

## Review Paper

**Use of freshwater mollusc shells in the button industries by local artisans in Mehsi, East Champaran, Bihar, India**

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**ABSTRACT**

Molluscs are the second largest group of animals after insects and are an important link in the different types of food chain and food web. Many species of molluscs are a source of medicine, food and other economically important items. Molluscs are often used to make jewelry and ornaments. Some shells are often collected because of their great beauty. Since mollusc shells are composed mainly of calcium carbonate they have had a number of industrial uses. Ground shells produce the finest lime which is used in pottery glazes, tooth paste and poultry food additives either dead or alive; they may be used for a number of industrial purposes such as road construction and building foundations, Mehasi, a small town in north western part of Bihar state is famous for commercial use of mollusc shells for producing ornamental items and button. The industry which started more than 100 years ago is spread across 13 panchayat and includes around 150 units. Only large sized freshwater mussels of the family Unionidae i.e. *Lamellidens* spp., *Parreysia* spp. and a few *Radiatula* spp. are used in button production, ornamental and art works (Necklaces, Bracelets, Ear-rings, Broches, Cufflinks, Anklets, Neckbands, Armlets and Locketts). Buttons of varying sizes from 14-40 mm were produced as per the demand. The mixed small and thin-shelled individuals belonging to family Viviparidae, Pleuroceridae, Thiaridae and Corbiculidae were transformed into shell-powder for supply to poultry feed industries. In Bihar, use of molluscs as food is also common in rural areas in northern part of the state, where annual and perennial water bodies are abundant. Status survey and review of the molluscs used in the button industries and was studied and found no scheduled species is used in the industries. The indiscriminate exploitation of the mollusc shells is resulting in the loss of biodiversity which will definitely affect the health of aquatic ecosystem.

**Keywords:** *Mehsi, Artisans, Aquatic Molluscs, Button, Ornaments.*

**INTRODUCTION**

Molluscs are the largest group of animals after insects and are an important link in the different type of food Chain and food web. Many species of molluscs are of a source of medicine, food and other economically important items. The use of freshwater molluscs as protein-rich food is very much in practice in a number of countries including India. With low fat and crude fibre content, molluscs are excellent source of necessary trace and minor elements needed for proper growth and development of human being and it can be used as high-nutrient supplementary feed for domestic animals, birds and even for fish culture. It is also used due to highly nutritious flesh and shells of mollusc throughout the country in Bangladesh (Baby *et al.*, 2010). Freshwater molluscs have been in practice for pearl culture in China and Japan (Mizumoto, 1979). Many of the freshwater molluscs which are found in natural stock are used as food in Meghalaya, Manipur, West Bengal, Jharkhand, Mizoram as well as North & South Bihar (Ramakrishna and Dey, 2007, Subba Rao and Dey, 1986). Molluscs shells grit, dust and residual pieces are also used in the preparation of poultry feed and sometimes mosaic tiles (Bannerjee and Satish, 1988) Munshi and Chowdhury, 1988). Many of the sea molluscs species are a favor rate item of food with Indian coastal population

who are accustomed to taking sea foods (Rao, K.V.1969). From Neolithic era to the beginning of the 20<sup>th</sup> century *Unio* species from clean streams, have been consumed as human food. The mussels were also used as additive fodder for pig farming in Europe. Nowadays local *Radiatula* and *Parreysia* species are still being offered in market for human consumptions in some districts of North-East India and Eastern Nepal. Molluscs are often used to make jewelry. In ancient times, dyes were made from various molluscs. Some shells are often collected because of their great beauty. Since mollusc shells are composed mainly of calcium carbonate they have had a number of industrial uses. Ground shells produce the finest lime which is used in pottery glazes, tooth paste and poultry food additives either dead or alive; they may be used for a number of industrial purposes such as road construction and building foundations (Wells & IUCN 1981). Shell of all *Unio* species have been used as raw material for the production of nacreous buttons in Vienna till the last century (Fischer and Schuller, 2012). Equivalent button production in large scale has been developed in North America (Watters *et al.*, 2009) and India (Subba Rao, 1989) with the valves of numerous thick-shelled genera.

The present study was based on use of molluscs in button production in Mehsi {(25°20'59.80''N 85°06'35.97'E), 51m (167ft) MSL} a small rural market adjacent to the Mehsi railway station, about 48 km. east of Motihari in East Champaran district of Bihar. Mehsi is famous for producing ornamental items and buttons. About 350 cottage industries in Mehsi block was reported in past, but now only about 84nos. of industries exist and they are producing button whenever, they get orders for the product (Datta, Munshi and Chowdhury, 1988). But locals reported more than 125 units still exist in the different Panchayat. Each cottage industry consists of 1 to 6 artisans.

### **Objectives of the study:**

In Mehsi Block, the button and handicraft industries use variety of mollusc shells collected from the water bodies in North Bihar. These may pose threat to diversity of molluscs and other aquatic species also. So the present work was undertaken to study the following objectives:

- a) To identify the mollusc shells used by local artisans in button industries in Mehsi, East Champaran, Bihar.
- b) To study the level of exploitation in such molluscs by artisans' community.
- c) To suggest suitable conservation and protection measures if any required for the sustainable use of molluscs of Mehsi, East Champaran, Bihar.

### **MATERIALS AND METHODS**

A vigorous field survey of the industrial cluster was conducted in Mehsi Block in East Champaran, Bihar during October–November 2013 on randomly selected Panchayat, information available with the locals and officials of Department of Environment and Forests posted in the districts of East Champaran, Bihar. Altogether for times (two times in September 2013 and two times in October 2013) the researcher has visited the industrial cluster area, the local cottage industries at Mehsi Nagar Panchayats, Kathahan, Uchilpur, Bakhri Nazir, Bathna, Main Mehsi, Purani Mehsi, Manchan Chapra, east and west Bakhri in Mehsi Block. Samples of unprocessed mollusc shells were collected opportunistically as well as intentionally from the stock kept in and around industries and from the artisans, local rivers i.e. Burhi Gandak and many other water bodies of different panchayat of Mehsi block (Plate 1A & 1B). The artisans were also interviewed to know the source of shells. Most of the

questionnaire were asked on species used for various items; place of collection of any specific species, which species comes from where? Is there change in availability of specific species in due course of time? And the trade and commerce aspect. The collected mollusc shells were brought to the Gangetic Plains Regional Centre, Zoological Survey of India, Patna, laboratory for identification using standard literatures (Preston, 1915; Subba Rao, 1989; Neseemann *et al.*, 2003, 2005 and 2007; Ramakrishna and Dey, 2007).

## **RESULTS AND DISCUSSION**

During the visit it was observed that the molluscs collected by the local artisans consist mainly of gastropods and pelecypoda. They are commonly called as freshwater mussels, naiads, clams, or even oysters. They can easily be identified from bilateral, coelomate, often altered to asymmetrical without or rarely with evident of metamerism soft bodied, covered with shell of one or more than one piece secreted by mantle or pallium (a fold of body wall) characters. It has also neutral body wall modified to a muscular organ (foot); pharynxes commonly provided with toothed band the redula and with gills, open circulating stem and meta nephridia. Due to specialized group of the animal kingdom having at least two features-mantle and redula not found in any other animals. A typical head (not found in pelecypoda) bears a terminal mouth, eyes, tentacles and often sensory organ; a muscular foot for movement; posterior dorsal visceral mass containing most of the viscera. Pelecypods are completely enclosed by a pair of lateral shell (Ramakrishna and Dey, 2007).

Interview with the artisans revealed that the mollusc shells used by button industries and handicraft works in Mehsi is mainly collected from various part of the Upper-and Lower Gangetic Plains of Uttar Pradesh and partially in Bihar from Gandak, Budhi Gandak, Bagmati, Koshi and from other small rivers of Darbhanga, Samastipur, Rosra and Madubani areas. The artisans also communicated that when flood water recedes a large quantity of live and dead shells, deposited along the water line is collected by local laborers (Photo Plate 1E). It was also informed by the locals that with few exceptions of accidentally collected live specimens, the raw material for the industry were dead Molluscs shells. (Out of 52 interviewees 48 (92.3%) were in support of the statements, pers. comm., artisan 2013). The collected material is transported in trucks to the industry cluster. The freshwater shells are graded on the basis of size and stored for further processing and use (Plate 2).

- i. Preparation of products:** On the site visit revealed that large sized freshwater mussels of the family Unionidae *i.e.* *Lamellidens* sp., *Parreysia* sp. and a few *Radiatula* spp. were used in button production, ornamental and art works (Necklaces, Bracelets, Ear rings, Brooches, Cufflinks, Anklets, Neckbands, Armlets and Locketts: Plate 9-11). Buttons of varying sizes from 14-40 mm were produced as per the order for supply (Photo Plate 11). The mixed collection of small and thin-shelled individuals belonging to family *Viviparidae*, *Pleuroceridae*, *Thiaridae* and *Corbiculidae* were transformed into shell-powder for supply to poultry feed making industries. The raw materials are collected and transported to the industries and are washed thoroughly in water. After washing molluscs are put into the kerosene/earthen oil and boiled slowly for 1 to 2hrs as per thickness of the shell for removing the color of skin (Photo Plate 7A). This process is done in an aluminium pot. Now material is dyed in a mixture of 1:100 of H<sub>2</sub>SO<sub>4</sub> and Water (1ml H<sub>2</sub>SO<sub>4</sub>+100ml water) with any water color locally available for giving permanent color. After this molluscs are dried up and put into cutting machine to give different shape and size as per requirement/need for button and ornaments. A different cutting tool is used to make a beveled edge or a flat one, or to make slightly concave button (Plate 7E). After the buttons and ornaments are cut and drilled, they have rough

or sharp edges, scratches and tool marks. They are placed into a hexagonal wooden tumbling drum, which contain water and abrasive material, and a foaming agent. The drums spin for up to 12-24 hours. The buttons bounce around in the drum until they are smooth and shiny. After tumbling, the buttons are washed and dried.

**ii. Quality Control:** After the buttons and ornaments are completely finished, they are placed on a black cloth/plastic sheet and visually inspected for defects by the expert staff of the industry. The inspector must check each button and ornaments for flaws and remove any cracked or mis-cut ones. The buttons are now ready for packaging and sale. Altogether 16 taxa of freshwater molluscs were collected from the button industries and in and around of Mehsi block in West Champaran district, Bihar (India). Checklist with classification of the molluscs observed to be used in button industries in Mehsi is depicted in Table 1.

Table 1

**Checklist of mollusca collected from the vicinity of the button industries in and around Mehsi block, East Champaran, Bihar (India)**

Sl. No.	Class	Family	Scientific Name
1.	Gastropoda	Pleuroceridae	<i>Brotia costula</i> (Rafinesque, 1833)
2.	Gastropoda	Thiaridae	<i>Melanoides tuberculatus</i> (O.F. Müller, 1774)
3.	Gastropoda	Viviparidae	<i>Bellamya bengalensis</i> (Lamarck, 1822)
4.	Gastropoda	Viviparidae	<i>Mekongia crassa</i> (Benson, 1836) [= <i>Bellamya crassa</i> ]
5.	Pelecypoda	Corbiculidae	<i>Corbicula striatella</i> Deshayes, 1854
6.	Pelecypoda	Unionidae	<i>Lamellidens jenkinsianus</i> (Lea, 1859)
7.	Pelecypoda	Unionidae	<i>Lamellidens jenkinsianus daccaensis</i> (Preston, 1915)
8.	Pelecypoda	Unionidae	<i>Lamellidens marginalis</i> (Lamarck, 1819)
9.	Pelecypoda	Unionidae	<i>Lamellidens marginalis</i> aff. <i>sublamellata</i> Preston, 1912
10.	Pelecypoda	Unionidae	<i>Lamellidens consobrinus</i> (Lea, 1859)
11.	Pelecypoda	Unionidae	<i>Lamellidens corrianus</i> (Lea, 1834)
12.	Pelecypoda	Unionidae	<i>Parreysia favidens</i> (Benson, 1862)
13.	Pelecypoda	Unionidae	<i>Parreysia favidens pinax</i> (Benson, 1862)
14.	Pelecypoda	Unionidae	<i>Radiatula caerulea</i> (Lea, 1831)
15.	Pelecypoda	Unionidae	<i>Radiatula occata</i> (Lea, 1860)
16.	Pelecypoda	Unionidae	<i>Radiatula gaudichaudi</i> (Eydoux, 1838)

Among the sample collected from the artisans, a total of 4 taxa of Gastropoda and 12 taxa of Pelecypoda of freshwater molluscs were identified. In general, the large bodied freshwater mussels belonging to family Unionidae are being used for button production, ornamental and art works. It was observed that smaller sized Pelecypoda and Gastropoda were stocked together with large molluscs (Plate 2A-D). The smaller animals were randomly and inadvertently collected with the members of Unionidae (Plate 2D and 6ABCD). Mostly *Parreysia* sp. was used in making the button due to their thickness. The *Lamellidens* sp. was used to make the ladies ornamental art work due to its big shape and size. Large sized freshwater molluscs were used in button production, ornamental and art works *i.e.* 4 and 2 holes button, Necklaces, Bracelets, Ear rings, Brooches, Cufflinks, Anklets, Neckbands, Armllets, Locketts Agarbatti (Incense stick) stand and Paperweight depicted in Table 11A - 11F.

**Ecological Niche:** All large Freshwater mussels described in the present study are limited or endemic to South Asia and the Northern part of the Indian subcontinent. Only *Lamellidens*

*marginalis* has a much wider distribution that exceeds from Iran in the West to Myanmar (Burma) in the East. *Lamellidens marginalis* inhabits lentic water bodies such as oxbow lakes, man-made ponds and natural lakes in the Indo-Gangetic plains and the Himalayan middle mountains up to elevations of 800 meter above mean sea level. *Lamellidens corrianus* and *Lamellidens consobrinus* are typical river species of Northern India including Bangladesh. *Parreysia favidens* (subspecies) is a strict running water species which occurs in numerous streams and rivers of the lowlands (Subba Rao, 1989). Similar habitat preference can be found in *Radiatula occata*. The most abundant freshwater mussel *Radiatula caerulea* has a wider ecological range that includes various stagnant and running water bodies. *Radiatula gaudichaudi* is a rare taxon that appears to be limited on large and well oxygenated natural oxbow lakes along the course of Ganga River (Nesemann *et al.*, 2007). The above mentioned bivalves are geographically restricted on northern India, Nepal, Bangladesh and few localities closed to the Indus River in Pakistan.

**Table 2**  
**Button products from mollusc shells**

Sl. No.	Holes in button	Size ( mm)
1.	4 holes	14mm-40mm
2.	2 holes	14mm-40mm

**Table 3**  
**Ornament products from mollusc shells**

Sl. No.	Name of the items	Length (Cms)	Diameter (Cms)
1.	Anklets (Payal/Paira)	-	14
2.	Kara	-	13
3.	Armlets( Bajo)	40	6.5
4.	( Bajo/Ghundi)	15	-
5.	Bracelets	15	-
6.	Kangnapho	-	5.5
7.	Chuhdani Pahunchi	18	-
8.	Brooches	4	-
9.	Cufflinks	2.5	-
10.	Ear rings	3.5, 4 & 5	-
11.	Locketts (Kantha)	7	-
12.	Neckbands (Hasli)	-	13
13.	Necklaces	40,42,43,45,46,80	-
14.	Jawahar	33	-
15.	Joison	23	-
16.	Waistband(Chabiya / Chandrakar)	7, 38 & 55	-



**Table 4**  
**Samples of molluscs collected from the button industrial area in and around Mehsi block, East Champaran district, Bihar**

Class	Family	Species	Condition of Shell Collected
Gastropoda	Pleuroceridae	<i>Brotia costula</i> (Rafinesque, 1833)	Dead shell & few shell with dead muscle
	Thiaridae	<i>Melanoides tuberculata</i> (O.F. Müller, 1774)	Dead shell
	Viviparidae	<i>Bellamya bengalensis</i> (Lamarck, 1822)	Dead shell & few shell with dead muscle
		<i>Mekongia crassa</i> (Benson, 1836) [= <i>Bellamya crassa</i> ]	Dead shell
Pelecypoda	Corbiculidae	<i>Corbicula striatella</i> Deshayes, 1854	Dead shell & few shell with dead muscle
		Unionidae	<i>Lamellidens jenkinsianus</i> (Lea, 1859)
	<i>Lamellidens jenkinsianus daccaensis</i> Preston. 1915)		Dead shell
	<i>Lamellidens marginalis</i> (Lamarck, 1819)		Dead shell
	<i>Lamellidens marginalis</i> aff. <i>sublamellata</i> Preston, 1912		Dead shell
	<i>Lamellidens consobrinus</i> (Lea, 1859)		Dead shell & few shell with dead muscle
	<i>Lamellidens corrianus</i> (Lea, 1834)		Dead shell
	<i>Parreysia favidens</i> (Benson, 1862)		Dead shell
	<i>Parreysia favidens pinax</i> (Benson, 1862)		Dead shell
	<i>Radiatula caerulea</i> (Lea, 1831)		Dead shell & few shell with dead muscle
	<i>Radiatula occata</i> (Lea, 1860)		Dead shell & few shell with dead muscle
	<i>Radiatula gaudichaudi</i> (Eydoux, 1838)	Dead shell	

**Table 5**  
**Questionnaire asked from the artisan of Button industry in and around Mehsi block, East Champaran, Bihar**

Sl. No.	Questionnaire
1.	When the industries were started?
2.	In how many Panchayat mollusc shells industries are running?
3.	What is the average elementary or high school education of laborers ?
4.	How many artisans were working during establishment of the industries?
5.	How much salary was given during the establishment year?
6.	Currently how much salary is being paid to each laborer?
7.	What is the average age group of labourers ?
8.	How many artisans family are currently working in industries?
9.	How many average members are in a family?
10.	Is it enough salary for survival of a family?
11.	Are you getting business round the year?
12.	Are the workers getting any support from the Government?
13.	What is the timing of working in the industry?
14.	What are the problems coming during working hrs. ?
15.	How many persons are involved in collection of shells from local habitat?
16.	Is there any local market for selling the products?
17.	If not where the products are being sold?
18.	How many hours usually work per week at this business/family business?
19.	Is there is any union in this profession?
20.	Are you people getting any bonus or any festival tips?
21.	Which species used for various items?
22.	Which species comes from where?
23.	Is there any change in availability of some species in due course of time?

**Plate 1**  
**HABITAT / SOURCE OF MOLLUSC SHELLS**



A. BURHI GANDAK FLOWING NEAR MEHSI



B. BURHI GANDAK FLOWING NEAR MEHSI



C. LABOURERS COLLECTING MOLLUSCS SHELL



D. SHOWING MOLLUSCS SHELL



E. SHELLS ON THE BANK AFTER FLOOD

**Plate 2**  
**MATERIAL STOCK (SHELLS) FOR THE INDUSTRIES (Inside village)**



A. Shell stock: *Lamellidens sp.*, *Parreysia sp.* & *Radiatula sp.*



B. Shell stock: *Lamellidens corrianus* & *Lamellidens consobrinus*



C. Shell stock: mostly *Parreysia favidens*



D. Shell stock *Parreysia favidens*

**Plate 3**  
**MOLLUSC SHELLS COMMONLY USED SPECIES**



A. *Parreysia favidens* Dorsal



B. *Parreysia favidens* Ventral



C. *Radiatula gaudichaudi* Ventral



D. *Radiatula gaudichaudi* Dorsal



E. *Radiatula caerulea* Dor. & Vent.



F. *Radiatula ocata*

**Plate 4**  
**MOLLUSC SHELLS COMMONLY USED SPECIES**



A. *Lamellidens marginalis*



B. *Lamellidens marginalis* Dorsal



C. *Lamellidens marginalis sublamellata* Ventral



D. *Lamellidens marginalis sublamellata* Dorsal



E. *Lamellidens jenkinsianus daccaensis*



F. *Lamellidens jenkinsianus daccaensis* Ventral



**Plate 5**  
**MOLLUSC SHELLS COMMONLY USED SPECIES**



A. *Lamellidens corrianus* Dorsal



B. *Lamellidens corrianus* Dorsal



C. *Lamellidens consobrinus* Ventral



D. *Lamellidens consobrinus* Dorsal



E. *Parreysia favidens pinax* Ventral



F. *Parreysia favidens pinax* Dorsal

**Plate 6**  
**MOLLUSC SHELLS COMMONLY USED SPECIES**  
(Transformed into shell-powder for supply to poultry feed making industries)



A. *Bellamya bengalensis* (Lamarck, 1822)  
& *Mekongia crassa* (Benson, 1836)



B. *Brotia costula*



C. *Corbicula striatella* Dorsal



D. *Corbicula striatella* Ventral

**Plate 7**  
**PROCESSES OF MAKING PRODUCTS FROM SHELLS**



A. Boiling process in acidic medium



B. Finishing process for final shape



C. Coloring / dyeing drums



D. Shells after dyeing



E. Making different size hole in the button



F. Budha: An art work

**Plate 8**  
**PROCESSES OF MAKING PRODUCTS FROM SHELS**



A. View of inside industry



B. Button: Raw product



C. Button: Raw product

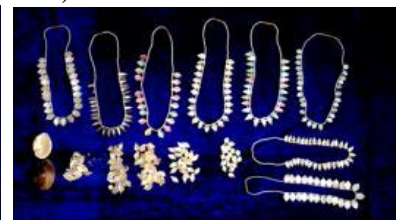
**Plate- 9**  
**SHELL PRODUCTS (Ornaments and art work)**



A. Necklace Products



B. Button Products



C. Necklace Products



D. Button Products



E. Ear rings



**Plate 10**  
**SHELL PRODUCTS (Ornaments and art work)**



Hair pin product



Hair pin

**Plate -11**  
**SHELL PRODUCTS (Ornaments and art work)**



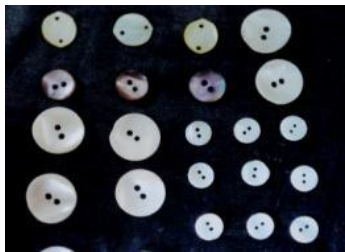
A. Shell ready for ornaments work



B. Shell ready for ornaments work



C. Shell ready for ornaments work



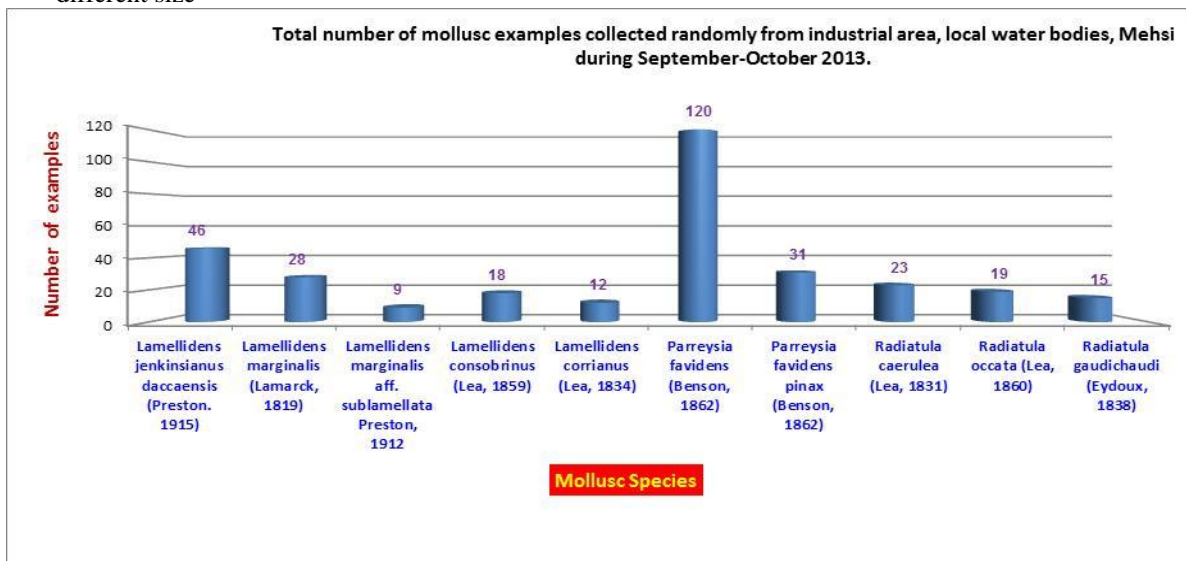
D. Button products of different size

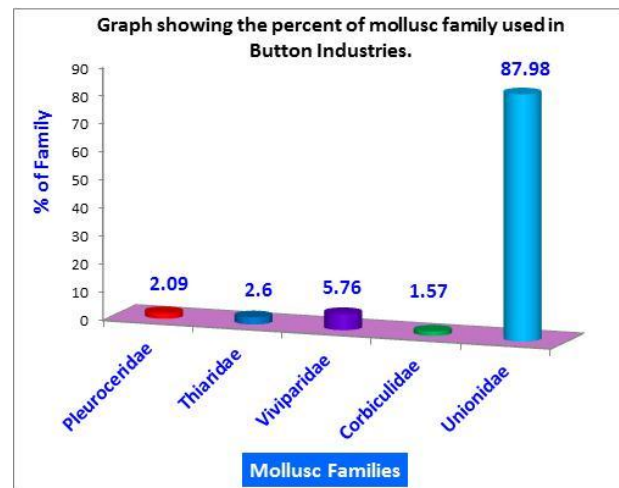
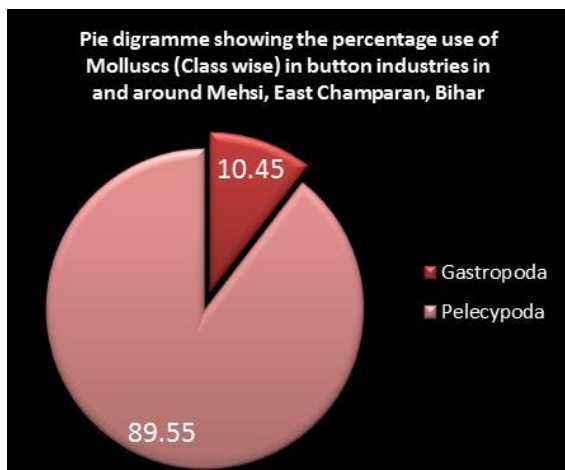


E. Hairpin & button products



F. Hair pin products





## CONCLUSIONS

1. According to artisans, only dead shells are collected. However, as per our observation some of the bivalve species are collected live and it could be witnessed from the specimens with fresh flesh attached with the shells of the collected stock of collections.
2. None of the Molluscs shells observed in the study have been enlisted in the Schedules of the Wildlife (Protection) Act, 1972.
3. In India no commercial harvesting of molluscs is done for the production of button or any other ornaments. But in the button industries of Mehsi the level of use of molluscs species available in nature is very high. According to the earlier scientific report these industries need 700 tons of raw material and market finished shell product of 120 lakh annually (Datta Munshi and Chowdhury, 1988). Such huge demand of raw materials had resulted in the over-harvesting, collection of individuals at a higher rate than the natural reproductive capacity of the population, is one of the major threats to biodiversity and leading ultimately to depletion of population (Subba Rao, 1989).

## **Suggestions for Suitable Conservation and Protection Measures**

All large Freshwater mussels are declining in the urban areas. The reasons for the local population extinctions are mostly water pollution by domestic and industrial sewage effluents and habitat destruction. Numerous water bodies are being filled for construction of roads, residential and industrial buildings in the urban areas. Still existing water bodies are cut off from the surrounding and neighboring wetlands (Sharma *et al.*, 2012). Fish migration in the rainy season is disrupted and additionally the remaining habitats are polluted from the adjacent new settlements. The fish migration is an important mechanism for natural dispersal of the large freshwater mussels through glochidia as well as important compensation of downstream drift during the flood period (Terui Akira *et al.*, 2014). Therefore this reviewed study advocates:-

1. As some of the well-known bivalve *Lamellidens marginalis*, *Lamellidens consobrinus* and *Lamellidens corrianus* are not as common today as these were used to be decades ago (Nesemann *et al.*, 2003). This indicates the habitat degradation, overexploitation and depletion of the Molluscs shell resources. Many of freshwater mollusc species face conservation issues due to habitat degradation and in some cases due to over exploitation for the freshwater pearl industry, and for the nacre of their shells, which was used in button manufacturing of the North American Unionoida about 70% are either extinct (21



species), endangered (77 species), threatened (43 species) or are listed as species of special concern (72 species). (Williams *et al.*, 1993). The *Parreysia favidens pinax* (Benson, 1862) is a rare bivalve species for Bihar region and due to its thick shell it is being used in the button industry in large scale. If the use of this species will be continued the population will become scarce. This example point out the need for a judicious exploitation of various species of mollusc. The conservation of the commercially important mollusc is suggested ( Subba N. V. Rao, 1989)

2. So there is a need for a judicious exploitation of various species of bivalve in the button industries.
3. Collection of shells should be regularized by the concerned stakeholders (State Forests Department) after constitution of a monitoring body of experts for the same. The same committee should also look after the sustainable use of mollusc shells. It should be strictly observed that only dead mollusc shells are being collected and used in button industries. Since there is no any related law / legal provisions to disallow this practice never the less the concerned department (Department of Environment and Forests, Govt. of Bihar) to ensure this at local level as custodian of the wildlife.
4. Local artisans should be made aware about the importance of molluscs in the aquatic ecosystem and furthermore to the human race, so that they can be a part of the conservation strategies. The enforcement of Wildlife Protection Act-1972 should be ensured if there is any violation of the act.

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