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Sara Magalhães, Ph.D.

Professor of Evolutionary Biology

Universidade de Lisboa

Born in 1973 in Lisbon

Ph.D. in Biology from the University of Amsterdam

ARBEITSVORHABEN

The Role of the History of Exposure in Adaptation to Multiple Stressors

Evolutionary biologists have developed a sophisticated theoretical framework explaining how organisms adapt to their environment. However, this framework generally considers simple environments, with one selective agent (stressor), and empirical examples of real-time evolution mostly do not consider important selection pressures posed by antagonists, namely competitors or predators. In contrast, ecologists have been addressing the impact of multiple stressors on populations, but this research topic has not percolated much into evolutionary biology. In particular, we still lack a general framework to understand how temporal differences in exposure to stressors (i.e., the history of exposure) affects the evolution of organisms. We also fail to understand how the similarities and differences among the ecological and evolutionary responses to the conflict posed by different antagonists affect evolutionary trajectories. This is particularly important given the general acknowledgement that evolution can operate within short timeframes. I propose to shed light on this issue by systematically reviewing the literature on the genetic, ecological, and evolutionary consequences of multiple stressors, with an emphasis on evolutionary conflict with various antagonists, with the aim of identifying cases from which knowledge of the impact of the history of exposure can be extracted. I propose to develop a general framework, defining common features, identifying knowledge gaps, and suggesting methods to move this field forward. The tasks that I propose are situated at the intersection among research fields and would benefit from input from other research areas dealing with asynchronies in the history of conflict. Therefore, my project will certainly benefit from an exchange of ideas with researchers at the Wissenschaftskolleg who have other backgrounds.

Recommended Reading

Fragata, Inês, Raul Costa-Pereira, Mariya Kozak, Agnieszka Majer, Oscar Godoy, and Sara Magalhães (2022). "Specific Sequence of Arrival Promotes Coexistence via Spatial Niche Pre-emption by the Weak Competitor." *Ecology Letters* 25: 1629–1639. <https://doi.org/10.1111/ele.14021>.

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Ravné, Virginie, Leonor R. Rodrigues, Maud Charlerly de la Masselière, Benoît Facon, Lechosław Kuczyński, Jacek Radwan, Anna Skoracka, and Sara Magalhães (2024). "Understanding the Joint Evolution of Dispersal and Host Specialisation Using Phytophagous Arthropods as a Model Group." *Biological Reviews* 99: 2019–237. <https://doi.org/10.1111/brv.13018>.

Magalhães, Sara (Kettering,2023)

Limited host availability disrupts the genetic correlation between virulence and transmission

<https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1895664195>

Magalhães, Sara (Oxford ,2022)

Specific sequence of arrival promotes coexistence via spatial niche pre-emption by the weak competitor

<https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1895662850>