

Application and Aspects of Biometeorology in Inland Open Water Fisheries Management in the Context of Changing Climate: Status and Research Needs

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Abstract : Inland open water fisheries provide food, income, livelihood and nutritional security to millions of fishers across the globe. However, the open water ecosystem and fisheries are threatened due to climate change and anthropogenic pressures, which are more visible in the recent six decades, making the resources vulnerable. Understanding the interaction between meteorological parameters and inland fisheries is imperative to develop mitigation and adaptation strategies. As per IPCC 5th assessment report, the earth is warming at a faster rate in recent decades. Global mean surface temperature (GMST) for the decade 2006–2015 (0.87°C) was 6 times higher than the average over the 1850–1900 period. The direct and indirect impacts of climatic parameters on the ecology of fisheries ecosystem have a great bearing on fisheries due to alterations in fish physiology. The impact of meteorological factors on ecosystem health and fish food organisms brings about changes in fish diversity, assemblage, reproduction and natural recruitment. India's average temperature has risen by around 0.7°C during 1901–2018. The studies show that the mean air temperature in the Ganga basin has increased in the range of 0.20 - 0.47 °C and annual rainfall decreased in the range of 257-580 mm during the last three decades. The studies clearly indicate visible impacts of climatic and environmental factors on inland open water fisheries. Besides, a significant reduction in-depth and area (37.20–57.68% reduction), diversity of natural indigenous fish fauna (ranging from 22.85 to 54%) in wetlands and progression of trophic state from mesotrophic to eutrophic were recorded. In this communication, different applications of biometeorology in inland fisheries management with special reference to the assessment of ecosystem and species vulnerability to climatic variability and change have been discussed. Further, the paper discusses the impact of climate anomaly and extreme climatic events on inland fisheries and emphasizes novel modeling approaches for understanding the impact of climatic and environmental factors on reproductive phenology for identification of climate-sensitive/resilient fish species for the adoption of climate-smart fisheries in the future. Adaptation and mitigation strategies to enhance fish production and the role of culture-based fisheries and enclosure culture in converting sequestered carbon into blue carbon have also been discussed. In general, the type and direction of influence of meteorological parameters on fish biology in open water fisheries ecosystems are not adequately understood. The optimum range of meteorological parameters for sustaining inland open water fisheries is yet to be established. Therefore, the application of biometeorology in inland fisheries offers ample scope for understanding the dynamics in changing climate, which would help to develop a database on such least, addressed research frontier area. This would further help to project fisheries scenarios in changing climate regimes and develop adaptation and mitigation strategies to cope up with adverse meteorological factors to sustain fisheries and to conserve aquatic ecosystem and biodiversity.

Keywords : biometeorology, inland fisheries, aquatic ecosystem, modeling, India

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