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RESEARCH ARTICLE

IMPACT OF ENVIRONMENTAL POLLUTANTS ON THE DISTRIBUTION OF 'CHITI KANKRA', *VARUNA LITTERATA* (FABRICIUS, 1798) IN AND AROUND CALCUTTA LEATHER COMPLEX, W.B., INDIA

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ABSTRACT

The present study was aimed towards the impact of environmental pollution caused by Calcutta Leather Complex (CLC) industries near Bantala on Chiti Kankra (*Varuna litterata*) population. Round the year (July 2016-June 2017) survey indicates that almost complete absence of *Varuna litterata* along the prodirection of industrial effluents in relation to time lapse, biodegradation and other environmental components. From inputs of local fishermen and villagers, it was informed that the abundance and distribution of *Varuna litterata* was plenty decades ago in the concerned water ways to that of other part of coastal Sundarbans and Midnapore estuarine distributaries. Now nearly absolute absence of *Varuna litterata* fingers the effect of physico-chemical pollutant components drained out of Calcutta Leather Complex. The pollution toxicity is the composition of B.O.D, C.O.D, salinity, pH change of water, sulphate, phosphate, chloride, heavy metal like chromium and solid slug etc. The work is in progress to find out the main toxicants producing grave impact on the life history stages, feeding, reproduction and migration as a whole in ecology of *Varuna litterata*.

Key words: *Varuna litterata*, Pollutants, Calcutta Leather Complex, W.B.

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INTRODUCTION

Calcutta Leather Complex (CLC) near Bantala in east Kolkata (previously called 'Calcutta'), is located 14km south-east from the central business hub of Kolkata and has an area of about 450 hectares (4.5 square kilometers). The complex was constructed in late 1990s. The CLC started its operations from 30th July 2005. Many illegal tanneries continued to operate outside the CLC (Roy *et al.*, 2013). Maximum tanning industries in the world are carried out in low and middle income countries due to accessibility of low-cost labour and it also depends on availability of materials (Azom *et al.*, 2012).

Varuna litterata, locally called Chiti kankra is a grapsid crab, commonly known as 'herring bow crab' are euryhaline and can be found in coastal river, brackish water or at sea. They usually inhabit the mangroves, estuarine and apparently freshwater environments, in shallow sub tidal regions and usually found under rocks, logs and dead leaves and live in shallow burrows along the embankments or sides of pools, creeks and shallow banks (Devi *et al.*, 2013). Kemp (1915) first reported the mass migration of the megalopae in the Hooghly River near Calcutta, India.

Ryan and Choy (1990) observed the upstream migration of *V. litterata* megalopae in Fiji. Madhyastha and Rangneker (1974) studied on the metabolic effect of eyestalk removal in *V. litterata*. Larval development of *V. litterata* was reported by Tu Chin-Hung (1992). Behavioural study on the small edible crab *V. litterata* in the coastal water of Bay of Bengal was carried out by Manna (1988). Devi *et al.* (2013) reported the brachyuran crab diversity and also investigated the habitat ecology and food and feeding habitat of *V. litterata* from Cochin backwaters, Kerala, India. Shoba and Rose (2016) also reported that hemolymph of *V. litterata* has the capacity to agglutinate a variety of mammalian erythrocytes. Devi and Joseph (2017) reported the occurrence of *V. litterata* in Cochin Backwaters and also described the morphology and the habitat preferred by concerned species. Mahapatra *et al.*, (2017) determined the size and weight range of the crab and made a proper relationship between body dimensions and weight of *V. litterata* in Sundarbans, West Bengal. The present study is the first report on gradual decrease or near absence of *V. litterata* around canal of CLC may be due to industrial toxicity.

MATERIALS AND METHODS

This study was carried out for one year from July 2016 to June 2017 on the basis of expected pollutant degradation and dilution due to influx and ingress of tidal water from sea. 3

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study stations were selected along the study area (from CLC to Malancha). The first sampling station was near the CLC i.e. source point in the canal. The second site was located at Ghusighata, 20 Km away from CLC. The third sampling site was Malancha, 30 Km from CLC, where the total canal water outflows into mainstream of river Bidyadhari via Kalindi river and finally into Bay of Bengal. The crabs were collected twice a month at approximately 15 days interval throughout the study period from these mentioned stations. Collections were made using bamboo stick made traps in the selected water channels from 6 pm to 6 am. The fishermen were not agreed to use bamboo traps at day time. Collected crab specimens were washed thoroughly to remove all debris and identified by the author.



Figure 3. Draining out of polluted water from CLC into the canal

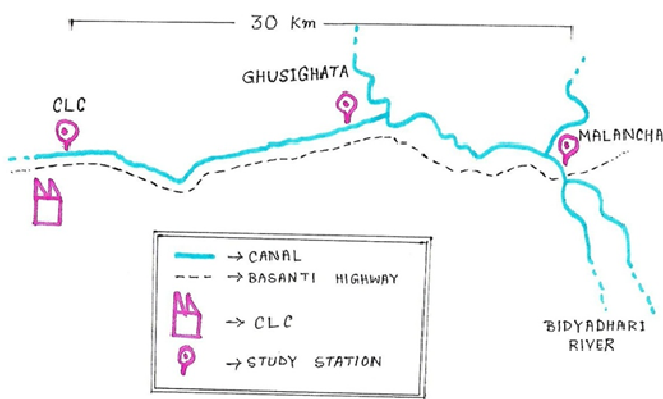


Figure 1. Study sites (1-3) along wastewater carrying canal from CLC to Malancha

RESULT

A survey was conducted along the study area (CLC to Malancha) revealed the occurrence status of *V. litterata* throughout the study period. Among the 3 selected stations, *V. litterata* is found only in 2 stations namely Ghusighata and Malancha, but the concerned crab species is absent near CLC where entire effluents mix with the canal water. Out of two stations the occurrence of *V. litterata* is relatively high near Malancha. The following table reveals frequency of occurrence of *V. litterata* during various months in the study area. On the basis of catch of *V. litterata* the results indicate that, specimen hauled increases inversely with the distance of water from the source of origin of pollutants (CLC). It also signifies breeding biology of migration of *V. litterata* riches at its highest in July. Month of less frequency of crabs may focuses hibernation or migration back to sea that has to be studied further and confirmed since the migration and survivability of those crabs are not well documented.

DISCUSSION

A thorough survey in and around CLC in North 24 Parganas of West Bengal and the interaction with the local people and fishermen reveal that the population of *V. litterata* in these areas have been decreased gradually to a low rate. But the people there cited that the density of faunal diversity especially *V. litterata* was not like this few decades before. They mentioned that the establishment of CLC in the late 1990s is the main cause of low density of *V. litterata* in and around the river Bidyadhari.



Figure 2. Outlet meshed with solid garbage of CLC.

Table 1. Recorded *Varuna litterata* (in number, adults and subadults) from all the study sites by the present author

Year	Month	Station 1		Station 2		Station 3		
		1 st Sampli-ng	2 nd Samp-ling	1 st Sampli-ng	2 nd Sampli-ng	1 st Sampl-ing	2 nd Sampli-ng	
2016	July	0	0	173	134	687	564	
	August	0	0	92	87	283	213	
	September	0	0	61	48	167	173	
	October	0	0	29	18	116	98	
	November	0	0	11	06	69	43	
	December	0	0	0	0	0	0	
	January	0	0	0	0	0	0	
	February	0	0	0	0	0	0	
	March	0	0	0	0	37	41	
	April	0	0	16	21	82	77	
	2017	May	0	0	54	67	267	328
		June	0	0	127	104	664	692

The waste of the leather factory affects the growth and population abundance of *V. litterata* upto Malancha, a place in North 24 Parganas, 30 km away from the leather complex. The waste materials of the factory contain high amount of pollutants. The effluents of this factory are being drained through small canal or nullah and directly contaminate the canal water, the main dwelling and breeding ground of chiti kankra. The fishermen along this region state that this canal water is also used for pisciculture. It is true that the density of *V. litterata* is not the same throughout the year. Mainly it is found noticeably during April to August. They migrate upstream through active swimming pelagically. The peak period of migration in and around 'New Moon' at night of June and July. Breeding season of *V. litterata* starts from April and continued up to July when they migrate, this type of migration is also known as 'Breeding migration'. It was observed that far from the complex, the density level of *V. litterata* is gradually increases. It suggests that the concentration of fatal pollutants decrease accordingly, so the power and action of the pollutants that affect the normal populations of *V. litterata* are diluted and degraded as it flows down with the canal of river water towards the outfall. The fishermen of the area are less concerned about the decrease of *V. litterata* population as it doesn't affect their economy. But the local poor people are affected a lot both from the economic point of view and health is concerned, not only this, food chain and ecological balance has been disturbed due to its population decrease. Scientifically crab contains high complex protein and carbohydrate component. The poor people could get it at almost no cost, thus it was famous as low cost food. But the recent absence of *V. litterata* directly or indirectly affects their lifestyle and to some extent health. They lack protein and other components derived by *V. litterata*. Like hilsa, chiti kankra tries to go upward from the sea or river mouth in particular seasons mainly during breeding season. Usually it comes to canal or other water bodies through the culvert. But recently the density and population of chiti kankra decrease due to the high level of pollutants in the river water. In case of Ghushighata the growth and density gradually decreased from the foundation of the leather complex in late 1990 to the full-fledge running the factory in 2005. But after this period (1997-2005) the existence of chiti kankra is hardly to be noticed. Guerra-Garcia and Garcia-Gomez (2004) observed that. Crustaceans are most sensitive to environmental pollution and they also describe crustacean community as a bioindicator of environmental variables. On the other hand variations in physico-chemical water qualities induce change in immune status of Crustaceans (Varadharajan *et al.*, 2013). Perhaps they do not cross their acceptable pollution limit. If they cross, they must die i.e. total absence of this crab species are found in CLC area throughout the year. They must have some sensory system to migrate or stay even temporarily in n dimensional ecological niches. The limit of acceptability of the environmental factors should be studied thoroughly. Devi and Joseph (2017) reported that *V. litterata* is an inhabitant of mangrove regions and prefer areas with close proximity to the sea having good tidal influx. Azom *et al.* (2012) studied on tanning industries in Bangladesh and also noted that tanning activities involve serious environmental hazards. The West Bengal Pollution Control Board permitted the operation of tanneries only if they were located within the leather complex. But Roy *et al.* 2013 noted that unauthorized and illegal operations were taking place in the concerned area. They also reported that decrease in water pH over the last 10 years due to excessive loads of organic pollutants in wastewater.

Significantly increase in salinity, TDS, phosphate and nitrate concentration in canal water was also reported by Roy *et al.* 2013. According to Roy *et al.* 2013, concentration of Cr, Fe, Pb increased markedly since last 10 years. Mukherjee (2011) also noted that slit formation is a major problem for wastewater carrying canals in the wetland ecosystem and affects both pisciculture and agriculture. Sudhira and Gururaja (2012) reported that wetland areas decrease day by day due to increase in human population in and around Kolkata.

Conclusion: From the studied result it can be concluded that pollution has a major role in the survival and migration of *V. litterata* within their theoretical, ecological niches. The peak time of migration is June-July. Salinity, pH, water temperature etc. also interfere in their migration and survival. It has also been informed that the *V. litterata* population has decreased seriously from decades ago throughout W.B coast possibly due to over population, excess catching to prepare animal food and water pollution etc. It needs conservation. Under the circumstances farmer, local people and government can play a crucial role to keep the situation under control and prevent the destruction of population of chiti kankra that also help the growth of the concerned species. The farmer can use less pesticide in the farming land. Beside this, local people can launch awareness programme emphasizing the need of protecting the growth of aquatic organisms including chiti kankra. Above all government should be more judicious, prudent and vigilant while giving recognition to factories which are not eco-friendly. Sewage water should be treated before releasing in the canal.

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