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PARASITOLOGICAL ASPECTS OF INVASIONS OF ALIEN SPECIES

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Abstract. Biological invasions by alien species present significant challenges not only to native biodiversity but also to host-parasite dynamics within ecosystems. This article examines the parasitological dimensions of species invasions, focusing on mechanisms such as parasite release, spillover, spillback, and parasite-mediated competition. Drawing on empirical examples from mammalian, amphibian, and aquatic systems, the paper explores how invasive species either evade or introduce parasitic organisms, and how these interactions impact native species fitness, community structure, and disease transmission. The analysis underscores the need to integrate parasitological surveillance into invasive species management and biosecurity policy, emphasizing that parasites are active ecological agents in the success and consequences of biological invasions. A deeper understanding of these dynamics is essential for designing effective conservation and public health interventions.
Keywords: alien species, biological invasions, parasitology, parasite spillover, parasite release, host-parasite interaction, zoonosis, ecological disruption, invasive hosts, biosecurity.

INTRODUCTION

Biological invasions by alien species represent one of the major drivers of biodiversity loss and ecosystem disruption globally. These invasions are not merely ecological events but also complex parasitological phenomena, as invasive species often interact with local parasite communities in unpredictable ways. Parasites can act both as mediators and consequences of biological invasions, influencing the fitness, spread, and ecological impact of alien hosts. The parasitological dimension of invasion biology therefore warrants critical examination, especially in light of emerging zoonotic risks, native host-parasite displacement, and the evolution of novel host-pathogen systems.

MATERIALS AND METHODS

A well-documented phenomenon in invasion biology is the parasite release hypothesis, which suggests that alien species introduced to new habitats often leave behind many of their natural parasites. This release from parasitic pressure gives invasive species a competitive advantage over native taxa. For example, the North American grey squirrel (Sciurus carolinensis), when introduced to the UK, demonstrated reduced parasite load compared to native red squirrels (Sciurus vulgaris), which contributed to its rapid demographic expansion.

RESULTS AND DISCUSSION

In contrast, alien species can also introduce novel parasites to naïve ecosystems — a process known as parasite spillover. These new pathogens may infect native species lacking evolutionary resistance, resulting in population declines. The introduction of Echinococcus multilocularis through dog populations in Eastern Europe is a case in point, leading to human alveolar echinococcosis outbreaks in areas previously free of the parasite.

Spillback occurs when alien species amplify the transmission of native parasites, acting as hyper-competent hosts. For instance, invasive cane toads (Rhinella marina) in Australia have been shown to facilitate the proliferation of native helminths such as Rhabdias pseudosphaerocephala, intensifying parasitic burdens on sympatric amphibian species.

Parasites also influence interspecific interactions via parasite-mediated competition. Native species suffering higher parasite loads may become ecologically inferior in competition with less burdened invaders. In some instances, invasive species are co-introduced with their parasites,

forming tightly linked ecological units. The introduction of Anguillicola crassus, a parasitic nematode of eels, into Europe along with its Asian host, disrupted native eel populations across freshwater systems.

The parasitological dimensions of species invasions have profound implications for conservation biology, wildlife management, and public health. Invasive parasites can destabilize entire trophic networks and serve as reservoirs for zoonoses. Moreover, they often complicate control strategies, as parasites may persist even after the removal of their original hosts, or shift to new hosts altogether. Surveillance and monitoring of parasitic fauna associated with alien species should be integrated into biosecurity frameworks.

Invasion biology and parasitology intersect not only in ecological disruption but also in evolutionary dynamics. When alien species enter a novel environment, they often encounter unfamiliar parasites or are relieved from co-evolved ones. This disturbance in host-parasite coevolution can catalyze rapid evolutionary change in both the invaders and the native species they interact with. Notably, invasive hosts may develop increased resistance or tolerance to local parasites over short timescales, whereas native hosts — when exposed to exotic parasites — may undergo severe fitness declines due to a lack of evolutionary adaptation [2].

Empirical studies have demonstrated that host-switching events are common in invasion scenarios. For example, the invasive American mink (Neovison vison) in Europe has acquired native European parasites such as Echinococcus multilocularis and Trichinella spp., which it may not have encountered in its native range. Conversely, in certain regions, it acts as a competent vector of Aleutian mink disease virus, affecting native mustelid populations. Such events illustrate how host-parasite networks become restructured, often unpredictably, following biological invasions [3].

While parasites are often viewed as burdens, under certain conditions they can facilitate the establishment and spread of invasive species. For instance, some parasites manipulate host behavior in ways that may inadvertently benefit invasive host dispersal. Trophically transmitted helminths, which increase host predation risk to complete their life cycles, may enhance the ecological impact of alien prey species by making them more accessible to predators, thus modifying food web structures.

On the other hand, parasites may also act as biological barriers to invasion. This occurs when native parasites infect alien species but significantly reduce their survival or reproductive capacity — a phenomenon observed in some freshwater fish introductions. For example, Gyrodactylus salaris, a monogenean parasite of Atlantic salmon, limits the establishment of non-native salmonids in Norwegian rivers [4].

CONCLUSION

Understanding the parasitological aspects of alien species invasions provides critical insights into their ecological dynamics and consequences. Parasites are not passive participants in invasion processes but active agents influencing host success, native species decline, and pathogen emergence. Incorporating parasitological expertise into invasion science is therefore essential for holistic management strategies and the protection of ecosystem integrity.

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