A study on tropical fish sheds light on species invasions

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Sebastiano de Bona/The University of Jyvaskyla. Credit: The University of Jyvaskyla

Biodiversity, i.e., the variety of life forms on Earth, is in great danger. Human-driven climate change and intensive land use are altering ecosystems, and globalisation facilitates the transport of non-native species into already disturbed habitats. Invasive populations are a major cause of extinction, so controlling their impact is crucial. In his dissertation, M.Sc Sebastiano De Bona shed light on the invasion process by studying populations of guppies in the Caribbean island of Trinidad.

The thesis deepens the understanding of how invasive populations become established, occupy a habitat, and spread to new areas.

Guppies (Poecilia reticulata) are small freshwater fish, often introduced to control mosquito populations. After their introduction, guppies frequently become invasive and have negative impacts on the native ecosystem. Introduced guppy populations represent an ideal system to study invasion dynamics. Experimental translocations allow researchers to study the early phase of an invasion process, otherwise hard to witness, given its ephemeral nature.

In his dissertation, Sebastiano de Bona showed that even moderate habitat disturbances, like the thinning of the vegetation above the stream, can favour the establishment of introduced guppy populations. This result highlights the importance of decreasing disturbance and promoting habitat restoration as a way to slow down invasions.

Through the use of mathematical simulations, the thesis revealed that guppies are very effective invaders when introduced, but rapidly lose their potential to spread, as population growth decreases. In guppies, the speed of spread is strongly determined by survival and reproduction, whereas individual movement plays only a marginal role.

This result is in contrast with previous studies, like that of the cane toad in Australia, that showed long-distance movements to be the driver of the accelerating wave of invasion.

Finally, following the rapid population growth occurring after introduction, guppies emigrate from crowded habitat patches and colonise less-preferred habitats. The findings also suggest guppies can take into account multiple spatial scales when making decisions about their movement.

The thesis provides knowledge and tools that should be acknowledged when planning actions to control the spread of invasive populations. Knowing which are the major determinants of the establishment and spread provides a target for more effective management actions.

More information: The dissertation is published in the series JYU Dissertations, number 121, 196 p., Jyväskylä 2019, ISSN 2489-9003, ISBN:978-951-39-7835-8. Link to the publication: jyx.jyu.fi/handle/123456789/65588

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