

A massive update of non-indigenous species records in Mediterranean marinas

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ABSTRACT

The Mediterranean Sea is home to over 2/3 of the world's charter boat traffic and hosts an estimated 1.5 million recreational boats. Studies elsewhere have demonstrated marinas as important hubs for the stepping-stone transfer of non-indigenous species (NIS), but these unique anthropogenic, and typically artificial habitats have largely gone overlooked in the Mediterranean as sources of NIS hot-spots. From April 2015 to November 2016, 34 marinas were sampled across the following Mediterranean countries: Spain, France, Italy, Malta, Greece, Turkey and Cyprus to investigate the NIS presence and richness in the specialized hard substrate material of these marina habitats. All macroinvertebrate taxa were collected and identified. Additionally, fouling samples were collected from approximately 600 boat-hulls from 25 of these marinas to determine if boats host diverse NIS not present in the marina. Here, we present data revealing that Mediterranean marinas indeed act as major hubs for the transfer of marine NIS, and we also provide evidence that recreational boats act as effective vectors of spread. From this wide-ranging geographical study, we report here numerous new NIS records at the basin, subregional, country and locality level. At the basin level, we report three NIS new to the Mediterranean Sea (*Achelia sawayai sensu lato*, *Aorides longimerus*, *Cymodoce* aff. *fuscina*), and the re-appearance of two NIS previously known but currently considered extinct in the Mediterranean (*Bemlos leptochairus*, *Saccostrea glomerata*). We also compellingly update the distributions of many NIS in the Mediterranean Sea showing some recent spreading; we provide details for 11 new subregional records for NIS (*Watersipora arcuata*, *Hydroides brachyacantha sensu*

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