
**SUSPECTED PLASTIC INGESTION–ASSOCIATED RUMINAL
FOREIGN BODY SYNDROME IN A FREE-RANGING INDIGENOUS
COW (*BOS INDICUS*) FROM A COASTAL ECOSYSTEM OF EASTERN
INDIA: A FIELD-BASED CASE REPORT**

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ABSTRACT

Plastic pollution is a rising One Health challenge that impacts both terrestrial and coastal ecosystems and has a greater impact on livestock health and wellbeing. Free-ranging ruminants are particularly vulnerable to accidental ingestion of indigestible anthropogenic waste in contaminated grazing environments. This report describes a suspected case of plastic ingestion–associated ruminal foreign body syndrome in a free-ranging indigenous cow (*Bos indicus*) found dead in a highly polluted coastal habitat near Paradip, Odisha, India. The carcass was in a coastline natural environment that was marked by a large buildup of mixed municipal debris, ropes, plastic bags, and synthetic packaging materials. None of the symptoms of vehicular collision, predation, or traumatic injuries were found upon external assessment. Complete necropsy and histopathological examinations were not possible due to field limitations. As a result, the diagnosis is predicated on environmental exposure context and circumstantial field evidence. The results indicate that prolonged consumption of plastic debris in contaminated grazing areas may be linked to ruminal foreign body syndrome. This case underscores the necessity for integrated waste management and One Health surveillance in coastal ecosystems, as well as the ecological interface between cattle health and coastal pollution.

KEYWORDS: *Bos indicus*, Cattle mortality, Coastal ecosystem, Environmental contamination, One Health, Plastic pollution, Ruminal foreign body syndrome, Rumen impaction.

INTRODUCTION

Considering synthetic polymers are durable, widely distributed, and resistant to natural biodegradation, plastic pollution has become one of the worldwide longest-lasting environmental problems. Today plastics occur frequently in freshwater, marine, and terrestrial ecosystems, in places where they accumulate up and persist for decades, jeopardizing livestock, wildlife, and the integrity of the ecosystem as an entire system (Thompson et al., 2009; UNEP, 2021). According to recent international evaluations, improperly handled plastic garbage continues to increase, especially in regions with inadequate solid waste management infrastructure, therefore contributes to ecological and public health challenges (Jambeck et al., 2015; OECD, 2022).

In view of their indiscriminate grazing habits, ruminants like cattle (*Bos indicus*) are especially susceptible to ingesting foreign materials, especially in open, unmanaged, or free-ranging environments. While plastic bags, synthetic fibers, packaging materials, and rope fragments are accidentally consumed, they might accumulate in the rumen and cause foreign body syndrome. Impaired ruminal motility, impaired fermentation efficiency, anorexia, chronic emaciation, dehydration, and, in rare cases, mortality if not identified and treated promptly are the symptoms of this illness (Ramaswamy & Sharma, 2011; Abu-Seida & Al-Abbadi, 2016; Akraiem & Abd Al-Galil, 2016; Makhdoomi et al., 2018; Rajput et al., 2018).

The coastal ecosystems comprise volatile ecological interfaces where anthropogenic waste, marine litter, and sewage from the land mix together. In these kinds of environments, cattle grazing is more likely to encounter plastic residue that is carried by tidal action, fishing, tourism, and port-related activities. Notwithstanding such a higher risk, there exists currently scant field-studied veterinary documentation in the scientific literature of cattle mortality linked to plastic in coastal ecosystems, especially from developing coastal regions (Barnes et al., 2009; GESAMP, 2015). This reveals a major gap in One Health-focused surveillance that connects environmental contamination to the health of livestock.

Study Area

A case was reported from a coastal area close to Mahala Sea Beach, near Paradip Port on the Bay of Bengal coast in Odisha, India (20.225723° N, 86.593094° E) Figure 1. The investigation spot is typical of a particularly dynamic coastal habitat that is impacted by tourism, fishing, industrial maritime operations, and urban development. Anthropogenic waste, especially plastic products such as polyethylene bags, packaging materials for food, polyester ropes, synthetic fibers, and fishing-related materials, is heavily accumulating along

the coastline. An accumulation of waste and dispersal across intertidal zones is affected by seasonal coastal currents, wave dynamics, and continuous tidal activities. In consequence of these conditions, areas with free-range livestock grazing are subjected to serious levels of threat.

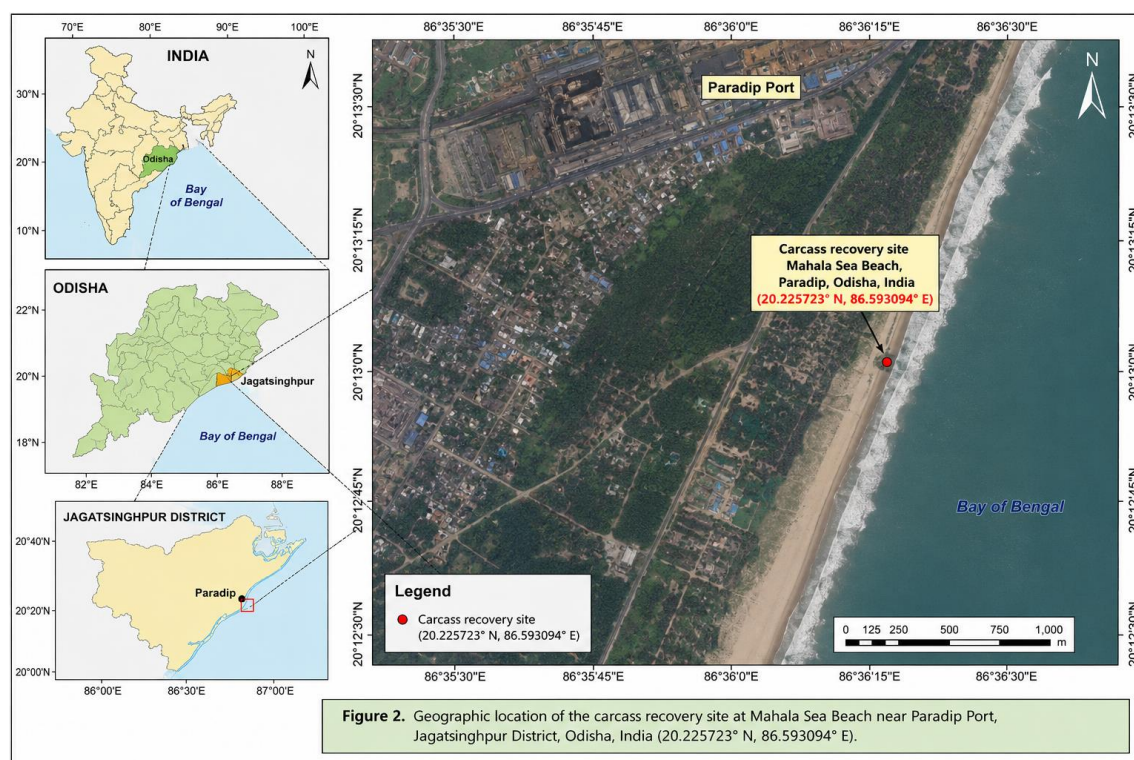


Figure 1. Geographic location of the study area near Mahala Sea Beach, Paradip, Odisha, India.

Case History and Field Observations

In a substantially contaminated shoreline environment, an adult free-ranging native cow (*Bos indicus*) was observed dead in a sandy coastal habitat (Figure 2). Neither apparent evidence of vehicular collision, predation marks, or traumatic injuries were found upon external inspection. The state of the carcass indicated chronic physiological deterioration rather than unexpected death. In the surrounding area of the carcasses, field surveys revealed a significant accumulation of plastic and other types of anthropogenic waste products (Figure 3). Around the stomach and the surrounding sand surface, fragile synthetic substances and plastics debris were observed. Given the logistical and field limitations, a gross interior inspection was not feasible. As a result, it was not possible to immediately assess the state of internal organs and ruminal fluids.



Figure 2. Carcass of an indigenous cattle (*Bos indicus*) found dead in a coastal seashore environment during field investigation (photographed by Dr. S. Vijayan).

Pathophysiological Considerations

Ingested plastic materials in ruminants are not broken down by microbes and remain in the reticulum and rumen. Reduced feed intake, tympany, digestive problems, and weight loss are caused by progressive accumulation interference to the ruminal motility as well as normal fermentation mechanisms. Functional ruminal stasis or mechanical obstruction can be caused by a persistent buildup of foreign particles in the rumen. Dehydration, which imbalance in electrolytes, and chronic weakness are examples of major metabolic syndromes that lead to gradual decline and mortality. The length of exposure, the quantity of the substance consumed, and the physical characteristics of plastic waste significantly increase severity (Figure 3).

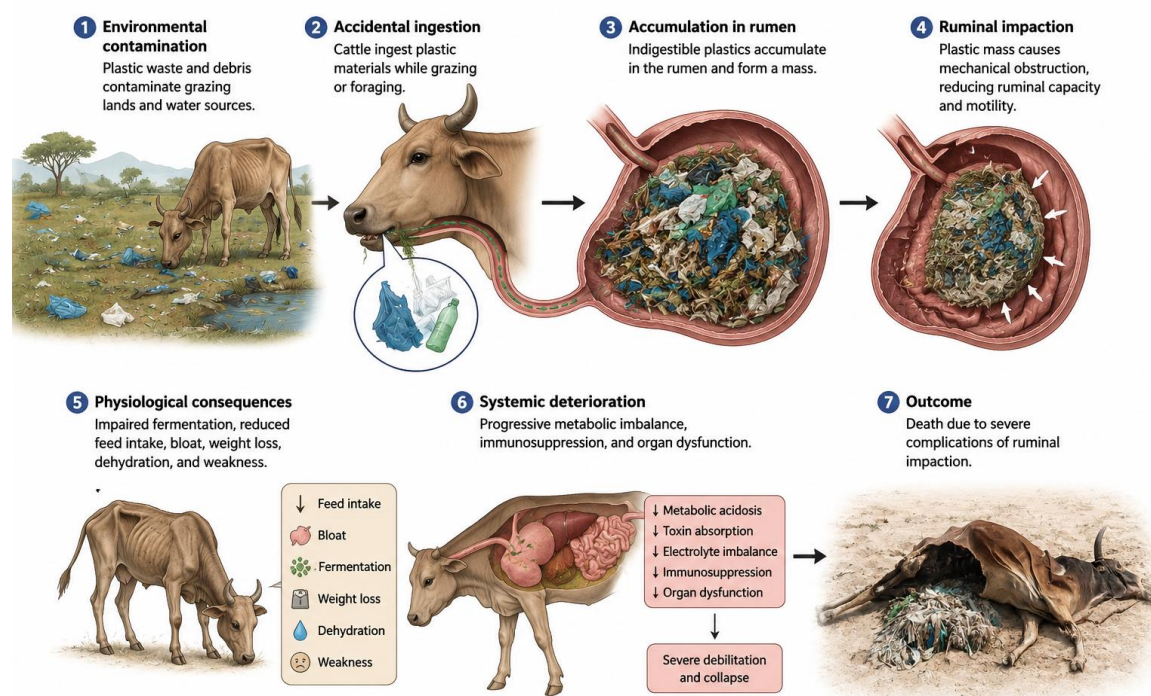


Figure 3. Pathogenesis of plastic-associated ruminal foreign body syndrome in cattle. Stepwise progression from environmental contamination and accidental ingestion to ruminal accumulation, functional impairment, systemic metabolic derangement, and mortality in free-ranging *Bos indicus* exposed to plastic-polluted grazing environments.

DISCUSSION

The present case indicates the ecological relationship between animal well-being and environmental plastic contamination. Cattle that graze freely in contaminated coastal environments are continuously interacting with manure that comes from sources such as marine debris and terrestrial runoff. The potential associated with external causes for death, such as injury to the body, vehicular collisions, or predatory behavior, is decreased when there are no traumatic lesions. Acute ingestion of plastic junk is well-supported by the environment, and ruminal damage seems likely to result from consuming it. Infectious diseases (such as septicemia and clostridial infections), toxicological causes (for example, as chemical or plant toxic effects), parasitic infestations, malnutrition, and metabolic abnormalities are examples of a variety of diagnoses. Nevertheless, an absence a necropsy examination and laboratory testing proved difficult to confirm or rule off these diseases.

A rising problem is the accumulation of microplastics in the rumen, which can lead to long-term digestive problems and ease environmental dispersal by means of fecal excretion, thus sustaining cycles of ecological contamination. From the standpoint of One Health, plastic

pollution is a common environmental risk that affects ecosystem stability, animal health, and maybe human health through contaminated food chains and environmental deterioration. As a result, coastal grazing areas may serve as crucial exposure hotspots that call for concentrated management and surveillance measures.

LIMITATIONS OF THE STUDY

The absence of necropsy-related investigation, histological assessment, and laboratory-based confirmation limitations this study. As an outcome, the diagnosis continues to remain preliminary and depends only on field findings and the context associated with environmental exposure. It did not prove viable to definitively link the ruminal foreign body syndrome to the cause of mortality.

CONCLUSION

This field study describes a possible case of ruminal foreign body syndrome connected to consumption of plastic within a free-ranging native cow from a coastal accomplishing in eastern India. The scenario points out coastal zones as important interface for environmental exposure and underlines the vulnerability of livestock if exposed to grazing environments contaminated alongside plastics. To mitigate such hazards, One Health surveillance mechanisms must be put in place, waste management procedures must be strengthened, and livestock exposure to hazardous coastal areas should be restricted. To confirm the precise impact that pollution from plastic on livestock well-being in coastal environments, more comprehensive necropsy-based research will be required.

Ethical Statement

This study involved opportunistic field observation of a deceased animal. No live animal experimentation was conducted.

Conflict of Interest

The author declares no conflict of interest.

Funding

The author declares no conflict of interest.

Author Contribution

SV conducted field investigation, data interpretation, manuscript preparation, and final approval.

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