

## A new contribution to the alien macroalgal flora of the Ustica Island Marine Protected Area (Tyrrhenian Sea, Italy)

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### Abstract

A second record of the non-indigenous species *Botryocladia madagascariensis* G. Feldmann (Rhodophyta) along the coasts of the “Ustica Island” Marine Protected Area (Tyrrhenian Sea, Italy) is reported. With this additional record for the Sicilian coasts, we provide a description of collected specimens of *B. madagascariensis* and habitat details. Numerous fertile female gametophytes with cystocarps immersed in vesicles were also observed, for the second time in the Mediterranean Sea, and described.

**Key words:** non-indigenous species, *Botryocladia madagascariensis*, Mediterranean Sea

### Introduction

The spread of non-indigenous species (NIS) is an ongoing phenomenon which is widely recognized as a major threat to biodiversity and natural ecosystem function (Wallentinus and Nyberg 2007). In the Mediterranean Sea, the annual number of recorded NIS has increased exponentially over the last 100 years (Occhipinti-Ambrogi et al. 2011a, b; Katsanevakis et al. 2013). Multiple human-related stressors (i.e. habitat fragmentation and destruction, pollution, maritime transport, tourism, aquaculture, exploitation of resources, global warming, and opening of the Suez Canal) have led to the introduction of ~ 1000 NIS, of which 134 are macrophytes (24 Chlorophyta, 79 Rhodophyta, 30 Ochrophyta, and 1 Tracheophyta) (Verlaque et al. 2015; Alós et al. 2016; Galil et al. 2017).

Identifying future NIS and taking effective steps to prevent their dispersal and establishment constitutes an enormous challenge to marine biologists. Sicily

and its surrounding islands, located at the crossroads between the Western and Eastern Mediterranean, are particularly vulnerable to the introduction of NIS. In this region, the exposure to multiple transport pathways, including fisheries and recreational fleets, has promoted the introduction either accidentally or intentionally of several NIS, despite the high number of Marine Protected Areas (MPAs) already established. This area plays an important role as a receiver, transit and donor zone for NIS within the Mediterranean Sea, and monitoring and surveillance is required to reduce the risk of future NIS introductions. The creation of permanent habitat “alarm systems” might be an effective tool in the management of NIS introductions. In this regard, Sicilian MPAs can play an important role as “sentinel sites” where the effects of NIS invasion can be studied and management strategies can be developed to counter and contrast such negative effects. In order to develop effective managing plans for the prevention and control of NIS,