Validation of indigenous knowledge on edibility of baby clam, *Katylesia opima* from the Ratnagiri coast of Maharashtra

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Indigenous knowledge can be judiciously blended with modern scientific knowledge and its benefit to the fishers can be greatly improved. Bivalve fishery is traditionally practiced along the estuarine ecosystems in coastal district of Ratnagiri in Maharashtra. Fishermen, by virtue of their intricate association with coastal environment and daily observations of natural resources possess rich indigenous knowledge (IK). In present study, an attempt was made to validate the indigenous knowledge of fishermen related to the seasonal edibility of Baby clam (*Katylesia opima*) with respect to season-wise variation in the quantity of meat. Data on edibility of clams was collected from 50 fishermen using semi-structured schedules. For validation of the indigenous knowledge, laboratory data on percentage edibility, lipid, protein, ash and glycogen were collected and analyzed. In clams, all the variables tested only the lipid content and percentage edibility (PE) returned significant results (p < 0.05). The summer season displayed the median value, while monsoon the highest and winter the lowest for both the variables. Further, PE and lipid varied significantly during monsoon and winter season (p<0.05). An important aspect of IK that lowest edibility is associated with winter is validated by the study.

**Keywords:** Indigenous knowledge, Clam, Biochemical composition, Percentage edibility, Validation

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Indigenous knowledge is the knowledge acquired by people in particular geographic area and over a time period by experience, experimentation and handling on old people’s knowledge. It is adapted to the local culture and environment, is dynamic and changing. Indigenous knowledge (IK) is also known by similar terms, the main ones being local knowledge, traditional (ecological) knowledge, indigenous skill and *ethnoscientific*. There are conceptual and semantic problems associated with all of them. To avoid ambiguity in present study, we use the term indigenous knowledge. Indigenous knowledge uses the information, advice and wisdom that have evolved over centuries of living as part of the environment. IK is a valuable source of environmental information that allows communities to realize their own expertise, and apply their own knowledge and practices to help protect their way of life. Human communities relying directly on their natural resources for subsistence have a detailed knowledge of their environments. The economic, social and cultural activities of those people depend upon the local biota and the implicit environmental cycles. The traditional fishers are termed as a repository of valuable knowledge about the dynamic nature of fishery resources and ecosystems. Subsequently, the fisheries development and system pre-requisite identification and characterization of existing perceptions, information seeking behaviors, indigenous technical wisdom, base level scientific knowledge and local institutions on fishes.

World Conservation Strategy stressed that sustainable management of natural resources could only be achieved by developing a science based on the priorities of local people and creating a technological base that blends both traditional and modern approaches to solving problems. In fact, the system of scientific production of knowledge (methodologies) has itself gone through certain paradigmatic transformations. However, to be scientific, at the first place, the system of knowledge production has to resort to systematic investigation. Second, and perhaps the most important aspect of such knowledge is that it requires validation.

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Clams have been for a long time a very important food resource for humans and enjoy a high local demand. Moreover, bivalves (clams, mussels and oysters) contribute to the livelihood of many poor fishers in India who dwell in small houses spread over the coastal areas. These fishermen possess rich indigenous technical knowledge and expertise in fishing activities which they transfer from generation to generation. It is necessary that the bivalves conform to good quality standards such as amount of meat and appearance, which determine their edibility. The fishers of Ratnagiri coast traditionally believe that the quantity of meat in bivalves particularly clams is more during summer and less during winter months. Thus fishers associate fullness of the clams with edibility which according to them varies with season. To validate the traditional claim, an attempt was made to test whether season has any bearing on edibility of clams using proxies for fullness of meat such as percentage edibility, lipid, protein, ash and glycogen. The results will help in identifying the best season for exploitation of clams for better consumption value and yield to the fishers. Similarly, temporal closures can be suggested when the bivalves are in poor condition.

Methodology

The indigenous knowledge on fullness of meat of clam as a proxy for edibility was collected from local fishers through semi-structured interviews and informal conversations. The respondents were selected based on snow-ball method by which people from the community and the interviewees themselves indicate the people to be interviewed. Ratnagiri district with a coastline of 167 km has a bivalve fishery that is concentrated in fishing villages situated adjacent to estuaries and which have rich bivalve beds. A total of about 50 fishers were interviewed from five such randomly selected villages of Ratnagiri district including 42 males and 8 females. The selected villages were Mirya, Karla, Bhatye, Rajiwade and Jaitapur.

Documented IK was assessed against seven criteria (scientific value/logic, efficacy, cost effectiveness, availability of materials, easy to follow, cultural appropriateness and environmental soundness), which were developed in earlier study. Further, the IK was validated by allowing experts (n =15) to assess IK against the seven criteria in percentage terms. The assessment by the experts were ranked into high (more than 70%), moderate (50% - 70%) and low (less than 50%) validity groups.

For the purpose of scientific investigation, the Baby clam, Katelysia opima was selected which is collected almost throughout the year from the region. About 30 fresh samples of the species were collected from the local fishers every month for the laboratory validation of the IK.

Laboratory investigations involved the cleaning of the clam, weighing the samples, followed by shucking of meat from the shells. Shucked meat was gently pressed between the folds of blotting paper to remove excess moisture and weighed precisely to the milligram on an electronic balance was used. The percentage edibility was calculated by the following equation:

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\text{Percentage edibility} = \frac{\text{Weight of wet meat}}{\text{Total weight with shell}} \times 100
\]

Besides percentage edibility, biochemical proxies for edibility namely protein, lipids and ash were estimated for clam. Glycogen content was estimated. Monthly values for PE, protein, ash and glycogen were grouped season wise and seasonal values were considered for validating the results. The seasons considered for data interpretation were Season 1-summer (February - May), Season 2-monsoon (June – September) and Season 3–winter (October to January). The data were treated using one-way ANOVA for the effect of the season. Data analysis was performed on SAS (ver. 9.3)

Results

Fishers correlated their IK with reference to the seasons of the year. The most popular aspect of indigenous knowledge in this category, viz. the quantity of meat in clams is more during summer months and less during winter months are rated moderate to high on scientific value (60.00 - 73.33%) and low on other assessment criteria (13.33 - 40.00%) as given in Table 1.

The average lipid content of Katelysia opima varied from 2.62 - 4.20% (Fig. 1). Tukey’s studentized range (HSD) test (p < 0.05) showed significantly low value of lipids during winter and highest in monsoon. The protein values were ranged from 34.99 - 40.34%. The highest values were noted during monsoon and lowest during winter (Fig. 2). The ash content of K. optima ranged from 4.29 - 4.59% (Fig. 3). While the glycogen were recorded...
highest (8.11%) during monsoon and lowest (6.44%) during winter (Fig. 4). The average percentage edibility of *K. opima* varied significantly from 9.85% (winter) to 13.84% (monsoon) (Fig. 5). Tukey’s test confirmed these values to differ significantly (p < 0.05).

Of all the variables tested only the PE and lipid content returned significant results when treated season wise (p < 0.05). For both the variables summer season occupied the median value, whereas monsoon the highest and winter the lowest. Thus PE and lipid content provide a useful proxy for edibility of *K. opima* according to the present study.

According to the IK, lowest edibility is associated with winter which is validated by the present study. However, the other IK that highest edibility is
associated with summer was proven wrong on both the accounts. On the contrary monsoon was seen to be associated with highest edibility in both species (p < 0.05).

Discussion

The results of the present study reveal that the difference in the percentage edibility and biochemical composition of \textit{K. opima} was seen to be associated with seasonal variations. In tropical bivalves, reproductive cycle is responsible for variation in the biochemical changes. Several authors have studied the relation between mollusks condition and reproductive cycle. These authors have reported that percentage edibility and condition index decreases after spawning\textsuperscript{6}.

The low values of lipid and percentage edibility during winter may possibly indicate that spawning might have already occurred during the end of monsoon in both the cases. Further work on reproductive biology of \textit{Katelysia opima} is needed. Sawant & Mohite\textsuperscript{7} reported that the spawning period of \textit{M. meretrix} from Ratnagiri was observed to be from September to January.

The significantly spatio and temporal variation in biochemical composition, condition index and percentage edibility of \textit{P. malabarica} could be attributed to various life stages and influence of ambient environment\textsuperscript{8,9}.

Maximum protein content of \textit{K. optima} during monsoon season could be a mechanism of storage of reserves during gametogenesis to meet energy required during spawing seasons\textsuperscript{10}. Other possibility for elevated protein content could be the increased feeding efficiency with increased chlorophyll as resulting in proper assimilation of food and better metabolic condition. Spawning period of \textit{P. malabarica} was reported to be from September to January\textsuperscript{11}, hence the lower values of protein could be attributed to spawning activity.

Lipid and protein contents followed almost the similar pattern with highest during monsoon. Lipid reserves are used by molluscs for gonadal development\textsuperscript{10}, which was evident from the declining lipid values at both the stations during pre monsoon months.

The increased ash content during summer period might be due to an increased inorganic content in the body constitutes\textsuperscript{12}.

Glycogen content also showed seasonal variation with high values during monsoon and lowest in winter, similar pattern reported by Appukkuttan & Arvindan\textsuperscript{10}.

Percentage edibility gave the account of the quality of the meat of the clam, which showed a definite seasonal variation. Percentage edibility values in the present study remained high during monsoon; these clams had a good meat quality during this period and could be considered as best for human consumption during this period. Appukkuttan & Arvindan\textsuperscript{10} have observed the similar pattern in PE values on the \textit{P. malabarica} from Ashtamudi estuary. The spawning in \textit{P. malabarica} commenced from September and continues till January. It appeared that the considerable decline in the percentage edibility observed from September to January was due to spawning. Percentage edibility remained high during April to October; which indicated a good meat quality during this period and the clams could be considered as best for human consumption during this period\textsuperscript{12}.

Conclusion

The quantity of meat (edibility) in clams is more during summer months and less during winter months. This particular aspect of IK was chosen for validation because best period for human consumption of the clams can be known from the findings of this study. But present study validated only one aspect of IK that the lowest edibility is associated with winter. However, the other aspect of IK that highest edibility is associated with summer was proven wrong. From the point of view of yield to the fishermen and edibility, it can be suggested that the clam, \textit{K. opima} should be suitably and sustainably
harvested during the monsoon. However, as the spawning season may coincide with the end of the monsoon, care must be taken to avoid the indiscriminate collection of the clams. The exploitation should be discouraged during winter when the clam is in poor condition. On the contrary monsoon season was seen to be associated with highest edibility in both species (p < 0.05).

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References