration', a property that makes bivalves potentially useful as 'biomonitors' for water quality monitoring programmes, and also for bioremediation to improve the quality of polluted waters. Bioaccumulation of toxins is one of the many possible tools that can be employed in bio monitor ing. Hanging culture of Dreissenapo lymorpha is used to reduce suspended matter loads, toxins and especially organic pollutants. Mytilus edulis, the blue mussel have been used traditionally in the marine sector for environmental monitoring due to concern for pollution in coastland estuarine areas. Anodonta cygnea when exposed to toxin strain of cyanobacterium, accumulated huge quantity of the peptide oscillatoria toxin that was present in low concentrations within the cyanobacterial cells. Moreover some bivalve species are exposed to pollution through pedal feeding or gill ingestion of sediment. Accumulation occurs in tissues e.g. heavy metals will accumulate primarily in muscles and organ (soft) tissues and organic pollutants accumu late in the lipid. Bivalves have been known to me tabolize certain classes of compounds better than others controlling ecotoxicity. More recently fresh water bivalves have been utilized to assess the quality of lakes, rivers and streams (Misra and Mukhapadhyay, 2008).

Conclusion

Ecosystem services are benefits to humans. Fresh water mussels performed important role in aquatic ecosystems, which may in turn be framed as the ecosystem services that they contribute to or provide. These include services such as nutrient recycle and storage, structural habitat, substrate and food web modification, and use as environmental monitors; regulating services such as water purification (biofiltration); and provisioning and cultural services including use as a food source, as tools and jewelry, and for spiritual enhancement. Mussel-provided ecosystem services are declining because of large declines in mussel abundance. Mussel propagation could be used to restore populations of common mussel species and their ecosystem services.

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