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### Role of parasites in the successful invasion of Mediterranean salterns by the exotic invasive *Artemia franciscana*

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## Role of parasites in the successful invasion of Mediterranean salterns by the exotic invasive *Artemia franciscana*

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## The Role of Parasites in the Successful Invasion of Mediterranean Salterns by the Exotic Invasive *Artemia franciscana*

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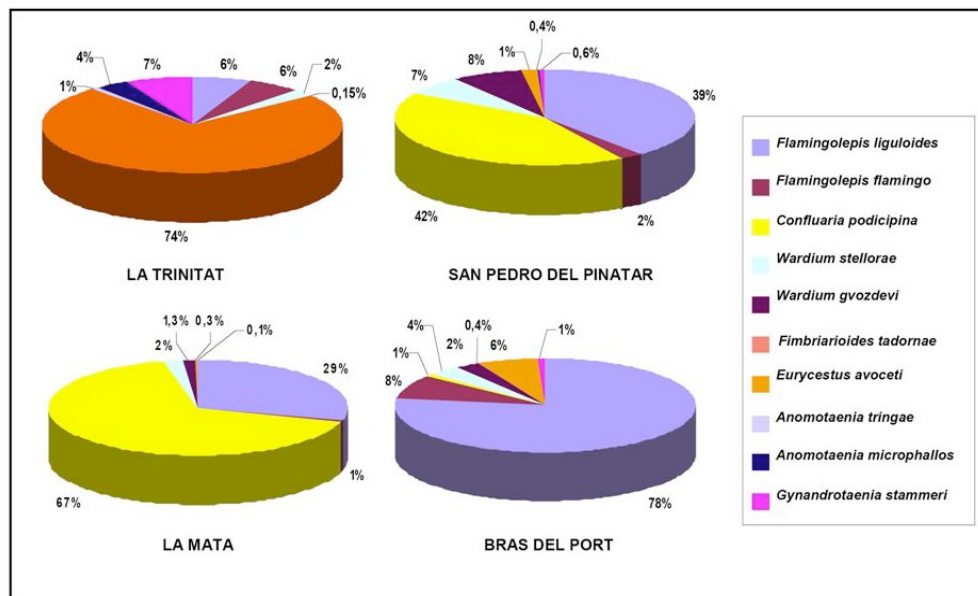
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*Artemia* species (Branchiopoda, Anostraca) play an important role as intermediate hosts of parasite cestodes (Cyclophyllidae), facilitating transmission of the parasite to the avian hosts by predation. When exotic invasive species escape from their coevolved parasites and encounter new parasites in the invaded environment, they can experience a demographic release (enemy release hypothesis), becoming highly competitive and an important threat to biodiversity. Here we report the presence of American *A. franciscana* in a Mediterranean saltern where this exotic species eliminated autochthonous *Artemia* species. To assess whether invasive *A. franciscana* is parasitized by cestodes to the same extent as native *Artemia* species, we studied the natural infection of *A. salina* and *A. parthenogenetica* from non-invaded Mediterranean salterns: San Pedro del Pinatar (Murcia Province), Bras del Port and La Mata lagoon (Alicante Province) and parasitized *A. franciscana* in the invaded saltern La Trinitat (Tarragona Province). To compare the infection levels, we used the prevalence (number of infected hosts divided by the total number of hosts examined), mean intensity (total number of parasites found in a sample divided by the number of hosts infected) and mean abundance (total number of parasites found in a sample divided by the total number of hosts examined). The present study included three samples of the two bisexual

species of *Artemia* and five samples of *A. parthenogenetica*. We collected them during 2007 and 2008 and between 150 and 600 individual *Artemia* were examined from each sample in search of parasites. The mean prevalence was only 25% in the *A. franciscana* species compared to 35% in *A. salina* and 52% in *A. parthenogenetica*. The mean abundance of the cestode infection was 0.38/individual in the *A. franciscana* species compared to 0.47 in *A. salina* and to 1.30 in *A. parthenogenetica*. The highest mean intensity of cestode infection was found in *A. parthenogenetica* (2.20/*Artemia*). Bisexual species, *A. franciscana* and *A. salina*, showed similar mean intensities: 1.25 and 1.20, respectively. Ten cestode species, most hymenolepidid cestodes (*Flamingolepis liguloides* and *Confluaria podicipina*) were found in the autochthonous brine shrimp species (Figure 1). In the *A. franciscana* population we found only eight parasite species, mainly dilepidids (*Eurycestus avoceti*). *Confluaria podicipina* and *Wardium gvozdevi* never appeared in the invasive species. In conclusion, cestode parasites may play a role in the competitive interaction between native and invasive brine shrimps. Before we can conclude if these reduced levels of infection in *A. franciscana* are consistent with the enemy release hypothesis further work will be required.



**Figure 1**—Cestode species recorded in brine shrimp populations in the Mediterranean salterns studied: La Trinitat, invaded with *A. franciscana*, and San Pedro del Pinatar, La Mata and Bras del Port as non-invaded salterns.