

Devising Conservation Strategy for the Freshwater Crab *Barytelphusa guerini* in Godavari and its Tributaries in Marathwada, Maharashtra, India

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Abstract

Freshwater crabs belong to the largest group of invertebrates. They are ecologically as well as economically important owing to their role in nutrient recycling, water quality monitoring and small-scale fisheries. They have recorded their presence in nearly all freshwater habitats ranging from streams emerging from mountains or highland to large rivers along with all water bodies in the land. The past few decades, there has been an upsurge of attention in the use of freshwater crabs as an ecological model for assessing impact of various environmental stress and pollutant in the rivers. A number of studies have showed that various chemical pollutant and pesticides have affected the population structure of the crabs in the Godavari basin. This has resulted in a steep decrease in the populations of the crabs in the region. The present investigation was undertaken to study the ecological stress on the crab species *Barytelphusa guerini* in the Godavari river basin and its tributaries along with systematic survey in the river basin and also on the river bank. Then here suggested some fact findings and action plan proposed for conservation of the species for future in the river basin.

Keywords: *Barytelphusa guerini*, Red List, The Godavari River, Tributary, Ecology.

Introduction

Freshwater crabs constitute one of the largest group of invertebrates occupying the Indian peninsula waters. They have recorded their presence in nearly all freshwater habitats ranging from streams emerging from mountains or highland to large rivers along with all water bodies in the land. They are ecologically as well as economically important owing to their role in nutrient recycling, water quality monitoring and small-scale fisheries. Nearly 1280 species belonging to 4 super families occurs throughout the world which accounts 20% of identified brachyuran diversity. The past few decades, there has been an upsurge of attention in the use of freshwater crabs as an ecological model for assessing impact of various environmental stress and pollutant in the rivers. A number of studies have showed that various chemical pollutant and pesticides

have affected the population structure of the crabs in the Godavari basin. This has led to a sharp decline in the populations of the crabs in the region.

The Red List maintained by the IUCN has indicated that *Barytelphusa guerini* has come under least concerned animal owing to its extensive distribution, assumed large population. As the number of habitats and the survivor of crabs are waning speedy enough to be eligible for listed in threatened category. The forthcoming threats to this species comprise of habitat deterioration owing to increased population, industrial interference and agricultural constraint (Cumberlidge, 2008). Thus, the study on the population and ecological aspects has led to steps towards conservation of this species.

The success of conserving these freshwater crabs is dependent on protection of natural habitat areas that are adequately large to endure the quality of water. It is not documented whether these freshwater crabs are vulnerable to polluted or silted waters. There is ample literature that shows that these crabs are uncertain to survive in these changed environmental factors.

Conservation:

The abundance, relative abundance and sex ratio were the most important factors for population studies. These parameters show that the abundance, relative abundance and sex ratio of crabs were similar in all locations during the period of study. Population parameters of fishery resources are among the most important indicators for fishery management because they are directly related to the available resource stock giving estimative of the number of crabs available for fishery (commercial purpose) and those that should be conserved and not fished (non-commercial purpose) (Hattori, 2006; Wunderlich *et al.*, 2008).

The locations of studied areas closer to the human habitat are those with high use to the crab fishery and with low importance to the crab conservation. The areas away far from the human habitat are least exploited and considered major importance for the crab conservation. The biological criteria related to the *B. guerini* population viz. structure abundance and sex ratio of crabs were more important than land use and cover and social criteria for the demarcation of the suitable areas for the crab conservation.

The constrained ranges of many species coupled with the loss of habitat owing to human driven activities across the world. These are prime reasons of worry for the long-term existence of this fauna. A high degree of endemism as associated with freshwater crabs, is also related with many species living in specific habitats such as river rapids, low-lying swamps, hills and mountain with

forest cover, and islands. Additional investigation is suggested to determine the minimum effective size and design of protected areas for freshwater species such as crabs (Cumberlidge *et al.*, 2012).

The ecology and distribution of the freshwater crabs are turn out to be well known for facing the impending hazards for their enduring continued existence. The protection of many species of freshwater crabs depends mainly on conservation of regions of natural habitat sufficient huge to sustain quality of water. Even though it is still unknown precisely the sensitivity of the freshwater crabs to polluted waters. A large number of studies results showed that crabs did not stay alive when rendered to these factors (Yeo *et al.*, 2007).

Urbanization, industrialization, agricultural operation and utilization of natural resources are essential certainty in developing countries, but negotiations may have to be made if it is ascertained that freshwater crab species should not wiped out in the future. Thoughtful and cautious utilization of available natural resources may prevent species extinctions as long as water quality is maintained and is not heavily polluted. Besides, the forest and vegetation covering on the land is properly maintained and protected (Cumberlidge *et al.* 2009).

MATERIAL AND METHODS

The study area

The study was conducted across the Godavari river basin and its tributaries. Survey was carried out along the sides of river basin and its tributary. Observations taken place for the habitat, abundance and distribution of the crabs along the Godavari river basin near Markand which is just behind Vishnupuri project, Kaleshwar, Punegaon having an elevation 366 meters above the sea level. Punegaon is a village in Nanded taluka 12 km towards the east from Nanded city. Its geographical coordinates are 19° 9'0" North and 77°20'0" East, near Amdura, Asna river near Shikarghat Gurudwara, Mata Sahib Gurudwara left bank tributary of Godavari, Fish catching area at Babli dam in Dharmabad taluka of Nanded district. Also Survey of the tributary Purna river near Dhangar taklali were carried out.

The climatic conditions prevalent in this region rainfall varies between 1,100 mm and 1,500 mm, that is the three climatic seasons are well defined, one season rainfall occurs in the first half of the year between the months of April to August and Corresponds to more than 70% of

precipitation and a dry season occurs in the second between the months of September and March. The seasonal temperature variation is very significant.

RESULT AND DISCUSSION

India is the seventh largest country with an area of 3,287,263 square kilometres with a coastline extending to 7,516.6 km. The climate in the Himalaya varies from temperate to arctic, in the Indo-Gangetic plains and southern plateau as tropical and subtropical. The plant diversity is rich and encompasses all types of forests and a vast cover of grasslands. These forest and grassland harbors millions of fauna representative of these habitats. The annual rainfall varies as a minimum of 100 mm in the Rajasthan's desert to a maximum of 5000 mm in Meghalaya's evergreen forest. The ecology of biogeographical zones of India primarily depends of the rainfall received. On the basis of the habitats, India has been distributed into the subsequent biogeographically regions/ zones- Trans-Himalayan region, Himalayan region, Indian Desert region, Semi-arid zone, Western Ghats, Deccan Peninsula, Gangetic Plains, North-East India, Islands and Coasts.

However, the expanse of the country is only around 2% of biosphere's entire land mass; India harbors as much as 6.67 % of entirely identified species of faunas. On the basis of available information, the Indian fauna comprises approximately 81000 species together with the kingdom Protista. The largest group of the insects comprises of approximately 53430 species, followed by group of molluscs encompassing over 5000 species, whereas the mammals constitute 372, birds comprise of 1228, with reptiles contributing 446 species, amphibians constitute 204 species and with fishes of 2546 species. These include 77 species of mammals, 55 species of birds, 20 species of reptiles, one species of amphibian and a large number of insects and other invertebrates which are threatened with extinction, to varying degrees.

India has a wide diversity in aquatic environment and endemism of the freshwater fauna is also high, but the study of these aspects is fairly inadequate. Many new species until now are not described and leaving several taxonomic questions unanswered. Furthermore, the information of freshwater crab species pertaining to their distribution, the current status, along with the biology and ecology is very inadequate. The species described earlier are known through the original description and the known species are only a few that were obtained in a insufficient random sampling locations. Additionally, specimen collections of freshwater crabs currently are short of sufficient specimens belonging to several species. This necessitates extensive surveys to discover

Comment [MB1]:

new species, enhance species distributions, describe specific habitat requirements, pronounce population levels and trends, assess status, identify explicit threats to freshwater crabs and advocate conservation approaches and protection zones (Cumberlidge *et al.*, 2012).

The following is a general checklist of conservation measures for threatened species:

A. Fact Finding

1. To undertake surveys to determine
 - (a) The status of the taxon,
 - (b) the existing threats to its survival,
 - (c) The residual habitat for its survival, and
 - (d) The lawful and enforcement condition.
2. To initiate research projects to establish its ecology, the factors restraining its population-growth and the relationship between it, its habitat and the local human interaction.

B. Action Proposed

1. Legal
 - (a) To encourage new legislation or make better use of powers under existing legislation,
 - (b) To encourage a special international convention,
 - (c) To bring about changes in law enforcement in regard to conservation areas
2. To declare new conservation areas.
3. To establish a continuing scientific, action plan
 - (a) Through scientific research programs
 - (b) By establishing research stations.
4. To undertake educational/public awareness programs.
5. To encourage existing conservation efforts.
6. To re-establish a taxon by translocation/release of captive bred stock or by increasing the food supply or living space by habitat management.
7. To control feral/hybrid animals.

Ordinary species evaluated as Least Concerned have a extensive allocation in the rivers, wetlands, and mountain streams of the region. Till now, it had been proved to be comparatively tolerant to the modifications in use of land-use affecting aquatic ecosystems. It is hopeful that

additional compliant species can endure in the previously troubled and noticeably polluted waters of the rivers and streams. The escalating deterioration of natural forest cover and vegetation due to pollution as a result of urbanization, industrialization and agricultural development affects the water bodies and rivers in the long term. This would lead to exposing the completely aquatic species leads are vulnerable (Leoville et al., 2021). Even species evaluated as Least Concerned could undergo disastrous decline due to sudden changes in land utilization and development, hydrology projects or pesticide use. It is still unknown the species in the aquatic habitat would survive with habitat interruption and pollution. Taking into consideration their specific habitat requirements, there is chance that these species will not adapt as readily as the prevalent lowland species. The fast speed of development in many countries will leave a fine line of differentiation between a species assessed at Least Concerned from Vulnerable species, or a vulnerable species from an endangered species. The developmental projects might exert a remarkable effect on species with precise habitat necessity and a constrained distribution. Protection, preservation and conservation actions must consequently be intended principally at conserving the reliability of ecological niches and habitats and should be strictly monitored at the same time on freshwater crab populations.

The conservation assessment of freshwater crabs in Maharashtra corresponds to the initial stride in the direction of the recognition of threatened species within the region. This will also direct to the improvement of a protection, preservation and conservation actions for endemic species (Novais et al., 2021). The constrained array of many species along with the man made harm to habitat disturbance or loss is key reasons of concern for the ever continued existence of this crab. The freshwater crabs encompass an elevated level of endemism with many species existing in the dedicated habitats. Additional investigation is required to resolve the least efficient size and design of protected, preserved and conserved areas for freshwater species such as crabs.

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