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# Note

# Seasonal abundance of commercially important finfish and shellfish seed resources in Shambhavi Estuary, Karnataka

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## ABSTRACT

Year round availability of commercially important fin and shellfish seed is one of the essential requirements for capture based aquaculture (CBA). The present study was undertaken to ascertain the availability of finfish and shellfish seed resources in the Shambhavi Estuary, Mulki, Karnataka. Six species of commercially important seed resources were recorded *viz*., *Mugil* spp., *Etroplus suratensis, Lutjanus argentimaculatus, Lutjanus russelli, Fenneropenaeus indicus* and *Penaeus monodon*. The distribution and relative abundance of the above seeds were studied in different seasons for a period of 12 months from March, 2011 to February, 2012 in relation with the important environmental parameters such as rainfall, temperature, dissolved oxygen, salinity and pH. All the above parameters studied showed significant variation with the seasonal abundance of the fish and shellfish seeds. Among the finfish seeds, *Mugil* spp. and *E. suratensis* dominated and contributed to 56.4% and 25.6% respectively in the month of June. However, these two species were available in small quantities during rest of the study period. The occurance of *P. argentimaculatus* and *L. russelli* was to the tune of 1.5% (November) and 3.2% (May) respectively. Among shrimp seeds, *F. indicus* showed distinct seasonal variation with their peak abundance in the early pre-mansoon (January/February) months and late post-mansoon months (November/ January). Whereas, *P. monodon* was predominant during early post-monsoon season (November/December). The outcome of this study would be useful for planning of capture based-aquaculture of commercially important finfish and shellfish species in coastal Karnataka.

Keywords: Estuary, Finfish seed, Seasonal abundance, Shambhavi Estuary, Shellfish seed, Karnataka

Capture based aquaculture (CBA) is the practice of collection and culture of commercially important seeds from the wild and is practiced worldwide on a variety of marine and freshwater species. The fish production from capture based aquaculture is estimated to be at least 20% of the total annual fish aquaculture production with a value of US$1.7 billion (FAO, 2004; Ottolenghi *et al*., 2004). Fishing, aquaculture and allied activities are reported to have provided livelihood to over 14 million persons in 2008-09, apart from being a major foreign exchange earner. The aggregate fish demand for India has been projected as 6.7-7.7 million t by 2015 (Praduman Kumar *et al.*, 2005). In this context, aquaculture seems to hold the key for meeting future challenges in demand for fish.

Karnataka's coast line extends over a length of 320 km with numerous river mouths, lagoons, bays, creeks and long beaches. Fourteen rivers drain their waters into the coastal waters of Karnataka. The important estuaries include Netravti-Gurpur, Shambhavi, Gangolli, Hangarakatta, Sharavathi, Aganashini, Gangavali and Kalinadi (http://parisara.kar.nic.in/PDF/coastalzone.pdf). It is well known that the estuaries and brackishwater impoundments form the nursery grounds for several economically

important species of finfish and shellfish (Wickens, 1976; Achuthankutty and Nair, 1980; Achuthankutty, 1987; Gunaga *et al*., 1989; Sambandam, 1994; Mohan *et al*., 1995; De and Sinha, 1997). Studies on the distribution and abundance of commercially important finfish and shellfish seed resources along Dakshina Kannada coast are limited to Nethravathi Estuary (Ramesh, 1993; Koorse, 1994; Lakshmipathi, 1998; Moger *et al*., 2000, Manja Naik *et al.,* 2009). Shambhavi Estuary is the focal point of study for fishery scientists on finfish and shellfish resources, but observations on the availability of commercially important seed resources from these waters are meagre (Manja Naik *et al.,* 2009). The knowledge about the availability of natural seed resources of desired finfish and shellfish is one of the prerequisites for successful capture based aquaculture and in this backdrop, the present study was initiated in Sambhavi Estuary.

## Materials and methods

Shambhavi Estuary is situated at about 30 km north of Mangalore (13° 5' 60 N and 74° 47' 60 E). The estuary is perennial in nature with a tidal influence felt upto 6 km and 6.6 km along Shambhavi and Pavanje rivers respectively (Ramachandra, 1981). The Shambhavi Estuary is more dynamic in nature and become almost fresh during south-west monsoon (June-September) period due to the influx of freshwater through riverine flow. During post-monsoon (October - January) period, estuarine water is moderately saline while in the pre-monsoon season (February - May), it is almost similar to seawater due to reduced freshwater influx. In the present study, cast net (having 5 m length, 17 m circumference and 13 mm mesh size) was employed for the seed collection from the estuarine mouth (13° 04. 624' N and 74° 46. 729' E) towards upper stretch for a distance of 6 km (13° 06. 074' N and 74° 47. 537' E) (Fig.1) and sampling was done monthly during lowest low tide and high tide from March, 2011 to February, 2012. Dissolved oxygen, pH and salinity were analysed using water analyser (Multi 350i, Merck, Germany). Water temperature was recorded using standard mercury in glass thermometer. Monthly rainfall and weather data were collected from the "Daily Weather Reports" of the Indian Meteorological Department for Dakshina Kannada District during March, 2011 to February, 2012. The sampling points were fixed to fall in zig-zag path to cover length and breadth of the estuary. Per haul, the net covered an area of 4 $m^2$. Finfish and shellfish seeds were identified up to species level following FAO species identification sheets for fishery purspose, Western Indian Ocean, Fishing area 51 (Fischer and Bianchi, 1984).

The monthly data were treated separately and processed for pre-monsoon (February – May), monsoon (June –September) and post-monsoon (October –January) seasons to study the seasonal variation and abundance of seeds.

Rainfall and weather data collected from Indian Meteorological Department for Dakshina Kannada District during study period is presented in Table 1 and mean values of hydrographical parameters are presented in Table 2. The rainfall recorded during the study period was found to vary from a minimum of 76.2 mm (November) to 936.9 mm (July). There was no rainfall during December to February and March. The water temperature recorded during the study period was found to vary from a minimum of 26 ºC (monsoon season) and maximum of 31.2 ºC (pre-monsoon season). The dissolved oxygen in the water varied between 4.03 ml $l^{-1}$ and 4.90 $ml^{-1}$. Both minimum and maximum values were recorded

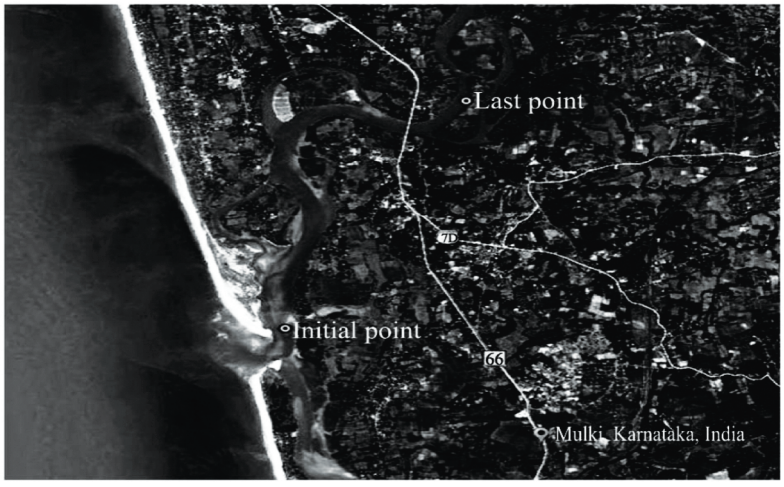


Fig. 1. Map showing survey area in Shambhavi Estuary, Mulki, Dakshina Kannada (Photo.credit:Image©2012 DigitalGlobe)

during the post-monsoon season. Salinity of the study area varied from 0.05 ppt (monsoon) to 35 ppt (pre-monsoon). The pH was found to vary from 7.20 (post-monsoon) to 8.29 (monsoon). Fluctuation of physico-chemical parameters on annual, seasonal or short time intervals is well known and the aquatic community inhabiting this environment adapt to those changes (Horn and Allen, 1981). An environmental basis for species association, in any aquatic system, is constituted by a number of variables right from physical parameters, the hydrological features, the plankton, the availability of nutrients and the food materials. The most important variables which are reported to influence the abundance of organisms in estuarine environment are temperature, salinity, dissolved oxygen and pH (Pushparajan *et al*., 2012).

The details of seasonal variation and relative abundance (%) of finfish and shellfish seed in the Shambhavi Estuary during March, 2011 to February, 2012 are summarised in Table 3.

The commercially important finfish and shellfish seed resources in the Shambhavi Estuary comprised *Mugil* spp., *Etroplus suratensis, Lutjanus argentimaculatus, Lutjanus russelli, Fenneropenaeus indicus* and *Penaeus monodon*. However, only *Mugil* spp. and *Etroplus suratensis* were available throughout the year. The seeds of *Mugil* spp. were predominant in the samples throughout the survey period. *E. suratensis* seeds were dominant during south-west monsoon (4.7%) than pre-monsoon (1.2%) and post-monsoon (1.8%) seasons. The seed of *L. argentimaculatus* were collected only during the post-monsoon (2%) and pre-monsoon (0.3%). *L. russelli* seeds were encountered only during pre-monsoon period (0.6%). The present study is first of its kind report on seed survey for finfishes from Shambhavi Estuary.

The seed of *F. indicus* were recorded in the samples only during post-monsoon (3.2%) and pre-monsoon (1.5%) seasons. Vedavyasa Rao (1980) and Manja Naik *et al.* (2009) also observed the abundance of seed of *F. indicus* during pre-mosoon and late post-monsoon period in Mulki Estuary. Similarly, Selavaraj *et al.* (2005) reported that *F. indicus* were relatively more during pre-monsoon season in Cochin backwaters. Moger *et al.* (2000) reported *F. indicus* seed was predominant in the samples collected during pre-monsoon and post-monsoon months in the Nethravathi Estuary. The abundance of *F. indicus* during the pre-monsoon months may be attributed to the higher salinity and temperature prevailing during the period. Similar abundance of *F. indicus* during the period of high temperature and salinity was observed by Gunaga *et al.* (1990) and Hoq *et al.* (2006) in Kali Estuary and Sundarban mangroves respectively.

*Peneaus monodon* seeds were observed during post-monsoon (1.5%) months and during pre-monsoon period (0.8%). Manja Naik *et al.* (2009) reported the abundance of *P. monodon* seed during pre-monsoon season in the Mulki Estuary. Mohan (1984) while presenting the hydrobiologcial characters of the surf waters of Calicut reported the peak period of occurrence of post-larvae of *P. monodon* as September-December.

Table 1. Rainfall and weather data collected from Indian Meteorological Department for Dakshina Kannada District during the study period

| Month | Rainfall (mm) | Temperature ($^0$ C) | | Relative humidity (%) |
|---|---|---|---|---|
| | | Maximum | Minimum | |
| March 2011 | 0.00 | 34.1 | 23.1 | 78.4 |
| April 2011 | 126.7 | 33.6 | 24.2 | 50.7 |
| May 2011 | 100.5 | 33.3 | 23.8 | 72.9 |
| June 2011 | 736.9 | 30.0 | 23.6 | 79.2 |
| July 2011 | 936.9 | 30.2 | 23.4 | 80.6 |
| August 2011 | 912.0 | 30.3 | 23.6 | 81.3 |
| September 2011 | 514.6 | 30.3 | 23.5 | 79.2 |
| October 2011 | 251.3 | 31.1 | 24.5 | 52.4 |
| November 2011 | 76.2 | 31.0 | 23.0 | 67.1 |
| December 2011 | 0.0 | 31.5 | 23.7 | 43.9 |
| January 2012 | 0.0 | 31.9 | 23.2 | 65.8 |
| February 2012 | 0.0 | 33.3 | 21.8 | 67.5 |

Table 2. Monthly variations in hydrographical parameters in Sambhavi Estuary (mean ± S. D.).

| Month | Water temperature (°C) | pH | Dissolved oxygen ((ml$^{-1}$) | Salinity (ppt) |
|---|---|---|---|---|
| March 2011 | 30.34 ± 0.71 | 8.18 ± 0.06 | 4.16 ± 0.39 | 33.5 ± 0.98 |
| April 2011 | 30.57 ± 0.69 | 7.91 ± 0.11 | 4.11 ± 0.16 | 35.0 ± 0 |
| May 2011 | 30.65 ± 0.92 | 7.84 ± 0.12 | 4.14 ± 0.34 | 35.0 ± 0 |
| June 2011 | 29.06 ± 0.55 | 8.28 ± 0.06 | 4.69 ± 0.07 | 1.67 ± 0.85 |
| July 2011 | 26.00 ± 0 | 8.29 ± 0.06 | 4.69 ± 0.07 | 0.05 ± 0.13 |
| August 2011 | 27.54 ± 0.63 | 8.23 ± 0.07 | 4.53 ± 0.18 | 9.27 ± 7.54 |
| September 2011 | 27.00 ± 1.02 | 7.21 ± 0.11 | 4.04 ± 0.09 | 10.11 ± 11.5 |
| October 2011 | 28.90 ± 0.35 | 7.20 ± 0.05 | 4.03 ± 0.33 | 10.12 ± 11.4 |
| November 2011 | 28.05 ± 0.29 | 7.40 ± 0.06 | 4.50 ± 0.12 | 15.80 ± 0.51 |
| December 2011 | 27.95 ± 0.41 | 7.50 ± 0.07 | 4.50 ± 0.12 | 29.50 ± 0.85 |
| January 2012 | 30.50 ±0.75 | 7.49 ± 0.27 | 4.90 ± 0.12 | 30.80 ± 0.28 |
| February 2012 | 31.23 ± 0.79 | 7.32 ± 0.14 | 4.73 ± 0.08 | 33.28 ± 0.85 |

Table 3. Relative abundance (%) of commercially important finfish/shellfish seeds Shambhavi Estuary during March, 2011 to February, 2012

| *Species* | Pre-monsoon | Monsoon | Post-monsoon | Annual average |
|---|---|---|---|---|
| *Mugil spp.* | 33.1 | 29.2 | 39.7 | 34.0 |
| *Etroplus suratensis* | 1.2 | 4.7 | 1.8 | 2.6 |
| *Lutjanus argentimaculatus* | 0.3 | 0 | 2.0 | 0.7 |
| *Lutjanus russelli* | 0.6 | 0 | 0 | 0.2 |
| *Fenneropenaeus indicus* | 1.5 | 0 | 3.2 | 1.5 |
| *Penaeus monodon* | 0.8 | 0 | 1.5 | 0.8 |

Interestingly, analysis of samples for diurnal distribution of seed indicated that relatively more numbers were caught during lowest low tide (60%) and in the early morning hours (65%) or late in the evening hours (30%). It is also proved during seed survey that the congregation of seeds of finfish and shellfish is more on either sides of estuary and mangrove vegetation rich area. Vedavyasa Rao (1980) also reported similar pattern in diurnal availability of finfish/shellfish seeds. Many other commercially important fish seeds like *Trachinotus* spp., *Lutjanus* spp., *Acanthopagrus* spp., *Sillago sihama*, *Gerres* spp. and *Sphyraena* sp. were reported in smaller quantities during the survey in Shambhavi Estuary, The provisional assessment of the magnitude of the seed resource available in the estuary indicated that there is good scope for collection of six species of fish seeds (Table 1.) which can be utilised for capture-based aquaculture.

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