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Ocean literacies: the promise of regional approaches integrating ocean histories and psychologies

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The current concept of ocean literacy reflects a prerequisite for achieving ocean sustainability. Existing ocean literacy reflects a fundamentally western view of oceans that works in tension with ocean literacy goals. Although ocean literacy practitioners and researchers are, laudably, starting to incorporate Indigenous knowledges and perspectives from BIPOC communities, attention to historical change continues to be left out of ocean literacy, to the detriment of ocean literacy goals. This article points out that, given the reality that human-ocean relationships have changed over time, and differed among cultural groups in the past as well as in the present, ocean literacy needs to incorporate ocean history at a foundational level. Because there are historical differences in human relationships with oceans, it stands to reason that regional ocean literacies must be more effective than a universal and timeless ocean literacy framework. Following the logical efficacy of a regional approach to ocean literacy, this article further argues that regional ocean literacies should involve the systematic inclusion of emotional elements. Regional ocean literacies should be constructed through knowledge co-production, involving diverse types of expertise, knowledge and actors to produce context-specific knowledge and pathways towards a sustainable future. To fully exploit the potential of ocean literacy, there is a need for the UN Ocean Decade to work towards regional and place-based approaches that incorporate history as well as culture in an iterative and collaborative process involving diverse types of expertise, knowledge and actors.

KEYWORDS

ocean sustainability, ocean history, behavior change, emotions, regional approach

1 Introduction

Human activity and climate change are increasingly affecting marine species within most of the global oceans (O'Hara et al., 2021). Trends of oxygen depletion, distinct acidification of the open oceans as well as complex changes in the food web are now established facts (IOC-UNESCO, 2022b). It is time for a fundamental transformation of

our relationship with the sea. This requires enduring and substantial change of basic societal institutions, technologies, and cultural patterns (Patterson et al., 2017; Jacob et al., 2022). Ocean literacy empowers people as “ocean citizens” who make informed lifestyle choices to minimize negative impacts on ocean health and thereby participate in the transformation of the human-ocean relationships for sustainability (Fletcher and Potts, 2007; Domegan et al., 2019; Buchan et al., 2023).

Broadly defined as “an understanding of the ocean’s influence on us and our influence on the ocean” (Cava et al., 2005), ocean literacy and its enhancement is one of the priorities of the UN Decade of Ocean Science for Sustainable Development 2021–2030. Growing emphasis is being placed on its role as a mechanism of change (IOC-UNESCO, 2022a). Since its introduction in 2004, the focus of ocean literacy has shifted from being a tool applied in formal education and training contexts to a tool aimed at triggering actions towards ocean sustainability (Ryabinin et al., 2019). This includes the development of effective tools and approaches to transform ocean knowledge into meaningful behavior change and action for ocean sustainability (McKinley and Burdon, 2020). Part of this evolution has been the application of a systems approach to better account for the complex linkages between individuals, societies and oceans (Brennan et al., 2019), as well as the introduction of additional dimensions into models of ocean literacy, namely emotional connection, access and experience, adaptive capacity, and trust and transparency (McKinley et al., 2023). Researchers have also pointed out the importance of diversifying communication channels to increase the scientific literacy of diverse audiences, for example, through the use of social media (Kopke et al., 2019).

Behavioral change rarely occurs as a result of simply providing information (Amel et al., 2017; McCauley et al., 2019). Studies show a limited relationship between environmental knowledge and pro-environment decision-making, the so-called value-action gap (Kollmuss and Agyeman, 2002). Effective behavioral interventions require understanding what influences human thought and behavior (Ashley et al., 2019; Borja et al., 2020), and how audiences connect with a particular topic, place or issue (Kollmuss and Agyeman, 2002). Behavioral interventions are most successful if audiences are well defined, benefits and barriers to behaviors are clearly identified, and key motivators and biases at play are known (Schwerdtner Máñez et al., 2020). Evidence shows that people’s perceptions towards marine environments differ notably between regions, reflecting individual concerns and varying levels of awareness (Lotze et al., 2018).

The ocean literacy community recognizes the importance of acting regionally, as reflected, for example, in the regional groups of the European Marine Science Educators Association named after their respective seas (Mediterranean, Baltic, etc.). Regional adaptations of the ocean literacy framework have been produced for instance in the Mediterranean (Mokos et al., 2020), Taiwan (Tsai and Chang, 2019), or the US Great Lakes (Michigan Sea Grant, 2018). However, these regional bodies, while focusing on specific seas or ocean areas, promote and pursue the universal ocean literacy framework adopted by UNESCO in 2017. That framework, we argue, lacks inclusion of diverse perspectives upon human

interactions with the oceans over time, which impedes environmental action (Rozwadowski, 2020). For example, the Great Lakes Literacy Principles do not include the knowledge systems of the many Indigenous communities in the region. While research calls for the inclusion of Indigenous perspectives in Great Lakes governance (McGregor et al., 2023), the principles only mention that the Great Lakes are an important element in the heritage of many cultures, and they do not acknowledge any historical dimensions to either Indigenous relationships or other residents’ connections to aquatic environments (Michigan Sea Grant, 2018). A notable exception is the Canadian Network for Ocean Education, which contributes to a distinguished Canadian ocean literacy which values and respects Traditional Indigenous Knowledge and Inuit Qaujimagatuqangit (CaNOE, 2023).

An explicit incorporation of ocean histories into ocean literacy would equip such regional organizations with what one might call “regional ocean literacies.” That is, existing ocean literacy is associated with the assertion by scientists of the overriding importance of recognizing one world ocean, a view supported by the “Drop the S” campaign (as in oceans) (<https://www.oceanprotect.org/2019/10/17/drop-the-s/>). While the “one ocean” approach is certainly important to highlighting connectivity across ocean spaces, we argue that the goals of ocean literacy would be more effectively met through recognition of plural oceans and seas – each hosting distinctive human histories and cultures – leading to regional ocean literacies with both the content as well as the communication and action outcomes tailored to the identities of the people and the needs of the region. Our argument is built on an analysis of the 2021 ocean literacy framework and guidelines and the scientific literature on ocean literacy in combination with the historical method and argumentation.

2 Humanizing ocean literacies

Since the development of the ocean literacy concept in the early 2000s, the inclusion of ocean-related topics into school curricula has become a world-wide movement. The content of these “blue curricula” has largely been situated at the intersection of environmental education and the natural sciences. With the broadening of the concept, aspects such as emotions and nature-connectedness are now deliberately included to deliver the desired social systemic change (IOC-UNESCO, 2022a). However, ocean literacy principles still view the human relationship with the ocean as timeless and acultural (Rozwadowski, 2020). They reflect a cultural view in which the one ocean is seen as something universal, global, and valued for its benefit to people. This view emerged from the ocean relationship forged originally in western Europe in the age of global geographic discovery and subsequent colonialism and imperialism (Kroll, 2008; Rozwadowski, 2018). This does not match the lived experiences of many people who had, and still have, distinctive relationships with varied parts and extents of the volumetric oceans (Rozwadowski, 2018). In its current form, ocean literacy is a relatively young Anglo-Saxon term for a process that has been practiced in diverse cultures for centuries (Worm et al., 2021).

Given thus, it is proposed here that the ocean literacy principles need to be revised to include historical change as well as cultural differences. The seven principles of ocean literacy adopted by UNESCO in 2017, and which appear in the most recent 2021 online publication, are identical to those created by the US coalition of marine scientists and educators that was first published in 2005¹. What follows is a textual analysis of the May 2021 “Ocean Literacy” Guide on the UNESCO website. Of the seven principles, only one invokes humans explicitly, a curious omission given the definition of ocean literacy as “understanding the ocean’s influence on you and your influence on the ocean.” In the 2021 version of the UNESCO ocean literacy online publication, the principles are no longer even “Ocean Literacy” principles but instead “Ocean Science” principles. Although the Ocean Decade recognizes ocean science as being broad, the current principles have no room for history or culture. The “Fundamental Concepts” supporting the principles leave humans out of the first five except for indirect references, such as to pollution or to ways the oceans can affect humans, for example by providing oxygen needed for life. Principles six and seven, stating that “The ocean and humans are inextricably interconnected” and “The ocean is largely unexplored,” incorporate humans into their fundamental concepts, in the latter case implicitly.

Confining humans to two of the “science” principles and leaving them entirely out of the others reinforces the tendency of modern science since the Enlightenment to insist that humans are separate from the natural world, an ideology that has encouraged an imperial, extractivist posture toward the ocean environment in the western world since the 18th century. Westerners came to view the ocean as a timeless and static place whose resources were essentially limitless (Kroll, 2008; Rozwadowski, 2018). European imperial states viewed the oceans and their resources as available for control by anyone with the knowledge to extract resources or project power (Reidy, 2008). Indeed, some of the earliest state funding of science supported ocean investigations, which in turn promoted expansion of traditional maritime activities, such as shipping, commercial fishing and naval warfare (Reidy and Rozwadowski, 2014). Given the origins and history of the ocean literacy concept in the United States, it is perhaps expected that western views of science and oceans form the foundation of ocean literacy as presently articulated. As also evident from the evolution of the concept, this is the opposite of what ocean literacy intends.

¹ The current UNESCO document is UNESCO, *Ocean Literacy for All: A Toolkit, IOC Manuals and Guides, 80* (Paris, UNESCO, 2021), p. 20; available online here: https://static1.squarespace.com/static/5b4cecfde2ccd188cfed8026/t/6101cb7536e2ed6426ba15b6/1627507591681/OceanLiteracyGuide_V3_2020.pdf. The 2005 version is *Ocean Literacy: The Essential Principles and Fundamental Concepts of Ocean Sciences K-12* (2005). Available through the Internet Archive at: <https://web.archive.org/web/20060928045209/> <http://www.coexploration.org/oceanliteracy/documents/OceanLitChart.pdf>. The only difference is the tense of one verb, which shifted from “The ocean makes the earth habitable” in 2005 to “made” in 2013 and back to “makes” in 2021.

A better strategy for ocean literacy would be to consider people as environmental humanists do, recognizing that the human relationship with the oceans has existed for millennia and understanding that different groups of people at different times have had distinctive relationships with the parts of the seas they encountered. These relationships are not limited to the modern ones of extraction, degradation, recreation, and rejuvenation that dominate the principles six and seven. They also encompass spirituality, reciprocity and cultural identity, and they changed over time and differed among cultural groups. The monsoon regime in the Indian Ocean helped shape a distinctive pattern of travel and trade from India to Africa and back seasonally, starting thousands of years ago, resulting in a cultural view of the ocean in this region as a transport surface for trade, not as territory. The importance of trade prompted littoral communities to recognize and defend freedom of navigation and commerce (Anand, 1983; Steinberg, 2001). By contrast, inhabitants of Micronesia, in the Pacific, saw seas as territorial spaces, valued for resources of food but also of connectivity. Western explorers found the Pacific to be both empty and hostile, while Pacific islanders, by contrast, experienced “seas of islands.” (Hau’ofa, 1993; Chaplin, 2014). The fact that some cultures approach oceans as an unfamiliar, hostile, or non-human place, but others call them home, must be better reflected in the ocean literacy principles, in particular, within principle six.

Principle six of the ocean literacy framework states that, “The oceans and humans are inextricably interconnected.” The fundamental concepts of this principle enumerate resources the oceans provide for people: living resources for food and medicine, non-living ones for energy and minerals, and less tangible ones such as connectivity and separation, related to transportation and national security. All of these are credited with supporting national economies. A separate bullet point also recognizes oceans for providing inspiration, rejuvenation, heritage and discovery. Recreation, though a major economic sector beginning in the mid-19th century and contributing significantly to today’s “blue economy,” appears here as a non-economic activity. This sharp distinction between economic and supposed non-economic ocean activities does not reflect historical reality, or even the lived experience of many peoples today. The view of the ocean as a source of inspiration and personal renewal was novel in western Europe and North America in the 19th century, emerging from a historical moment the historian John Gillis calls “the second discovery of the sea” (Gillis, 2012). This new appreciation for the oceans was just as influential economically as traditional maritime activities, helping to shape the tourism that is so crucial to many coastal communities. While ocean literacy includes the observation that oceans contribute heritage to cultures, there is no acknowledgement that such heritage has exerted lasting legacies into the present.

Existing ocean literacy principles teach that humans have affected the oceans in many ways. This formulation implies that all humans are equally responsible for the damage done to oceans in the statement, “Humans affect the ocean in a variety of ways”, which acknowledges no distinction between different groups of humans and their widely varying contributions to ocean damage. For example, Basques were the first to whale commercially, and whalers from

Europe, the US, Japan and the Soviet Union were responsible for the vast majority of large whales harvested worldwide. Indigenous groups that relied on whales, such as the Inuit or the Makah, suffered terribly, both nutritionally and culturally, as a result (Reid, 2015; Arch, 2018; Demuth, 2019). Whereas ocean literacy insists that, “Everyone is responsible for caring for the ocean,” the truth is that some people bear more responsibility than others, and thus should be expected to do more to mitigate ocean environmental issues, something that is well understood in environmental justice terms but that is hard to reconcile with existing ocean literacy principles. Similarly, ocean literate people are told they should understand that much of the world’s population lives in coastal areas, which are susceptible to natural hazards. Left unsaid is the culpability of those people who contributed most to global climate change for present and coming sea level rise, which will negatively impact groups of people such as Pacific islanders who did little to contribute to the problem (Gerhardt, 2023). Also elided is the fact that the political and economic choice of coastal development, which leaves people and property vulnerable, is often disguised by defining damage from hurricane or other forces as “natural disasters” even when they are consequences of past human decisions and actions (Steinberg, 2006).

The category of discovery receives special distinction in ocean literacy, with the seventh principle devoted to the ocean being “largely unexplored.” Explorers and exploration are defined in the fundamental principles as being limited to scientists from a variety of disciplines, scientific instruments, and tools like mathematical models. Past explorers who weren’t scientists are ignored, presumably because only 5% of the oceans have been explored, despite the indelible imprint that past human exploration has had on our understandings of oceans as dangerous, challenging, and yet knowable and eminently usable (Kroll, 2008; Rozwadowski, 2018; Adler, 2019). Other ways of knowing oceans are simply disregarded. Left out, for example, are people like Anutan islanders, who live in the Solomon Islands and have been documented as conducting sophisticated and detailed mental mapping of the sea floor around their island home (Feinberg et al., 2003). This kind of knowledge holds promise for co-management of marine resources, in part because it incorporates the past as well as the present. Similar incorporation of Indigenous and local working knowledge holds promise for helping to mitigate exactly those problems that the ocean literacy framework assumes can only be addressed by modern science. Fortunately, ocean literacy practitioners have begun to incorporate Indigenous knowledges and perspectives of BIPOC communities (Black People, Indigenous People and People of Color). The Canadian Ocean Literacy Strategy is a prime example of a bottom -up, regionally focused, community-driven strategy with contributions from Indigenous and Inuit communities (Canadian Ocean Literacy Coalition, 2021). More needs to be done, and historical knowledge in particular must contribute, because of its ability to help us understand that past ocean ecosystems were vastly different than today’s (Pauly, 1995).

This analysis has deliberately employed the plural “oceans,” whereas the present ocean literacy framework insists on a singular, world ocean. Scientists, educators and environmentalists use the singular ocean to underline the fact of interconnections between all seas, noting that the water circulates not only through ocean basins

but also to and from the atmosphere, rivers and other bodies of water, including the cryosphere. Promoting an understanding of a singular ocean intends to help ocean literate citizens understand that, despite the ocean’s vast size, it is finite and its resources limited, and to support the notion of the ocean and humans being connected and linked. However, this principle also asserts a timeless and static global ocean that does not match the lived experiences of most humans over most of history. Different groups of people have, and had, varied relationships with specific parts of the oceans. Even scientists have not always viewed the ocean as a unified whole, as the title of the 2003 Pew Commission report, *America’s Living Oceans*, attests. A presentist scientific outlook may prefer a singular ocean, but this forces a presentist perspective that yields an overly simplistic, ahistorical understanding of human-ocean relationships that ultimately obstructs environmentalists’ goals.

Until people view the oceans as connected to – rather than divorced from – history and culture, it will remain difficult to achieve meaningful environmental action. The humanities and social sciences can enrich the goals and achievements of ocean literacy. History can recover past uses of the oceans, and the creation of the knowledge that enabled those uses. It can also offer a means for understanding the power of cultural representations to shape perceptions and uses of the oceans. The post-World War II ocean frontier, viewed through western, and especially US eyes, promised access to essentially limitless resources and also contributed to the long delay, relative to the mostly terrestrial environmental movement, in recognizing the vast oceans as an environment susceptible to human activities and in need of protection (Rozwadowski, 2018).

Understanding the power of culture, including representations such as ocean wilderness or ocean frontier, to reflect or create historical change illuminates the relationships between people and oceans in the past. Oceans must also be understood from different socio-cultural perspectives: the vast knowledge systems, values, and experiences that shape diverse peoples’ relationships with the oceans are as fluid and complex as the oceans themselves (Te Punga Somerville, 2017). A better appreciation of the length and character of human interactions with oceans explicates the complexity of ocean issues, a complexity that must be addressed for ocean environmentalism to succeed. Understanding the power of culture suggests that the creation of new narratives, metaphors and images could support better understanding of the marine environments and our dynamic relationships with them.

3 The role of emotions

The interest in and the application of behavioral insights to conservation theory and practice have expanded significantly over the last years (Nielsen et al., 2021; Crosman et al., 2022). Part of this development has been an increasing attention to the role of emotions, which are thought to play an important part in ocean-related behaviors and for understanding the relationship between people and their marine environment (McKinley et al., 2020). Research shows that awareness of the consequences of unsustainable behavior can cause emotionally distressing

reactions, such as shame or guilt, and shows a strong connection between feelings of guilt and responsibility to the willingness to make sacrifices for the environment (Bamberg and Möser, 2007; Jefferson et al., 2015). A recent study by O'Halloran and Silver (2022) suggests the use of feelings of sadness and awe as an effective method to connect people with marine environments. If people conclude that their behavior is not compatible with their personal values – a mismatch known as cognitive dissonance (Festinger, 1962) – they will strive to resolve or deny it (Bandura, 2016). Because cognitive dissonance has been shown to support environment-friendly adjustments in behavior (Dickerson et al., 1992), it can be used to support behavioral changes (Stoll-Kleemann and O'Ridoran, 2020; Stoll-Kleemann et al., 2022).

Positive emotions such as pride, hope, and gratitude are known to be key drivers for action (Markowitz & Shariff, 2012; Antonetti and Maklan, 2014). For example, the conservation organization RARE has successfully used hundreds of so-called regional Pride campaigns. These social marketing programs turn a charismatic flagship species into a symbol of local pride, thereby generating broad support for the protection of entire ecosystems on different spatial levels. Such campaigns are one example of how to encourage behavioral change beyond the individual level, because they help create a group identity and support the establishment of shared social norms, two aspects that shape group behavior. These campaigns would be strengthened by making explicit the histories behind the peoples' reliance on these particular species for a variety of sustenance and spiritual reasons.

With respect to the convincing arguments for a systematic inclusion of emotional elements in choices regarding ocean relevant behavior (Borja et al., 2020), McKinley et al. (2023) suggest making emotional connectedness to oceans a fundamental component of ocean literacy. Furthermore, including emotional dimensions can help with/promote exploring and supporting regional ocean literacies. We argue that a regional approach provides the appropriate geographical, social and institutional context to do that.

4 Defining regions for future ocean literacies

If attention to history, culture and emotions can, as we argue, form the foundation for more effective leveraging of recent understanding of ways to achieve behavioral changes toward ocean sustainability, then what remains is to consider the most promising scale for such efforts. A region is a spatial category encompassing places that are internally similar to each other and externally dissimilar to places outside. Although regions correspond to real entities, Montello et al. (2014) introduce the term “cognitive regions” to describe how individuals and cultural groups organize their understanding of landscapes, and argue that the boundaries of these cognitive regions may be substantially vague. Such a cognitive definition of regions also applies to oceans. Steinberg (2001) argues that different cultures produced distinct views of the oceans, each directly linked to, and produced by, their respective political-economic systems and uses of ocean space and resources. Oceans are spaces defined by societies, and the actual and intended uses of the seas have shaped the cultural understandings of oceans in

communities around the world (Rozwadowski, 2018). “What looks like uniform bodies of water are in fact historical composites of contiguous and culturally conditioned resource-spaces, the exploitation of which was made possible by their representations and regulations, technologies and sciences” (3R Oceans project, 2022). Political and economic forces have influenced the governance and representation of the seas as much as they have the land. For example, Micronesians viewed the seas around their islands as a space that was part of society, providing resources and linking people together. The ocean space of one island adjoined that of the next closest, so that oceans rested under territorial control (Steinberg, 2001; Rozwadowski, 2018).

Pressey and Bottrill (2009) suggest the definition of seascapes demarcated by common patterns and processes of biodiversity and human uses, governance and threats. These may be smaller than the above-mentioned regional seas. Developing this further, we suggest the practice of outlining a region as basis for regional ocean literacies based on a spatial entity, characterized for example by complementarity and connectivity. This goes beyond ecological characteristics and also acknowledges the perspectives of human actors. Such a region is not necessarily an entire ocean or sea basin, but could very well be part of a basin, or a stretch of water connecting two basins.

The logic of the regional approach demands, in fact, that the specifics of what will be effective for a particular group of people in a particular place should be worked out by a community of relevant experts, including humanists and social scientists as well as natural scientists and science communicators. While there is beauty, and also truth, in the idea of the one ocean as a globally connecting system, it is equally true that people, in both the past and present, experienced, and continue to experience, many oceans and seas, which, then, points to many ocean literacies.

We argue that the corresponding regional ocean literacies must be place-specific, represent different knowledge and emotional systems and reflect the histories of the particular areas in question. They should be developed through knowledge co-production, an iterative and collaborative processes involving diverse types of expertise, knowledge and actors to produce context-specific pathways towards a sustainable future (Norström et al., 2020). Through empowering communities, engaging the public and contributing to local coastal place-making (Buchan et al., 2023), such regional ocean literacies will greatly contribute to achieving the goals of the Ocean Decade.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

Author contributions

KSM and SS-K developed the idea and an outline. KSM wrote the first draft of the manuscript. HR wrote sections of the

manuscript. All authors contributed to the article and approved the submitted version.

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