SCIENZE A SISTEMA PER LA SOSTENIBILITÀ
La ricerca al Dipartimento di Biologia Ambientale
ROMA, 5 GIUGNO 2024

Biological invasions: which is the role of phenotypic plasticity?

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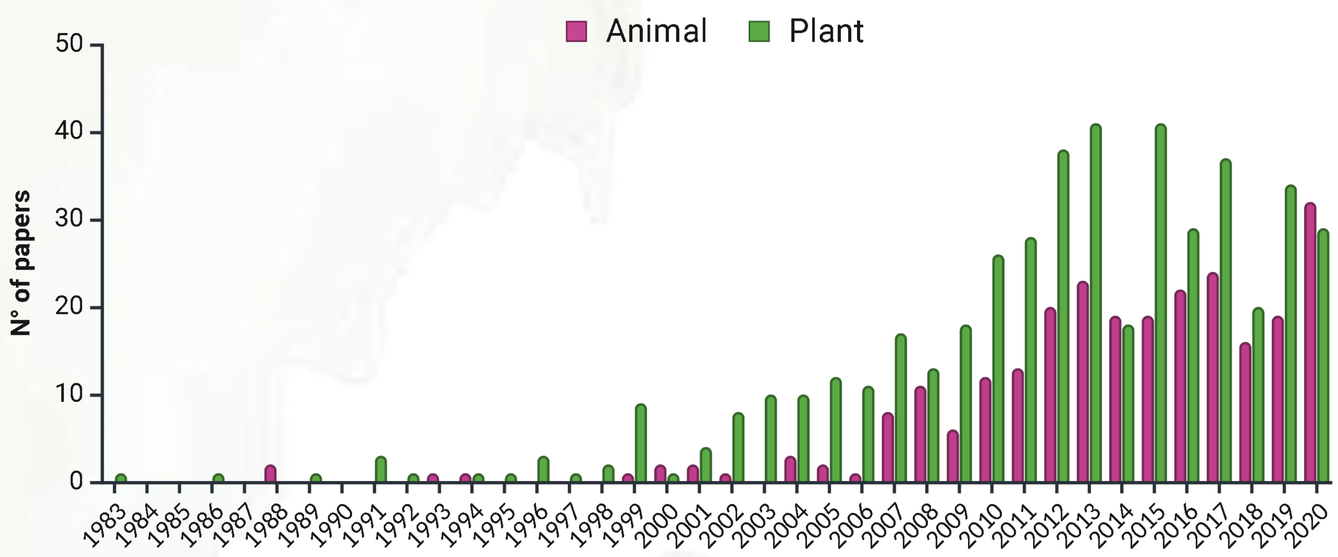
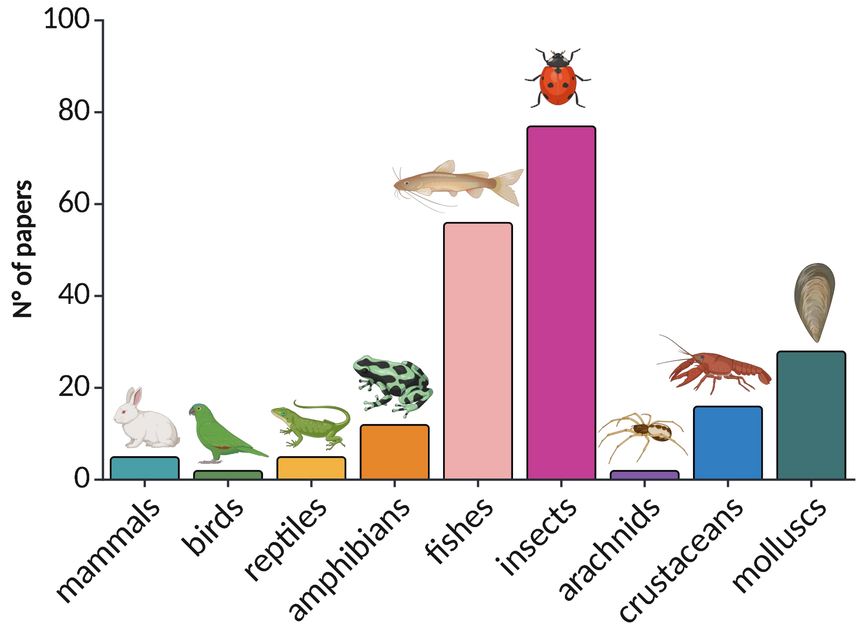
Biological invasions are one of the worst threats to biodiversity, ecosystem services, and human health. However, only some transported organisms survive, establish, and become invasive in new areas. We focused on phenotypic plasticity, the change in the phenotype in response to gene–environment interactions, and its role in determining invasions success.

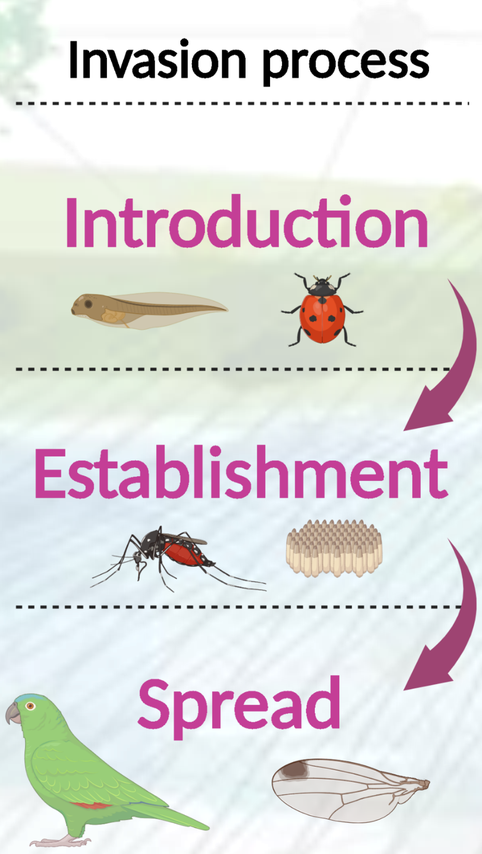
We conducted a literature search on Scopus for the terms: (**Plasticity**) AND (**Invasive** OR **alien** OR **invasion** OR **colonising** OR **invasiveness** OR **non-native**) AND (**development** OR **developmental** OR growth) to answer two main questions:

1. Have studies explored phenotypic plasticity in animal biological invasion?





2. How phenotypic plasticity is involved in biological invasion process?



Role of phenotypic plasticity

- Rapid adaptation to new biotic conditions within a generation
- Reduction of the cost of directional selection
- Decreasing extinction risk
- Outcompete local species through carry-over effects: an important mechanism for invasive species experiencing new predatory or competitive environments

- Plasticity in traits linked to the population growth rate (e.g. an increase in fecundity, an earlier age at first reproduction, a lengthening of the reproductive period, or a decrease in the peak reproductive age) favours the establishment in the new environment

- Plasticity in dispersal traits promotes the continued spread of a newly established species beyond its point of introduction

Conclusions

Phenotypic plasticity is a major determinant of biological invasion success, fostering the process through the invasion stages. Although acknowledged in previous literature, the actual contribution of phenotypic plasticity to the shaping of the *ideal invader* is still underrated. More research on phenotypic plasticity in animal invasive species is needed, using methods like common garden experiments and home-and-away comparisons, to better understand its role in invasion processes.

DBA Dipartimento di Eccellenza MUR 2023-2027

FACOLTÀ DI SCIENZE MATEMATICHE FISICHE E NATURALI

SAPIENZA UNIVERSITÀ DI ROMA

To the book chapter: Cordeschi, G., Costantini, D., & Canestrelli, D. (2022). Plastic Aliens: Developmental Plasticity and the Spread of Invasive Species. In *Development Strategies and Biodiversity: Darwinian Fitness and Evolution in the Anthropocene* (pp. 267-282). Cham: Springer International Publishing.