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TITLE

FILLING THE GAPS: OVERCOMING THE PRESTONIAN SHORTFALL IN BIOMPHALARIA STRAMINEA (GASTROPODA: PLANORBIDAE) POPULATIONS IN NEOTROPICAL DRY FOREST RESERVOIRS

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ABSTRACT

The semi-arid region of Brazil has historically been characterised by water scarcity, which for centuries has influenced the dynamics of the environment and the way of life of human populations. In this region, water reservoirs serve as important sources of supply during long periods of drought; however, they frequently receive untreated sewage discharges. This practice fosters the maintenance of disease vector populations, such as schistosomiasis mansoni. The lack of information about the abundance and dynamics of these vectors over space and time, known as Prestonian shortfall, adds an extra layer of concern to the situation of the semi-arid reservoirs. This limited understanding hampers our ability to predict events and manage and effectively conserve freshwater mollusc populations. To bridge this gap, we investigated the effect of seasonality in the semi-arid region on the dynamics of Biomphalaria straminea populations, the primary vector of the Schistosoma mansoni in Caatinga reservoirs. We conducted monthly collections between June 2017 and May 2020 in three reservoirs in the municipality of São Julião, Piauí, located in urban and rural zones. Based on the literature, specimens were identified, measured, and categorised into young and adult individuals, and precipitation data were obtained from public government databases (INMET). We used GLMs and circular statistics to verify the existence of seasonal patterns in the abundance of molluscs. We recorded 5,555 specimens of B. straminea, with an average size of 5.11 mm. In terms of age composition, young individuals predominated (79%) compared to adults ($p < 0.001$; $W = 9$). We found that precipitation has a negative effect on the abundance of B. straminea (intercept = 5.52; coefficient = -1.08; $R^2 = 0.41$; $p < 0.001$), with the dry season ($n = 3,411$; 61%) presenting a higher number of individuals than the rainy season ($n = 2,144$; 39%). The dry season coincided with the highest abundance peak recorded in the reservoirs ($\rho = 0.6$) and with a greater number of young individuals ($n = 2,741$) compared to adults ($n = 629$) compared to the rainy season (young = 1,667; adults = 518). We did not observe uniformity in the distribution of B. straminea abundances throughout the study period, indicating the presence of seasonal variations in the abundance of this species (Rayleigh test = 0.6099; $p < 0.001$). The abundance of the Biomphalaria straminea species during the dry season highlights the need for more effective surveillance and control strategies, considering the increased risk of helminthiasis, especially schistosomiasis. This elevated risk is associated with environmental conditions favourable to vector proliferation at this time of year and with the increased density of animals and the greater demand for water resources in the reservoirs.

KEYWORDS

Caatinga; Intermediate Host.; Population Ecology; Semi-arid

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