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Special Issue Ocean Literacy

Ocean Literacy across the Mediterranean Sea region in the Era of 2030 Agenda and the Decade of Ocean Science for Sustainable Development (2021-2030)

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Editorial

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Contribution to the Special Issue: "Ocean Literacy across the Mediterranean Sea region"

Ocean Literacy across the Mediterranean Sea region in the Era of 2030 Agenda and the Decade of Ocean Science for Sustainable Development (2021-2030)

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While marine education and aquatic environment issues have been studied since the early 1960s, and the Ocean Literacy (OL) concept was only relatively recently defined as the understanding of the ocean's influence on peoples' lives and their influence on the ocean (Cava *et al*., 2005), OL is nevertheless the outcome of a long-term process undertaken in the USA in early 2000s. The Ocean Literacy Framework comprises two documents: a) Essential Principles and Fundamental Concepts of Ocean Sciences (National Oceanic and Atmospheric Administration – NOAA, 2013), representing the basic ocean issues that students should know and understand by the time they graduate from high school; b) the Ocean Literacy Scope and Sequence (National Marine Educators Association, 2010), providing information and guidance as to what students need to understand at different grade bands from kindergarten to high school. Though OL started as a knowledge concept, it has evolved via a multi-perspective approach that promotes interdisciplinary and intercultural competencies, which also contribute to ocean conservation, management, and sustainability (Mokos *et al*., 2022). Through this process, OL crossed over the national boundaries of the United States and is today accepted throughout the world (Payne *et al*., 2022).

In 2017 the United Nations convened a high-level *"Our Ocean"* Conference to support the implementation of Sustainable Development Goal 14 (SDG 14): Conserve and Sustainably Use the Oceans, Seas and Marine Resources, of the 2030 Agenda for Sustainable Development. One basic outcome of this meeting was an inter-governmentally agreed declaration, a *"Call for action"* in which Article 13.a) reads as follows: "*Support plans to foster ocean-related education, for example as part of education curricula, to promote ocean literacy and a culture of conservation, restoration and sustainable use of our ocean*", hence emphasizing the importance of OL. This demonstrates the strong commitment of the UN to conserve and manage ocean and marine resources for sustainable development nowadays and in the future. Moreover, the UN has declared a Decade of Ocean Science for Sustainable Development 2021-2030 to support and achieve SDG 14, which simultaneously supports other SDGs (Ryabinin *et al*., 2019). The Decade aims to achieve major scientific and technological progress by generating six societal outcomes, one of which is a "*transparent and accessible ocean*" and includes considerable advancement and increase of OL in society, from education and school curricula to decision-makers and the public at large (Santoro *et al*., 2017; Ryabinin *et al.*, 2019). Furthermore, the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO) is currently developing the Ocean Literacy Strategy – Ocean Literacy for the UN Decade of Ocean Science for Sustainable Development – in order to advance OL during the UN Decade. In this context, the Mediterranean Sea is considered to be a key component in the development, economy, and culture of European, North African, and Asian countries as well as an agent for the "*transformative change*" that needs to be achieved for a sustainable future in this region (Cheimonopoulou *et al*., 2022).

In 2015, as part of the European Marine Science Educators Association (EMSEA) annual conference held in Crete (Greece), the EMSEA Mediterranean Working Group – among other regional groups – was launched. Since then, this group has promoted OL across the Mediterranean Sea region by: a) translating the OL principles and concepts into several Mediterranean languages (see https://www.marine-ed.org/ocean-literacy/translations); b) developing Mediterranean Sea Literacy (MSL) guide (Mokos *et al*., 2020; 2021) and its brochure (see https://www.emsea.eu/ocean-literacy/publications), both translated into different languages to promote the MSL concepts to students, teachers, educators, stakeholders, end-users, policymakers, actors, and in general the societies of the Mediterranean countries; c) coordinating educational research programmes (Mogias *et al*., 2019); d) co-organizing events and educational activities at various local and international levels (Cheimonopoulou *et al*., 2022).

For all the above-mentioned reasons, this Special Issue is devoted to OL and includes studies adapted to the specificities of the Mediterranean Sea as well as articles concerning OL issues worldwide. More specifically, the Special Issue presents 13 studies carried out by 66 (co) authors of different disciplines working in universities, research centres/institutes, museums, aquaria, entrepreneurships, networks/associations not only of the Mediterranean Sea region (Croatia, Cyprus, Egypt, Greece, Italy,

Malta, Spain and Turkey) but also worldwide (Belgium, China, Poland, South Africa, UK and USA). All articles have undergone the peer-review process of the *Mediterranean Marine Science* journal (two or more independent referees) and were allocated into three sections:

Section 1: Ocean Literacy background

Payne *et al*. (2022) provide a brief history of the origin of the OL campaign and its influence across the globe based on the foundation designed and developed by individuals and organizations in the United States over a span of twenty years. The concept of the Ocean Literacy Framework is also presented. Yet, the lack of critical resources in the USA relies "…*on the services of dedicated members of the National Marine Educators Association (NMEA) whose vision of making known the world of water is part of their collective DNA*…".

The development of OL and the European Commission's response to the rising need for OL are described in Mokos *et al*. (2022). The European Marine Science Educators Association (EMSEA), the first OL network outside the USA, has encouraged the establishment of regional groups to facilitate collaboration for the sustainable future of the European seas. Recommendations for OL actions are also provided.

Section 2: Ocean Literacy research and educational tools

Koulouri *et al*. (2022) study OL issues in relation to content knowledge, misconceptions, attitudes, and behaviour of junior high school students from eight Mediterranean countries. In parallel, a pilot survey carried out among Mediterranean high school students using for the first time a research tool based on the newly launched Mediterranean Sea Literacy guide is investigated by Cheimonopoulou *et al*. (2022). A short description of OL research and activities across the Mediterranean Sea region is also presented. Results of both studies revealed low to moderate knowledge of OL and MSL issues, correspondingly. Design and implementation of specifically targeted educational programmes through close collaboration between schools, universities, research institutes, and Ministries of Education across the Mediterranean Sea region is required in the future.

Mogias *et al*. (2022) investigate the presence of ocean sciences issues in Greek high school education science textbooks, with respect to the Ocean Literacy Framework. Analysis of the results revealed inconsistencies as well as limited and fragmented information. Based on this study, curriculum designers, textbook authors, marine educators, and marine scientists could cooperate on a wider scale towards the inclusion of OL topics into national curricula worldwide.

A new online instrument, the Blue Survey, was developed and validated by Paredes-Coral *et al*. (2022) to measure various dimensions (e.g., knowledge, personal interest, stewardship, ocean as an economic resource, behaviour, activism) of OL across different adult populations, including those closely related to the sea (e.g., maritime professionals). According to this survey, researchers and practitioners could better understand the factors which contribute to shaping an ocean-literate person.

Andriopoulou *et al*. (2022) study the use of digital storytelling in developing the environmental and sustainability awareness and enhancing the scientific literacy of high school students. Use of this instructional tool in non-formal learning environments emphasizes the importance of Information and Communication Technologies (ICT) and their multiple applications both in the school community and in extra-curricular activities.

A temporary exhibition held at the Natural History Museum of the University of Pisa in Italy, during 2020-2021, and adjusted to Covid-19 pandemic conditions is presented in Merlino *et al*. (2022). The educational and awareness-raising results produced from this proposed approach reveal the impact of non-formal settings (e.g., museums, zoos and aquaria) on both the knowledge and attitudes of children and the general public.

Section 3: Citizen Science projects

Citizen Science has been recognized as an important tool for active involvement of citizens and their contribution to marine research topics. Such projects also result in public environmental awareness, and therefore lead citizens to use knowledge and communicate about marine issues in a meaningful way and make informed and responsible decisions.

Special Issue studies contribution towards this direction: scuba divers investigating the threat status of the fan bivalves *Pinna nobilis* Linnaeus, 1758 and *P. rudis* Linnaeus, 1758 in Maltese waters (Deidun *et al.*, 2022); the European spiny lobster, *Palinurus elephas* (JC Fabricius, 1787) in the Aegean Sea (Kampouris *et al*., 2022). Coastal users (e.g., promenade and beach visitors as well as scuba divers) are also surveyed for their knowledge and attitudes towards marine algae in the Adriatic Sea in order to support research and monitoring in this area (Lucrezi, 2022).

Alvisi *et al*. (2022) describe the process of the development of a citizen science platform designed and implemented during the lockdown period in 2020 caused by the COVID-19 pandemic. Citizens' attention focused on the collection of household data and information relevant to water use, seafood consumption as well as plastic material use and disposal. The more or less direct connections between citizens' lifestyles and the eco-marine system are highlighted.

A long-lasting project, "Blue Paths", which integrates OL and Marine Citizen Science in school curricula in Italy, is presented by Mioni (2022). The project has set up a network among schools, institutions, citizens, and research centres. The existing educational plans are harmonized according to the latest recommendations of the

Sustainable Development Goals (UN SDGs) of the 2030 Agenda.

The above-mentioned studies of this section revealed a need to develop and promote appropriate communication tools and effective involvement strategies in citizen science projects for encouraging citizens to disseminate their experiences, thus creating the awareness of global citizenship.

A bibliometric analysis and science mapping of scientific publications on OL between 2005 and 2019, obtained from Web of Science and Scopus databases, has shown that, over time, OL issues have gained more attention and acknowledgement within the scientific community (Paredes-Coral *et al*., 2021). However, there are still considerable limitations, and promoting cross-institutional and cross-disciplinary cooperation among research institutions, marine education networks, and blue economy stakeholders is critical to support this purposeful movement and represents an urgent challenge.

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