Molluscan fisheries in Pakistan: Trends in capture production, utilization and trade

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Overall, molluscan capture production has increased manifolds; however after 2000 there is decreasing trend in its production. There is no recorded data for its consumption in Pakistan. Trade values show that this commodity is mainly exported and there is negligible sporadic import in few years. Export and percentage contribution of molluscan fisheries in total seafood production is decreasing with the passage of time.

[Keywords: Molluscan fisheries, Production, Consumption, Trade trends, Economic potential, Pakistan]

Introduction

Molluscs, after cyprinids, are the most common aqua-cultured organisms around the globe[1-2].They form the most preferred group for mariculture and can be farmed in marine as well as brackish water environment. Their contribution in global production is about 25%. They constitute 21% of the total aquaculture production, while their share is 65% among total molluscan production including capture production[3]. In contrast to global aquaculture production, capture production of molluscs has shown decreasing trend from 2000 to 2010[4]. The aquaculture production of molluscs is mainly from freshwater (56.6% and 50.1% in terms of quantity and value respectively)[3]. Molluscan aquaculture, particularly of green mussel and blood cockles, has shown rapid increase since early 1980[5]. In 2008, they contributed 66% to global mariculture and 25% to all aquaculture production[6], in contrast to mariculture production from other groups, such as finfish, that just remained 9% in 2008.

China is a major molluscs producing country. Its bivalve molluscan production represents about 70% of the world production. Major aqua cultured molluscan species include calms and cockles and ark shells while marine capture production is mainly represented by scallops and pectens[4]. Global supplies of seafood including molluscs show increasing trend. This trend is evidenced by an increase, in the total production by weight, of 3.9% in 1970 and 32.4% in 2004[3]. It is envisaged that, in future, molluscs shall gain more popularity in global market[2]. Molluscs can be proved as an economic asset[7].

Pakistan is a coastal country having long, 1120 km, coastline running between South East Indian borders to the Northwest Iranian border and is rich in marine resources. Maritime zone is more than 30% of the land area[2]. Nature has bestowed Pakistan with a rich variety of molluscs which can serve as a potential source for mariculture development[8-12]. In total, the number of identified molluscs goes beyond seven hundred, while for land snails it is more than one hundred[13]. However, from Pakistani marine waters, in 2003, 15 species of shrimps and 12 species of

cephalopods, along with other fin fishes, have been reported[14]. In 1998, molluscan biomass production remained eight thousand against 625 landings. Computed MSY value was four thousand with an estimated incremental potential of 3375 tons[15]. In international seafood markets, Pakistani share of shell fish is 21 thousand tons (1.62% of the world in quantity), while its export value is 109 Million USD[16].

Despite of rich molluscan diversity and their economic involvement, unfortunately in Pakistan molluscan fisheries research is neglected and is still infancy. Only few researchers have contributed to this field of science in the past and their research is of basic nature. This neglecting behavior is a reflection of human nature of preference certain organisms over the other, that may be due to cultural, financial or local influence[17-18]. Previous molluscan studies either describe their biodiversity or discuss them on some other biological parameter and devoid of economic prospective[19-22].

The aim of this project is to highlight the untold, unappreciated and unexplored molluscan fisheries in Pakistan and throw light on its potential for economic development. The objective is not just to tell the story but also highlight important steps for the development of this sector by raising various questions for further research. This study shall enhance general awareness about molluscs and help to make better policies by Government and at the same time shall also act as a catalyst for new researchers to study molluscs. Thus open a new horizon of research that has been neglected in the past.

Materials and Methods

Bench study was done to compile this work. Extensive review of literature was searched mainly through internet surfing. Pakistan, being a developing country, has data limitation in fisheries sector particularly about molluscs. Molluscan fishery is least explored and neglected sector in Pakistan, especially in terms of economic perspective. To solve and overcome this information deficit problem every possible effort was made. Both, the public and private sectors were contacted and explored to get as maximum information as possible to get full insight into project objectives. A questioner, containing ten questions, was drafted asking required information related to project work.

A number of publications in the form of reports, scientific papers, communications, opinion articles etc. were analyzed to gather information. Data related to the molluscan fisheries in Pakistan was obtained by contacting Food and Agriculture Organization of the United States (FAO). Online data mining from FAO website was also done by using FishStatJ – FAO Global Fishery and Aquaculture Statistics Software[23]. Molluscan fisheries data (1982-2011) was divided into three groups with respect to time and production quantity i.e. pre, post and 90's period. Numbers obtained was represented graphically by using Microsoft Word Excel 2007. Same software also served to calculate percentages and annual growth rates. Annual growth rates were calculated as: GR = (Pre V - Pas V) / Pas V X 100. Where GR = growth rate, Pre V = Present year value and Pas V = past year value.

Results

Reported molluscan capture production was totaled as 15.8378×10^4 megagrams (Mg) from (1982-2011) with highest production of 102.08×10^2 Mg in 1999. Period from 1982 to 1989, with an average capture production of 1.6225×10^2 Mg year^{-1}, showed less molluscan production. However, starting from 1990, 38.89×10^2 Mg, to 2011, 93.3×10^2 Mg, overall the production gradually increased and became more than double. During this period 1995, 1998, 2003 and 2007 were the years which showed decreasing trend in production i.e. 52.87, 65.25, 72.35 and 60.71×10^2 Mg respectively, as compared to the former year. The calculated average production throughout the study period was 52.8×10^2 Mg year^{-1} (Fig 1 a). Graphical representation of the calculated annual growth rates showed that there is only one spike at 1990 indicating highest growth rate observed during the whole study period. During, pre and post 90's the average calculated growth rates were 161.42, 55.14 and -0.036 respectively. However, overall the average calculated growth rate was 68.96 year^{-1} (Fig 1 b). Data analysis showed that during pre 90's period molluscs contribution to the total sea food production was even below a whole number (average contribution was 0.24% year^{-1}). Then, there started an era of some contribution from the beginning of 90's evident by average contribution of 5.51% and 5.52% year^{-1} during and pre 90's

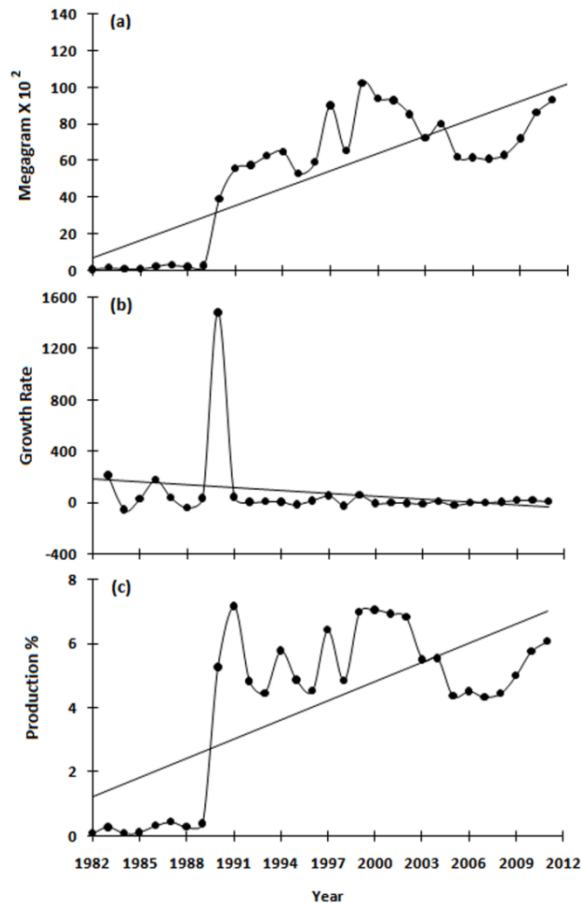period. On the whole average % contribution was calculated as 4.11 year^{-1} (Fig 1 c).

Fig. 1—Time series data of capture production of Molluscs in Pakistan (a), calculated annual growth rates (b) and production % of Molluscs to all seafood production (c). Straight line represents trend line.

Squid, cuttlefish and octopuses, constitute the major group of molluscs that was caught, showed a peak capture production of 102.08 X 10^2 Mg in 1999. Starting from a scratch in 1982, 0.49 X 10^2 Mg, its production increased manifolds till 2011, 79.92 X 10^2 Mg. Average capture production of this group during, pre and post 90's period was 64.85, 1.62 and 70.74 X 10^2 Mg year^{-1} respectively. The total capture production of this group was computed as 1510.41 X 10^2 Mg. Other groups of molluscs, including abalones, winkles, conchs and calms, cockles, arkshells, showed little capture production starting from 5.55 and 2.52 X 10^2 Mg in 2004 and 2007 while in 2011 their production value was 7.3 and 6.09 X 10^2 Mg respectively. However, the average capture

production of the former and latter group evaluated as 6.15 and 4.83 Mg year^{-1} correspondingly (Fig 2 a). Despite of molluscs production in Pakistan there is no recorded data we could found regarding its consumption. However they are used as delicacy and their utilization is negligible.
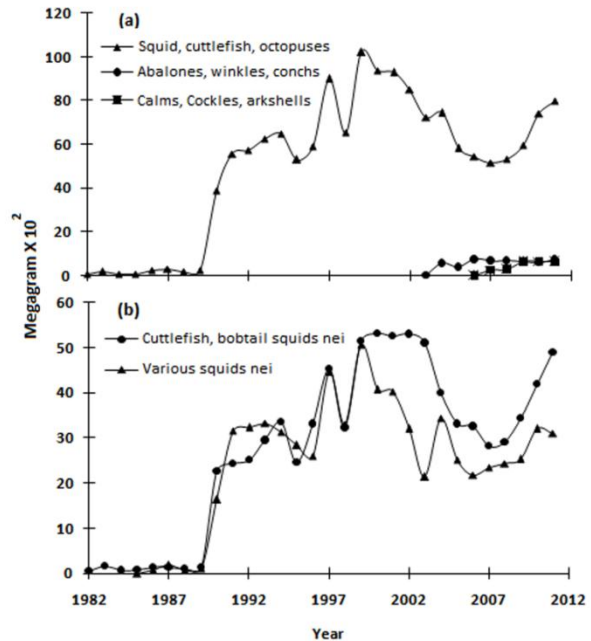

Fig. 2—Time series data of capture production of various Molluscan groups (a) and various groups of squids (b).

Linear regression line of molluscan export quantity, with overall average export quantity of 35.18 X 10^2 Mg, has shown declining trend. There is no reported export of molluscs before 90's. During and after 90's average export quantity computed were 58.16 and 19.24 X 10^2 Mg year^{-1} with an average growth rate, it showed increasing trend, of 25.21 and 381.31% year^{-1} correspondingly (Fig 3 a,b). Export percentage of molluscs to the total molluscs capture production has also been decreased during the course of the time. However, period of 90's can be considered as a golden period for molluscs export as most of the molluscs caught through capture production was exported bringing a lot of revenue. In 1993, 1994 and 1995 the export quantity superseded capture quantity of molluscs. The average % of molluscs exported during and pre 90's period was 88.51 and 18.86 year^{-1} respectively (Fig 3 c).
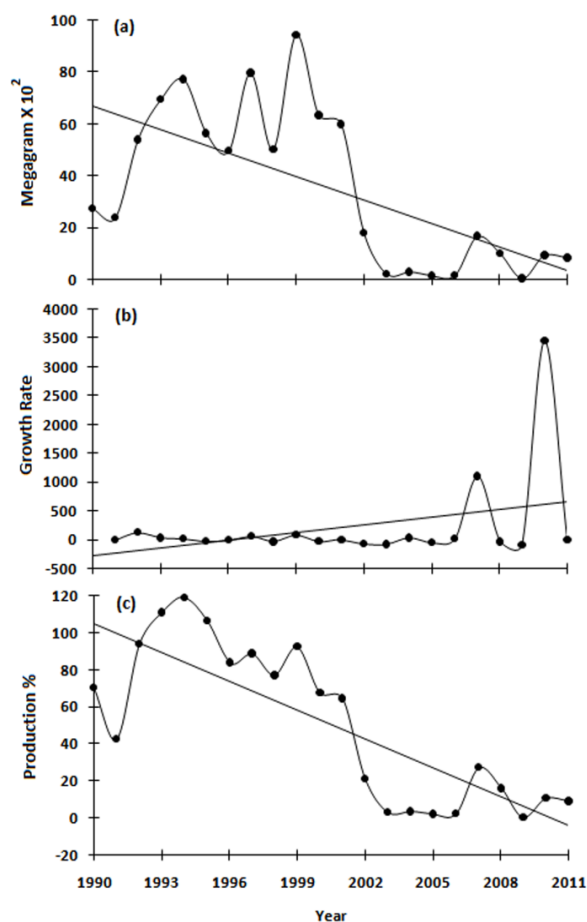
Fig. 3—Time series data of Molluscan export quantity of Pakistan (a), their calculated annual growth rates (b) and % of exported Molluscs to the total capture production of Molluscs(c).

Export earnings, being tied up with export quantity, decreased with the passage of time. Overall average export earnings calculated was 51.33 (000 USD) year^{-1}, while during and post 90's period their value was 88.5 and 20.36 (000 USD) year^{-1} in that order (Fig 4 a). On the whole average computed growth rate of export earnings was 128.26, while 16.15 and 212.35 year^{-1} were the values of growths rates analyzed for during and post 90's period (Fig 4 b,c).

Discontinuous time series data is available for import of molluscan due to sporadic import of this commodity. However, there is increasing trend in its import. Molluscan highest import quantity, 2.51 X 10^2 Mg, was observed in 2010. Total and average calculated values for molluscan import were 3.55 and 0.44 X 10^2 Mg correspondingly. Average production percentage and average growth rate in molluscs imports were computed as

0.53 and 204.40 year^{-1} in that order (Fig 5 a,b,c). Total import expenditure was figured as 8.19 (000 USD) with an average growth rate of 360.14 (Fig 6 a,b).
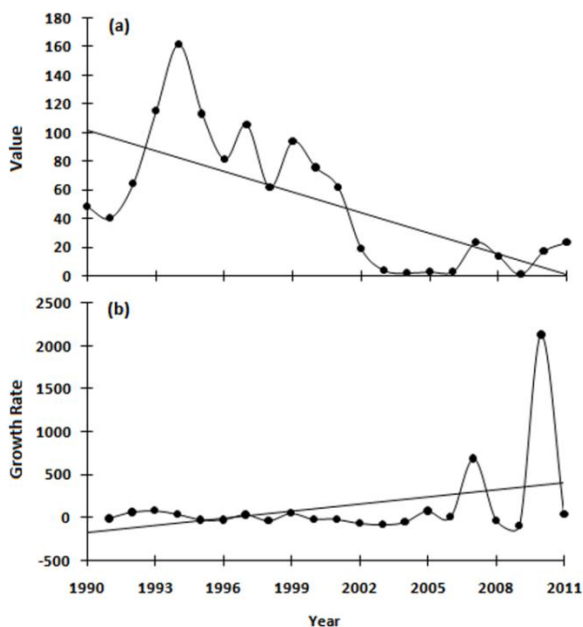

Fig. 4—Time series data of Molluscan export earnings (a) and their calculated annual growth rates (b).

Discussion

In Pakistan there is no utilization of molluscs and we could not find its recorded consumption data. However, in fact as being native resident, they are consumed in Pakistan but in very low quantity. During the course of time they are gaining popularity but the rate is very low. They are eaten as delicacy and are offered by main hotels in big cities. Thus just elite class tastes them. Many factors are responsible for low molluscan utilization in Pakistan including social and cultural selection. Other factors include high prices, less availability in the local market, lack of publicity and less familiarity with this food item. Food palatability plays vital role in food selection in addition to social and cultural selection. Four pillars of food selection, sight, smell, taste and texture, arouse response towards the selection or rejection of food[24]. For most of the persons, it becomes very difficult to accept such a food that is beyond routine experience. Particularly the seafood, that has a peculiar smell, mostly has repelling effect for the persons experiencing this food for the first time.
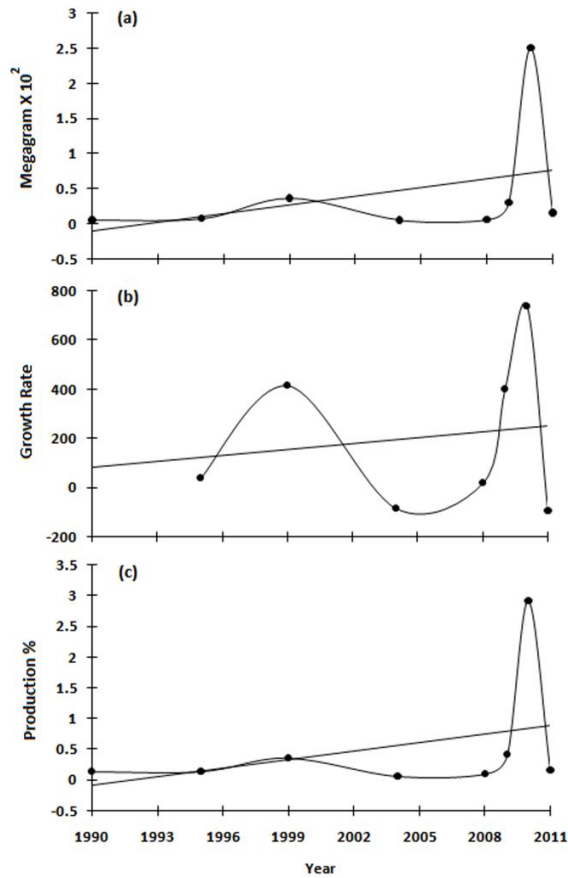
Fig. 5—Time series data of molluscan import quantity of Pakistan (a), their calculated annual growth rates (b) and % of imported molluscs to the total capture production of molluscs (c).

Figure 6: Time series data of molluscan import expenditure (a) and their calculated annual growth rates (b).

Aquaculture is relatively new in Pakistan and is growing with the passage of time[25].It is mostly done for fin fish to meet the needs of local consumption. Currently, there is no aquaculture for molluscs in Pakistan and molluscan export mainly depends on the capture production of molluscs. Thus government should make such policies that promote this sector in Pakistan because it plays a vital role in the livelihood of people especially living near coastal areas[26]. In addition to this, many countries in the world import this food item and it can give a lot of revenue. By promoting coastal and inland molluscan aquaculture we can fight hunger and poverty at the same time.

It is very interesting to find that in some years the export quantity exceeds the catch quantity of molluscs.
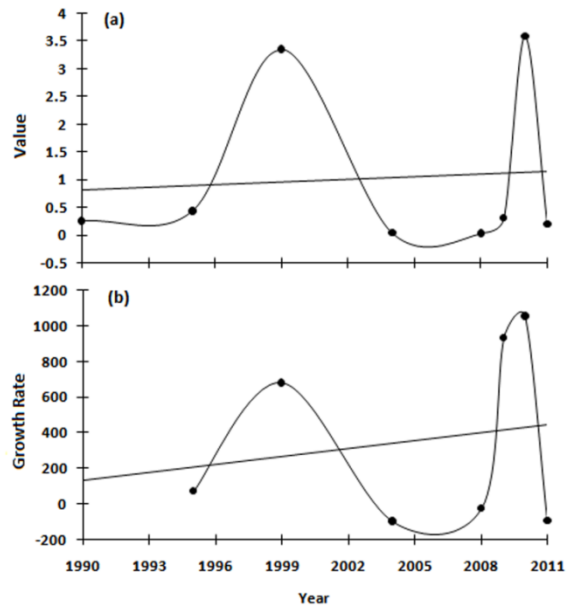
For example in 1995, the export quantity was 56.29 X 10^2 Mg against the catch quantity of 52.87 X 10^2 Mg. Our investigation regarding this phenomenon has concluded that in Pakistan fisheries catch is under reported. Under reporting of fishing catch, has also been previously reported[27-28]. Mostly captured molluscs are exported while a small fraction of it, without recorded quantity, is used locally. Sometimes to meet the order and earn money, molluscs exporters in Pakistan first import and then re-export this commodity i.e. dumping effect in terms of economics. However, the imported quantity is negligible and mainly used to complete the order quantity.

In Pakistan molluscan production has multiplied, like world, with the passage of time. Period of 90's can be regarded as a golden period for molluscs in Pakistan as their capture production decreases on both sides of this time. It is worthy to note that whenever there is peak in production the catch quantity decreased in the following years. That may be justified in terms of overexploitation and maximum sustainable yield limit. Harvesting of aquatic organisms, beyond sustainable range, is evidenced by many researchers from Pakistani waters[29-32]. Capture production is also directly dependent upon effort.

The number of fishers decreased in the beginning of current millennium that is also another possible justification for decreased capture production for molluscs. However, the capture production per fisherman has been decreased validating first reason for decreased production. So, there is dire need to explore molluscan fisheries status in Pakistan in terms of maximum sustainable yield. Thus through policy making this precious resource can be conserved for future. Obviously, government policies as well as financial earnings should trigger more and more people to engage in this business. But, in fact, unfortunately, policy making and then their implementation has always been questionable in Pakistan. Filthy landing sites, poor cold chain coupled with improper handling and policies have resulted in the degradation of the fisheries sector.

EU ban on fishery products from Pakistan resulted due to poor management of this sector. Pakistan suffered from economic set back when million dollar orders were cancelled within no time due to this ban. To take care of this situation UNIDO initiated EU funded project with the help of government in 2004. The main objectives of this program were to alleviate the situation by solving trade problems. Ultimately, in 2007 ban was lifted. Now, Pakistani trade is again restoring its position in international market but many challenges are still ahead.

Thus, revolutionary steps are needed to strengthen molluscan fisheries in Pakistan and promote its trade. That is the key step towards prosperity.

Following is the list of crucial suggestions that are essential for the development of this fisheries sub-sector. Molluscan aquaculture should be promoted in Pakistan through trainings, workshops etc. The Government may offer some financial support to farmers. There must be statistical estimation for this fishery resource so we can know its MSY value. There must be a campaign for general public awareness about molluscs regarding their culture, financial as well as nutritional benefits. Government should pay subsidy to lower its price in the local market so that more local consumers taste get used to this worthy creature. Molluscus research should also be encouraged in higher educational institutes. A comprehensive study should be done to know about molluscs market and its potential for trade.

Traders should be urged, trained and supported by the Government.

Conclusion
Capture production of molluscs has decreased with the passage of time resulting in the reduced export of this commodity. There exists no consumption of molluscs in Pakistan. In order to revive this fisheries sub-sector public and private sectors should play their vital role.

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