

**Concern about the human health implications of marine biodiversity loss is higher among less educated and poorer citizens:
Results from a 14-country study in Europe**

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Supplementary Materials

Table S1: Potential marine threats to human health and health-related research areas covered by the SOPHIE survey.

<i>Potential marine threats to human health</i>		<i>Health-related research area</i>	
1	Human and animal sewage in bathing waters	1	Bathing water quality
2	Sea-level rise	2	Coastal protection/defences
3	Loss of marine biodiversity/species	3	Marine species/wildlife protection
4	Ocean acidification (caused by CO ₂ being absorbed into the ocean, making the water more acidic)	4	Marine-climate change issues
5	Plastic pollution of marine waters	5	Plastic pollution in marine waters
6	Coastal overdevelopment (homes, hotels etc.)	6	The health/wellbeing effects of living near the coast
7	Sunburn & sunstroke on coastal visits	7	Education and awareness raising
8	Drowning from recreational activities	8	The health/wellbeing effects of spending leisure time in and around marine environments
9	Collapse of fish stocks	9	Sustainable aquaculture
10	Jellyfish swarms	10	Jellyfish swarms and algal overgrowth
11	<i>Increased frequency of harmful algae (toxic blue-green algae, red tides etc.)</i>	11	<i>Biotechnology from marine organisms (medicines, cosmetics etc.)</i>
12	<i>Invasive (non-native) marine species introduced by humans into new marine locations</i>	12	<i>Marine renewable energy</i>
13	<i>Emergence of drug-resistant microbes in seawater</i>	13	<i>Sustainable shipping (electric ships etc.)</i>
14	<i>Contamination of seafood</i>	14	<i>Deep-sea mining</i>
15	<i>Chemical/ oil pollution of marine waters</i>	15	<i>Behaviour change to improve health/wellbeing</i>
16	<i>Flooding and storms</i>		

Note: Topic order was randomised for each participant. Some potential marine threats and marine research areas were broadly linked (e.g. #3 biodiversity loss) while others were not (italicised).

Table S2: Variables for predicting a) health-related concern and b) support for research funding into understanding the health. This table is adapted from Davison et al. (2021) supplementary materials.

Variable name	Question Wording	Question response options	Regression model categories/scale	Operationalisation notes
Socio-demographics				
Age	Please see notes.		18-99	Age was collected prior to survey by YouGov and used as a scale in analysis.
Gender	Please see notes.		‘Men’ (reference), ‘Women’	Gender was collected prior to survey by YouGov.
Educational attainment	<i>“What is your highest education level?”</i>	Europe: Primary school, middle school, secondary(high) school, Other, None	‘No degree’ (reference)	Nine response options were provided which were formed into two categories for analysis. A ‘missing’ category was also created which incorporated the response “prefer not to answer”. Taken from the CLAMER survey (Gelcich et al., 2014).
		Europe: First university degree, Masters university degree, PhD university degree	‘Degree’	
		Prefer not to answer	‘Missing’	
Employment situation	<i>“Which of these descriptions best describes your situation (in the last seven days)?”</i>	In paid work	‘Full/part time’ (reference)	Four categories were formed from the nine response options provided. “Don’t know” and “prefer not to answer” response options were also formed into a ‘missing’ category for
		In education	‘Student’	
		Retired	‘Retired’	

		Unemployed and actively looking, Unemployed and not actively looking, Chronic illness or disability which limits ability to work, Community or military service, Doing housework/looking after children or other persons, Other, Don't know	'Other'	analysis. Taken from the European Social Survey (2018). The operationalisation of employment situation was based on that of Garrett <i>et al.</i> , (2019).
		Prefer not to answer	'Missing'	
Income	<i>"Which of the following describes your household's total annual* income after tax and compulsory deductions, from all sources? If you don't know the exact figure, please give an estimate."</i>	Income deciles 1 – 3	'Low income'	Taken from the European Social Survey (2018). Three categories were created for analysis from 10 response options. Responses "don't know" and "prefer not to answer" were formed into an additional 'missing' category for analysis. Different income deciles (i.e. response options) were provided for different countries reflecting local currencies and average earnings. Categorisation of income allowed the 1955 respondents who gave 'missing' answers to be retained in regression analysis.
		Income deciles 4 – 7	'Middle income' (reference)	
		Income deciles 8 - 10	'High income'	
		Prefer not answer, Don't know	'Missing'	
Political orientation	<i>"In politics, people sometimes talk of 'left' and 'right'. Where</i>	0-3	'Left' (reference)	Taken from the European Social Survey (2018). For analysis purposes (chiefly so we could
		4-6	'Centre'	

	<i>would you place yourself on this scale, where 0 means the left and 10 means the right?”</i>	7-10 Prefer not to answer, Don't know	'Right' 'Missing'	include 'missing' responses; N = 2192) we created the categories: 'left' (0 – 3; reference), 'centre' (4 – 6), 'right' (7 – 10) and 'missing' ("don't know" and "prefer not to answer").
Contact with the marine environment				
Coastal proximity	<i>“Approximately how far do you live from the coast in miles/km?”</i>	Up to 1km	'≤1 km'	Adapted from the MARLISCO survey (Hartley <i>et al.</i> , 2013). Eight response options were provided which, for analysis, were collapsed into four categories, 'up to 1 km', '1-5 km', '5-20 km', 'more than 20 km', categories previously used when investigating coastal living and physical activity (White <i>et al.</i> , 2014). A 'Missing' category incorporating response option "Prefer not to answer" was also created for analysis. The response option "Don't know" (n = 415) was incorporated into the '>20km' category as investigation revealed that some of these respondents lived in the Czech Republic, whilst others rarely or never visited the coast.
		More than 1km - up to 2km, More than 2km – up to 5km	'>1-5 km'	
		More than 5km - up to 10km, More than 10km – up to 20km	'>5-20 km'	
		More than 20km - up to 50km, More than 50km – up to 100km, More than 100km, Don't know	'>20 km' (reference)	
		Prefer not to answer	'Missing'	
Frequency of coastal visits	<i>“Thinking now about the last 12 months in particular, which of these statements best describes how often, if ever, you visit the coast or the sea?”</i>	Once a week or more often	'≥ Once a week'	An adapted measure from the Monitor of Engagement with the Natural Environment (MENE; Natural England, 2017) survey. Respondents were provided with six response options, which for analysis were combined into

		Once every 2 or 3 weeks, Once a month, Once every 2 or 3 months, Once or twice a year, Never	'Visits the coast < once a week' (reference)	two, categorised as 'visits the coast \geq once a week', 'visits the coast < once a week'. The 'missing' category for analysis was created using the response options "don't know" and "prefer not to answer".
		Prefer not to answer, Don't know	'Missing'	
Marine recreational activities	<i>"Which of the following recreational activities, if any, do you engage in that are related with the sea or coast? (Please select all that apply)"</i>		Seven dummy variables:	Measured by adapting response options from the MENE (Natural England, 2017), CLAMER (Gelcich et al., 2014) and Watersports Participation (Royal Yachting Association et al., 2018) surveys. Eighteen response options were provided. Based on previous literature (Papathanasopoulou et al., 2016; Elliott et al., 2018), these were characterised into six distinct groups which were entered as dummy variables for analysis. A 'Missing' category (integrating "Don't know" and "Prefer not to answer" responses) was also included in analysis to ensure that the reference category related to respondents who engage in no recreation activities.
		Beach/coast walking, dogwalking, holistic activities, beach games	i) 'Active coastal recreation' (e.g. beach/coastal walking)	
		Watching the view, wildlife watching, sunbathing/picnics	ii) 'Passive coastal recreation' (e.g. watching the view),	
		Seafishing, Snorkelling/scuba, Motor boating/jetskiing, Sailing, Rowing/ kayaking, Surfing/ bodyboarding, Windsurfing/ kite-surfing/ land yachting	iii) 'Recreational water sports' (e.g. surfing),	
		Swimming	iv) 'Swimming'	
		Eating Seafood	v) 'Eating seafood'	
		Other	vi) 'Other'	
		Don't know, Prefer not to answer	vii) 'Missing'	

Marine sector occupation	“Please indicate whether you or any member of your household works in any of the following professions/industries associated with the marine environment”	Commercial fishing, Aquaculture, Traditional marine energy sector, Marine renewable sector, Shipping, Cruise industry, Coastal tourism/recreation, Coastal management, Marine environment protection, Marine research, Marine policy, Other	‘Marine occupation in household’	Question was adapted from the CLAMER survey (Gelcich et al., 2014). Respondents were provided with a list of 13 marine professions/industries, and due to relatively low numbers in specific categories these were collapsed into two responses for analysis: ‘marine occupation in household’ and ‘no marine occupation in household’. A ‘missing’ category (made up of “Don’t know” and “Prefer not to answer” options) was also included for analysis.
		None of above	‘No marine occupation in household’ (reference)	
		Prefer not to answer, Don’t know	‘Missing’	
Psychological factors				
Personality traits	“How well do the following statements describe your personality? I see myself as someone who...”			The BFI-10 (Rammstedt and John, 2007) was used to assess personality traits. The BFI-10 is an abbreviated version of the Big Five Inventory (BFI-44; John et al., 1991) with the five core traits of the Big Five personality domains represented, i.e. openness, conscientiousness, extraversion, agreeableness and neuroticism. The five personality traits were measured using 10 personality statements (two statements per personality trait), on a five-point scale from 1 (disagree strongly) to 5
Openness	“has few artistic interests” and “has an active imagination”	All 10 personality statements were measured on a five-point scale from 1 (disagree strongly) to 5 (agree strongly).	Mean score between 1 and 5 for each personality trait.	
Conscientiousness	“tends to be lazy” and “does a thorough job”			
Extraversion	“is reserved” and “is outgoing, sociable”			

Agreeableness	<i>“is generally trusting” and “tends to find fault with others”</i>	(agree strongly). After reverse scoring the negative item for each trait, a mean score was created for each personality trait.
Neuroticism	<i>“is relaxed, handles stress well” and “gets nervous easily”</i>	
<i>Note: Concern was also added as a predictor variable to models (4) predicting research support.</i>		