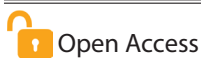


Conservation of Horseshoe Crab: Ecological Importance and Sustainability Challenges

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Abstract

The horseshoe crab is an ancient marine arthropod that plays a major role in a marine environment and is a bioindicator. Apart from this, it has major demand in the biomedical field. It also indirectly helps migratory birds, ecotourism and education. Unfortunately, they are now in an extinct phase due to activities including habitat destruction, overharvesting, climate change and bycatch. In India, their population is mainly reduced due to bycatch and climate. The conservation efforts are done to protect them and their culture technology is underway.

Keywords: Bioindicator, Bycatch, Conservation, Horseshoe crab

Introduction

Holding the name of an ancient marine arthropod with a 450 million history, Horseshoes play a major role in the environment mainly in balancing the marine food web and ecosystem. Though it sounds like a crab, but not belongs to the Crustacea. It belongs to the class Merostomata and subphylum Chelicerata (Sekiguchi and Shuster Jr., 2009). The blue blood of this creature has demand in the biomedical field which is valued for detecting bacterial endotoxins that ensure the safety and sterility of marine products and vaccines (John *et al.*, 2018). Despite its critical role in protecting public health and ecosystems, the horseshoe crab faces increasing threats from overharvesting for blood collection which raised significant conservation concerns.

Physical Characteristics

The identifying characteristics of horseshoe crabs are horseshoe shaped carapace and have 10 to 12 legs. Their body is divided into three parts are the prosoma (head), opisthosoma (abdomen), telson (tail part of the horseshoe crab). Its ventral and dorsal side is represented in figure 1 and 2. Its blood colour is blue, which is also its unique characteristic and it mainly feed on clam and marine worms. It lives for 14 to 20 years.

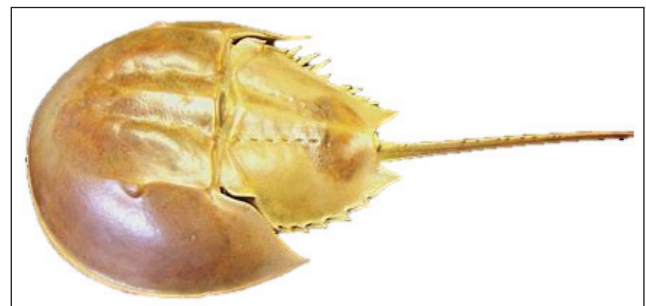


Figure 1: Dorsal side of horseshoe crab

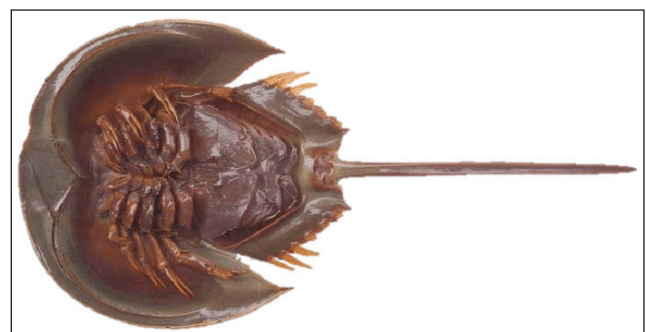


Figure 2: Ventral side of horseshoe crab

Article History

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Species of Horseshoe Crabs

The species, common name and distribution of horseshoe

crabs are represented in table 1 and their pictures are represented in figure 3-6.

Table 1: The species, common name and distribution of horseshoe crabs

Species	Common name	Distribution
<i>(Limulus polyphemus)</i>	Atlantic Horseshoe Crab	Eastern coast of North America.
<i>(Carcinoscorpius rotundicauda)</i>	Mangrove Horseshoe Crab	Indian Ocean, Southeast Asia.
<i>Tachypleus gigas</i>	Indo-Pacific horseshoe crab, Indonesian horseshoe crab, Indian horseshoe crab, Southern horseshoe crab.	Western Pacific, Southeast Asia.
<i>Tachypleustri dentatus</i>	Chinese horseshoe crab	East Asia



Figure 3: Atlantic Horseshoe Crab



Figure 4: Ventral side of horseshoe crab



Figure 5: *Tachypleus gigas*



Figure 6: Chinese horseshoe crab

Distribution of Horseshoe Crab in India

Mangrove and Indo- Pacific horseshoe crabs are dominantly found in India mainly in the Bay of Bengal and the Arabian Sea. Mangrove horseshoe crabs are mainly found in eastern coastal states of India such as West Bengal, Odisha, Tamil Nadu and Andhra Pradesh. Indo- Pacific horseshoe crabs are mainly found in Southern coastal states such as Kerala, Karnataka and Tamil Nadu. Unfortunately, in India the population of these two species are declining which is

supported by the recent study that shown the decline of mangrove shoe crab of 64.7% and Indo-pacific horseshoe crab of 72.2% from 2000 to 2010.

Importance of Horseshoe Crabs

- These crab eggs are a good energy source for ocean migratory birds such as Red knot which depend mainly for their long distance migration.
- They play a major role in the marine environment by maintaining a healthy ecosystem through acting as both

prey and predator.

- They also act as bioindicators as they are sensitive to environmental changes such as pollution and global warming. Therefore, changes in their population indicate the severity of ecosystem health.
- It is also used as bait in fishing for catching mainly eels and conches and also useful for ecotourism and education which helps to study ancient animals, evolution patterns and behaviour of migratory birds.
- It has a major demand in biomedical field due to its blue blood that contains Limulus ameobocyte lysate (LAL) which is useful for the detection of bacterial endotoxin in medical devices, vaccines and surgical instruments (Li *et al.*, 2015). The collection of blue blood from the horseshoe crab for biomedical purposes is represented in figure 7.



Figure 7: Collection of blue blood from the horseshoe crab for a biomedical purpose

Key Threats for Horseshoe Crab

1. Coastal development and pollution are the main threats for horseshoe crabs which disturb their environment, habitat and also beaches where they lay their egg. Its destruction also affects the migratory bird population as it depends on their egg.
2. Exploitation of horseshoe crabs for medicinal use also affects their population. Most of them are used for the removal of blood. Even though they are released back, horseshoe crabs will die either due to over-blood removal or handling stress and damage.
3. Climate change mainly increasing temperature is also one of the main reasons for their population reduction that disturbs their breeding nest. The main example is the Amphan cyclone in 2020, which caused severe damage to the breeding ground at the Sagar Islands of the Bay of Bengal.
4. Although horseshoe crabs are not the primary target, they come in the net while fishing that cause damage and death.

Conservation of Horseshoe Crab in India

In India, the main reasons for the decline of the horseshoe population are pollution, bycatch and the destruction of mangrove forests and estuaries that are essential for their breeding, destroyed their populations. But concern about them has risen mainly in the Sundarbans and the coasts of Orissa and Andhra Pradesh due to the decline of their number. Conservation measures are taken to save the horseshoe crab. It is also listed under the Schedule IV of the Wildlife (Protection) Act 1972. The Conservation efforts are

supported by the Wildlife Protection Act (1972), which limits the personal consumption of 3 horseshoe crabs (Pramanik *et al.*, 2021). In addition, the illegal collection or hunting of wildlife can result in a three-year prison sentence, a fine of up to 1 lakh, or both. This legal framework and seasonal fishing bans and fishing gear controls under the Fisheries Act (1897), help ensure that horseshoe crab populations can reproduce and remain sustainable in the wild. Efforts are being made by State Forest Departments, governments and non-government organisations to map breeding sites and assess the habitat status of horseshoe crabs throughout their range. Future conservation plans for horseshoe crabs in India must focus on long-term habitat improvement through scientific mangrove planting and sustainable debris management. It is particularly important to involve local fishing communities in these efforts. Additionally, the captive rearing and breeding of horseshoe crabs is currently underway. These regulations are essential for balancing local income opportunities with the long-term conservation plan.

Conclusion

The contribution of horseshoe crab towards the environment has a long history that plays a major role from supporting marine environment to medical safety. It also acts as a bioindicator which provides alerts on environmental changes. But now their population is declined due to human activities. Saving the horseshoe crab is essential for the safety of the marine environment and earth. There is a need for the development of the culture of this species along with other conservation practises. Moreover, this is a reminder of the interconnection and protection of life on earth.

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