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The Environment Effect on Freshwater Snails

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Description

It is essential to have a solid understanding of the local distribution, diversity and factors that drive the occurrence and abundance of freshwater snail intermediate hosts in order to comprehend the transmission of snail-borne parasitic diseases and implement effective interventions in endemic areas. The main environmental and biotic factors that influence the occurrence and abundance of snail species were identified by utilizing decision tree models and canonical correspondence analysis. In the study area, nine different species of snails were collected, with biomphalaria straminea, Sinotaia quadrata and physella acuta being the most common. Our review showed that the main factors influencing the overflow and event of snail species were the presence of hunters and contenders, macrophyte cover, chlorophyll-a, substrate type, stream profundity and water speed. Snail species were found more frequently and in greater numbers in water bodies impacted by human activities, particularly sewage discharge, which may have reduced the presence and abundance of snail competitors and predators [1,2].

These findings suggest that integrated snail control strategies in the study area should take into account the fact that proper management of water bodies to reduce water pollution may result in an increase in the number of snail predators and competitors. Snails are members of the invertebrate family gastropod and can be found all over the world in aquatic ecosystems. Freshwater habitats like dams, lakes, rivers, streams and ponds have been home to approximately 5000 species. Some of these are freshwater snails that are important to medical and veterinary health because they are the carriers of parasitic diseases. Major parasitic diseases spread by snails continue to be significant public health concerns all over the world, particularly in developing nations. Schistosomiasis is a parasitic endemic disease that affects nearly 240 million people worldwide and puts another 700 million at risk of getting it. Six blood fluke species have been reported to infect humans and cause schistosomiasis; among these, Schistosoma haematobium, Schistosoma mansoni and Schistosoma japonicum are the vitally pathogenic species [3].

The main factor that causes schistosomiasis is schistosoma eggs; Inflammation of the urinary and reproductive systems, obstructive or intestinal diseases, liver and spleen inflammation and liver fibrosis (Schistosoma mansoni and Schistosoma japonicum), as well as immunopathological reactions in the host are the results of parasitizing on host tissues. Schistosomiasis japonicum continues to be a major threat to social and economic development in China's Hubei, Hunan, Jiangxi, Anhui, Jiangsu, Sichuan and Yunnan provinces. Another parasitic disease that is common in many places is Angiostrongyliasis cantonensis. It is found in Southeast Asia, the Pacific Islands, parts of South and Central America and the Caribbean. Eosinophilic encephalitis and meningoencephalitis are the primary clinical manifestations of this serious disease. Over 3000 cases of angiostrongyliasis cantonensis had been reported in nearly 300 countries and regions with the majority of outbreaks occurring in endemic regions. The spatial distribution of intermediate hosts is largely responsible for the distribution of diseases spread by snails. Despite the fact that cases of imported parasitic disease have been found, it has been established that areas without intermediate host snails do not have an endemic snail-borne parasitic disease. The physical factors of temperature, precipitation, aquatic macrophyte cover, hydrography and substrate composition all play a role in the distribution and abundance of snails; chemical factors like pH, electrical conductivity, chemical oxygen demand, total nitrogen, total phosphorus and the five-day biochemical oxygen demand and biological factors like competition, food and interactions between predators and prey. Nonetheless, the overall significance of natural variables shifts significantly in various districts because of the ecological heterogeneity, showing that nearby reviews are expected to decide the favored environments of snail [4].

Snail intermediate hosts' preferred habitats and the environmental factors that influence their distribution are critical to the successful control and elimination of snail-borne diseases. A few studies on the biology of several freshwater snails have been done in Shenzhen and nearby areas. However, the surveyed snails are primarily biomphalaria straminea and pomacea canaliculata and the sample sites are dispersed. Snail-borne disease prevention and control efforts are hindered by the fact that little is known about the region's snail distribution and the main factors that influence its abundance. As a result, the goals of this study were to determine the biotic and abiotic factors that have an impact on the abundance and distribution of freshwater snail intermediate hosts of parasites in Southern China. Priority habitat identification and the identification of targets for the prevention and control of snail-borne diseases in this region may benefit from this study's findings. The occurrence and abundance of snail species were predicted using 32 environmental variables both biotic and abiotic factors. The models were created using classification and regression trees (CART). Most of the time, the models say that the most common species will always be there and the rarest species won't. The top-down induction of decision trees (TDIDT) principle serves as the foundation for the algorithms used to induct decision trees. In a similar vein, the M5 algorithm was used to construct regression tree models that linked the abundance of snail species to environmental variables. An extremely well-liked regression tree algorithm is using the divide-and-conquer strategy. It breaks up the entire dataset into smaller subsets. In this method, the parameter space is divided into sections (subspaces) and a linear regression model is built for each one. All models were subjected to 10-fold cross-validation and the trees were induced using default parameter settings. Snails were prevalent and abundant in water bodies with a lot of human activity, like sewage discharge, in this study.

These polluted waters' high concentrations of organic matter and ions made it easy for snails to grow and spread. Snails with fewer species and smaller numbers in clean water, according to our observations, were less affected by human disturbances. These bodies of water are home to a wide range of invertebrate competitors and predators, including coleoptera, odonata, hirudinae and hemiptera, whose presence significantly reduces snail density. These invertebrate assemblages have been shown to be responsible for a significant decrease in snail populations, which could be taken into account when implementing integrated snail control strategies. As a result, in order to control the local spread of snail-borne diseases, comprehensive snail control strategies ought to prioritize reducing the prevalence and abundance of hosts among freshwater snails. This suggests that one of the most effective strategies for the comprehensive control of snail-borne diseases in Shenzhen and the surrounding areas may be the proper management of water bodies to reduce water pollution [5].

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Conflict of interest

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