{rokbox title=|Study area. The study area included only the EU waters of the described regional seas :: Image: Authors|
thumb=|images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-haunting-challenge-newly-introduced-non-indigenous-species-european-seas-outinen-et-al-2025-thumb.jpg|}images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-haunting-challenge-newly-introduced-non-indigenous-species-european-seas-outinen-et-al-2025.jpg{/rokbox}

Okko Outinen, Peter A.U. Stæhr, Romeu S. Ribeiro, **Aina Carbonell**, **Robert Comas-González** , **Lydia Png-Gonzalez** , **Maite Vázquez-Luis** , Ann-Britt Florin, Rahmat Naddafi, Arjan Gittenberger, Hans Jakobsen, Ana C. Costa, Manuela I. Parente, Branko Dragičević, Jakov Dulčić, Slavica Petović, Martina Orlando-Bonaca, Borut Mavrič, Cátia Bartilotti, Jorge Lobo-Arteaga, Miriam Tuaty-Guerra, Frédérique Viard, Cécile Massé, Luca Castriota, Silvia Livi, Marika Galanidi, Argyro Zenetos, Natacha Carvalho, João Canning-Clode, Paola Parretti, Patrício Ramalhosa, Nuno Castro, 2026.
The haunting challenge of the trends and pathway assessments on newly introduced non-indigenous species in European seas
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Abstract: The spread of aquatic non-indigenous species (NIS) is recognised as a major threat to the recipient regions ecosystems. The present study reviewed all NIS that have been introduced to the marine waters of the European Union (EU) until 2021, and their introduction pathways. Further, the study statistically analysed temporal trends in new NIS introductions and addressed uncertainties in relation to transporting pathways. Time-series analyses indicated that the observed trends in new NIS introductions have followed smoothly increasing trajectories for the entire study area, Mediterranean Sea, North-East Atlantic Ocean, and the Baltic Sea, whereas abrupt increase was detected for the Black Sea. It is noteworthy that the increasing trends started to slow down at the end of 2010s. Strongly increased research interest towards marine invasions since the early 2000s, and new environmental policies likely affected the observed trends. Future updates will be key to assessing whether this slowdown is truly a persisting trend or only an anomaly in the long term. The pathway assessment suffered from notable uncertainties, as the assigned confidence levels for pathways were low or unassigned for a large proportion of the introduced NIS in all study regions. Transport by shipping vectors was assigned as the most common pathway (51%) for new NIS introductions to EU seas, although there was very rarely direct evidence of this. The study highlights the need to overcome the pathway uncertainties, as robust information on introduction pathways is critical to manage new

NIS introductions effectively.

Keywords: Invasive alien species, Marine bioinvasions, Trend analysis, Pathways, Research interest