

SUPPLEMENTARY MATERIAL

Table S1. List of public engagement and participation activities carried out by the Chair, 2018-2020.

Public engagement	Description
Workshops	Two major workshops held in 2010 and 2018, coordinated by the University of Girona
Science open days	Conferences and demonstrative activities held in 2018 and 2019 (including demonstrative laboratory sessions and demonstrative activities at sea) Co-organized with the Catalan Institute of Oncology and the Catalan Health Institute
Science festivals	Lectures as part of events organized by other institutions in different localities in 2018 and 2019
TV and radio	Participation in local and regional programmes (interviews)
Newspapers	Publication of articles in several local and regional newspapers
Other publications	Publication of other dissemination materials such as guides (e.g., Omega 3 Guide and the Maritime Recreational Activities and Human Health guide); labels and banners related to preventing human health issues in connection with the conservation of the marine ecosystems; certificates to acknowledge stakeholders' engagement in the Chair's activities
Website	Creation of the Chair's website (www.oceanshealthudg.edu) containing information about the Chair's structure and goals and a summary of the OHH topics covered
Social media	Creation of the Chair's social media channels (Twitter, Facebook, Instagram, and YouTube) to quickly disseminate news to the public
Exhibitions	Creation of a touring, temporary exhibition illustrating how marine ecosystems are linked to human health and wellbeing. Collection of explanatory panels, photos, animals, and chemical compounds The mobile OHH, which can be moved from town to town, to illustrate how life evolved from water
Films	Elaboration of a full documentary film about OHH (to be presented in 2020) and short videos about several OHH topics
Conferences	Conferences for particular groups (high school students, the elderly, environmental and health professionals, etc.) within the framework of specific conference series on health and marine environmental issues organized by other institutions at the regional, national, and international levels
Other	Preparation of promotion material for the public (stickers, T-shirts, etc.)
Public participation	Description
	Research study in Cap de Creus to assess whether snorkelling and scuba diving at sea may contribute to the improved wellbeing of healthy people and oncology patients Public perception questionnaires (open and closed ended questions) and focus groups

<p>Research studies on the effects of maritime recreational activities on human health and well-being</p>	<p>In collaboration with the Catalan Health Institute, the Catalan Oncology Institute, the Roses Against Cancer Foundation, and local scuba diving clubs</p> <p>Goal: development of “Blue Prescriptions” by local community health practitioners, considering blue spaces as a “health asset” (i.e., a resource that enhances the ability of individuals, communities, and populations to maintain and sustain health and wellbeing). “Blue Prescriptions” are health professionals’ advice to patients to be physically active in or near the sea, considering the salutogenic effects of blue spaces (sea and coast), which are similar to the “green prescriptions” implemented in some countries such as New Zealand, Scotland, and Japan.</p> <hr/> <p>Research study in Cap de Creus on the complex links between several marine recreational activities and human health and wellbeing. The conclusions drawn were based on published studies and the personal experience of qualified, professional instructors in the area of Cap de Creus in response to open-ended questionnaires.</p> <p>In collaboration with the MedPAN Network of MPAs in the Mediterranean and local companies and associations offering leisure activities at sea (e.g., kayaking, swimming, sailing, scuba diving, etc.).</p> <p>Goal: to increase awareness among stakeholders of the existing relationships between the marine recreational activities taking place in the MPA, and human health and citizen wellbeing.</p> <hr/> <p>Doctoral Thesis and Final Bachelor's Degree Projects on the effects of maritime and coastal activities such as kayaking and coastal walking on citizen health and wellbeing.</p> <p>Final Bachelor's Degree Project on Tetrodoxins (TTXs) in pufferfish. Co-financed by Tossa de Mar town council and the Chair.</p> <p>In collaboration with local stakeholders (scuba diving clubs, kayaking associations, fisher’s associations, etc.) and IRTA.</p> <p>Goal 1: to develop a new tourist model more based on sustainable and healthy maritime and coastal leisure activities, while helping to improve the tourism offer during the low season</p> <p>Goal 2: to contribute to the knowledge of TTXs in pufferfish</p>
<p>Research study on the self-monitoring of health variables</p>	<p>Use of smart watches (wearable tech) to enable ocean and coastal users to self-monitor health variables, and to support bi-directional communication with health care providers</p> <p>In collaboration with the Catalan Health Institute, the Catalan Oncology Institute, and local snorkelling/scuba diving clubs</p> <p>Goal: to assess whether snorkelling at sea may contribute to improved health variables such as heart frequency, blood pressure, and hours of sleep in oncology patients</p>
<p>Biological studies with health repercussions</p>	<p>Research study to analyse the omega-3 fatty acids in the most valued fishery species caught in the Costa Brava region (Northern Catalonia). Search for alternative or complementary sources of omega 3 fatty acids. Review of the benefits of omega-3 for human health (e.g., cardiovascular risk and cancer). Evaluation of omega 3 fatty acids in fish prey as an indicator of habitat quality.</p> <p>Communication of the results of the project to the public and the stakeholders involved via the “Omega-3 Guide to the Costa Brava” and workshops</p>

In collaboration with the Institute of Marine Sciences (ICM-CSIC), the D.G Fisheries of the Government of Catalonia, the Fisheries Local Action Group (FLAG) Costa Brava, the Catalan Institute of Oncology, local professional fisheries. associations, fishmongers, fish restaurants, and fish processing plants

Goal: to evaluate the health risks in seafood (parasites and heavy metals)

Social studies with health repercussions

Research study on the social determinants of health, including equitable access to marine resources among people from different ethnic groups

In collaboration with the Social Anthropology Dept. of the Autonomous Barcelona University, the Fisheries Local Action Group (FLAG) Costa Brava, local professional fisheries associations, and fishmongers

Goal: to integrate the sociocultural issues in the OHH field

Table S2. International and local/regional cornerstone strategies endorsed by the Chair, together with a short description of each.

Level	Cornerstone strategy	Description	References
	One Health and Planetary Health approaches	Two worldwide strategies for expanding interdisciplinary collaborations and communications in all aspects of health care for humans, animals, and the environment to safeguard the health of the environment and humans.	Lerner et al., 2017 Hill-Cawthorne, 2019
	Precautionary principle	A worldwide strategy initially designed for approaching issues of potential environmental risks when extensive scientific knowledge on the matter is lacking, but can also be extended into public health	Kriebel et al., 2001 Sand, 2000
	Sustainable Development Goals of the UN's 2030 Agenda for Sustainable Development.	A worldwide strategy, the goals of which include the conservation of the seas and oceans, the sustainable use of the marine resources, the promotion of a healthy life, the preservation of people's wellbeing, and the reduction of inequalities. In particular SGD no. 14: Conservation and sustainable use of the oceans, seas, and marine resources.	The Sustainable Development Agenda – United Nations Sustainable Development, 2020
International	EU's marine and health policies	Health 2020 European Policy Framework and Strategy for the 21st Century Marine Strategy Framework Directive Bathing Water Directive Maritime Spatial Planning Directive Blue Growth Strategy Food 2030 Strategic Research Agenda (SRA) for Oceans and Human Health in Europe	H2020 SOPHIE Consortium, 2020 Blue growth Maritime Affairs, 2020 Maritime spatial planning Maritime Affairs, 2020 Bathing water Directives – European Environment Agency, 2020 Law - EU Coastal and Marine Policy - Environment - European Commission, 2020 WHO Regional Office for Europe, 2013
Regional/local	Marine and health policies in Catalonia	2030 Maritime Strategy of Catalonia Catalan Strategy on the marine environment and biodiversity 2018-2030 Health Promotion Plan (PAAS) Catalan Health Plan 2016-2020 Local Public Health Plan (PINSAP)- COMSalut Project Food Security Plan 2017-2021 Co-management model of the professional fisheries in Catalonia.	2030 Maritime Strategy of Catalonia, 2020 Pla de seguretat alimentària de Catalunya 2017-2021. Agència Catalana de Seguretat Alimentària, 2017

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Table S3. List of major environmental issues together with their factors and drivers, and associated public health challenges identified by the stakeholders during the implementation phase of the Chair. Key references used are shown.

Environmental issue	Environmental factors/drivers	References	Public health challenge	References
Decline of local fishery resources	Omega 3 fatty acids and other micronutrients	Gow et al., 2014 García-Moreno et al., 2013	Loss of local supply of omega 3 fatty acids, which provide various health benefits for consumers. Search for alternative or complementary sources of omega 3 fatty acids. Consideration of health benefits of seafood beyond mere consumption and protein. Preservation and better use of wild stocks of omega 3 fatty acids to optimize their utilization for human consumption. Better understanding of the linkages between fisheries, nutrition, and health.	Hicks et al., 2019; Leppo et al., 2013; Lloret et al., 2016 Román et al., 2019
Decrease in condition/quality of seafood species	Heavy metals Persistent Organic Contaminants	Kim et al., 2009 Trainer et al., 2015 Dallinger et al., 1987	Current and emerging health risks of seafood consumption leading to acute or chronic health diseases such as nervous system diseases, allergies, gastrointestinal diseases, reproductive system	Berdalet et al., 2016; González et al., 2018;

	Microplastics	Smith et al., 2018 Johnson et al., 2013	diseases, immune diseases, and chronic inflammation (which increases the risk of cancer).	González et al., 2019; Prata et al., 2020; Trabalón et al., 2017; Vilavert et al., 2017
	Toxins in seafood (e.g. shellfish) from Harmful Algal Bloom (HABs) species (certain dinoflagellates and cyanobacteria).			
	Known (saxitoxins, microcystins, anatoxins, etc.) and emerging toxins (Tetrodotoxins and ciguatoxins)			
	Pathogenic organisms (vectors): Bacteria, virus and parasites			
Air, water and noise pollution from maritime recreational activities	Maritime cruising Leisure motor boating	Perić et al., 2016 Maragkogianni et al., 2015 Rako et al., 2013	Air and water pollution from leisure boats and cruise ships (e.g., bad air quality on the decks of cruise ships and in the vicinity of ports and berths) may affect both users' health and that of other citizens (e.g., swimmers, local residents, etc) Higher risk of infections on board cruise ships	Egardt et al., 2018; EU Commission, 2007; Murray et al., 2011
Effects of tourism overcrowding	Diving Leisure boating Sunbathing on the beach	Venturini et al., 2016 Garrod et al., 2008 Jędrzejczak, 2004 Bujosa et al., 2015	Sunbathing, which may be linked to excessive sun exposure (increased cancer risk), and non-exercising (increase in overweight/obese people)	Camp et al., 2012; Lucrezi et al., 2017; Venturini et al., 2018

			Sea overcrowding by users can decrease satisfaction with the experience and hence the potential wellbeing effect of the activity	
Degradation of the quality of the coastal and marine environment	Domestic, industrial and agriculture waste, including organic and inorganic chemicals and plastics. HABs. Pathogens (resistant bacteria, virus, etc.)	EEA, 1999 Valavanidis, 2018	Quality reduction or loss of blue spaces where citizens can practice healthy outdoor activities. Specific health risks for certain sea users (e.g., swimmers and surfers) posed by exposure to toxic algae (e.g., <i>Ostreopsis</i>) and antibiotic resistant strains of bacteria (e.g., <i>E. coli</i>).	Borja et al., 2020; Vila et al., 2016
Impacts of global change on vulnerable marine species with bioactive potential	Loss of biodiversity / Risk of extinction Mass mortalities of certain taxa Oxygen limitation and acidification Declining populations	Casoli et al., 2017; Peters, 2019; Verdura et al., 2019	Loss of the opportunities that the bioactive potential of these species represent for discovering new medicines (e.g., antiviral, antifungal, antibacterial, and particularly antitumoral) within the framework of marine biotechnology.	Carreño and Lloret, 2019
Marine protected areas (MPAs) as a management tool for preserving the marine ecosystems and promoting better health and wellbeing.	Protection of fish stocks. Protection of blue spaces. Protection of species with bioactive potential. Protection of biodiversity.	EEA, 2015 MARINE PROTECTED AREAS – MedPAN, 2020	Endure the availability of local stocks of omega 3. Ensure the preservation of blue spaces. Ensure the preservation of species with possible pharmacological interest. Ensure the protection of marine species used in fundamental biological and medical research.	Francour et al., 2001; Martin et al., 2017; Rees et al., 2015; Wells et al., 2016

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Table S4. List of major human health issues and associated goals within the framework of OHH proposed by the Chair’s stakeholders. Key references used are shown.

Health issue	Goal	Key references
Sociocultural and economic factors related to health (health inequalities).	<p>Consider the equal and fair access to safe, nutritious, and sustainable seafood by different collectives and ethnic groups.</p> <p>Consider the salutogenic effects of leisure activities and coastal proximity among socioeconomically deprived communities since these effects could be stronger among these populations.</p>	Leppo et al., 2013; Miller et al., 2012
Community health promotion and engagement.	<p>Improve health and wellbeing outcomes by promoting a healthy, active life on the coast or in the sea through the design of “Blue Prescriptions” (similar to the so-called “Green Prescriptions”), as part of patients’ health management in primary care centers.</p> <p>Embrace the “asset approach” and the “salutogenic model”, which value the capacity, skills, knowledge, connections, and potential in a community (with particular emphasis in empowering women in community health)</p>	Improvement and Development Agency (Great Britain), 2010; Lindström et al., 2005
Blue Spaces as a tool for the improvement of the individual and collective wellbeing of particular vulnerable and at-risk populations.	Propose blue spaces as sites where vulnerable and at-risk populations such as migrants and refugee communities, patients recovering from clinical treatments, and the elderly can carry out healthy activities	Departament de Salut, Generalitat de Catalunya, 2014; Gascon et al., 2017; Vert et al., 2019
Historic wisdom: traditional diet and therapies.	<p>Rediscover the importance of maritime leisure activities to prevent and/or restore health by learning from history regarding the use of the coast and the seas.</p> <p>Rediscover the importance of seafood as a component part of the so-called “Mediterranean diet”, including the promotion of exploited, sustainable species that have fallen into disuse and that may contribute to a balanced diet</p> <p>Better understand of the evolution of coastal communities towards medicalization in the 20th century.</p>	Mentella et al., 2019; Schwingshackl et al., 2017
Blue zones	Understand why people live longer (areas with a high percentage of centenarians) and enjoy a better quality of life (so-called Blue Zones) in certain areas and communities located on the coast.	Buettner et al., 2016
Prevention of non-communicable diseases (NCDs)	Promote seafood in the diet and/or physical activity on the coast and at sea to help prevent diseases such as cardiovascular diseases, cancer, and mental disorders.	https://www.seafish.org/promoting-seafood

		Wurzbach, 2002
New medicines from the sea for the treatment of rare diseases and pain	Focus on the bioactive potential of certain marine organisms that can offer unique resources for the discovery of new treatments for rare diseases (e.g., the brevetoxins produced by some dinoflagellate species as a new therapy for cystic fibrosis, and the tetrodotoxins produced by some pufferfish species as a therapeutic agent for pain).	Bhatia et al., 2015; Nieto et al., 2012; Potera, 2007; Sharma et al., 2010

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