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Note

Food selection of a generalist herbivore exposed to native and alien seaweeds

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ABSTRACT

Understanding which factors influence the invasion of alien seaweed has become a central concern in ecology. Increasing evidence suggests that the feeding preferences of native herbivores influence the success of alien seaweeds in the new community. We investigated food selection of a generalist native grazer *Paracentrotus lividus*, in the presence of two alien seaweeds (*Caulerpa cylindracea* and *Caulerpa taxifolia* var. *distichophylla*) and two native seaweeds (*Dictyopteris membranacea* and *Cystoseira compressa*). Sea urchins were fed with six experimental food items: *C. cylindracea*, *C. taxifolia* var. *distichophylla*, a mixture of *C. cylindracea* and *C. taxifolia* var. *distichophylla*, *D. membranacea*, *C. compressa* and a mixture of *D. membranacea* and *C. compressa*. *P. lividus* ingested all the combinations of food offered, though it preferentially consumed the alien mixture, *C. cylindracea* and *D. membranacea*. The alien *C. taxifolia* var. *distichophylla* was consumed significantly less than the other food items and, interestingly, it was ingested in a greater amount when mixed with *C. cylindracea* than when on its own. This finding suggests that *C. taxifolia* var. *distichophylla* may become vulnerable to sea urchin grazing when it grows intermingled with *C. cylindracea*, which does not gain immediate protection from the presence of the very low palatable congeneric seaweed. The present study highlights the potential role of native grazers to indirectly affect the interspecific competition between the two alien seaweeds in the Mediterranean Sea.

1. Introduction

The current rate of biological invasions by alien species in the marine realm is astonishing. Alien invasions have been widely recognized as severe threats to ecological integrity worldwide and can result in huge economic and societal impacts (Ruiz et al., 1997; Occhipinti-Ambrogi, 2007; Katsanevakis et al., 2014). Seaweeds make up a considerable proportion of alien invasions in coastal habitats, globally representing about 10 to 40% of the total marine alien species (Schaffelke et al., 2006; Williams and Smith, 2007). This may be due to a variety of factors such as their vegetative reproductive capacity (Gollan and Wright, 2006) and production of toxic metabolites (e.g. alkaloids and terpenoids) that act as chemical deterrents against competing species and local herbivores (Paul et al., 2007). In this regard, two prominent hypotheses have been proposed in the field of invasion ecology concerning the role of species interactions in affecting invasion processes. The enemy release hypothesis (ERH) predicts that alien species have a competitive advantage over native species because they

are often introduced with few natural enemies and are not a preferred choice of generalist herbivores in their new habitat (Keane and Crawley, 2002; Hierro et al., 2005; Liu and Stiling, 2006). The biotic resistance hypothesis of Elton (1958) predicts that invasiveness of alien species can be restricted by the native species richness that is expected to decrease nutrient availability and increase competition, predation and natural enemies. Accordingly, generalist native grazers can potentially incorporate alien seaweeds in their diet, limiting their spread in recipient communities therefore contributing to invasion control (Gollan and Wright, 2006; Monteiro et al., 2009; Tomas et al., 2011).

Nevertheless, alien seaweeds may show considerable variation in their palatability to native herbivores, mainly because of their secondary metabolites that can function as deterrents against consumers (Paul and Fenical, 1986). These toxic compounds may influence native consumers by reducing their performance and fitness, enhancing the invasiveness of alien seaweeds (Tomas et al., 2011). Despite more than 50 years of research in the field of invasion ecology, the mechanisms behind the invasion success of introduced macrophytes are still highly

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