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The highly divergent New World *Artemia* species (Branchiopoda, Anostraca), *A. franciscana* and *A. persimilis*, show subtle differences in morphological traits involved in mating

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Abstract

Mate choice significantly impacts upon population divergence and therefore speciation, recognition of equals being critical in cases where species and divergent populations coexist. The New World species of the brine shrimp *Artemia*, *A. franciscana* and *A. persimilis*, were compared through Scanning Electron Microscopy (SEM) for the following traits: shape and ornamentation of spine-like projections on the basal part of the penes; relative size, shape and ornamentation of the frontal knobs; cuticolar cones on the male second antenna, and ovisac (brood pouch) morphology. In particular, frontal knobs, described as playing a role in maintaining riding pairs attached (amplexus), and ovisac morphology, grouped all individuals into the corresponding species, but these differences seem too subtle to prevent inter-specific mating. In other words, mating between both species would be unspecific (not a key-lock type), an expected finding for allopatric species that would not have the chance to reinforce reproductive mechanisms in sympatry, as predicted by the allopatric mode. Additionally, both species inhabit selectively differential habitats that would prevent viability of migrants. At the population level, *A. franciscana* locations at the southern edge of the species distribution in the Americas (Chile) showed variation to the typical *A. franciscana* pattern, a somewhat expected finding for peripheral populations. The saltworks at Pichilemu (34° S, central Chile) appear to be a special environment where individuals from both species could eventually coexist, as inferred by the hybrid-like appearance of some individuals. This type of environment facilitates the testing of novel morphological variants which may affect the shaping of morphological divergence.

Key words: *Artemia*, morphology, Chile, New World species, ecological adaptation, genetic divergence, reproductive isolation

Introduction

The brine shrimp *Artemia* inhabits extremely salty lakes in all continents, except Antarctica. The genus is useful for studying evolutionary divergence of populations because the island-like distribution of these lakes acts as a geographic barrier, whereas variation in ionic composition, salinity and water temperature can be an effective ecological barrier for individuals from divergent habitats. Further, seasonality of lakes, some of which can even dry out, induces extinction/re-colonization cycles affecting the effective number of reproducing individuals and therefore the genetic composition of species (review in Gajardo *et al*. 2002). Thus, although *Artemia* cysts (resting eggs) are known to be passively dispersed across long distances by migratory waterbirds (Green *et al*. 2005), populations of most species tend to be genetically heterogeneous, that is, locally differentiated or adapted (Gajardo *et al*. 1995, 2002; Clegg and Gajardo 2009; Maniatsi *et al*. 2009). Abreu-Grobois (1987) suggested ecological divergence as the driver of *Artemia* population differentiation, but the impact of local selective pressures on phenotypic traits influencing survival and reproduction has not been further addressed since the work of Lenz and Browne (1991). As theory predicts, locally adapted populations should have reduced gene flow because immigrants are less adapted than residents, and because hybrids perform poorly in either of their parental environments (Rundle and Nosil 2005; Schluter 2009).

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