

High Speed Urbanization and its Effects on Aquatic Food Chain Especially on Fish in Bata River of Odisha, India

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Received: 15.07.2016 / Accepted: 18.08.2016 / Published online: 22.08.2016

Abstract:

High speed urbanization is usually accompanied by pollutants being released into the environment hampering the health of the aquatic ecosystems. This calls for the urgent need to establish appropriate measures to counteract ecological disturbances. Even though this is happening in many parts of the world, it is especially notable in developing countries such as India, where the rate of urbanization is very high. Run-off waters cause pollutants to accumulate in nearby aquatic bodies and sometimes lead to unexpected and sudden changes in the state of trophic levels. How such increases in the magnitude of environmental stressors and pollutants lead to massive die-off events is the central story of this short article. In the context of this alarming situation, a recent episode of massive fish death in Bata river of Odisha state (India) is discussed to highlight the alarming situation of this area, aiming to attract the attention of both Governments and ecological managers to put in place counter measure plans to avoid such events from occurring in the future.

Keywords: Anthropization; Aquatic pollution; Developing country; Fish death; High speed urbanization.

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Introduction

High-speed urbanization, frequently leading to environmental pollution is a challenging issue in developing countries such as India (Paital, 2016a). Countries, during their economic development, often ignore the consequences for environmental quality, a subject which in the long-run can affect the welfare of its people (Chi, 1994). Rivers are probably one of the most important resources for human progress: by providing water and means of communication, the development of large cities throughout human history has been intimately intertwined with the presence of important rivers. But the proximity of such high human densities make rivers specially sensitive environments to physic-chemical alterations which commonly arise due to discharge of household and industrial effluents. Examples in the literature are countless and can be found across the world (Ali and Soltan, 1996; Bai and Shi, 2006; Meybeck et al., 2007; Mishra et al., 2009; Mouri et al., 2011). Pollution does not only alter physic-chemical water parameters but can also significantly affect the bacteriological biota (Mishra et al., 2009), which will have deep consequences not only on the human populations relying on these bodies of water, but also on the local fauna and flora. Thus, naturally, human waste disposal without creating nuisance to the environment has been a problem since immemorial times (Klein, 2013). Riverine systems, acting as the connectors between surface run-off and larger water bodies such as lakes or oceans, become more susceptible to pollutant accumulation, which especially affects secondary or tertiary trophic levels in these ecosystems. Fish, as one of the major trophic levels in rivers, when part of these die-off events, are easily detected by the general public. However, the reason(s) behind the death of aquatic fauna remains frequently unanswered (Paital et al., 2016a). If prolonged in time, such environmental alterations may eventually affect both faunal and floral diversities including human health (Leaf, 1989; Epstein,

1999; Sing et al., 2016). As briefly reviewed in (Paital et al., (2016), the Indian subcontinent has been the focus of numerous of these events, a matter which has raised the alarm of ecophysiologicals and conservationists aiming to restrict massive death of fishes in fresh water aquatic bodies.

The massive die-off event of fishes in Bata river

We would like here to highlight the event occurring on early morning of 5th June 2016, when over 450,000 fish carcasses (corresponding mainly to *Labeo rohita*, *Catla catla* and *Cirrhinus mrigala*) were noticed floating in the water of Bata river near Balijhara, Paradip, Jagatsingpur, Odisha. This event attracted a significant amount of media and experts aiming to determine the reasons behind this massive mortality event. Researchers first pointed to the possible link with the prevailing high air temperature (>46°C). The carcasses were quickly removed by Government officials for analyses and to avoid further degeneration of water quality (**Figure 1**). Eventually the reasons for these fish death in the Bata river were revealed by the state Government of Odisha, who after analyzing water samples, established that heavy alterations of the physico-chemical characteristics of the water were responsible. Indeed, a nearby area of 25 acres is currently being heavily constructed and its effluent discharges, corresponding to household wastes as well as chemical effluents from industries located closeby, are heavily impacting local waterbodies. The polluted water had high basicity, high biological oxygen demand, NH₃, nitrate, PO₄ and salinity as well. Particularly, 450 mg hardness, 1.25 mg PO₄ and 1.65 NH₃ per liter have been reported (The Sambad, 2016). Two years earlier, two similar events of fish die-offs occurred in the nearby area of Deogarh (Odisha state, India) on 18th June 2014. So, natural hazards, pollution and subsequent biochemical deficiencies including metabolic depression could be contributing

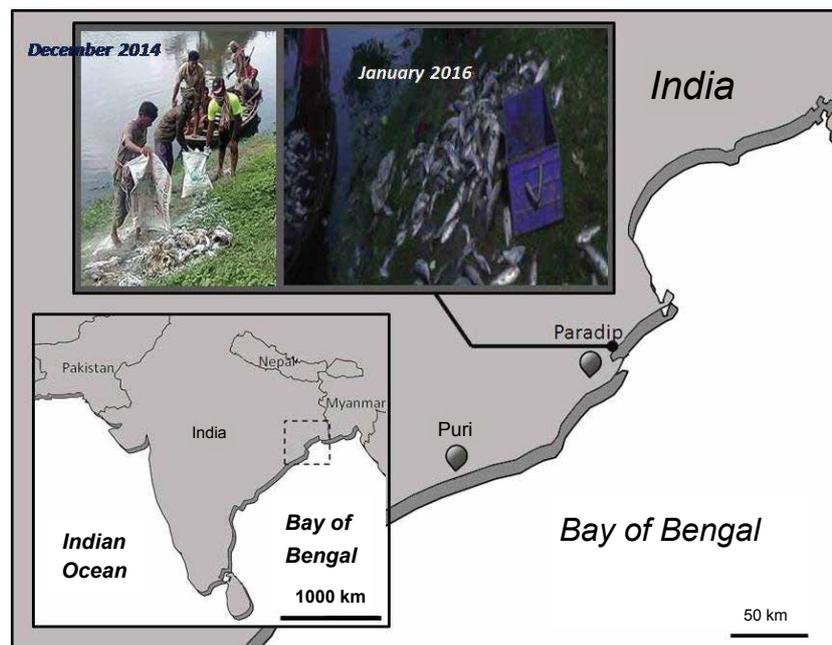


Figure 1: Large scale destruction of fish in Bata river of India on 5th June 2016.

factors too (Chainy et al., 2016; Paital, 2016b; Paital and Chainy, 2016; Paital et al., 2016b).

Future Perspectives

It is clear, from the above mentioned examples as well as many others across the world that anthropization, high speed urbanization and climatic factors such as El Niño may be contributory factors for the massive death of fishes (Paital, 2016a, 2016b; Sciencemag.org, 2016). Therefore, strict regulations and follow up actions are highly necessary in countries such as India in order to protect the fisheries, the largest economically and ecologically contributory trophic level in global food chain. Bio-treatment of household wastes, safe disposal of industrial effluents and regular water quality monitoring by competent authorities should become a priority, contributing to preventing such future die-off episodes.

Acknowledgements

The authors would like to thank the Orissa TV.in, Prameya news for rendering their help as well as 3 anonymous referees for their useful comments on the original manuscript. Funding by UGC, New Delhi, India for providing Dr. D.S. Kothari Fellowship to BRP (No. F. 4-2/2006 (BSR)/13-853/2013 (BSR)) is acknowledged. Additional funding comes from Marie Curie Actions from the European Union (FP7-PEOPLE-2013-IEF) [Grant number 622087-“IAS-Life”] awarded to GARI.

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