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Prophylaxis the mosquito larval population through amphibian and fishes

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Abstract
Mosquitoes (Diptera: Culicidae) are a key threat for millions of people worldwide including India, since they act as vectors for devastating pathogens and parasites. My research focus for malaria vector control. Mosquito larvae are usually targeted using organophosphates, insect growth regulators. Indoor residual spraying and insecticide-treated bed nets are also employed. However, these chemicals have negative effects on human health and the environment and induce resistance in a number of vectors. Newer and safer tools have been recently implemented to enhance control of mosquitoes. Here, I focus on some crucial challenges about eco-friendly control of mosquito vectors like Amphibian and Fishes, mainly the improvement of biology methods behavior-based control strategies (sterile insect technique ("SIT") and "boosted SIT"). A number of hot areas that need further research and cooperation among parasitologists, entomologists, and behavioral ecologists are highlighted.

Keywords: fish, frogs and around water and prophylaxis

Introduction

A debate is in India on the use of frogs for the control of mosquito larvae in view of decline of frog population and possible increase in mosquito density. Ban on killing frogs is already in effect in India (The Indian Wildlife (Protection) Act, 1972) since 1972. Frogs belong to the order Anura (tailess). They have evolved 250 million years ago and well adapted to varied ecology (Frog-Wikipedia, 2007).The use of synthetic chemical insecticides for vector control is in decline due to high costs, the development of resistance in many target populations, and perceived risks to the environment and human health. Owing to increased epidemic activity and difficulties in controlling the insect vector, dengue has become a major public health problem in many parts of the tropics. WHO says that as an infectious disease with a dramatic negative influence on health, the environment and the economy (Gibbons and Vaughn, 2002) [3].

Altho chemical insecticides will remain important in vector control programs, problems they have caused, and the paucity of new types under development, have for some time chose the stimulated interest in alternative control agents like biology method. In seeking replacements for chemicals, the pathogens and nematodes that cause diseases fatal to vectors have received considerable study over the past 30 years, particularly with respectto theirpotential for controlling the mosquito vectors of malaria and filariasis, and the blackfly vectors ofonchocerciasis (Federici 1981, Chapman 1985) [5].

Mosquito control relies heavily on synthetic pyrethroids. Concern about the threat of strong forms of resistance (Hargreaves K, 2000) [6] has stimulated renewed interest in alternative control methods including biological control and biopesticides. At present these methods are only operational against mosquito immatures (Fletcher M, 1992, Takagi M, 1995) [7, 8], the best known being the use of *Bacillus thuringiensis* var. *israelensis* (*Bti*). *Bti* is effective against mosquito larvae (Mittal PK, 2003) [9] but cannot control the pupal stage, frequent repeat applications are needed (Gunasekaran K, 2004) [10] and it is expensive.

Material Methods

Exotic species have frequently caused declines of native fauna and may contribute to some cases of amphibian decline. Introductions of mosquito fish (*Gambusia affinis*) and bullfrogs (*Rana catesbeiana*). We tested the effects of mosquitofish and bullfrog tadpoles on red-legged frog tadpoles in spatially complex, specious communities (Jennifer C, 2019) [11]. There is a strong perception that the decline in amphibians leads to an increase in mosquito population3 which needs sufficient scientific evidence. Studies on the role of frogs in controlling mosquitoes are meager thus, information on their effectiveness for mosquito control is lacking. In this review we discuss the reports and available information from various studies undertaken on the feasibility of use of frogs in mosquito control.

Result & Discussion

In a study by lakes in Khammam District (Mokany A, 2007) [12] on association of mosquito fish and Limnodynastes omatus (native frog) and Bufo marinus (non-native frog) it was stated that introduction of mosquito fish, Gambusia affinis hol brooki as a predator of eggs, hatchling and tadpoles affects both the native and non-native anurans thereby affecting the natural control of mosquito larvae. It may be noted that introduction of mosquito fish that preferably utilize amphibian eggs and tadpoles may cause substantial decline of amphibian populations.

Studies on different predators like birds, mammals, amphibians, reptiles and other insect predators in the Telangana region (Emerging disease issues, 2007). Studies have shown that tadpoles were reported to prey on mosquito larvae where they are the only food resource. Marian *et al*. 31 reported that the tadpoles of Rana tigrina show a preference for pupal stages whereas other mosquito predators prefer early larval stages. (Marian MP, 1983) [14]. Many larvae escape from predation and metamorphose to pupal stages, in that case presence of tadpoles of R. tigrina will exert simultaneous pressure on pupal stages. Ecological studies on consequences of interactions between the mosquito larvae and other controphic species are very few. Authors says that (Blaustein and Chase, 2007) [15] stated that such controphic associations are likely to reduce the mosquito populations and thus could be an effective management tool for their control.

Conclusion

Studies on the use of frog for mosquito control in India are very few. However, whether the decline of amphibians would result in increase in disease prevalence needs sufficient scientific evidence. Ecological investigations may provide insights for future research and should incorporate studies on the interactions, associations and prey-predator relationships between frogs, mosquitoes and other controphic species. Thus, there is a need to generate quantitative evidence to ascertain the possible role of frogs for disease vector control and management

In conclusion, our results indicate that *O. niloticus* can dramatically reduce mosquito larval densities in fishponds for at least six months and that this reduction is directly through predation. The relative population density of *A. gambiae s.l.*, a very efficient malaria vector, was reduced by 94% and this reduction was statistically highly significant.

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