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Rocky Shores: From Habitat Threat to Marine Awareness & Well-Being Benefits

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APPENDICES

A. List of Acronyms

ANOVA	Analysis of variance
ART	Attention Restoration Theory
BC	Beach clean
CW	Coastal walk
Df	Degrees of freedom
DRM	Day Reconstruction Method
JNCC	Joint Nature Conservation Committee
KBT	Keep Britain Tidy
M	Mean
MA	Marine Awareness
MCS	Marine Conservation Society
MENE	Monitoring Engagement with the Natural Environment
NEA	National Ecosystem Assessment
PANAS	Positive and Negative Affect Schedule
RP	Rock pooling
SD	Standard Deviation
WHO	World Health Organisation

B. Glossary

Abundance	The quantity of something
Affect-balance tradition	Calculating overall mood by subtracting average positive affect by the average negative affect score
Algal bloom	A rapid growth of microscopic algae in water
Anthropogenic stressors	Induced or altered by the presence and activities of humans rather than occurring naturally
Anthropogenic view	The view that nature should be used sustainably to maximise its output for human gain
Aquatic landscapes	See *blue-space*
Attention Restoration Theory (ART)	A psychological theory primarily used to explain the restorative benefits (mainly in terms of attention) of certain environments focusing on environmental properties: Being away, extent, fascination and compatibility
Bait collecting	Foraging an environment for organisms that can be used to entice fish or other animals
Beach cleaning	The act of removing rubbish that has accumulated on the shore to help tackle the environmental issue of marine litter
Behaviourism	A group of learning theories that focuses on the notion that learning involves associating a stimuli with a response
Being away	A component of the Attention Restoration Theory, referring to the psychological distance from everyday demands and stressors
Biodiversity	The number of species in a defined area, sometimes used interchangeable with *diversity* and *species richness*
Biology	The science of life
Biophilia Hypothesis	A psychological theory describing the connection humans have with nature, focusing on an innate drive and biological motivation to have contact with plants, animals and overall nature
Biota	Animal and plant life of a region
Blue-space	Natural environments with water elements (e.g. ponds, lakes and beaches). Also referred to as *waterscapes* and *aquatic landscapes*

Blue-space effect	Where environments with aquatic features are rated more positively than other environments
Carbon dioxide sequestration	The process of capturing and storing atmospheric carbon dioxide
Circumplex Model of Affect	A model of emotion which emphasises that this concept is represented by two-dimensions: Arousal and mood
Citizen science	Non-experts (members of the public) help collect data for scientific purposes
Coastal experts	Professionals who are linked to the management of coastlines and/or engaged with the public in these coastal environments
Coastal users	People that often visit the coast but do not have expertise or work in a profession that involves working on the coast
Coastal walking	Walking along the coastal path
Cognitivism	A group of learning theories that focuses on the mental and internal processing of information
Compatibility	A component of the Attention Restoration Theory, referring to the ability to fulfil a person's intention
Connectedness to nature	An individual's attachment to the natural environment
Constructivism	A group of learning theories that focuses on the notion that learning involves continuous building and amending previous structures and schemas
Convalescence	Recovering from ill health
Crabbing	The activity for fishing for crabs
Cultural services	A type of ecosystem service that address the non-material benefits such as recreation, psychological well-being and education
Debris	Loose materials, both man-made (e.g. litter) and natural (e.g. drift seaweed)
Depreciative behaviour	Behaviours that unintentionally damage the environment or organisms
Desiccation	Loss of water from marine organisms caused by exposure to air
Direct experience with nature	Experiences that involves physical contact with natural settings and wildlife free from human development

Dose-response effect	an optimum amount, frequency or intensity of a stimulus (e.g. environment) for an individual to receive the most benefit
Drift seaweed	Dislodged (not attached to a surface) seaweed that has drifted to the shore by the wind and tides
Ecocentric view	The view that nature has its individual right to survive and be used sustainably
Ecological validity	The degree to which the findings can be generalised to the real world
Ecology	The interactions between organisms and their environment
Ecosystem	A biological community between organisms and the physical environment
Ecosystem services	The benefits ecosystems provide that contribute to making human life both possible and worth living
Emersion	The condition of being out of water
Environmental literacy	Extensive knowledge or learning about the natural environment
Environmental stewardship	Tasks that focus on protecting the natural environment
Environmentalism	Nature's influence on humans and the influence humans have on nature
Equinoxes	Where the sun crosses the celestial equator, resulting in both day and night being of equal length (occurring twice a year)
Eudaimonic well-being	Focusing on striving for meaningfulness and the actualisation of human potentials
Eulittoral zone	The middle zone of the intertidal area (between the low and high tide line). Also termed as the *midlittoral* and is characterised by barnacles and mussels
Evolutionary Theory	A psychological theory that claims natural environments are beneficial to humans due to an unlearned disposition to pay attention and respond positively to nature for survival
Expectation effects	Results that are as a result (fully or partially) of an individual's expectations or anticipations
Extent	A component of the Attention Restoration Theory, referring to the richness of the environment

Fascination	A component of the Attention Restoration Theory, referring to the ability to involuntary capture attention
Fauna	The animals of a particular habitat
Fishing-litter	Items of rubbish associated with the fishing-industry, which typically includes pieces of fishing crates, fishing rope and lines, and heavy duty gloves
Flora	The plant life of a particular habitat
Fly-tipped litter	Illegal disposing of litter such as furniture
Fossil hunting	The collection of fossils for scientific study, hobby or profit
Free-choice learning	Self-directed, voluntary learning that is guided by individual interests and needs
Habitat	The characteristic space occupied by an individual, a population, or a species.
Habitat threat	Stressors that are likely to cause damage to the environment and/or its habitants
Health	The overall state of complete physical, mental and social well-being
Hedonic well-being	Focusing on subjective happiness, this focuses on the presence of positive mood, and the absence of negative mood
High tide	The state of the tide when at its highest level, influenced by the mood's gravitational force on the water
Immersion	The condition of being completely underwater
Indirect experience with nature	Experiences that involves physical contact with nature in a rather restricted and managed contexts, for instance in zoos and aquariums
Individual differences	A psychological phenomenon that focuses on characteristics or traits in respect of which individuals may be found to differ
Integrative approach	Combining different things (disciplines) to form a new approach
Intertidal	The environment between the marine and terrestrial environment
Intertidal assemblages	A collection of organisms in the environment between the land and the sea

Limits of Acceptable Change (LAC)	The amount of change to an environment to be allowed is defined explicitly by means of quantitative standards, the appropriate management actions needed to prevent further change are identified, and procedures for monitoring and evaluating management performance are established
Littoral fringe	The upper zone of the intertidal area (between the low and high tide line). Also termed as the *supralittoral fringe* and is characterised by lichens and periwinkles
Littoral rock	See *rocky shores*
Low shore infralittoral	See *Sublittoral fringe*
Low Tide	The state of the tide when at its lowest level, influenced by the mood's gravitational force on the water
Marine awareness	A person's knowledge or understanding about multiple aspects of the sea, including biological aspects, natural stressors and associated global and local anthropogenic threats
Marine Biology	The scientific study of organisms and the physical environment in the ocean or other marine waters
Marine litter	Any persistent, manufactured or processed solid material that enters the marine environment
Marine stewardship	See environmental stewardship but relating to the marine environment
Marine stressors	Factors that alter the environment, which are sourced from the sea (e.g. waves)
Marine wildlife tourism	Any recreational activity that has the primary purpose of watching, studying or enjoying marine wildlife
Meaningfulness	See *eudaimonic well-being*
Medical litter	Items of rubbish associated with medical waste (e.g. syringes and inhalers)
Midlittoral	See *eulittoral zone*
Mood	See *hedonic well-being*
Natural environments	Settings where vegetation and other natural elements are dominantly present
Neap tide	Tides with the minimum difference between high and low tide

Non-sourced litter	Items of rubbish that are too small and/or damaged to be able to identify what they were and where they came from
Objective marine awareness	Marine awareness assessed using objective techniques that can be compared to the scientific literature
Ocean acidification	The chemical reactions that reduces the pH in seawater as a result of the carbon dioxide being absorbed in the water
Ocean citizenship	The relationship between our everyday lives and the health of the coastal and marine environment
Paddling	To move feet or hands playfully in shallow water
Preference	Liking one thing over another, which, in the environmental literature, can be seen to indicate the settings that serve well-being
Pro-environmental behaviour	Behaviour that harms the environment as little as possible or even benefits it
Prospect-Refuge Theory	An evolutionary psychological theory claiming certain natural environments are beneficial as the setting can be innately judged on its refuge (ability to hide) and prospect values (ability to see) that was originally necessary for survival
Provisioning services	A type of ecosystem service that refer to the products from the ecosystem such as food and water
Psychoevolutionary Theory	An evolutionary psychological theory suggesting that humans have evolved adaptive physiological affective responses to natural scenes to aid survival; thus still have a biological prepared readiness to respond to natural scenes
Psychology	The scientific study of the human mind and its functions, including those affecting behaviour
Public-litter	Items that are accidently or deliberately left on the beach or carried there by winds and rivers, including drinks bottles, sweet and crisp wrappers and barbeque remains
Recreational carrying capacity	The level of recreational use an area can withstand while providing a sustained quality of recreation
Recreational ecology	The study of the ecological relationships in recreational contexts between human and nature
Recreational visits	Visits to an environment for leisure purposes

Regulating services	A type of ecosystem service that refer to the benefits obtained from the regulation of ecosystem processes such as crop pollination and climate regulation
Restoration	The process of recovery or renewal of resources that have been diminished
Revealed preference	Indirectly asking or observing peoples' preferences and likes (e.g. with willingness to pay measures and examining market rates)
Rock pooling	Exploring the pools of water for creatures
Rock pooling ethics	Exploring rock pools in a sustainable manner, such as respecting wildlife, returning organisms where they were found and turning boulders back round
Rocky shores	The transition between marine and terrestrial environments where solid rock predominates.
Salutogenic	Factors that support or improve human health
Savannah Theory	An evolutionary psychological theory that claims that humans respond positively to nature due to evolutionary processes of seeking a habitat, looking at spatial and temporal variability in habitat suitability
Selection biases	When participants are selected in a manner that increases the chance of obtaining a biased unrepresentative sample
Sewage-related debris	Items of rubbish that have entered the marine environment by the sewage system (items flushed down the toilet such as cotton buds)
Shipping-litter	Items of rubbish that have been discarded overboard ships
Solstices	Where the sun reaches the highest and lowest point in the sky at noon, resulting in the longest and shortest days of the year, respectively
Species density	The abundance of one specific species
Species richness	See *biodiversity*
Spillover effects	The indirect side effects of an intervention, behaviour or process
Spring tide	Tides with the maximum difference between high and low tide.
Subjective marine awareness	Marine awareness judged by the individual using self-reported items

Sublittoral fringe	The lower zone of the intertidal area (between the low and high tide line). Also termed as *low shore infralittoral* and is characterised by red algae and kelps
Substratum	The underlying layer or substance
Supporting services	A type of ecosystem service addressing the services responsible for the basic infrastructure of life such as primary and secondary production
Supralittoral fringe	See *littoral fringe*
Sustainability	An optimal balance between humans and the environment
Symbolic experience with nature	See *vicarious experience with nature*
Terrestrial stressors	Factors that alter the environment, which are sourced from the land (e.g. wind)
Test-retest reliability	Comparing two scores obtained from the same measurement and individual but at different times
Tide cycle	The periodic variation in the level of tide, where the water retreats and returns over roughly a twelve hour cycle
Topography	The arrangement of the physical features of an area
Urbanisation	More people living in built-up areas (e.g. towns or cities)
Vandalism	Resource damaging acts that are as result of individuals engaging in the acts with the deliberate intention and purpose to damage the object, environment or individual
Vertical gradient	The steepness of the shore
Vicarious experience with nature	Experiences that involves abstract encounters with nature (e.g. through media and television). Also referred to as *symbolic experience with nature*
Virtual reality	Computer simulated environments that can simulate physical presence in places in the real world
Volunteering	Individuals freely dedicating their time and effort to engage in an activty
Waterscapes	See *blue-space*
Well-being	A mental-state account where they focus more on how individuals think and feel about their lives

C. Chapter 3: Materials

An example of the survey administered for Study 1 in Chapter 3 before concluding with the debrief.

Note. Section 1 and 2 were counterbalanced

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SCHOOL OF PSYCHOLOGY RESEARCH

ROCKY SHORE SHORT SURVEY:

Exploring the Effects of Visiting Rocky Shores

How do visits to rocky shores affect people?

How do the same visits affect the rocky shore environment?

As part of an interdisciplinary project that is looking at the interaction between humans and nature, I am exploring these questions. Past research typically only looks at one of these aspects and also looks at nature in a very broad way. Thus, I will be examining a specific environment (rocky shores - the intertidal area where solid rock predominates like the picture below) and looking at both the effects humans have on rocky shores and the effects this environment has on humans. I would very much appreciate it if you could tell me your views on these aspects in regard to the effects **general visitors** have on the coast and the impact the coast has on them.

Please complete the **three sections** of this survey that will take **less than 15 minutes**. Feel free to complete and write as much or as little as you would like.

Photo of the rocky shore at Wembury, Devon, taken by Helen Bolton, Wembury Marine Centre

Consent to participate:

The objectives of this research have been explained to me.

I understand that I am free to withdraw from the research at any stage, and ask for my data to be destroyed if I wish.

I understand that my anonymity is guaranteed, unless I expressly state otherwise.

I understand that all responses will be treated confidentially and stored securely.

Under these circumstances, I agree to participate in the research (please check) ☑

Continue

Section 1 - IMPACTS ON THE ENVIRONMENT.

1. From your observations on general visitors' behaviours, please rate the list of activities below according to:

a. How **common** each activity is on rocky shores (check the appropriate box for each activity)

Activity	Not common at all		Moderately common activity		Very common activity
Walking	○	○	○	○	○
Dog Walking	○	○	○	○	○
Jogging / Running	○	○	○	○	○
Swimming	○	○	○	○	○
Snorkelling	○	○	○	○	○
Crabbing	○	○	○	○	○
Fishing	○	○	○	○	○
Playing with the family	○	○	○	○	○
Paddling	○	○	○	○	○
Sunbathing / Relaxing	○	○	○	○	○
Rock Pooling	○	○	○	○	○
Wildlife Watching	○	○	○	○	○
Picnicking	○	○	○	○	○
Fossil Hunting	○	○	○	○	○
Cycling	○	○	○	○	○
Other:	○	○	○	○	○

b. The potential **level of impact** each activity has on this environment; e.g. by impact, I mean potentially harmful effects on the rocky shore. (check the appropriate box for each activity)

Activity	No impact		Moderate impact		Severe impact
Walking	○	○	⊙	○	○
Dog Walking	○	○	⊙	○	○
Jogging / Running	○	○	⊙	○	○
Swimming	○	○	⊙	○	○
Snorkelling	○	○	⊙	○	○
Crabbing	○	○	⊙	○	○
Fishing	○	○	⊙	○	○
Playing with the family	○	○	⊙	○	○
Paddling	○	○	⊙	○	○
Sunbathing / Relaxing	○	○	⊙	○	○
Rock Pooling	○	○	⊙	○	○
Wildlife Watching	○	○	⊙	○	○
Picnicking	○	○	⊙	○	○
Fossil Hunting	○	○	⊙	○	○
Cycling	○	○	⊡	○	○
Other:	○	○	○	○	○

2. Using the activities cited above or any additional behaviours, if there was one visitor-related behaviour you would change in regard to damage caused to rocky shore species or habitats, what would it be and why?

3. How confident were you with your responses for this section? (please check)

Not confident at all		Reasonably confident		Very confident
○	○	○	○	○

Next

Section 2 - IMPACTS ON THE VISITORS.

1. Below is a list of activities. I would like you to rate each activity according to whether you think visitors in general leave a rocky shore in a **better or worse mood**. (check the appropriate box)

	Mood				
Activity	Much worse	Worse	Same	Better	Much better
Walking	○	○	⊙	○	○
Dog Walking	○	○	⊙	○	○
Jogging / Running	○	○	⊙	○	○
Swimming	○	○	⊙	○	○
Snorkelling	○	○	⊙	○	○
Crabbing	○	○	⊙	○	○
Fishing	○	○	⊙	○	○
Playing with the family	○	○	⊙	○	○
Paddling	○	○	⊙	○	○
Sunbathing / Relaxing	○	○	⊙	○	○
Rock Pooling	○	○	⊙	○	○
Wildlife Watching	○	○	⊙	○	○
Picnicking	○	○	⊙	○	○
Fossil Hunting	○	○	⊙	○	○
Cycling	○	○	⊙	○	○
Other:	○	○	○	○	○

2. Next, please rate whether people are **calmer or more excited** after a visit to a rocky shore doing each activity.

	Excitement				
Activity	Much calmer	Calmer	Same	More excited	Much more excited
Walking	○	○	○	○	○
Dog Walking	○	○	○	○	○
Jogging / Running	○	○	○	○	○
Swimming	○	○	○	○	○
Snorkelling	○	○	○	○	○
Crabbing	○	○	○	○	○
Fishing	○	○	○	○	○
Playing with the family	○	○	○	○	○
Paddling	○	○	○	○	○
Sunbathing / Relaxing	○	○	○	○	○
Rock Pooling	○	○	○	○	○
Wildlife Watching	○	○	○	○	○
Picnicking	○	○	○	○	○
Fossil Hunting	○	○	○	○	○
Cycling	○	○	○	○	○
Other:	○	○	○	○	○

3. I am also interested in people's perceptions of whether a visit to a rocky shore could change an individual's awareness of a particular topic. To examine this, what **level of change in awareness** do you feel general visitors experience after visiting a rocky shore in terms of: (please check the relevant box)

	A large decrease in awareness	**A slight decrease in awareness**	**No change in awareness**	**A slight increase in awareness**	**A large increase in awareness**
The overall biology (the science of life) of this rocky shore environment	○	○	○	○	○
The overall ecology (the interactions between organisms and their environment) of this rocky shore environment	○	○	○	○	○
The natural threats faced by organisms (including via habitat destruction) on rocky shores (e.g. wave action)	○	○	○	○	○
The general human-induced challenges facing rocky shore organisms (e.g. oil spills)	○	○	○	○	○
The specific visitor-induced threats to rocky shore organisms. (e.g. from trampling)	○	○	○	○	○

4. How confident were you with your responses for this section? (please check)

Not confident at all ○ ○ Reasonably confident ○ ○ Very confident ○

5. Any additional comments regarding this section?

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Section 3 - DEMOGRAPHICS - please tell me a bit about yourself. **Page 3 of 3**

1. What is (was, if retired) your occupation?	
2. Does (did) your work relate to rocky shores, if so how?	
3. When you go to a rocky shore, where do you typical go (e.g. Wembury)?	
4. Within the past 12 months, how often have you visited rocky shores?	○ Everyday ○ Several times a week ○ Once a week ○ Once or twice a month ○ Once every 2-3 months ○ Once or twice ○ Never
5. Who do you typically go with?	○ On my own ○ With someone else ○ As a group ○ With my dog (s) ○ With the family ○ Other
6. Where do you live (please provide the first part of your post code, e.g. PL5)?	
7. During your childhood (0-11years), where did you live?	○ Urban ○ Suburban ○ Rural
8. What is your gender?	○ Male ○ Female
9. How old are you?	○ 18-24 ○ 25-30 ○ 31-40 ○ 41-50 ○ 51-60 ○ 61+
10. Any Additional Comments?	

Next

An example of the survey administered for Study 2 in Chapter 3:

(Note. Section 1 and 2 were counterbalanced and a collective debrief was given at the end of the conference):

ROCKY SHORE SHORT SURVEY:

Exploring the Effects of Visiting Rocky Shores

How do visits to rocky shores affect people? How do the same visits affect the rocky shore environment?

As part of an interdisciplinary project that is looking at the interaction between humans and nature, I am exploring these questions. I will be examining a specific environment (rocky shores - the intertidal area where solid rock predominates) and looking at both the effects humans have on rocky shores and the effects the environment has on humans. As experts in this environment, I would highly value your opinions and observations, reflecting on your professional experience.

Photo of the rocky shore at Wembury, Devon, taken by Kayleigh Wyles

Please complete the **three sections** of this survey that will take **around 10 minutes**. Feel free to write as much or as little as you would like. Your responses will be kept confidential and completely anonymous. Once completed, please post in the box at the conference reception. More information on this study will be provided during the scheduled poster session.

Thank you for your time,

Kayleigh Wyles
(Kayleigh.Wyles@plymouth.ac.uk)
PhD Student, University of Plymouth

Research carried out on behalf of the University of Plymouth, funded by the NERC/ESRC:

SECTION 1 IMPACTS ON THE ENVIRONMENT.

1. From your experience, please rate the list of activities below according to:

   a. How **common** each activity is on intertidal rocky shores (tick the appropriate box for each activity);

Activity:	*Not common at all*		*Moderately common activity*		*Very common activity*
a. **Walking** – going for a walk along the shore	☐	☐	☐	☐	☐
b. **Dog Walking** – taking dog(s) for a walk along the shore	☐	☐	☐	☐	☐
c. **Swimming** – swimming around rocky shores / in rock pools	☐	☐	☐	☐	☐
d. **Crabbing** – catching crabs for consumption or leisure purposes	☐	☐	☐	☐	☐
e. **Fishing** – catching fish for consumption or leisure purposes	☐	☐	☐	☐	☐
f. **Playing** – playing games as a group / family	☐	☐	☐	☐	☐
g. **Sunbathing / Relaxing** – sitting or laying on the shore	☐	☐	☐	☐	☐
h. **Rock Pooling** – exploring pools of water	☐	☐	☐	☐	☐
i. **Wildlife Watching** – observing animals/birds	☐	☐	☐	☐	☐
j. **Picnicking** – eating food on the shore	☐	☐	☐	☐	☐
k. **Bait Collection** – collecting bait for commercial or leisure purposes	☐	☐	☐	☐	☐
l. **Other**: _____	☐	☐	☐	☐	☐

   b. The potential **level of impact** they have **on** rocky shores (tick the appropriate box for each activity).

Activity:	*No impact*		*Moderate impact*		*Severe impact*
a. **Walking** – going for a walk along the shore	☐	☐	☐	☐	☐
b. **Dog Walking** – taking dog(s) for a walk along the shore	☐	☐	☐	☐	☐
c. **Swimming** – swimming around rocky shores / in rock pools	☐	☐	☐	☐	☐
d. **Crabbing** – catching crabs for consumption or leisure purposes	☐	☐	☐	☐	☐
e. **Fishing** – catching fish for consumption or leisure purposes	☐	☐	☐	☐	☐
f. **Playing** – playing games as a group / family	☐	☐	☐	☐	☐
g. **Sunbathing / Relaxing** – sitting or laying on the shore	☐	☐	☐	☐	☐
h. **Rock Pooling** – exploring pools of water	☐	☐	☐	☐	☐
i. **Wildlife Watching** – observing animals/birds	☐	☐	☐	☐	☐
j. **Picnicking** – eating food on the shore	☐	☐	☐	☐	☐
k. **Bait Collection** – collecting bait for commercial or leisure purposes	☐	☐	☐	☐	☐
l. **Other**: _____	☐	☐	☐	☐	☐

2. If there was one visitor-related behaviour you would change in regard to damage caused to rocky shores' species or habitats, what would it be and why?

_____

_____

_____

_____

SECTION 2 **IMPACTS ON THE VISITORS.**

1. Below is the same list of activities as for Section 1. This time, I would like you to think about the momentary change in happy feelings you think visitors may experience after doing each activity. Please rate the change for each activity by putting a cross anywhere on the line.

Activity:	*Much less happy* — *No change* — *Much more happy*
a. **Walking** – going for a walk along the shore	
b. **Dog Walking** – taking dog(s) for a walk along the shore	
c. **Swimming** – swimming around rocky shores / in rock pools	
d. **Crabbing** – catching crabs for consumption or leisure purposes	
e. **Fishing** – catching fish for consumption or leisure purposes	
f. **Playing** – playing games as a group / family	
g. **Sunbathing / Relaxing** – sitting or laying on the shore	
h. **Rock Pooling** – exploring pools of water	
i. **Wildlife Watching** – observing animals/birds	
j. **Picnicking** – eating food on the shore	
k. **Bait Collection** – collecting bait for commercial or leisure purposes	
l. **Other**: _____	

2. I am also interested in people's perceptions of whether a visit to a rocky shore could change an individual's marine awareness (their knowledge and understanding of particular marine topics) without any professional guidance (e.g. signs or interpreters). To examine this, what **level of change in awareness** do you think visitors generally experience after visiting a rocky shore in terms of: (please tick the relevant box)

	No change in awareness		Moderate change in awareness		A large increase in awareness
The overall **biology** of a rocky shore environment	☐	☐	☐	☐	☐
The overall **ecology** of a rocky shore environment	☐	☐	☐	☐	☐
The **natural threats** faced by organisms (including via habitat destruction) on rocky shores	☐	☐	☐	☐	☐
The **general human**-induced challenges facing rocky shore organisms (e.g. oil spills)	☐	☐	☐	☐	☐
The **specific visitor**-induced threats to rocky shore organisms (e.g. from trampling)	☐	☐	☐	☐	☐

3. Do you have any additional comments regarding visitor's experiences?

_____
_____
_____
_____

SECTION 3 **DEMOGRAPHICS** - please tell me a bit about yourself.

1. What is your occupation? _____

2. Does your work (or previous work) relate to the intertidal rocky shore environment, and if so, how? (e.g. for a specific research question or for training students in the field) _____
_____
_____

3. What type of institution are you affiliated with?
   - ☐ **University**
   - ☐ **Government Body**
   - ☐ **Non-Governmental Organisation**
   - ☐ **Other** _____

4. How long have you worked in the coastal field? _____ (years)

5. Where are your typical places of work (country and region e.g. UK - south west)? _____
_____ _____

6. What is your gender? (please circle) **Male** **Female**

7. What is your nationality? _____

8. How old are you? (please circle) **18-24** **25-30** **31-40** **41-50** **51-60** **61+**

9. Any general additional comments?

_____
_____

THANK YOU FOR YOUR TIME AND HELP.

D. Chapter 3: Additional Analyses

Table D.1. *The means (and standard deviations) for the commonness and harmfulness measures that were combined to produce the total risk measure, for both Study 1 with coastal experts (n = 25) and coastal users (n = 97), and Study 2 with international coastal academics (n = 44).*

	Perceived Commonness				**Perceived Harmfulness**			
	Study 1			**Study 2**	**Study 1**			**Study 2**
	Overall	Coastal Experts	Coastal Users	Overall	Overall	Coastal Experts	Coastal Users	Overall
Walking	4.20 (1.02)	3.72 (1.28)	4.32 (0.91)	3.55 (1.15)	2.50 (0.84)	2.60 (0.71)	2.47 (0.87)	2.36 (0.92)
Dog walking	3.89 (1.18)	3.28 (1.28)	4.05 (1.11)	2.56 (1.18)	2.89 (0.92)	2.56 (0.92)	2.98 (0.90)	2.21 (0.97)
Jogging	2.43 (1.13)	2.00 (1.04)	2.55 (1.13)	-	2.54 (0.98)	2.17 (0.96)	2.63 (0.97)	-
Swimming	3.12 (1.07)	2.72 (1.02)	3.23 (1.07)	2.84 (1.29)	1.83 (0.78)	1.84 (0.69)	1.82 (0.80)	1.61 (0.69)
Snorkelling	2.89 (1.11)	3.12 (1.13)	2.82 (1.11)	-	2.04 (0.91)	2.16 (0.90)	2.01 (0.92)	-
Crabbing	3.46 (1.19)	3.48 (1.23)	3.45 (1.18)	2.69 (1.20)	3.31 (0.95)	3.40 (0.87)	3.29 (0.98)	3.45 (0.99)
Fishing	3.70 (0.97)	3.64 (0.91)	3.71 (0.99)	3.52 (1.19)	3.39 (0.98)	3.44 (0.96)	3.38 (0.98)	3.42 (1.01)
Playing with Family	3.96 (0.98)	3.76 (1.01)	4.01 (0.97)	2.44 (1.20)	2.70 (0.92)	2.60 (0.87)	2.73 (0.93)	2.30 (1.07)
Paddling	3.77 (1.08)	3.44 (1.08)	3.86 (1.07)	-	2.14 (0.88)	2.40 (0.71)	2.07 (0.92)	-
Sunbathing / Relaxing	3.40 (1.24)	2.76 (1.27)	3.56 (1.19)	3.07 (1.40)	1.71 (0.79)	1.52 (0.59)	1.76 (0.83)	1.68 (0.71)
Rock pooling	4.29 (0.96)	4.44 (0.92)	4.25 (0.97)	3.39 (1.20)	3.34 (1.03)	3.60 (0.96)	3.28 (1.05)	2.70 (1.09)
Wildlife Watching	3.70 (1.10)	3.88 (1.05)	3.65 (1.11)	3.12 (1.26)	1.79 (0.86)	2.04 (0.89)	1.72 (0.85)	1.80 (0.76)
Picnicking	3.48 (1.11)	3.08 (1.15)	3.58 (1.09)	2.88 (1.31)	2.81 (1.14)	2.44 (1.16)	2.91 (1.12)	2.39 (0.95)
Fossil Hunting	2.65 (1.33)	2.71 (1.43)	2.63 (1.31)	-	3.43 (1.16)	3.25 (1.23)	3.47 (1.14)	-
Cycling	1.52 (0.84)	1.20 (0.50)	1.60 (0.89)	-	2.88 (1.40)	2.21 (1.44)	3.05 (1.35)	-
Bait collecting	-	-	-	2.65 (1.21)	-	-	-	3.58 (1.12)

Note. Perceived commonness ranged from 1 (*not common at all*) to 5 (*extremely common*); perceived harmfulness ranged from 1 (*harmless*) to 5 (*extremely harmful*).

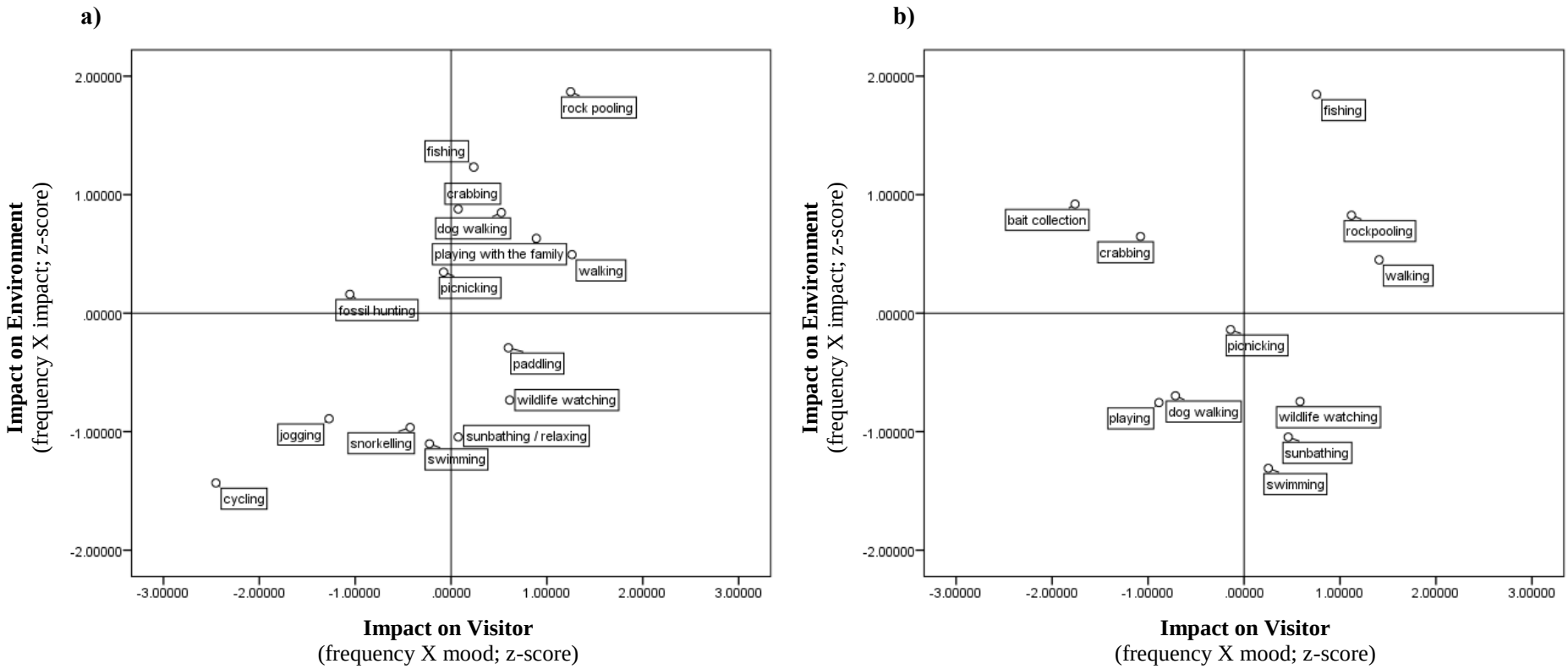


Figure D.1. Activity plots according to impact on the environment (with positive values referring to greater risk) and on the visitor (with positive values referring to great change in positive mood). Each variable is multiplied by perceived frequency to calculate total impacts. Fig. a) is for Study 1 with coastal experts and coastal users rating 15 activities (n = 122); Fig b) is for Study 2 with international experts rating 11 activities (n = 44).

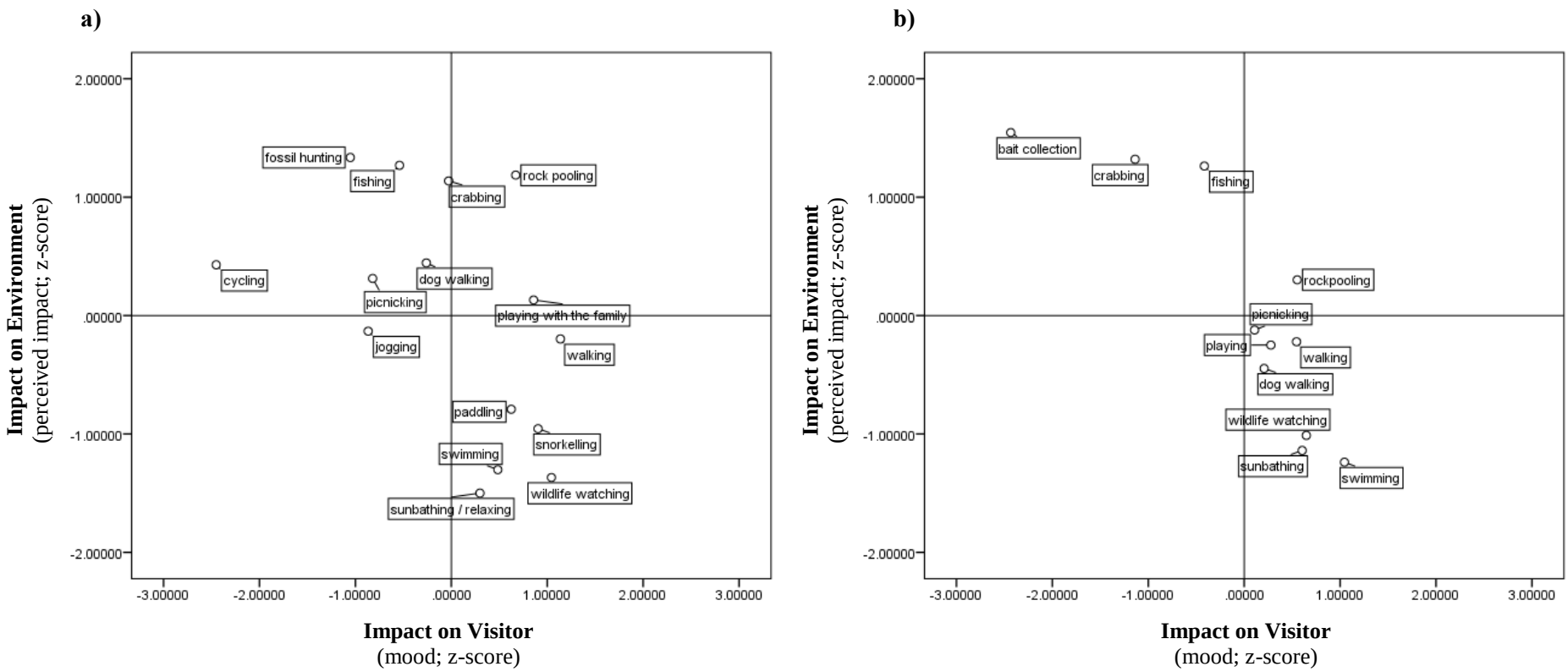


Figure D.2. Activity plots according to impact on the environment (with positive values referring to greater risk) and on the visitor (with positive values referring to great change in positive mood). The variables plotted are the average raw ratings for perceived impact and change in mood (excluding perceived frequency). Fig. a) is for Study 1 with coastal experts and coastal users rating 15 activities (n = 122); Fig b) is for Study 2 with international experts rating 11 activities (n = 44).

E. Additional Analyses: Correlations

Analysis

The primary focus of the thesis was to examine the impacts of differing aspects (e.g. activities, quality of the shore) of visiting rocky shores on well-being and marine awareness (as described in Section 3.2.1.4). However, to supplement this work, additional analyses were run in order to briefly explore the relationships between these variables. As addressed in Section 3.2.1.4, both parametric and non-parametric tests were run (Pearson's and Spearman's); with the former reported unless conclusions differed.

Study 1: Coastal experts and coastal users

As the activities were rated differently on the main measures (impact on the environment and impact on the visitor measures), it would be inappropriate to combine the activities for the correlational analysis. In order to examine the correlations between the main variables (risk to the environment, mood, arousal and marine awareness), correlations were run for each individual activity with the overall trends explained. As there were occasional discrepancies between Pearson's and Spearman's analysis, the latter was reported.

A positive correlation between risk to the environment and mood was generally found, implying that the more harmful activities are to the environment are also beneficial to people's mood. This was only significant for walking, playing, paddling, and rock pooling ($r_s > .19$, $p < .04$). A positive correlation between risk and arousal was also found for most activities, whereby as level of risk increases, individuals' excitement also increases, and as risk declines, individuals' feel calmer. Crabbing and fossil hunting were the only activities where this correlation was significant ($r_s > .18$, $p < .05$). There were no statistically significant correlations between risk and marine awareness, however most (10/15) activities suggested negative correlations, where the more people learn, the less impact the activity will have on the environment (ps > .09).

Most activities (12/15) found that as mood increases, arousal decreases (people feel calmer). This pattern was statistically significant for dog walking, jogging,

sunbathing/relaxing, and picnicking ($r_s > -.20$, $p < .03$); whereas a positive correlation was found for crabbing ($r_s = .18$, $p = .05$). All activities had a positive correlation between mood and marine awareness, but was only statistically significant for dog walking, fishing and playing ($r_s > .19$, $p < .04$). This suggests as mood increases, people's marine awareness also increases. Regarding arousal and marine awareness, most activities were negatively correlated, suggesting that when people feel calmer, their marine awareness increases. However, this correlation was only significant for walking and sunbathing/relaxing ($r_s > -.23$, $p < .01$).

Study 2: International academics

For the international academic sample, there were no statistically significant correlations (*p*s > .08). The general patterns were that as risk to the environment increases, so does happiness and marine awareness but as happiness increases, marine awareness is seen to decline.

Study 3: Field study on current visitors

Table E.1. *Correlation coefficients between variables for Study 3 (n = 214).*

		Mood (after)	**Meaning** (after)	**Satisfied** (after)	**Subjective MA** (before)	**Subjective MA** (after)	**PRS**
Well-being	Mood (before)	.461***	.369***	.299**	.077	.114	.258***
	Mood (after)		.383***	.554***	.049	.138*	.211**
	Meaning (after)			.433***	.064	.063	.350***
	Satisfied (after)				-.006	.055	.261***
Marine Aware	Subjective MA (before)					.844***	.029
	Subjective MA (after)						.044

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Spearman's reported.

Study 4: Quantitative-focused laboratory study

As there were differences between the conditions for each variable, it would have been inappropriate to combine them. Consequently, the overall patterns are reported. As preferences increased, both happiness and restorative ratings also increased for all four experimental conditions (ps < .001), whereas arousal declined (thus was more calming) but was only found to be statistically significant for the clean condition (p = .01). As happiness increased, restorativeness was also found to increase for all conditions (ps < .001); however the relation with arousal was mixed and statistically non-significant. The relationship between arousal and perceived restorativeness was also mixed, with two significant negative correlations whereby as participants felt more calm the more restorative they found the environment (for the clean and seaweed condition, ps < .008). Connectedness to nature was also found to increase with preference ratings for the clean and seaweed conditions (ps < .02) and also with arousal and restorativeness for these two conditions (ps < .03). In contrast, as connectedness increased, arousal was seen to decline (thus more calming) for the seaweed condition (ps < .04).

Study 5: Qualitative-focused laboratory study

As before, the overall patterns are reported. As preferences increased, both happiness and restorative ratings also increased for all four experimental conditions (ps < .02), whereas no significant correlations were found between arousal and preference (p > .16). Similarly to Study 4, as happiness increased, restorativeness was also found to increase (statistically for three of the conditions ps < .001); however the relation with arousal was mixed and statistically non-significant. The relationship between arousal and perceived restorativeness was also mixed and not statistically significant. Unlike Study 4, connectedness was not statistically correlated with any of these variables.

The two marine awareness measures (subjective and objective) originally included to pilot the measures were not found to correlate with any of the other variables, including between themselves (r_s = -.20, p = .40).

Study 6: Current beach cleaning volunteers' experiences

There were a number of correlations between variables (see Table E.2). Within the main constructs, it was evident that the two after measures of hedonic well-being were correlated ($p < .001$), and that the types of well-being (hedonic and eudaimonic) were positively correlated (ps $< .02$). The two awareness measures were not statistically correlated, potentially implying that very different constructs were measured or highlighting measurement issues.

Between the different constructs, it was noted that participants' intention to perform pro-environmental behaviours increased with well-being (both hedonic and eudaimonic). Behavioural intentions also increased with subjective marine awareness, but this was not as strong ($p = .04$). The meaningfulness of the beach clean was also positively correlated with subjective marine awareness, implying that those who found the experience meaningful also felt their awareness about the issue also increased.

Table E.2. *Correlation coefficients between variables for Study 6 from Chapter 6.*

		Well-being			**Marine Awareness**				**Behaviour**
		Mood (after)	**Satisfied** (after)	**Meaning** (after)	**Subjective MA** (before)	**Subjective MA** (after)	**Objective MA** (before)	**Objective MA** (after)	**Intention** (after)
Well-being	Mood (before)	.517***	.167	.250*	-.061	.119	-.134	.110	.226
	Mood (after)		.355**	.283*	.060	.135	-.123	.133	.380***
	Satisfied (after)			.486***	.007	.198	.068	-.142	.444***
	Meaning (after)				.006	.260*	.069	-.064	.451***
Marine Awareness	Subjective MA (before)					.474***	-.010	-.172	.114
	Subjective MA (after)						-.119	-.179	.234*
	Objective MA (before)							.028	.020
	Objective MA (after)								-.045

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Spearman's reported.

Study 7: Comparing beach cleans to other activities

As in Study 6, it was evident that the two after measures of hedonic well-being were correlated, and that the types of well-being (hedonic and eudaimonic) were positively correlated. Subjective marine awareness was only statistically positively correlated with both objective marine awareness measures at time 3, but only with the litter related one in time 2. The two objective awareness measures were not statistically correlated, suggesting (as intended) that they measured different constructs (awareness about marine litter and about biodiversity). The intention measures were also highly correlated.

Between the different constructs, after the activities well-being (hedonic and eudaimonic) was positively correlated with subjective marine awareness and objective marine awareness regarding marine litter, indicating that as mood increases, awareness also increases. This pattern is also consistent between well-being and behavioural intentions. As both subjective and objective (litter) marine awareness increased overall behavioural intention also increased.

Table E.3. *Correlation coefficients between variables for Study 7 at baseline.*

	Marine Awareness				
	Subjective MA	**Objective MA – litter**	**Objective MA – bio**	**Behavioural Intentions**	**Connectedness**
Mood	.026	.175	-.041	.016	.155
Subjective MA		.016	.120	.079	.091
Objective MA - litter			.165	.811***	-.117
Objective MA – bio				.214*	.028
Overall intent					.365***

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Pearson's reported.

Table E.4. *Correlation coefficients between variables for Study 7 immediately after the activity*.

	Well-being		**Marine Awareness**					
	Satisfaction	**Meaning**	**Subjective MA**	**Objective MA – litter**	**Objective MA – bio**	**Behavioural Intentions**	**Connectedness**	**Restorativeness**
Mood	.577**	.323***	.278**	.167	-.106	.166	.193	.450***
Satisfaction		.603***	.282**	.389***	.041	.399***	.266*	.436***
Meaning			.423***	.550***	-.077	.594***	.500***	.306**
Subjective MA				.359***	.034	.464***	.278**	.246*
Objective MA - litter					.010	.884***	-.039	.082
Objective MA – bio						-.019	.029	-.029
Overall intent							.443***	.449***
Connectedness								.149

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Pearson's reported.

Table E.5. *Correlation coefficients between variables for Study 7 one week after the activity.*

	Well-being	**Marine Awareness**					
	Meaning	**Subjective MA**	**Objective MA – litter**	**Objective MA – bio**	**Overall intent**	**Connectedness**	**Restorativeness**
Satisfaction	.626***	.140	.297**	-.057	.337***	.196	.371***
Meaning		.237*	.587***	.069	.585***	.474***	.210*
Subjective MA			.354***	.327**	.416***	.230*	.323**
Objective MA - litter				.087	.905***	-.096	.112
Objective MA – bio					.137	.040	-.050
Overall intent						.478***	.456***
Connectedness							.149

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Pearson's reported.

F. Chapter 4: Materials

The before-survey given to participants:

Participant ID: _____ (researcher to complete)

COASTAL SURVEY

Section 1: Your Visit

1. Where do you plan to go? (Please tick those that are most appropriate)
   - ☐ Shore (sand / rocks)
   - ☐ Coastal Path
   - ☐ Town
   - ☐ Other

Section 2: Current Emotion

1. How do you feel right now? Please rate each statement on how you feel at this moment:

I feel…	Not at all		Somewhat		Very Strongly
a. happy	☐	☐	☐	☐	☐
b. nervous / anxious	☐	☐	☐	☐	☐
c. sad / depressed	☐	☐	☐	☐	☐
d. content / relaxed	☐	☐	☐	☐	☐
e. frustrated	☐	☐	☐	☐	☐
f. calm	☐	☐	☐	☐	☐
g. that my mind is focused rather than scattered	☐	☐	☐	☐	☐
h. that my mind is in another place	☐	☐	☐	☐	☐

Section 3: Marine Awareness

1. I am interested in existing levels of awareness / knowledge on different marine topics specifically related to rocky shores (the intertidal area where solid rock predominates like here). Please rate the level of awareness you feel you have on the five topics below (please tick the relevant box for each):

	Lower than average awareness	Slightly lower than average	Average level of awareness	Slightly higher than average	Higher than average level of awareness
The overall **biology** (the science of life) of a rocky shore environment	☐	☐	☐	☐	☐
The overall **ecology** (the interactions between organisms and their environment) of a rocky shore environment	☐	☐	☐	☐	☐
The **natural threats** faced by organisms (including via habitat destruction) on rocky shores	☐	☐	☐	☐	☐
The **general human**-induced challenges facing rocky shore organisms (e.g. oil spills)	☐	☐	☐	☐	☐
The **specific visitor**-induced threats to rocky shore organisms (e.g. from walking)	☐	☐	☐	☐	☐

Section 4: Demographics

1. Within the past 12 months (not including today), how often have you visited areas with rocky shores (the intertidal area where solid rock predominates)? (please circle)

Everyday	Several times a week	Once a week	Once or twice a month	Once every 2-3 months	Once or twice a year	Never

2. Within the past 12 months (not including today), how often have you visited **this particular site**? (please circle)

Everyday	Several times a week	Once a week	Once or twice a month	Once every 2-3 months	Once or twice a year	Never

3. What is your gender? (please circle) **Male** **Female**

4. How old are you? (please circle) **16-24** **25-30** **31-40** **41-50** **51-60** **61+**

5. Where have you travelled from today (please provide *just* the first part of the post code. e.g. PL5)? __ __ __ __

   Note. All answers will be kept anonymous and kept confidential

6. If different to question 5, where do you live (*just* the first part of your post code, e.g. PL5)? __ __ __ __

   Note. All answers will be kept anonymous and kept confidential

7. What is your highest level of education? _____

8. What is (was, if retired) your occupation? _____

9. Any general additional comments?

   _____

   _____

   _____

   _____

The after-survey:

Participant ID: _____ (researcher to complete)

Hope you enjoyed your visit. Thank you for returning to complete the final measures. Some of the questions will look familiar, but please complete as much as you can.

Thank you

Section 1: Current Emotion

1. How do you feel right now? Please rate each statement on how you feel at this moment:

I feel…	Not at all		Somewhat		Very Strongly
a. happy	☐	☐	☐	☐	☐
b. nervous / anxious	☐	☐	☐	☐	☐
c. sad / depressed	☐	☐	☐	☐	☐
d. content / relaxed	☐	☐	☐	☐	☐
e. frustrated	☐	☐	☐	☐	☐
f. calm	☐	☐	☐	☐	☐
g. that my mind is focused rather than scattered	☐	☐	☐	☐	☐
h. that my mind is in another place	☐	☐	☐	☐	☐

2. Please rate how strongly you agree with each statement on how you feel about today's overall activities compared to other activities you could have done:

Today's activities were…	Not at all		Somewhat		Very Strongly
a. worthwhile and meaningful to me	☐	☐	☐	☐	☐
b. worthwhile and meaningful to my friends/family	☐	☐	☐	☐	☐
c. in line with my values	☐	☐	☐	☐	☐

3. All things considered, how satisfied are you with your visit today on a scale from 1 to 10?

Very Unsatisfied									Very Satisfied
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1	2	3	4	5	6	7	8	9	10

Section 2: Marine Awareness

1. Please rate the level of awareness you feel you have on the five topics below relating to rocky shores (the intertidal area where solid rock predominates) (please tick the relevant box for each)

	Lower than average awareness	Slightly lower than average	Average level of awareness	Slightly higher than average	Higher than average level of awareness
The overall **biology** (the science of life) of a rocky shore environment	☐	☐	☐	☐	☐
The overall **ecology** (the interactions between organisms and their environment) of a rocky shore environment	☐	☐	☐	☐	☐
The **natural threats** faced by organisms (including via habitat destruction) on rocky shores	☐	☐	☐	☐	☐
The **general human**-induced challenges facing rocky shore organisms (e.g. oil spills)	☐	☐	☐	☐	☐
The **specific visitor**-induced threats to rocky shore organisms (e.g. from walking)	☐	☐	☐	☐	☐

Section 3: The Coastal Experience: Restorative properties of being on the coast.

1. In regard to this particular coastal site, please rate your level of agreement with the following statements:

		Completely disagree			Neither agree nor disagree			Completely agree
a.	This site is a place which is away from everyday demands and where I would be able to relax and think about what interests me	☐	☐	☐	☐	☐	☐	☐
b.	This place is fascinating; it is large enough for me to discover and be curious about things	☐	☐	☐	☐	☐	☐	☐
c.	This site is a place which is very large, with no restrictions to movements; it is a world of its own	☐	☐	☐	☐	☐	☐	☐
d.	Here, it is easy to orient and move around so that I could do what I like	☐	☐	☐	☐	☐	☐	☐

Section 4: Your Day at the Coast

1. On the map attached, please highlight the **route** you walked / areas you visited.
2. Please complete a brief diary (see separate booklet)

Section 5: Final Note

1. Are you aware of the Seashore Code (a sustainable guide to exploring the coast)? (please tick the most relevant box)

Not at all		Vaguely		Completely
☐	☐	☐	☐	☐

2. To what degree did you follow it? (please tick the most relevant box)

Not at all				Completely
☐	☐	☐	☐	☐

The first page of the activity diary illustrating how it should be completed:

Participant ID: _____ (researcher to complete)

COASTAL SURVEY

Diary Component

Section 4: Your Day at the Coast

1. I would like to know what **you** (as an individual) did whilst at the coast. Please complete a brief diary of your day whilst at the coast; split into different activities. For each activity, write what you did with a brief description of what that involved, overall time spent doing it, how many different times you did it, where (out of the options available) and who with. Finally, please rate how you felt.

For example:

Activity 6	Title: *Rock pooling*	Where:	With: *My 2 children*
	Description: *Looking for animals in rock pools. Found a couple of shrimps!*	☐ In the sea ☒ On the rocks ☐ On sand/shingle ☐ On a path ☐ In a building ☐ Other	For how long (total): *0 hr 30 min* How many times: *3x*

How did you feel during this activity on a scale from 0 to 100 (put a cross on the line or state a number):

0 = Very Unhappy — *50 = Neutral* — *100 = Very Happy*

0 = Very Calm — *50 = Neutral* — *100 = Very Excited*

1

An example of the accompanying map:

(South Milton Sands; not presented in the current thesis)

[Figure has been removed due to Copyright restrictions]

The table the data collectors completed

(Before and after respectively):

Consent Notes:

Weather cond.	Busyness	PP No	Time	Group		Consent ?	Clothing / Brief car details	Comments
				No of children (<18)	No of adults (>18)			

After Collector's Notes:

Weather cond.	Busyness	PP No	Time (of survey)	Actual Departure	Comments

G. Chapter 4: Additional Analyses

Site specific demographics

Table G.1. *The demographic information for the two separate sites used in Study 3.*

	Wembury (*n* = 108)	**South Milton Sands** (*n* = 106)
Gender	75 (69%) females	58 (55%) females
Age	Largest category: 31-40 (33%) then 41-50 (29%)	Largest category: 41-50 (29%) then 31-40 (26%)
Education	Largest category: university qualification (33%) or professional (27%)	Largest category: university qualification (33%) or professional (26%)
Occupation	Most careers clearly not related to rocky shores (89%)	Most careers clearly not related to rocky shores (86%)
Frequency of visits to rocky shores	Largest category: once or twice a month (31%)	Largest category: once or twice a year (31%)
Frequency of visits to this site	Largest category: never visited before (27%)	Largest category: never visited before (29%)
Local / Tourist	64 (59%) travelled from home	43 (41%) travelled from home
Distance Travelled (time)	24 min (*SD* = 23 min)	24 min (*SD* = 35 min)
Distance From Home (time)	1 hr 41 min (*SD* = 1 hr 49 min)	2 hr 33 min (*SD* = 2 hr 2 min)
Group size	1 (*SD* = 1.46) children 2 (*SD* = 2.02) adults	1 (*SD* = 0.94) children 2 (*SD* = 1.91) adults
With dog(s)	8 (7%) with dogs	38 (36%) with dogs
Time on shore	3 hrs and 11 min (*SD* = 9 minutes)	3 hrs and 9 min (*SD* = 10 minutes)
Day of week	75 (69%) on a weekday	106 (100%) on a weekday
School Holidays	59 (55%) during school holidays	34 (32%) during school holidays
Drop-out rate	36 (24%)	19 (15%)

Additional non-reported measures

A self-reported measure of attention was included on the same scale as the positive and negative affect scales: from *not at all* (1) to *very strongly* (5). Participants were asked how strongly they felt *that my mind is focused rather than scattered* and *that my mind is in another place*. When combined this made a reasonably poor reliable scale (Cronbach's $\alpha > .57$).

Attention was found to significantly increase from an average of 3.93 (*SD* = 1.08) to 4.14 (*SD* = 1.04), t (208) = 2.81, $p = .005$, $d = .20$ (small effect).

Additional activity results

Table G.2. *The descriptive data for each of the nine activities.*

	Number	Duration (minutes)	Frequency	Who with (freq of each category)	Where (freq of each category)
Relaxing Activities	92	M = **98.82** SD = 87.74 Range = 5-360	M = **2.16** SD = 1.93 Range = 1-8	28 = On own 3 = pet(s) 16 = 1 other 3 = child(ren) **34 = group** 5 = 1 other + dog	0 = sea 5 = rocks **78 = sand** 3 = path 0 = building 3 = other 1 = mixed
Enjoying surroundings	10	M = **66.89** SD = 113.52 Range = 2-330	M = **3.00** SD = 2.31 Range = 1-6	**4 = On own** 0 = pet(s) **3 = 1 other** 0 = child(ren) 1 = group 2 = 1 other + dog	0= sea 2= rocks 1= sand **5= path** 0= building 0= other 1= mixed
Playing	99	M = **44.71** SD = 41.60 Range = 2-270	M = **1.71** SD = 1.31 Range = 1-8	1 = On own 6 = pet(s) 2 = 1 other **43 = child(ren)** 38 = group 4 = 1 other + dog	2= sea 4= rocks **84= sand** 0= path 0= building 1= other 3= mixed
Water-equipment activities	15	M = **83.21** SD = 76.45 Range = 15-300	M = **1.15** SD = 0.38 Range = 1-2	2 = On own 0 = pet(s) 0 = 1 other 5 = child(ren) **8 = group** 0 = 1 other + dog	**14= sea** 0= rocks 0= sand 0= path 0= building 0= other 1= mixed
Rockpooling	93	M = **45.41** SD = 31.99 Range = 5-120	M = **1.43** SD = 1.00 Range = 1-5	4 = On own 0 = pet(s) 5 = 1 other 27 = child(ren) **51 = group** 4 = 1 other + dog	1= sea **86= rocks** 1= sand 0= path 0= building 0= other 4= mixed
Supervising Children	10	M = **78.75** SD = 39.07 Range = 30-150	M = 1.13 SD = 0.35 Range = 1-2	**5 = On own** 0 = pet(s) 0 = 1 other 0 = child(ren) 1 = group 0 = 1 other + dog	0= sea 0= rocks **7= sand** 0= path 0= building 0= other 1= mixed
Food-related	206	M = **27.58** SD = 16.87 Range = 1-90	M = **1.13** SD = 0.43 Range = 1-3	15 = On own 2 = pet(s) 23 = 1 other 19 = child(ren) **124 = group** 15 = 1 other + dog	0= sea 2= rocks **101= sand** 5= path 69= building 16= other 5= mixed
Swimming	88	M = **39.41** SD = 36.92 Range = 1-180	M = **2.09** SD = 1.58 Range = 1-8	8 = On own 2 = pet(s) 7 = 1 other 23 = child(ren) **45= group** 3 = 1 other + dog	**84= sea** 1= rocks 2= sand 0= path 0= building 0= other 1= mixed
Walking	77	M = **53.85** SD = 36.66 Range = 5-180	M = **1.51** SD = 0.90 Range = 1-5	9 = On own 14 = pet(s) **17 = 1 other** 3 = child(ren) **18 = group** 16 = 1 other + dog	1= sea 4= rocks **23= sand** **25= path** 0= building 0= other 24= mixed

Full regression analyses

Table G.3. *The first regression examining the predictive value of demographic & visitor characteristic variables on overall satisfaction ($n_{participants}$ = 209)*

	B	***SE B***	***β***	***p-value***
Step 1 – Demographic Variables				
R^2 = .03 | Adjusted R^2 = -.03 | F_{change} (11, 190) = 0.55, p =.86				
Constant	8.94	0.24		
Gender (male)	-0.11	0.21	-0.04	.62
Age (16-24)	0.20	0.74	0.02	.79
Age (25-30)	0.28	0.47	0.05	.55
Age (31-40)	0.06	0.26	0.02	.83
Age (41-50 – ref)	-	-	-	-
Age (51-60)	-0.33	0.33	-0.09	.32
Age (61+)	-0.11	0.30	-0.03	.72
Education (none)	-1.94	1.43	-0.10	.18
Education (school)	0.24	0.34	0.06	.48
Education (college)	0.10	0.34	0.02	.76
Education (university - ref)	-	-	-	-
Education (postgraduate)	0.15	0.32	0.04	.64
Education (professional)	0.33	0.26	0.11	.21

Table G.3 Cont. *The first regression examining the predictive value of demographic & visitor characteristic variables on overall satisfaction ($n_{participants}$ = 209)*

	B	***SE B***	***β***	***p-value***
Step 2 – Demographic Variables & Past Experiences R^2 = .10 | Adjusted R^2 = -.02 | F_{change} (12, 178) = 1.12, p = .34				
Constant	8.96	0.33		
Gender (male)	-0.15	0.22	-0.05	.49
Age (16-24)	0.16	0.76	0.02	.83
Age (25-30)	0.23	0.51	0.04	.66
Age (31-40)	0.01	0.27	0.00	.98
Age (41-50 – ref)	-	-	-	-
Age (51-60)	-0.39	0.33	-0.10	.24
Age (61+)	-0.15	0.31	-0.05	.61
Education (none)	-2.17	1.47	-0.11	.14
Education (school)	0.18	0.34	0.05	.60
Education (college)	0.11	0.35	0.03	.75
Education (university - ref)	-	-	-	-
Education (postgraduate)	0.18	0.32	0.04	.58
Education (professional)	0.31	0.26	0.10	.25
Visit rocky shores (everyday)	0.94	0.88	0.10	.29
Visit rocky shores (several)	0.68	0.50	0.16	.17
Visit rocky shores (weekly)	0.16	0.46	0.04	.72
Visit rocky shores (monthly)	0.22	0.35	0.07	.54
Visit rocky shores (couple of months)	0.12	0.32	0.04	.72
Visit rocky shores (yearly - ref)	-	-	-	-
Visit rocky shores (never)	-1.23	0.59	-0.16	.04
Visit that site (everyday)	-0.96	1.34	-0.07	.48
Visit that site (several days)	-0.37	0.60	-0.07	.53
Visit that site (weekly)	-0.77	0.52	-0.14	.14
Visit that site (monthly)	-0.40	0.41	-0.10	.33
Visit that site (2 months)	0.25	0.35	0.07	.47
Visit that site (yearly)	-0.07	0.29	-0.02	.82
Visit that site (never - ref)	-	-	-	-

Table G.3 Cont. *The first regression examining the predictive value of demographic & visitor characteristic variables on overall satisfaction ($n_{participants}$ = 209)*

	B	***SE B***	***β***	***p-value***
Step 3 – Demographic Variables, Past Experiences & Visit Characteristics R^2 = .22 | Adjusted R^2 = .06 | F_{change} (10,168) = 2.47, p = .009				
Constant	8.44	0.86		
Gender (male)	-0.05	0.22	-0.02	.82
Age (16-24)	-0.17	0.85	-0.02	.84
Age (25-30)	0.54	0.50	0.09	.29
Age (31-40)	0.12	0.27	0.04	.66
Age (41-50 – ref)	-	-	-	-
Age (51-60)	-0.19	0.35	-0.05	.59
Age (61+)	-0.05	0.31	-0.02	.87
Education (none)	-1.68	1.47	-0.08	.25
Education (school)	0.05	0.33	0.01	.88
Education (college)	0.22	0.35	0.05	.53
Education (university - ref)	-	-	-	-
Education (postgraduate)	0.11	0.31	0.03	.73
Education (professional)	0.23	0.26	0.07	.38
Visit rocky shores (everyday)	0.92	0.87	0.10	.29
Visit rocky shores (several)	0.71	0.50	0.17	.16
Visit rocky shores (weekly)	0.12	0.47	0.03	.80
Visit rocky shores (monthly)	0.05	0.37	0.02	.89
Visit rocky shores (couple of months)	0.12	0.33	0.04	.72
Visit rocky shores (yearly - ref)	-	-	-	-
Visit rocky shores (never)	-1.37	0.62	-0.18	.03
Visit that site (everyday)	-0.99	1.33	-0.07	.46
Visit that site (several days)	-0.45	0.62	-0.08	.47
Visit that site (weekly)	-0.82	0.53	-0.15	.12
Visit that site (monthly)	-0.39	0.43	-0.10	.36
Visit that site (2 months)	0.10	0.35	0.03	.77
Visit that site (yearly)	-0.10	0.30	-0.03	.75
Visit that site (never - ref)	-	-	-	-
Distance Travelled (time)	-0.01	< 0.01	-0.27	<.001
Distance from home (time)	< 0.01	< 0.01	-0.05	.75
Group (children in group)	-0.07	0.09	-0.08	.43
Group (adults in group)	0.12	0.15	0.08	.44
Group (with dogs)	-0.15	0.28	-0.05	.59
Overall duration	< 0.01	< 0.01	0.21	.01
Day of week (weekday)	0.19	0.31	0.05	.54
Holiday (summer holidays)	0.04	0.23	0.01	.88
Site (Wembury)	0.10	0.25	0.04	.67
Local (vs. tourist)	0.01	0.47	0.00	.98

Exploratory mediation analyses

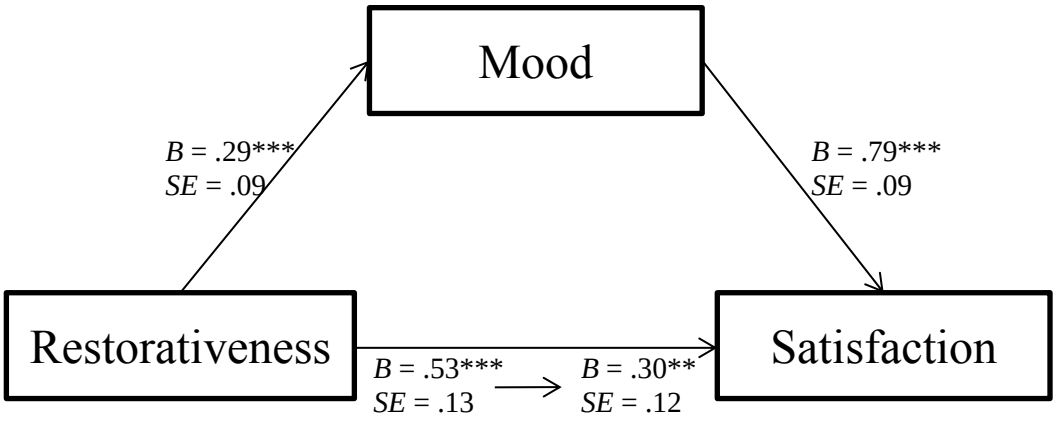


Figure G.1. The exploratory mediation effect between perceived restorativeness, mood (after) and overall satisfaction.
Note. Asterisks indicate the significance of the coefficients: $^{**}p < .01$; $^{***}p < .001$. A bootstrapping procedure (Preacher & Hayes, 2004) found that mood had a partial mediating effect on restorativeness on satisfaction (.22; 95% confidence interval = [0.09, 0.37]).

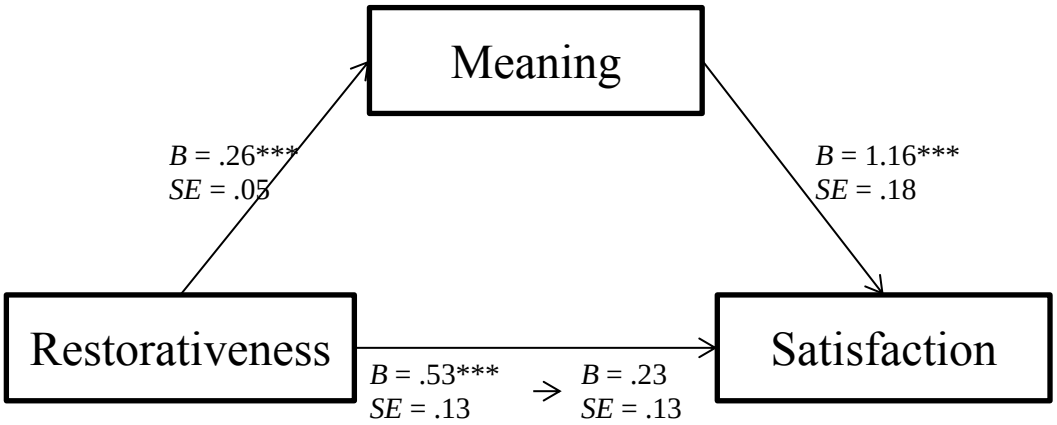


Figure G.2. The exploratory mediation effect between perceived restorativeness, meaning and overall satisfaction.
Note. Asterisks indicate the significance of the coefficients: $^{***}p < .001$. A bootstrapping procedure (Preacher & Hayes, 2004) found that meaning had a full mediating effect on restorativeness on satisfaction (.30; 95% confidence interval = [0.13, 0.54]).

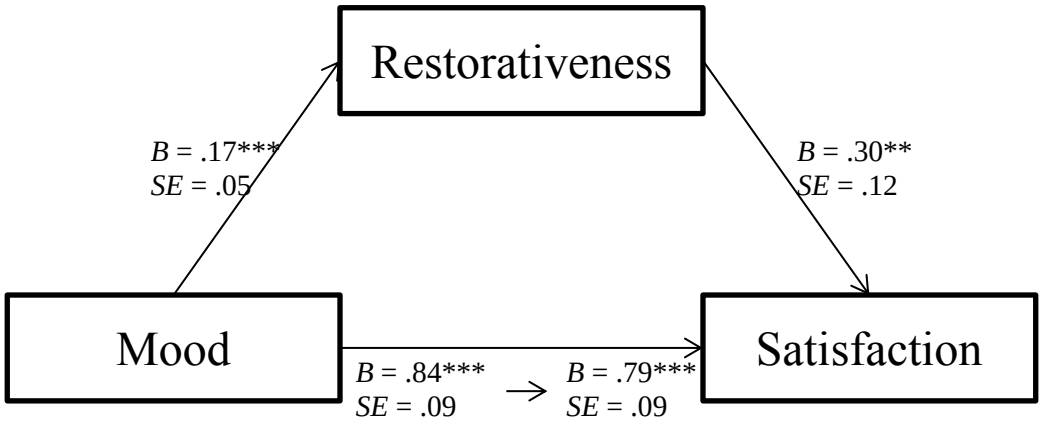


Figure G.3. The exploratory mediation effect between mood (after), perceived restorativeness and overall satisfaction, exploring the other direction.
Note. Asterisks indicate the significance of the coefficients: $^{**}p < .01$; $^{***}p < .001$. A bootstrapping procedure (Preacher & Hayes, 2004) did not find a statistically significant mediating effect on satisfaction (.06; 95% confidence interval = [-0.003, 0.17]).

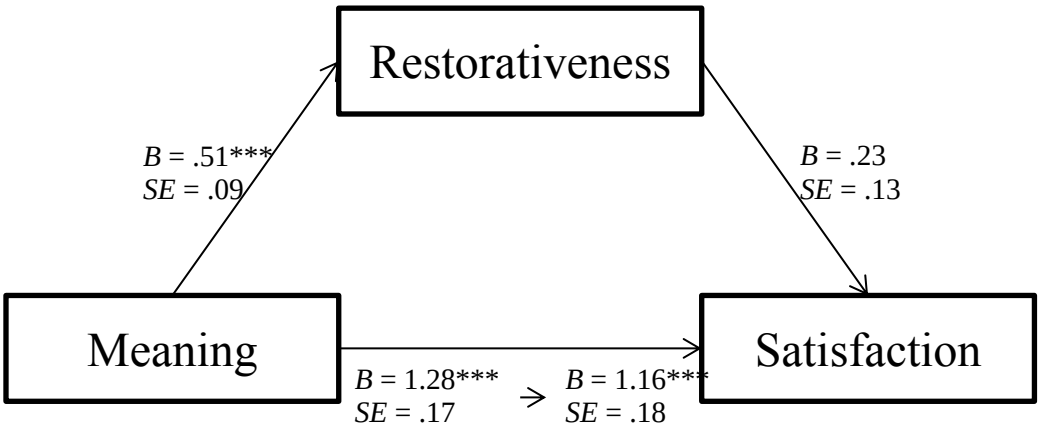


Figure G.4. The exploratory mediation effect between meaning, perceived restorativeness and overall satisfaction, exploring the other direction.
Note. Asterisks indicate the significance of the coefficients: $^{***}p < .001$. A bootstrapping procedure (Preacher & Hayes, 2004) did not find a statistically significant mediating effect on satisfaction (.12; 95% confidence interval = [-0.04, 0.31]).

H. Chapter 5: Materials

Stage 1 of Study 4:

The Connectedness to Nature Scale

Please rate the level of which you agree to each of the statements below:

	Completely disagree				Completely agree
I often feel a sense of oneness with the natural world around me.	1	2	3	4	5
I think of the natural world as a community to which I belong	1	2	3	4	5
I recognise and appreciate the intelligence of other living organisms	1	2	3	4	5
I often feel disconnected from nature [-]	1	2	3	4	5
When I think of my life, I imagine myself to be part of a larger cyclical process of living	1	2	3	4	5
I often feel a relatedness with animals and plants	1	2	3	4	5
I feel as though I belong to the Earth as equally as it belongs to me	1	2	3	4	5
I have a deep understanding of how my actions affect the natural world	1	2	3	4	5
I often feel part of the web of life	1	2	3	4	5
I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'	1	2	3	4	5
Like a tree can be part of a forest, I feel embedded within the broader natural world	1	2	3	4	5
When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature [-]	1	2	3	4	5
I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees	1	2	3	4	5
My personal welfare is independent of the welfare of the natural world [-]	1	2	3	4	5

Stage 2 of Study 4:

Screenshots of the layout of the photo rating component of Study 4

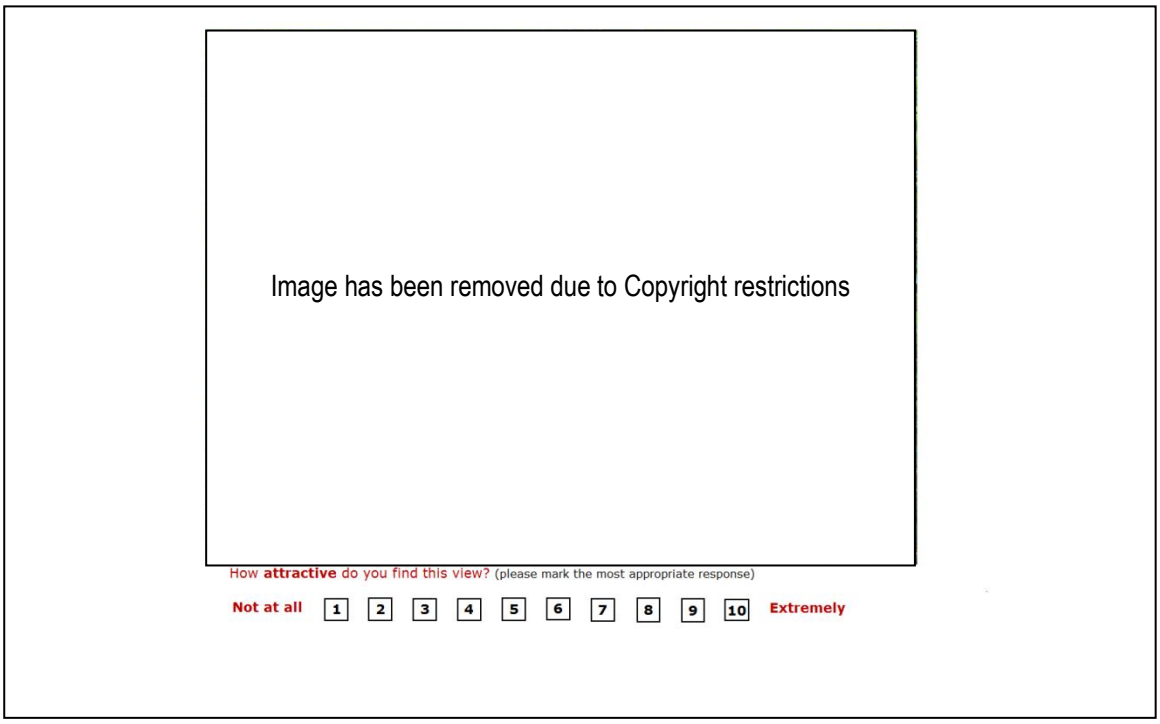


Image has been removed due to Copyright restrictions

How **willing would you be to stay in a hotel** with this view? (please mark the most appropriate response)

Not at all 1 2 3 4 5 6 7 8 9 10 **Extremely**

Image has been removed due to Copyright restrictions

How does the scene make you **feel**? (please mark the most appropriate response)

Very Sad 1 2 3 4 5 6 7 8 9 10 **Very Happy**

Image has been removed due to Copyright restrictions

How does the scene make you **feel**? (please mark the most appropriate response)

Very Calm 1 2 3 4 5 6 7 8 9 10 **Very Excited**

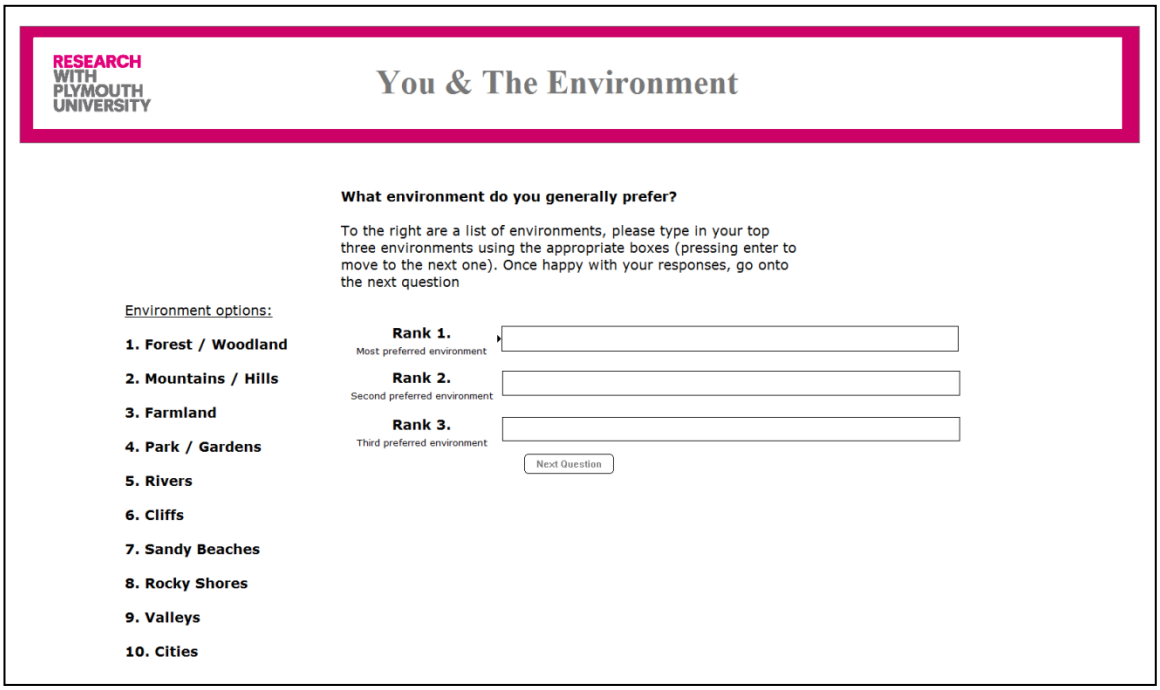
Image has been removed due to Copyright restrictions

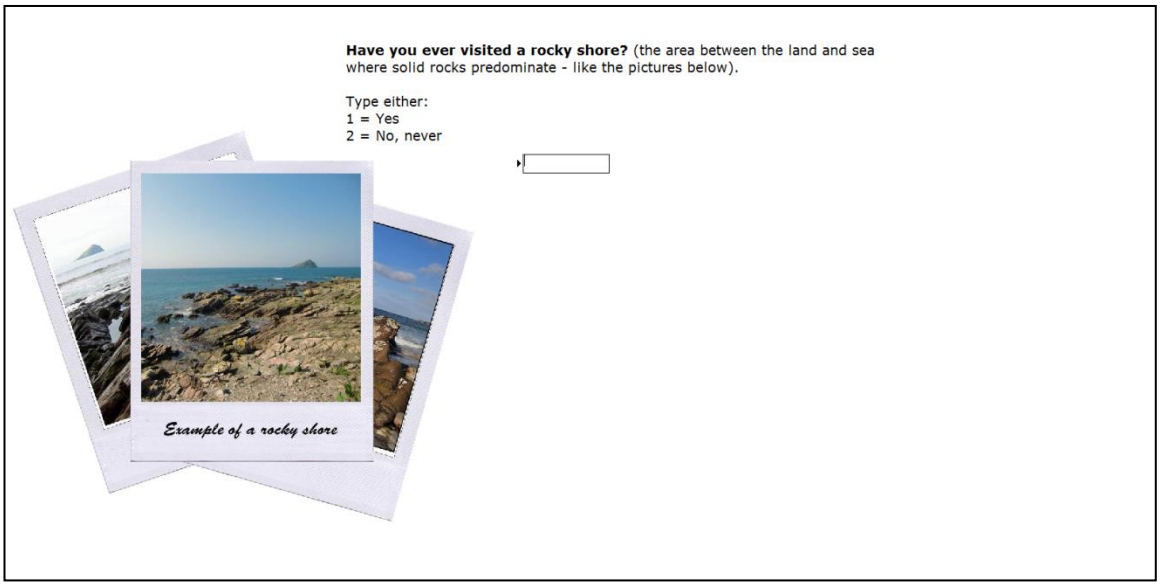
To what level would you agree with the statement: I would be **able the rest and recover** my ability and focus in this environment? (please mark the most appropriate response)

Not at all 1 2 3 4 5 6 7 8 9 10 **Completely**

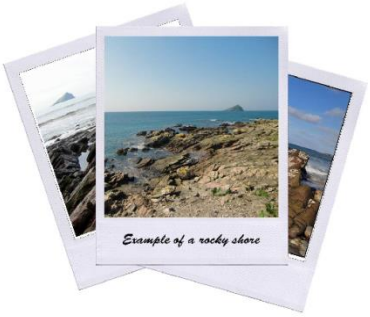
Stage 3 of Study 4:

Screen shots of the additional questions of Study 4





Within the past 12 months, how often have you visited areas with rocky shores? (tick the response most applicable)

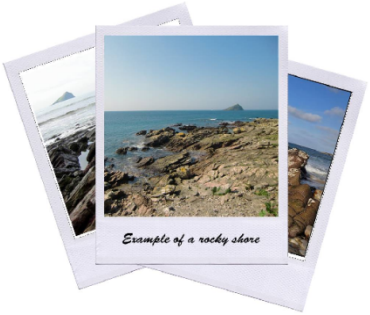


- Everyday
- Several times a week
- Once a week
- Once or twice a month
- Once every 2-3 months
- Once or twice a year
- Not once in the past 12 months

Next question

Please type the name(s) of rocky shores that you typically visit (e.g. Wembury) then press enter.

When you go to a rocky shore, who do you typically go with? (tick the response most applicable)



- On my own
- With someone else
- With my dog(s)
- With dog(s) and one other
- Children
- As a family / group
- Other

Next question

When you go to a rocky shore, what activities do you do?
(tick all that apply)

- ☐ Walking
- ☐ Running
- ☐ Rock pooling (exploring the pools of water)
- ☐ Beach combing (looking for stuff on the beach)
- ☐ Looking for wildlife
- ☐ Relaxing
- ☐ Food / drink
- ☐ Photography
- ☐ Bird watching
- ☐ Listening to music / radio
- ☐ Reading
- ☐ Socialising
- ☐ Playing
- ☐ Supervising children
- ☐ Fishing / crabbing
- ☐ Paddling
- ☐ Swimming
- ☐ Snorkelling / scuba diving
- ☐ Boating
- ☐ Body boarding
- ☐ Surfing
- ☐ Paddle boarding
- ☐ Other

Next question

RESEARCH WITH PLYMOUTH UNIVERSITY

A Bit About You

Please enter your age and press enter to continue:

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A Bit About You

Please type in your gender (1 = male, 2 = female) and press enter to continue

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A Bit About You

Please type the name of the university course and the stage you are currently in, then press enter.

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A Bit About You

Please type the first part of your postcode of your university residence (e.g. PL5) **then press enter.**

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A Bit About You

Please type the first part of your postcode of your non-term time residence (e.g. PL5) **then press enter.**
(even if the same as the last question)

RESEARCH WITH PLYMOUTH UNIVERSITY

A Bit About You

Please select the most applicable option from below that best describes where you lived during your childhood (0-18 years)**.**

- 1 - By the sea + urban
- 2 - By the sea + sub-urban
- 3 - By the sea + rural
- 4 - Inland + urban
- 5 - Inland + sub-urban
- 6 - Inland + rural

Next question

Stage 1 of Study 5:

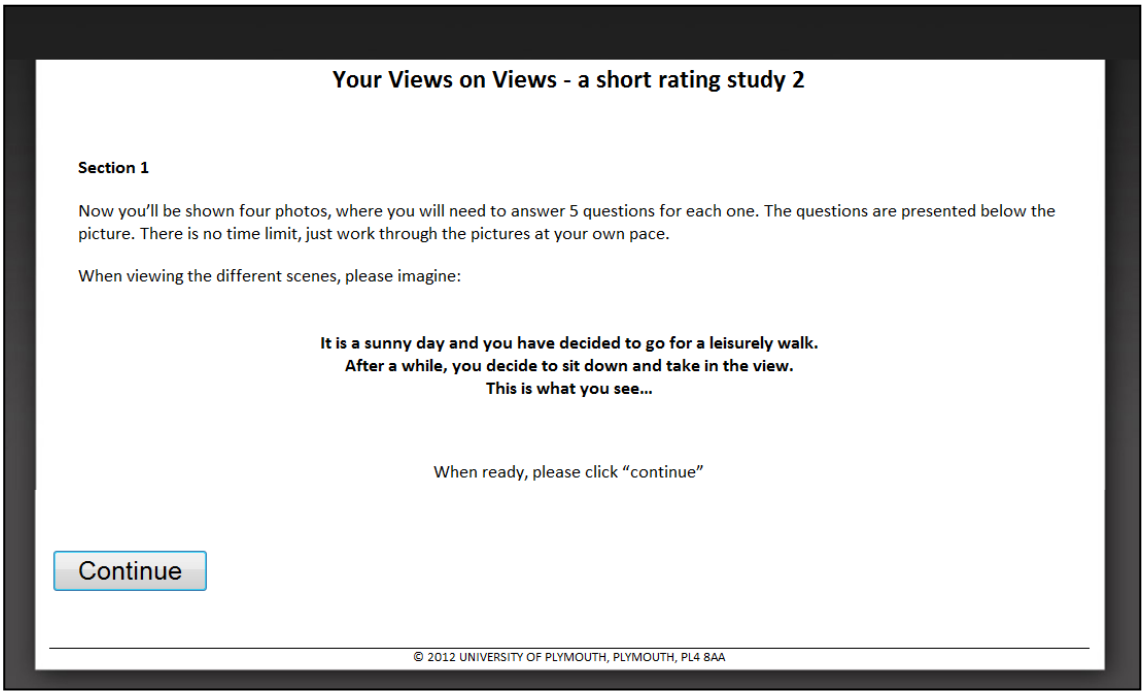
The shortened Connectedness to Nature Scale

Connectedness to Nature

Please rate how strongly you agree with each of the statements below:

	Completely Disagree				Completely Agree
a) I think of the natural world as a community to which I belong	○	○	○	○	○
b) I often feel part of the web of life	○	○	○	○	○
c) I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'	○	○	○	○	○
d) Like a tree can be part of a forest, I feel embedded within the broader natural world	○	○	○	○	○

Stage 2 of Study 5:



Your Views on Views - a short rating study 2

Section 1

Now you'll be shown four photos, where you will need to answer 5 questions for each one. The questions are presented below the picture. There is no time limit, just work through the pictures at your own pace.

When viewing the different scenes, please imagine:

It is a sunny day and you have decided to go for a leisurely walk.
After a while, you decide to sit down and take in the view.
This is what you see...

When ready, please click "continue"

Continue

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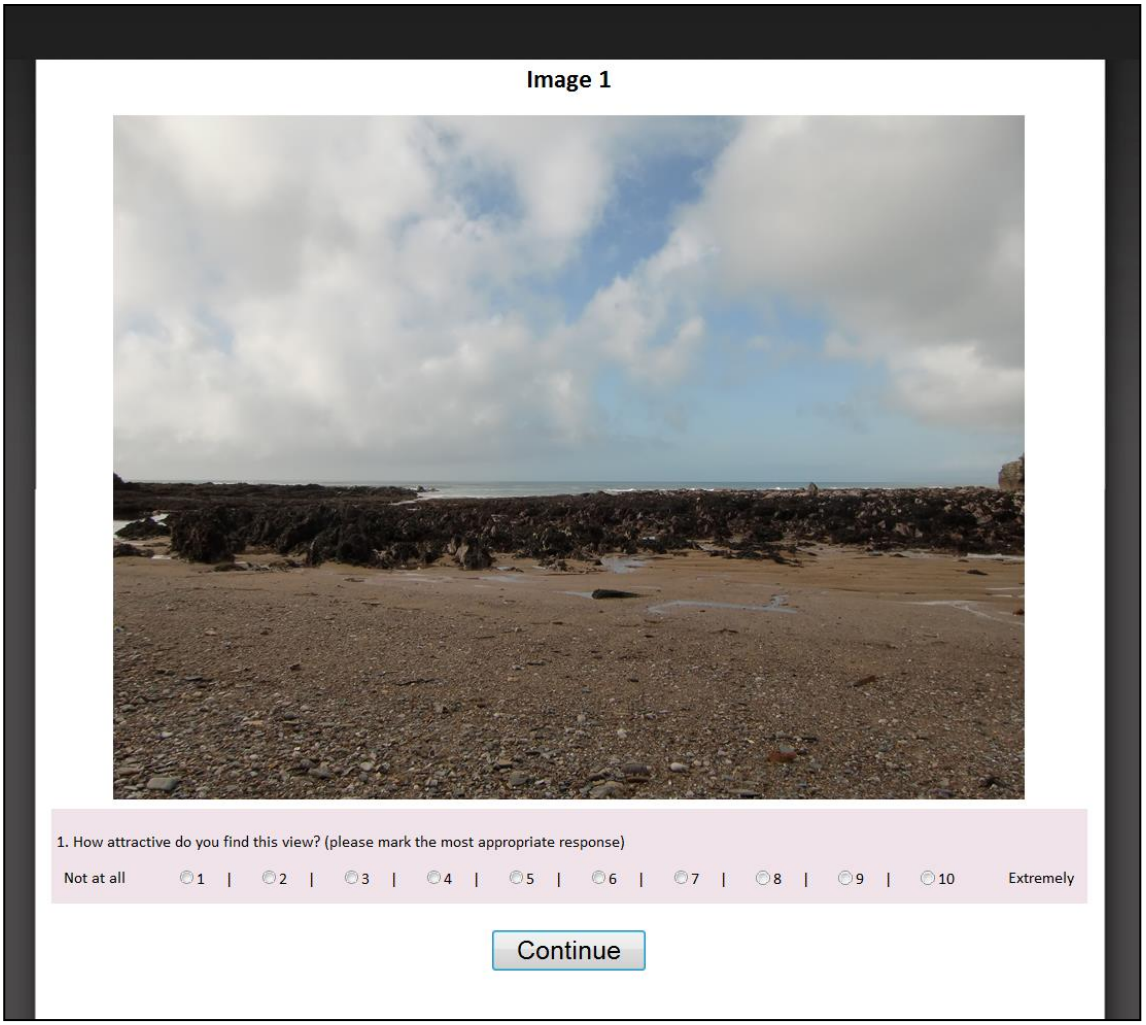


Image 1

1. How attractive do you find this view? (please mark the most appropriate response)

Not at all 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 Extremely

Continue

Image 1

2. How willing would you be to stay in a hotel with this view? (please mark the most appropriate response)

Not at all ○1 | ○2 | ○3 | ○4 | ○5 | ○6 | ○7 | ○8 | ○9 | ○10 Extremely

Continue

Image 1

3. How does this scene make you feel? (please mark the most appropriate response)

Very Sad ○1 | ○2 | ○3 | ○4 | ◉5 | ○6 | ○7 | ○8 | ○9 | ○10 Very Happy

Continue

Image 1

4. How does this scene make you feel? (please mark the most appropriate response)

Very calm ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 | ◯7 | ◯8 | ◯9 | ◯10 Very excited

Continue

Image 1

5. To what level would you agree with the statement: I would be able to rest and recover my ability and focus in this environment? (please mark the most appropriate response)

Not at all ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 | ◯7 | ◯8 | ◯9 | ◯10 Completely

Continue

Your Views on Views - a short rating study 2

Section 2

You will now be shown the same pictures as before along with your rating of how it made you feel. Please use the box below each picture to expand what it was about this photo that made you respond in that way.

Continue

Image 1

With 5 words or less, please describe the scene above.

Your happiness rating was: 5 (on a scale from 1 = very sad, to 10 = very happy)

What is it about this scene that made you respond this way and *why*? Please write as much as you would like:

Continue

Section 4 - Marine Awareness

To get an idea of your awareness regarding the coastal environment, please answer the following questions to the best of your knowledge. Remember, responses are completely anonymous and confidential.

1. Please rate the level of awareness you feel you have on the five topics below relating to the sea shore (please tick the relevant box for each)

	Not at all informed	Understand the basics	Moderately informed	Very informed	High Expertise
a) The overall **biology** (the science of life) of the sea shore.	○	○	○	○	○
b) The **natural threats** faced by organisms (such as damage from storms) on the sea shore.	○	○	○	○	○
c) The **general human-induced** challenges facing sea shore organisms (e.g. oil spills)	○	○	○	○	○
d) The **specific visitor-induced** threats to sea shore organisms (e.g. from walking)	○	○	○	○	○

2. Regarding beach litter (rubbish found on the coast), what do you believe are the 3 most common litter items found on the general UK coast? (e.g. cigarette butts)

i)

ii)

iii)

a) What do you think was the most common **type** of litter found on the UK coastline in 2011?	○ Fishing litter (items that were once used to catch fish either commercially or recreationally) ○ Public litter (left by the public on the coast or inland, which is carried by winds and rivers) ○ Sewage-related debris (items flushed down the toilet) ○ Non-sourced litter (items that are too small or damaged to be identified)
b) Over the last 10 years, plastic bottles found on UK beaches have...	○ Declined by 33% ○ Declined by 7% ○ Increased by 7% ○ Increased by 33%
c) On average in 2011, how many pieces of litter were found per kilometre?	○ 564 pieces ○ 1,149 pieces ○ 1,741 pieces ○ 2,345 pieces
d) How long do you think a disposable nappy (diaper) takes to decompose?	○ 5-20 years ○ 20-75 years ○ 75-450 years ○ 450-800 years

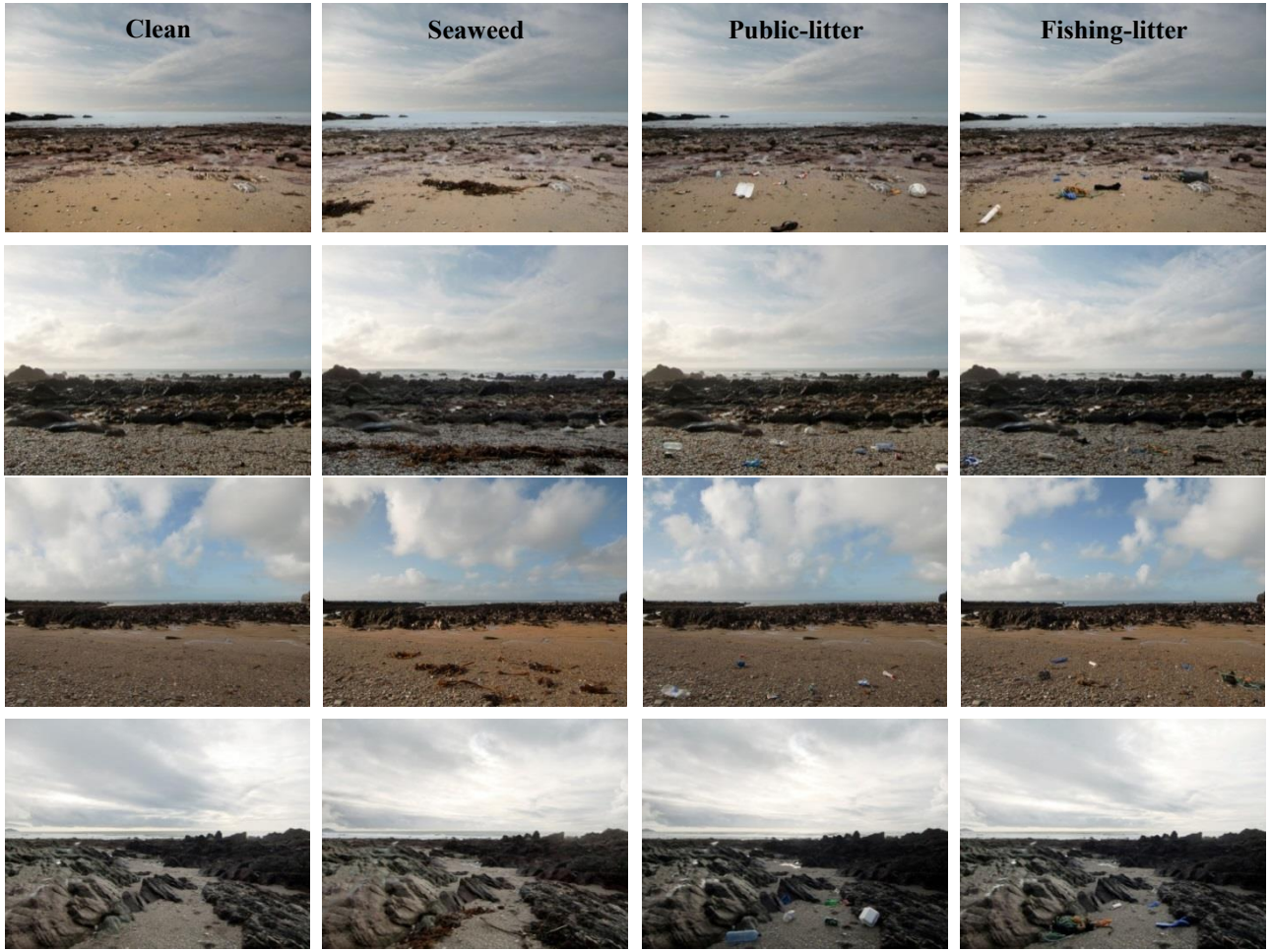
Continue

Section 5 - Tell us a bit about yourself

1. What is your gender?	○ Male ○ Female	
2. How old are you?		
3. Where do you live (please provide the first part of your post code, e.g. PL5)?		
4. What is your current occupation?		
5. During your childhood (0-11 years), how would you describe where you lived for the majority of the time? (please select)		
a)	○ By the sea ○ More in land	
b)	○ Urban ○ Suburban ○ Rural	

Continue

The pool of experimental stimuli, participants in Study 5 were randomly allocated:



I. Chapter 5: Additional Analyses

Other variables measured

Table I.1. *The descriptives of the remaining variables not reported in Chapter 5 for both studies.*

	Study 4 (*n* = 79)	**Study 5** (*n* = 19)
Gender	20 males, 59 females	8 males, 11 females
Age	*M* = 20.08, *SD* = 3.00	*M* = 35.79, *SD* = 17.13
Upbringing[o]	61% in land (39% by sea) 46% suburban (21% urban, 33% rural)	53% in land (47% by sea) 47% urban (42% suburban, 11% rural)
Favourite Environments[o]	Ranked #1 = forest (19% of votes) Ranked #2 = mountains (19%) Ranked #3 = forest (23%)	Ranked #1 = sandy & rocky shores (both with 32% votes) Ranked #2 = forest (37%) Ranked #3 = forest (21%)
Rocky Shore Visits		
Frequency of visits[o]	Once or twice a year (50%)	Once every 2-3 months (44%)
Company[o]	Family / group (54%)	Family / group (56%)
Activities[o]	Walking (82%) Socialising (53%) Rock pooling (50%)	Walking (84%) Rock pooling (53%) Picnicking (42%)

Note. The most popular categories for the categorical variables (identified by the º) are reported along with the percentage of respondents who selected that option.

Additional repeated contrast analysis:

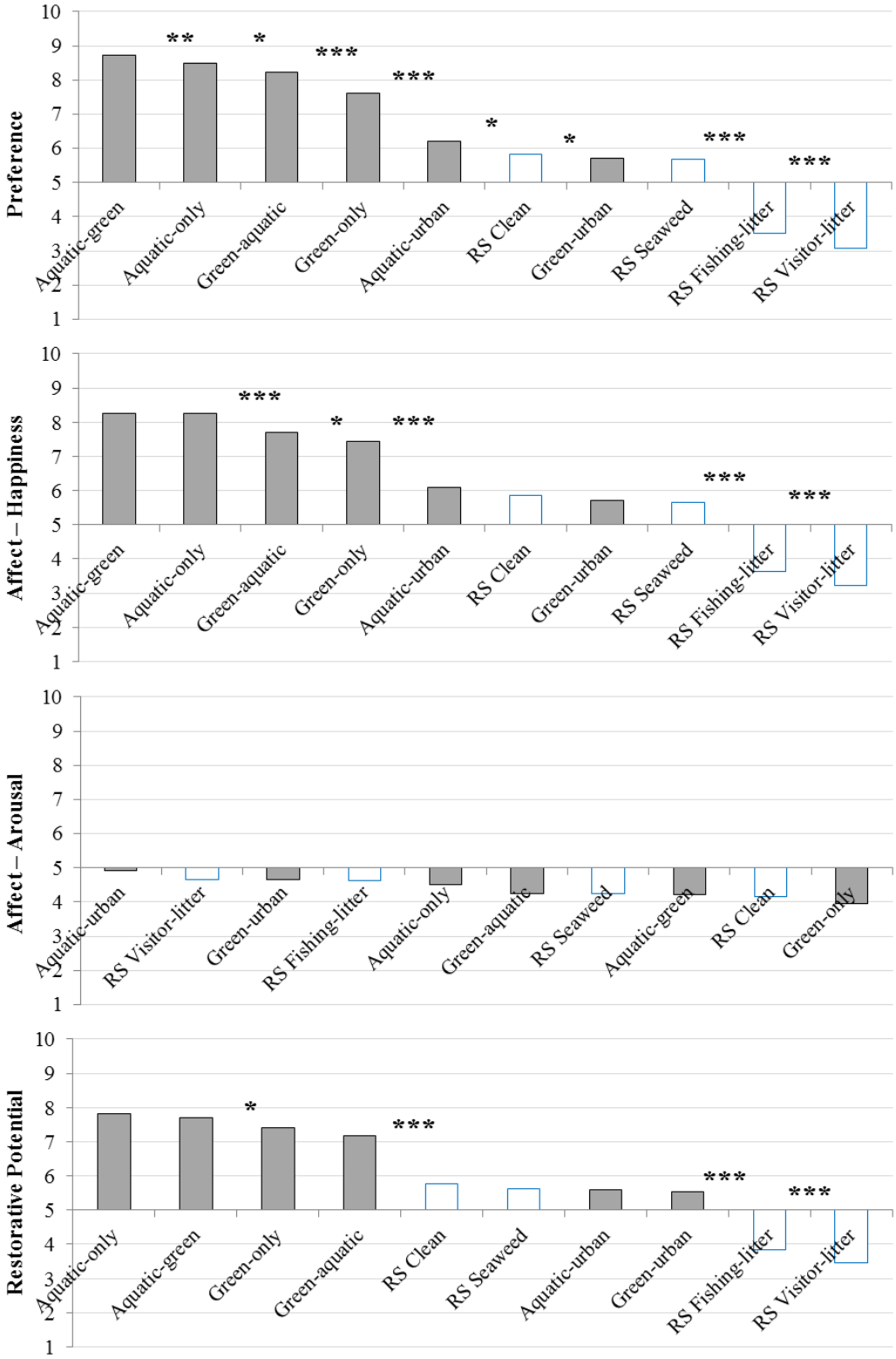


Figure I.1. The graphical illustration of the mean ratings for each measure for all ten conditions, with *s to represent where statistically significant findings occurred in the repeated contrasts (* = $p < .05$; ** = $p < .01$; *** = $p < .001$).
Note. RS refers to Rocky Shore (the experimental stimuli).

Additional qualitative analysis

Figure I.2. The graphical illustration of the words participants associated with each condition in Study 5 (*n* = 19, reproduced from Wordle, 2013)

Marine awareness

Measure: Using the same topics from Study 3, participants responded to each statement on a 5-point scale from *not at all* (1) to *high expertise* (5).

Results: Participants in Study 5 had an average subjective marine awareness rating of 2.88 (*SD* = 0.90) out of five.

Measure: participants were required to list the three most common litter items found on the general UK coast, which were coded according to categories published in marine litter reports (MCS, 2011). The three correct answers were *plastic pieces, plastic caps or lids*, and *polystyrene pieces*.

Results:

Table I.2. *The frequency (and percentage) of participants' responses to the marine awareness task to list the three most common litter items found on the general UK coast.*

MCS Rank	Response categories	Number of responses	
1	Plastic pieces	1	(2%)
2	plastic caps or lids	1	(2%)
3	polystyrene pieces	0	(0%)
4	crisp / sweet / lolly wrappers	8	(14%)
5	string & cord	0	(0%)
6	plastic drink bottles	14	(24%)
7	glass pieces	0	(0%)
8	cotton bud sticks	0	(0%)
9	fishing net and pieces	5	(8%)
10	plastic cutlery	0	(0%)
	Another valid category in MCS survey not in the top 10	29	(49%)
	Too vague / NA	1	(2%)
	Total	**59**	**(100%)**

Measure: Four multiple choice questions were developed to examine other aspects of marine litter (see Table I.3).

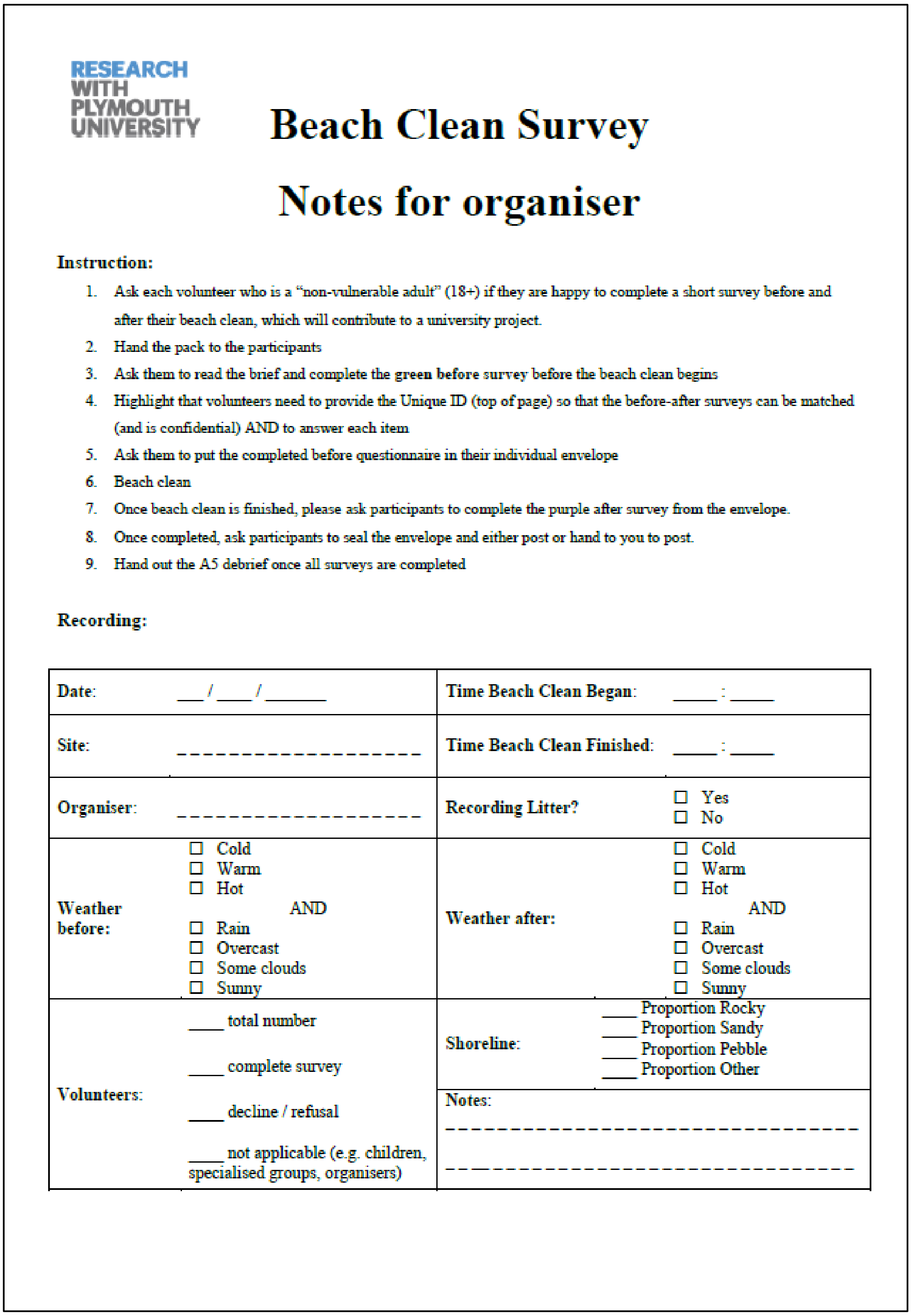
Results:

Table I.3. *The frequency (and percentage) of correct responses for each of the objective marine awareness questions on marine litter (n = 19).*

Question	**Number of correct responses**	
Q: What do you think was the most common type of litter found on the UK coastline in 2011? A: Public litter (left by the public on the coast or inland, which is carried by winds and rivers)	14	(70%)
Q: Over the last 10 years, plastic bottles found on UK beaches have… A: ... Increased by 33%	10	(50%)
Q: On average in 2011, how many pieces of litter were found per kilometre? A: 1,741 pieces	11	(55%)
Q: How long do you think a disposable nappy (diaper) takes to decompose? A: 75-450 years	10	(50%)

J. Chapter 6: Materials

Notes given to the organiser / data collector of Study 6:



RESEARCH
WITH
PLYMOUTH
UNIVERSITY

Beach Clean Survey

Notes for organiser

Instruction:

1. Ask each volunteer who is a "non-vulnerable adult" (18+) if they are happy to complete a short survey before and after their beach clean, which will contribute to a university project.
2. Hand the pack to the participants
3. Ask them to read the brief and complete the **green before** survey before the beach clean begins
4. Highlight that volunteers need to provide the Unique ID (top of page) so that the before-after surveys can be matched (and is confidential) AND to answer each item
5. Ask them to put the completed before questionnaire in their individual envelope
6. Beach clean
7. Once beach clean is finished, please ask participants to complete the purple after survey from the envelope.
8. Once completed, ask participants to seal the envelope and either post or hand to you to post.
9. Hand out the A5 debrief once all surveys are completed

Recording:

Date:	___ / ____ / _______	**Time Beach Clean Began:**	_____ : _____
Site:	____________________	**Time Beach Clean Finished:**	_____ : _____
Organiser:	____________________	**Recording Litter?**	☐ Yes ☐ No
Weather before:	☐ Cold ☐ Warm ☐ Hot AND ☐ Rain ☐ Overcast ☐ Some clouds ☐ Sunny	**Weather after:**	☐ Cold ☐ Warm ☐ Hot AND ☐ Rain ☐ Overcast ☐ Some clouds ☐ Sunny
Volunteers:	____ total number ____ complete survey ____ decline / refusal ____ not applicable (e.g. children, specialised groups, organisers)	**Shoreline:**	____ Proportion Rocky ____ Proportion Sandy ____ Proportion Pebble ____ Proportion Other
		Notes: ________________________________ ________________________________	

Before-survey for Study 6:

RESEARCH WITH PLYMOUTH UNIVERSITY

Before Survey

Section 1: Background

Time: ____:____ **Date:** __/__/____ **Site:** _____

So that I can match your two surveys, please provide a **unique ID** by using your initials + day and month of birth (e.g. KW611; DZ1307, SC1202): _____

Have you ever done this survey before (for Plymouth University)? (please circle) **Yes** **No**
Note. Repeat replies are good, so please continue regardless of answer

Section 2: Current Emotion

1. How do you **feel right now**? Please rate **each statement** on how you feel at this moment:

I feel…	Not at all			Somewhat			Extremely
a. happy	☐	☐	☐	☐	☐	☐	☐
b. nervous / anxious	☐	☐	☐	☐	☐	☐	☐
c. sad / depressed	☐	☐	☐	☐	☐	☐	☐
d. content / relaxed	☐	☐	☐	☐	☐	☐	☐
e. frustrated	☐	☐	☐	☐	☐	☐	☐
f. calm	☐	☐	☐	☐	☐	☐	☐

2. Any additional comments?_____

_____

Section 3: Beach Litter Awareness

To get an idea of your awareness regarding beach litter, please complete the following questions to the best of your knowledge. Remember, responses are completely anonymous and confidential.

1. **How much litter** found annually on the UK coastline is from **each source** below?

	Very little						Lots
Fishing items that were once used to catch fish either commercially or recreationally	☐	☐	☐	☐	☐	☐	☐
Illegal dumping of items (e.g. furnishing and pottery), also known as **fly-tipping**	☐	☐	☐	☐	☐	☐	☐
Medical items such as inhalers and plasters.	☐	☐	☐	☐	☐	☐	☐
Items that are too small or damaged to be identified **(Non-sourced)**	☐	☐	☐	☐	☐	☐	☐
Public items left by the public on the coast or inland, which is carried by winds and rivers.	☐	☐	☐	☐	☐	☐	☐
Items flushed down the toilet (also known as **sewage-related debris)**	☐	☐	☐	☐	☐	☐	☐
Shipping items that have been lost at sea	☐	☐	☐	☐	☐	☐	☐

Section 3: Beach Litter Awareness Cont.

2. What do you believe are the **3 most common litter** *items* found on the general UK coast?

   i. _____

   ii. _____

   iii. _____

3. How informed do you feel about beach litter? (please circle)

Not at all informed	Understand the basics	Moderately informed	Very informed	High Expertise

Section 4: Beach Cleaning History

1. How often have you taken part in organised beach cleans? (please circle)

More than once a month	Once or twice a month	Once every 2-3 months	Once or twice a year	Once or twice over the past 2 years	Never

2. How did you hear about today's event? _____

3. Who have you come with today? (please circle the one that most applies)

On own	Friend(s)	Partner	Children	Family	Group	Other: _____

Section 5: Please tell me a bit about yourself

1. What is your gender? (please circle) **Male** **Female**

2. How old are you? (please circle) **18-24** **25-30** **31-40** **41-50** **51-60** **61+**

3. Where have you travelled from today (please provide *just* the first part of the post code. e.g. PL5)? __ __ __ __
   Note. All answers will be kept anonymous and kept confidential

4. Within the past 12 months (not including today), how often have you visited **this particular beach**?

Everyday	Several times a week	Once a week	Once or twice a month	Once every 2-3 months	Once or twice a year	Never

5. What is your highest level of education (e.g. school, A-Levels, degree)? _____
   Note. You can choose to ignore this question and all answers will be kept anonymous and confidential.

6. What is (was, if retired) your occupation? _____
   Note. You can choose to ignore this question and all answers will be kept anonymous and confidential.

THANK YOU

Please fold and hand back to the researcher

After-survey for Study 6:

RESEARCH WITH PLYMOUTH UNIVERSITY

After Survey

Unique ID
(initials + day and month of birth, e.g. KW611) _____ **Time:** ____:____

Section 1: Current Emotion

1. How do you **feel right now**? Please rate **each statement** on how you feel at this moment:

I feel…	Not at all			Somewhat			Extremely
a. happy	☐	☐	☐	☐	☐	☐	☐
b. nervous / anxious	☐	☐	☐	☐	☐	☐	☐
c. sad / depressed	☐	☐	☐	☐	☐	☐	☐
d. content / relaxed	☐	☐	☐	☐	☐	☐	☐
e. frustrated	☐	☐	☐	☐	☐	☐	☐
f. calm	☐	☐	☐	☐	☐	☐	☐

2. Please rate the extent you agree with each statement on how you feel about today's beach clean compared to other activities you could have done:

Today's activities were…	Not at all			Somewhat			Extremely
a. worthwhile and meaningful to me	☐	☐	☐	☐	☐	☐	☐
b. in line with my values	☐	☐	☐	☐	☐	☐	☐

3. Any additional comments?_____
_____

Section 2: Beach Litter Awareness

Similarly to before, we are interested in your awareness and knowledge regarding beach litter. Please complete the following items to the best of your ability.

1. What do you believe are the **3 most common litter** *items* found on the general UK coast?
   i. _____
   ii. _____
   iii. _____

2. How informed do you feel about beach litter? (please circle)

Not at all informed	Understand the basics	Moderately informed	Very informed	High Expertise

Section 2: Beach Litter Awareness Cont.

3. **How much litter** found annually on the UK coastline is from **each source**?

	Very little						Lots
Fishing items that were once used to catch fish either commercially or recreationally	☐	☐	☐	☐	☐	☐	☐
Illegal dumping of items (e.g. furnishing and pottery), also known as **fly-tipping**	☐	☐	☐	☐	☐	☐	☐
Medical items such as inhalers and plasters.	☐	☐	☐	☐	☐	☐	☐
Items that are too small or damaged to be identified **(Non-sourced)**	☐	☐	☐	☐	☐	☐	☐
Public items left by the public on the coast or inland, which is carried by winds and rivers.	☐	☐	☐	☐	☐	☐	☐
Items flushed down the toilet (also known as **sewage-related debris**)	☐	☐	☐	☐	☐	☐	☐
Shipping items that have been lost at sea	☐	☐	☐	☐	☐	☐	☐

Section 3: Beach Clean

1. All things considered, how **satisfied** are you with today's beach clean on a scale from 1 to 10?

Very Unsatisfied									Very Satisfied
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1	2	3	4	5	6	7	8	9	10

2. What was the most common piece of litter you found today? _____

3. In the future, how likely is it that you will do the following behaviours?

		Not at all		Undecided		Definitely
a.	Volunteer to do another organised beach clean within the next year	☐	☐	☐	☐	☐
b.	Pick up litter found on the street	☐	☐	☐	☐	☐
c.	Encourage friends to do beach cleans	☐	☐	☐	☐	☐
d.	Keep hold of recyclable items until you find a recycling bin	☐	☐	☐	☐	☐
e.	Use more biodegradable products	☐	☐	☐	☐	☐

4. Any general additional comments?

_____

_____

_____

THANK YOU

Please fold and put with the before survey in the envelope and seal. Then ask for the debrief

Study 7's baseline online measures:

FIELD STUDY:
Exploring the effects of a trip to the coast

What is this study about?

We are interested in your experiences when you visit certain natural environments and do certain activities.

Who are we?

This research is being conducted by Kayleigh Wyles as part of a PhD project. For information, or complaints, email Kayleigh on kayleigh.wyles@plymouth.ac.uk or her supervisor Dr Pahl on sabine.pahl@plymouth.ac.uk

What do you have to do?

• First you will be asked to complete this online survey. This should take around 10 minutes.
• On the day of the field study, we will meet outside the public library (opposite Davy), where we will walk down to the Mayflower Steps on the barbican for the taxi boat (if you do not like boat transport, please inform Kayleigh ASAP on kayleigh.wyles@plymouth.ac.uk). Make sure you have sensible footwear (e.g. trainers, hiking boots, wellies), warm clothes as you will be outside for over 2 hours, and a waterproof in case it rains.
• **IMPORTANT: If you are not wearing suitable clothing, you will be refused participation for this study**
• During the short day trip, you will be asked to complete short surveys before and after a pre-planned activity that is not extensively active. If you have a known health problem (e.g. asthma) that may influence your ability to walk on unstable ground, please let Kayleigh know now and bring appropriate medication on the day.
• You will then walk (and catch the taxi boat) back to the university campus.
• A week later, you will be asked to complete a final short online survey.
• If the weather is awful, the study will be cancelled and re-arranged.

Are you happy to take part?

• In line with the University's Research Ethics Procedures we have to make sure everyone who agrees to do the survey fully understands what is being asked of them. If you have any questions please feel free to ask us.
• Risk assessments and safety precautions have been made, so that your safety is our highest priority.
• All answers are confidential and anonymous and only seen by the research team.
• You are free to withdraw from the study at any time.

Tick the box if you are happy to carry on. ☐

[*page 2*]

Participant ID

So that we can match your responses throughout the study, please provide a unique ID by using your initials + day and month of birth.
So: David Smith 29-01-1970 would be DS2901

Please enter your unique ID:

Marine Awareness

To get an idea of your awareness regarding the coastal environment, please answer the following questions to the best of your knowledge. Remember, responses are completely anonymous and confidential.

1. Please rate the level of awareness you feel you have on the five topics below relating to the sea shore (please tick the relevant box for each)

	Not at all informed	Understand the basics	Moderately informed	Very informed	High Expertise
a) The overall **biology** (the science of life) of the sea shore	○	○	○	○	○
b) The **natural threats** faced by organisms (such as damage from storms) on the sea shore	○	○	○	○	○
c) The **general human-induced** challenges facing sea shore organisms (e.g. oil spills)	○	○	○	○	○
d) The **specific visitor-induced** threats to sea shore organisms (e.g. from walking)	○	○	○	○	○

2. Marine litter, rubbish that has entered the environment, is a problematic issue. Please answer the following multiple choice questions regarding this environmental problem:

a) What do you think was the most common **type** of litter found on the UK coastline in 2011?	○ Fishing litter (items that were once used to catch fish either commercially or recreationally) ○ Public litter (left by the public on the coast or inland, which is carried by winds and rivers) ○ Sewage-related debris (items flushed down the toilet) ○ Non-sourced litter (items that are too small or damaged to be identified)
b) Regarding individual items, what do you think were the most common **items** found on the UK coastline in 2011?	○ Fishing ropes ○ Plastic pieces ○ Food wrappers ○ Plastic bags
c) Over the last 10 years, plastic bottles found on UK beaches have…	○ Declined by 33% ○ Declined by 7% ○ Increased by 7% ○ Increased by 33%
d) On average in 2011, how many pieces of litter were found per kilometre?	○ 564 pieces ◉ 1,149 pieces ○ 1,741 pieces ○ 2,345 pieces
e) How long do you think a disposable nappy (diaper) takes to decompose?	○ 5-20 years ○ 20-75 years ○ 75-450 years ○ 450-800 years

[page 4]

Marine Awareness Cont.

3. Please answer the following questions regarding marine biology

a) The scientific study of interactions among organisms and between organisms and their environment is….?	○ Biosphere ○ Biology ○ Ecology ○ Community

b) Below are pictures of different coastal organisms. Which of the following species do you think can be found along the UK coast?

○ Yes | ○ No
Beadlet anemone
© P. Barfield

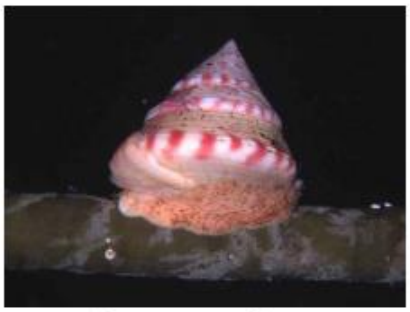
○ Yes | ○ No
Common prawn
© J. Anderson

○ Yes | ○ No
Cushion star fish
© J. Sewell

○ Yes | ○ No
Dog whelk
© B. Seeley

○ Yes | ○ No

Green sea urchin
© K. Hiscock



○ Yes | ○ No

Painted top shell
© P. Naylor

○ Yes | ○ No

Purple sea urchin
© S. Scott

○ Yes | ○ No

Rock goby
© P. Newland

Image has been removed due to

Copyright restrictions

● Yes | ○ No

Sea scorpion
© J. Oakley

○ Yes | ○ No

Snakelocks anemone
© P. Barfield

[*page 5*]

Your free leisure time

1. When you have a free afternoon or day, how do you like to spend it? What do you typically do and where?

2. Within the past 12 months, which environments have you spent time in/near/around?
Please select all that apply.

- ☐ Forest/Woodland
- ☐ Mountain/Hills
- ☐ Farmland
- ☐ Park/Garden
- ☐ Rocky Shore
- ☐ River
- ☐ Cliff
- ☐ Sandy Beach
- ☐ Valley
- ☐ City

3. Within the past 12 months, how often have you visited rocky shores in particular (the coastal area where solid rock predominates)?

Everyday	Several times a week	Once a week	Once or twice a month	Once every 2-3 months	Once or twice a year	Never
○	○	○	○	○	○	○

4. When at a rocky shore, what activities do you typically do? (please select all that apply)

Walking ☐	Relaxing ☐	Reading ☐	Paddling ☐	Body boarding ☐
Running ☐	Food/drink ☐	Socialising ☐	Swimming ☐	Surfing ☐
Rock pooling ☐	Photography ☐	Playing ☐	Snorkelling /scuba diving ☐	Paddle boarding ☐
Beach combing ☐	Bird watching ☐	Supervising children ☐	Boating ☐	Collecting litter ☐
Looking for wildlife ☐	Listening to music / radio ☐	Fishing / crabbing ☐	Other:	

5. How many days in a week do you watch television? (Please select one) [*new option: "none"*]

One	Two	Three	Four	Five	Six	Everyday
○	○	○	○	○	○	●

6. On a typical day, how many hours of television do you watch? ☐ 0 to 24 Hours

7. Within the past 12 months, how often have you watched **nature documentaries**, including DVDs and on catch-up services (e.g. Frozen Planet)? (Please select one)

Everyday	Several times a week	Once a week	Once or twice a month	Once every 2-3 months	Once or twice a year	Never

Behavioural Intention

In the future, how often do you think you will engage in the following behaviours (even if you already do them)?

	Never	Rarely	Sometimes	Quite a lot	All of the time
a) Volunteer to do organised beach cleans	○	○	○	○	○
b) Pick up litter found on the street	○	○	○	○	○
c) Encourage friends to do beach cleans	○	○	○	○	○
d) Keep hold of recyclable items until you find a recycling bin	○	○	○	○	○
e) Use more biodegradable products	○	○	○	○	○
f) When walking in nature, I will take care where I tread	○	○	○	○	○
g) When looking at wildlife (like an insect or crab), I will pick it up	○	○	○	○	○
h) Volunteer for citizen science programmes (e.g. recording species diversity)	○	○	○	○	○

	Never	Rarely	Sometimes	Quite a lot	All of the time
i) I will take things from nature such as plant clippings for my garden, fish for my pond / aquarium, food for my pets	○	○	○	○	○
j) I will explore the wildlife in nature, e.g. in rock pools on the beach	○	○	○	○	○
k) Buy highly energy-efficient appliances	○	○	○	○	○
l) Take my own bags to the shops	○	○	○	○	○
m) Actively volunteer for an environmental organisation (including WWF)	○	○	○	○	○
n) Support sustainable policies with petitions and my political vote	○	○	○	○	○
o) Persuade friends to lead a more sustainable lifestyle	○	○	○	○	○
p) Walk along my local coastal path					

[page 7]

Connectedness to Nature

Please rate how strongly you agree with each of the statements below:

	Completely Disagree				Completely Agree
a) I think of the natural world as a community to which I belong	○	○	○	○	○
b) I often feel part of the web of life	○	○	○	○	○
c) I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'	○	○	○	○	○
d) Like a tree can be part of a forest, I feel embedded within the broader natural world	○	○	○	○	○

Tell us a bit about yourself

1. What is your gender?	○ Male	○ Female
2. How old are you?		
3. What is the first part of your term-time address (please provide just the first part of the post code. e.g. PL5)?		
4. What is the first part of your non-term time (home) address? (the first part of the post code. e.g. PL5)?		
5. What course and stage are you currently enrolled in?		

[page 8]

Thank you

We look forward to seeing you for the field aspect of the study.

Remember to wear suitable footwear (preferably trainers and/or wellies), bring a waterproof and wear warm clothes.

Please remember your ID: KW0611. You will need it for both the field and follow-up part of the study.

Study 7's baseline paper measures:

Time 2

Please provide the same **unique ID** as the online survey by using your initials + day and month of birth (e.g. David Smith 29-01-1970 would be DS2901): _____

Current Emotion

1. How do you **feel right now**? Please rate **each statement** on how you feel at this moment:

I feel…	**Not at all**			**Somewhat**			**Extremely**
a. happy	☐	☐	☐	☐	☐	☐	☐
b. nervous / anxious	☐	☐	☐	☐	☐	☐	☐
c. sad / depressed	☐	☐	☐	☐	☐	☐	☐
d. content / relaxed	☐	☐	☐	☐	☐	☐	☐
e. frustrated	☐	☐	☐	☐	☐	☐	☐
f. calm	☐	☐	☐	☐	☐	☐	☐

Additional Comments

Any additional comments?_____

_____

_____

Rock pooling notes:

Final – rock pooling intervention
17.09.2012

Equipment:

- ☐ 3x bucket / trays
- ☐ 5/6x ID cards from Wembury
- ☐ 32x ID cards – [*Maria*]
- ☐ 1x stopwatch [*Marine Bio department*]
- ☐ 2x survey form (per day)
- ☐ 10x note paper
- ☐ 1x first aid kit [*Marine Bio department*]
- ☐ 1x mobile phone [*mine*]
- ☐ 1x camera [*mine*]
- ☐ 1x pack of antibacterial wipes [*Plymouth MCS*]
- ☐ 1x list of names (for health & safety reasons)
- ☐ 1x risk assessment
- ☐ 1x suntan lotion
- ☐ 1x emergency drinking water
- ☐ Hoodies
- ☐ Gloves, hat, scarf…
- ☐ Hot flask

To do:

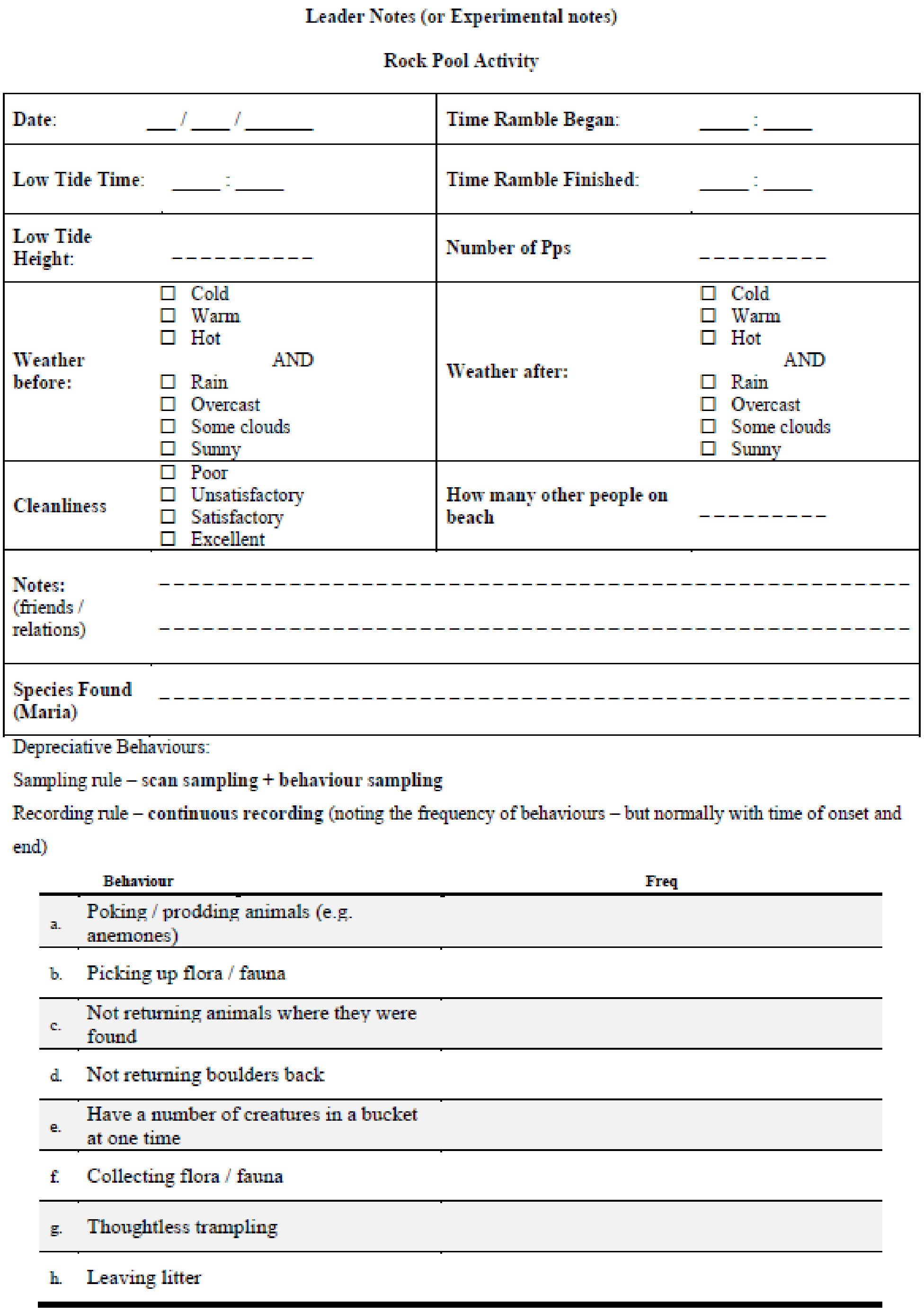
- ☐ Finalise Mount Batten Ferry transport

Overall Procedure:

1. Survey (KW)
2. Hand over to demonstrator (MC)
3. Introduce self + experimenter
4. Explain we'll be doing free-style rock pooling > then will record (citizen science)… describe
   a. First will explore > practice identifying (demo = give interesting facts)
   b. Shore Thing Survey
5. Explain the Shore Thing project.
6. Go through recording information
7. Address health and safety
8. Everyone work in pairs / threes (not with friends)

Notes:

KW phone number – [redacted]
MC phone number – [redacted]
MH phone number – [redacted]



Leader Notes (or Experimental notes)

Rock Pool Activity

Date:	___ / ___ / _______	**Time Ramble Began:**	_____ : _____
Low Tide Time:	_____ : _____	**Time Ramble Finished:**	_____ : _____
Low Tide Height:	----------	**Number of Pps**	---------
Weather before:	☐ Cold ☐ Warm ☐ Hot AND ☐ Rain ☐ Overcast ☐ Some clouds ☐ Sunny	**Weather after:**	☐ Cold ☐ Warm ☐ Hot AND ☐ Rain ☐ Overcast ☐ Some clouds ☐ Sunny
Cleanliness	☐ Poor ☐ Unsatisfactory ☐ Satisfactory ☐ Excellent	**How many other people on beach**	---------
Notes: (friends / relations)	-- --		
Species Found (Maria)	--		

Depreciative Behaviours:

Sampling rule – **scan sampling + behaviour sampling**

Recording rule – **continuous recording** (noting the frequency of behaviours – but normally with time of onset and end)

	Behaviour	**Freq**
a.	Poking / prodding animals (e.g. anemones)	
b.	Picking up flora / fauna	
c.	Not returning animals where they were found	
d.	Not returning boulders back	
e.	Have a number of creatures in a bucket at one time	
f.	Collecting flora / fauna	
g.	Thoughtless trampling	
h.	Leaving litter	

Briefing Script

Procedure

1. Introduce self + experimenter
2. Explain we'll be doing a rock pool ramble & recording… describe
    a. First will explore > practice identifying (demo = give interesting facts)
    b. Shore Thing Survey
3. Explain where the data will be used / The Shore Thing project.
4. Go through recording information
5. Identify some species using the card
6. Species interesting facts
7. Address health and safety
8. Explain my role (to aid the exploration, help identify species etc, makes sure we remain safe)
9. Everyone work in pairs / threes (not with friends)

The Shore Thing Project (www.marlin.ac.uk/shore_thing/about.html)

What it is =	The Shore Thing project is a project that allows A level + students and volunteers to take part in real science to help monitor the impact of rising sea temperature on our rocky shore species.
Aims =	to generate records, facilitate surveys around the British Isles, and raise awareness…
Where the data goes =	on the internet for everyone to access and use.

Health & Safety Information

1. Handle animals with care. Do not prod anemones…
2. When picking up animals, put them carefully back exactly where you found them
3. Many animals can be found under boulders, but you must carefully return the boulders back to their original position
4. When using buckets, only have one creature in there at a time with some water…
5. Only collect empty shells
6. Be careful where you're walking
7. Look after yourself.

Information (interesting facts)

- Rocky shores = intertidal area predominantly made of rock
- Intertidal means that the species are effected by land stressors (such as wind) as well as marine stressors (such as salinity and currents)
- Anemones + tentacles
- Starfish + re-growing arms
- Dog whelks + how they feed on limpets

Debriefing Script

- Collect everyone up
- Sort out equipment
- Ask around & Summarise what you found …
    - _____ was the most abundant thing (relate to survey)
    - We were fortunate enough to find _____ & _____
- Pass over to researcher for surveys.

Shore Thing survey:

The Shore Thing Timed Species Search

Name of Group	
Surveyors	
Leader/ecologist	
Date	
Survey location	

To ensure that the same area of shore can be surveyed year after year we need the position of where you started the survey. The search is for **20 minutes**. You can go as far away from the start point as you like but please look closely for your species and try not to get distracted.

6 Figure Grid Reference ☐

GPS Reading Lat: Deg ☐ Mins ☐ Sec ☐ N

Long: Deg ☐ Mins ☐ Sec ☐ W or E

Digital photo of the area taken? Yes ☐ No ☐

The Search

Each person should search for one or two species in the same habitat and area of the shore i.e. upper, middle or lower. Record abundance as:

Abundant (A)	Definitely found at a certain level on the shore
Frequent (F)	Definitely found after a little searching
Rare (R)	Intensive search for one or two specimens
Not Found (NR)	No specimens found after 20 minutes

The species 'Flash Cards' will help you with identification. The key features on the back includes information on where on the shore to look for your particular species.

NOTES

This Shore Thing Survey form is verified and validated by:

Name: _____

Contact No: _____

Signature: _____

Now that you have completed the survey you can upload your results on to the Shore Thing Web site **www.marlin.ac.uk/shore_thing/data.html**. Enter the site details, bearings etc. and then click on the shortcut at the top of the 'Transect details' page to go straight to the species page and notes. You can download photographs at the end.

Once the data has been uploaded could you please send your forms to **Fiona Crouch, Shore Thing Project Officer, Marine Biological Association, Citadel Hill, Plymouth, Devon. PL1 2PB**

Species / Habitat	Rockpools				Boulders/crevices/overhangs				Open rock			
	A	F	R	NF	A	F	R	NF	A	F	R	NF
Black lichen (*Lichina pygmaea*)												
Pink plates (*Mesophyllum lichenoides*)												
Harpoon weed (*Asparagopsis armata*)												
Wireweed (*Sargassum muticum*)												
Rainbow wrack (*Cystoseira tamariscifolia*)												
Tuning fork weed (*Bifurcaria bifurcata*)												
Sea oak (*Halidrys siliquosa*)												
Dabberlocks (*Alaria esculenta*)												
Snakelocks anemone (*Anemonia viridis*)												
Honeycomb worm (*Sabellaria alveolata*)												
Montagu's crab (*Xantho hydrophilus*)												
Volcano barnacle (*Balanus perforatus*)												
Flat or purple top shell (*Gibbula umbilicalis*)												
Common tortoiseshell limpet (*Testudinalia testudinalis*)												
Celtic sea slug (*Onchidella celtica*)												
Green ormer (*Haliotis tuberculata*)												
Slipper limpet (*Crepidula fornicata*)												
Pacific oyster (*Crassostrea gigas*)												
Painted top shell (*Calliostoma zizyphinum*)												
Thick top shell (*Osilinus lineatus*)												
Cushion star (*Asterina gibbosa*)												
Purple sea urchin (*Paracentrotus lividus*)												

Beach cleaning materials:

Final
17.09.2012

Equipment:

- ☐ 6x bin bags + bag holder – [*Plymouth MCS*]
- ☐ 6x pickers [*Plymouth MCS*]
- ☐ 6x clip boards + pens [*Plymouth MCS*]
- ☐ 6x forms – ask MCS general
- ☐ 1x first aid box – [*Marine Bio department*]
- ☐ 1x syringe / sharps box – [*Plymouth MCS*]
- ☐ 1x mobile phone [*mine*]
- ☐ 1x pack of antibacterial wipes [*Plymouth MCS*]
- ☐ 8x pairs of latex gloves – [*Plymouth MCS*]
- ☐ 1x scales [*Marine Bio department*]
- ☐ 1x list of names (for health & safety reasons)
- ☐ 1x risk assessment form
- ☐ 1x suntan lotion [*mine*]
- ☐ 1x emergency drinking water

Overall Procedure:

1. Survey (KW)
2. Hand over to demonstrator (MC)
3. Introduce self + experimenter
4. Explain we'll be doing a beach clean & simultaneously recording it… describe
5. Explain where the data will be used / The MCS's Beachwatch project.
6. Go through recording information
7. Address health and safety
8. Everyone work in pairs / threes (not with friends)

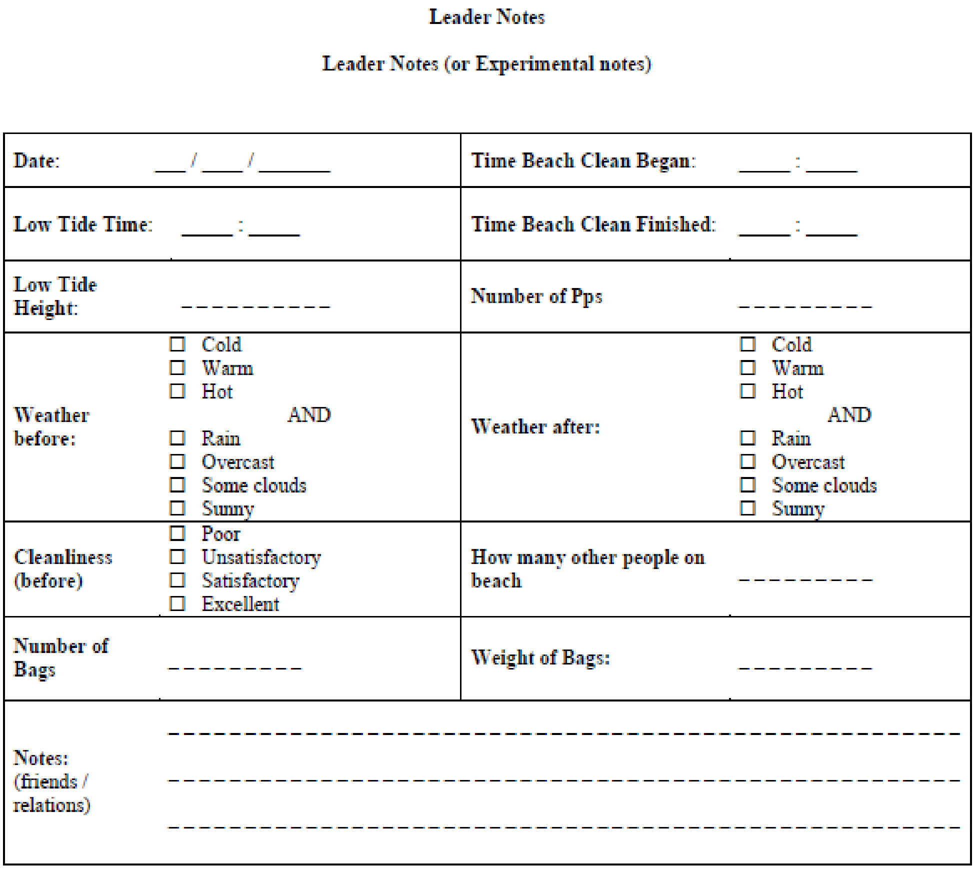
Notes (for us only)

If find a live cetacean – BDMLR 01825 765546 (office hours) or 07787 433412 (out of hours) or RSPCA 0300 1234 999

If find a dead cetacean – Cetacean Strandings Investigation Programme hotline 0800 6520333

Take note of:

- location and date found
- species and sex
- overall length
- condition of the animal
- your contact details should further information be needed



Leader Notes

Leader Notes (or Experimental notes)

Date:	___ / ____ / _______	**Time Beach Clean Began:**	_____ : _____
Low Tide Time:	_____ : _____	**Time Beach Clean Finished:**	_____ : _____
Low Tide Height:	----------	**Number of Pps**	---------
Weather before:	☐ Cold ☐ Warm ☐ Hot AND ☐ Rain ☐ Overcast ☐ Some clouds ☐ Sunny	**Weather after:**	☐ Cold ☐ Warm ☐ Hot AND ☐ Rain ☐ Overcast ☐ Some clouds ☐ Sunny
Cleanliness (before)	☐ Poor ☐ Unsatisfactory ☐ Satisfactory ☐ Excellent	**How many other people on beach**	---------
Number of Bags	---------	**Weight of Bags:**	---------
Notes: (friends / relations)	-- -- --		

Briefing Script

Procedure

1. Introduce self + experimenter
2. Explain we'll be doing a beach clean whilst reporting what we find
3. Explain *why* we are doing it (MCS information)
4. Talk through reporting sheet – be as accurate as possible – ask for help if need be
5. The beach cleaning process
    a. Record every item and put in the bin bag / sharp box
    b. Tally the items
    c. Identifying items – if having trouble, please ask.
    d. Record any markings indicating origin etc (e.g. codes)
    e. Unusual items – ask for assistance then describe on back
    f. Tally up at end
6. What do we *NOT* pick up?
    a. NOT faeces
    b. NOT dead animals
    c. No natural material (seaweed, driftwood etc)
    d. No heavy items
7. Address health and safety
8. Explain my role (to aid the exploration, help identify species etc, makes sure we remain safe)
9. Everyone work in pairs / threes (not with friends) 1 = picks up, 1 = reports

The Beachwatch Programme

What is it =	Beachwatch is part of MCS's campaign for Clean Seas and Beaches, that has been collecting and recording litter since 1994. Beaches are surveyed 1-4x a year
Aims =	to clean the coastline, raise public awareness, campaign at national levels on marine litter issues, and to promote measures to reduce litter at source
Where the data goes =	MCS's national database so that the patterns of marine litter can be examined.

Health & Safety Information

1. Do not pick up faeces or dead animals
2. Wear gloves when picking stuff up
3. Do not touch your face when completing this survey and do not drink or eat.
4. Sharp objects, such as syringes and needles, must be handled with extreme care and placed in suitable rigid containers - not in rubbish bags! We will have a 'sharps' box. Glass should be placed in a separate container.
5. Don't touch any containers or drums that may contain hazardous substances, or any unfamiliar objects - instead notify your organiser.

6. Be careful of slippery rocks, mud flats and other potential hazards, such as lifting items which are too heavy for you.
7. Avoid disturbing wild animals - any injured, stranded or dead animals should be reported to the organiser.
8. Your safety first

Information (interesting facts)

- Why is it important? Litter can be deadly to animals
  - Entanglement –
  - Digestion – e.g. birds eating plastic > don't satisfy hunger / blocks their digestive tract > die from starvation.
  - Harming the environment
  - Can transport invasive non-native species
- Why is it important? Litter can also be harmful to us
  - Our health – can stand on broken glass, swim in polluted water, have boat propellers / scuba diving equipment caught
  - Expensive – to clear up, loss to the tourist industry, to fix damages
- Where does it come from?
  - Land and sea
  - 7 different sources
    - Fishing litter – items that were once used to catch fish either commercially or recreationally
    - fly-tipping – Illegal dumping of items (e.g. furnishing and pottery)
    - Medical litter – items such as inhalers and plasters.
    - Non-sourced litter – Items that are too small or damaged to be identified
    - Public litter – items left by the public on the coast or inland, which is carried by winds and rivers. – most common one.
    - sewage-related debris – Items flushed down the toilet
    - Shipping litter – items that have been lost at sea

Debriefing Script

- Collect everyone up
- Tally up categories
- Sort out equipment
- Ask around & Summarise what you found …
  - _____ was the most abundant litter item today (relate to survey)
  - Did we find any interesting / unusual items?
- Pass over to researcher for surveys.
-

Beach clean survey:

[Figure has been removed due to Copyright restrictions]

Coastal walk materials:

Equipment:

- ☐ 1x first aid box – [*Marine Bio department*]
- ☐ 1x mobile phone [*mine*]
- ☐ 1x pack of antibacterial wipes [*Plymouth MCS*]
- ☐ 1x list of names (for health & safety reasons)
- ☐ 1x risk assessment form
- ☐ 1x suntan lotion [*mine*]
- ☐ 1x emergency drinking water
- ☐ 1x stopwatch

Overall Procedure:

1. Survey (KW)
2. Hand over to demonstrator (MH)
3. Walk 30 min (no stopping, just a gentle walk) – in pairs / solitary
4. Turn back
5. Survey

Leader Notes

Leader Notes (or Experimental notes)

Date:	___ / ____ / _______	**Time Walk Began:**	_____ : _____
Low Tide Time:	_____ : _____	**Time Walk Finished:**	_____ : _____
Low Tide Height:	- - - - - - - - - -	**Number of Pps**	- - - - - - - - -
Weather before:	☐ Cold ☐ Warm ☐ Hot AND ☐ Rain ☐ Overcast ☐ Some clouds ☐ Sunny	**Weather after:**	☐ Cold ☐ Warm ☐ Hot AND ☐ Rain ☐ Overcast ☐ Some clouds ☐ Sunny
Cleanliness (before)	☐ Poor ☐ Unsatisfactory ☐ Satisfactory ☐ Excellent	**How many other people on beach**	- - - - - - - - -
Notes: (friends / relations)	- -		

[Figure has been removed due to Copyright restrictions]

Study 7's measures immediately after

Time 3

Please provide the same **unique ID** as the online survey by using your initials + day and month of birth (e.g. David Smith 29-01-1970 would be DS2901): _ _ _ _ _ _ _ _ _ _

Current Emotion

1. How do you **feel right now**? Please rate **each statement** on how you feel at this moment:

I feel…	Not at all			Somewhat			Extremely
a. happy	☐	☐	☐	☐	☐	☐	☐
b. nervous / anxious	☐	☐	☐	☐	☐	☐	☐
c. sad / depressed	☐	☐	☐	☐	☐	☐	☐
d. content / relaxed	☐	☐	☐	☐	☐	☐	☐
e. frustrated	☐	☐	☐	☐	☐	☐	☐
f. calm	☐	☐	☐	☐	☐	☐	☐

Marine Awareness

To get an idea of your awareness regarding the coastal environment, please complete the following questions to the best of your knowledge. Remember, responses are completely anonymous and confidential.

1. Please rate the **level of awareness** you feel you have on the five topics below relating to the sea shore (please tick the relevant box for each)

	Not at all informed	Understand the basics	Moderately informed	Very informed	High Expertise
The overall **biology** (the science of life) of the sea shore	☐	☐	☐	☐	☐
The **natural threats** faced by organisms (such as damage from storms) on the sea shore	☐	☐	☐	☐	☐
The **general human-induced** challenges facing sea shore organisms (e.g. oil spills)	☐	☐	☐	☐	☐
The **specific visitor-induced** threats to sea shore organisms (e.g. from walking)	☐	☐	☐	☐	☐

2. **Marine litter**, rubbish that has entered the environment, is a problematic issue. Please answer the following multiple choice questions regarding this environmental problem:

   a) What do you think was the most common **type of litter** found on the UK coastline in 2011?
      - ☐ Fishing litter (items that were once used to catch fish either commercially or recreationally)
      - ☐ Public litter (left by the public on the coast or inland, which is carried by winds and rivers)
      - ☐ Sewage-related debris (items flushed down the toilet)
      - ☐ Non-sourced litter (items that are too small or damaged to be identified)

b) Regarding individual items, what do you think were the most common **items** found on the UK coastline in 2011?

- ☐ Fishing ropes
- ☐ Plastic pieces
- ☐ Food wrappers
- ☐ Plastic bags

c) Over the last 10 years, plastic bottles found on UK beaches have…

- ☐ Declined by 33%
- ☐ Declined by 7%
- ☐ Increased by 7%
- ☐ Increased by 33%

d) On average in 2011, how many pieces of litter were found per kilometre?

- ☐ 564 pieces
- ☐ 1,149 pieces
- ☐ 1,741 pieces
- ☐ 2,345 pieces

e) How long do you think a disposable nappy (diaper) takes to decompose?

- ☐ 5-20 years
- ☐ 20-75 years
- ☐ 75-450 years
- ☐ 450-800 years

3. Please answer the following questions regarding **marine biology**

a) The scientific study of interactions among organisms and between organisms and their environment is….?

- ☐ Biosphere
- ☐ Biology
- ☐ Ecology
- ☐ Community

b) Below are pictures of different coastal organisms. Which of the following species do you think **can be found along the UK coast**? (please tick all that apply)

Picture 1 ☐	Picture 2 ☐	Picture 3 ☐
Picture 4 ☐	Picture 5 ☐	Picture 6 ☐
Picture 7 ☐	Picture 8 ☐	Picture 9 ☐

P.T.O =>

Overall Satisfaction

1. All things considered, how **satisfied** are you with today's activity on a scale from 1 to 10?

Very Unsatisfied									Very Satisfied
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1	2	3	4	5	6	7	8	9	10

2. Please rate the extent to which you agree with each statement on how you feel about today's coastal activity compared to other activities you could have done:

Today's activities were…	Not at all			Somewhat			Extremely
a. worthwhile and meaningful to me	☐	☐	☐	☐	☐	☐	☐
b. in line with my values	☐	☐	☐	☐	☐	☐	☐

Behavioural Intention

In the future, how often do you think you will engage in the following behaviours?

		Never	Rarely	Sometimes	Quite a lot	All of the time
a.	Volunteer to do organised beach cleans	☐	☐	☐	☐	☐
b.	Pick up litter found on the street	☐	☐	☐	☐	☐
c.	Encourage friends to do beach cleans	☐	☐	☐	☐	☐
d.	Keep hold of recyclable items until you find a recycling bin	☐	☐	☐	☐	☐
e.	Use more biodegradable products	☐	☐	☐	☐	☐
f.	When walking in nature, I will take care where I tread	☐	☐	☐	☐	☐
g.	When looking at wildlife (like an insect or crab), I will pick it up	☐	☐	☐	☐	☐
h.	Volunteer for citizen science programmes (e.g. recording species diversity)	☐	☐	☐	☐	☐
i.	I will take things from nature such as plant clippings for my garden, fish for my pond / aquarium, food for my pets	☐	☐	☐	☐	☐
j.	I will explore the wildlife in nature, e.g. in rock pools on the beach	☐	☐	☐	☐	☐
k.	Buy highly energy-efficient appliances	☐	☐	☐	☐	☐
l.	Take my own bags to the shops	☐	☐	☐	☐	☐
m.	Actively volunteer for an environmental organisation (including WWF)	☐	☐	☐	☐	☐
n.	Support sustainable policies with petitions and my political vote	☐	☐	☐	☐	☐
o.	Persuade friends to lead a more sustainable lifestyle	☐	☐	☐	☐	☐
p.	Walk along my local coastal path	☐	☐	☐	☐	☐

The Environment

1. With regard to this particular coastal site, please rate your level of agreement with the following statements:

		Completely disagree			Neither agree nor disagree			Completely agree
a.	This site is a place which is away from everyday demands and where I would be able to relax and think about what interests me	☐	☐	☐	☐	☐	☐	☐
b.	This place is fascinating; it is large enough for me to discover and be curious about things	☐	☐	☐	☐	☐	☐	☐
c.	This site is a place which is very large, with no restrictions to movements; it is a world of its own	☐	☐	☐	☐	☐	☐	☐
d.	Here, it is easy to orient and move around so that I could do what I like	☐	☐	☐	☐	☐	☐	☐

Additional Comments

1. How many people in your group for today's activity did you know prior to this study? _ _ _ _ _ _ _ _

   a. If so, what is your relation? _

   _

   _

2. Any additional comments?_ _

   _

   _

   _

Study 7's online measures a week after:

PART 2

[*page 1*]

FIELD STUDY - PART 3:
Exploring the effects of a trip to the natural environment

Participant ID

So that I can match your responses throughout the study, please provide a unique ID by using your initials + day and month of birth.
So: David Smith 29-01-1970 would be DS2901

PLEASE USE YOUR ID YOU USED THE FIRST TIME ROUND!

Please enter your unique ID: [ ]

[*page 2*]

Marine Awareness

To get an idea of your awareness regarding the coastal environment, please answer the following questions to the best of your knowledge. Remember, responses are completely anonymous and confidential.

1. Please rate the level of awareness you feel you have on the five topics below relating to the sea shore (please tick the relevant box for each)

	Not at all informed	Understand the basics	Moderately informed	Very informed	High Expertise
a) The overall **biology** (the science of life) of the sea shore	○	○	○	○	○
b) The **natural threats** faced by organisms (such as damage from storms) on the sea shore	○	○	○	○	○
c) The **general human-induced** challenges facing sea shore organisms (e.g. oil spills)	○	○	○	○	○
d) The **specific visitor-induced** threats to sea shore organisms (e.g. from walking)	○	○	○	○	○

2. Marine litter, rubbish that has entered the environment, is a problematic issue. Please answer the following multiple choice questions regarding this environmental problem:

a) What do you think was the most common type of litter found on the UK coastline in 2011?	○ Fishing litter (items that were once used to catch fish either commercially or recreationally) ○ Public litter (left by the public on the coast or inland, which is carried by winds and rivers) ○ Sewage-related debris (items flushed down the toilet) ○ Non-sourced litter (items that are too small or damaged to be identified)
b) Regarding individual items, what do you think were the most common items found on the UK coastline in 2011?	○ Fishing ropes ○ Plastic pieces ○ Food wrappers ○ Plastic bags
c) Over the last 10 years, plastic bottles found on UK beaches have…	○ Declined by 33% ○ Declined by 7% ○ Increased by 7% ○ Increased by 33%
d) On average in 2011, how many pieces of litter were found per kilometre?	○ 564 pieces ○ 1,149 pieces ● 1,741 pieces ○ 2,345 pieces
e) How long do you think a disposable nappy (diaper) takes to decompose?	○ 5-20 years ○ 20-75 years ○ 75-450 years ○ 450-800 years

3. Please answer the following questions regarding marine biology

a) The scientific study of interactions among organisms and between organisms and their environment is….?	○ Biosphere ○ Biology ○ Ecology
	○ Community

b) Below are pictures of different coastal organisms. Which of the following species do you think can be found along the UK coast?

○ Yes | ○ No

Beadlet anemone

© P. Barfield

○ Yes | ○ No

Common prawn

© J. Anderson

○ Yes | ○ No

Cushion star fish

© J. Sewell

○ Yes | ○ No

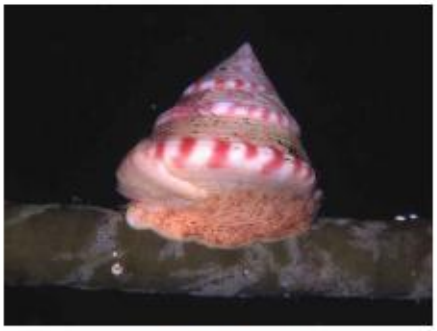
Dog whelk

© B. Seeley

○ Yes | ○ No

Green sea urchin

© K. Hiscock



○ Yes | ○ No

Painted top shell

© P. Naylor

○ Yes | ○ No
Purple sea urchin
© S. Scott

○ Yes | ○ No
Rock goby
© P. Newland

Image has been removed due to

Copyright restrictions

● Yes | ○ No
Sea scorpion
© J. Oakley

○ Yes | ○ No
Snakelocks anemone
© P. Barfield

Overall Satisfaction

1. On reflection, how satisfied are you with last week's activity on a scale from 1 to 10?

Very Unsatisfied									Very Satisfied
○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8	○ 9	○ 10

2. Please rate the extent to which you agree with each statement on how you feel about last week's coastal activity compared to other activities you could have done:

Last week's activities were…	Not at all			Somewhat			Extremely
a) worthwhile and meaningful to me	○ |	○ |	○ |	○ |	○ |	○ |	○
b) in line with my values	○ |	○ |	○ |	○ |	○ |	○ |	○

3. Within the past 12 months (not including for the study), how often have you visited Mount Batten?

Everyday	Several times a week	Once a week	Once or twice a month	Once every 2-3 months	Once or twice a year	Never

4. Any additional comments?

Behavioural Intention

In the future, how often do you think you will engage in the following behaviours (even if you already do them)?

	Never	Rarely	Sometimes	Quite a lot	All of the time
a) Volunteer to do organised beach cleans	○	○	○	○	○
b) Pick up litter found on the street	○	○	○	○	○
c) Encourage friends to do beach cleans	○	○	○	○	○
d) Keep hold of recyclable items until you find a recycling bin	○	○	○	○	○
e) Use more biodegradable products	○	○	○	○	○
f) When walking in nature, I will take care where I tread	○	○	○	○	○
g) When looking at wildlife (like an insect or crab), I will pick it up	○	○	○	○	○
h) Volunteer for citizen science programmes (e.g. recording species diversity)	○	○	○	○	○

	Never	Rarely	Sometimes	Quite a lot	All of the time
i) I will take things from nature such as plant clippings for my garden, fish for my pond / aquarium, food for my pets	○	○	○	○	○
j) I will explore the wildlife in nature, e.g. in rock pools on the beach	○	○	○	○	○
k) Buy highly energy-efficient appliances	○	○	○	○	○
l) Take my own bags to the shops	○	○	○	○	○
m) Actively volunteer for an environmental organisation (including WWF)	○	○	○	○	○
n) Support sustainable policies with petitions and my political vote	○	○	○	○	○
o) Persuade friends to lead a more sustainable lifestyle	○	○	○	○	○
p) Walk along my local coastal path					

K. Chapter 6: Additional Analyses

Objective marine litter awareness

Below is the break-down of the two objective marine litter awareness tasks and their associated findings. The first task required participants to *list the three most common litter items found on the general UK coast.* See Table K.1 for the descriptive results

Table K.1. *The frequency (and percentage) of participants' responses before and after the beach cleaning event (n = 87).*

MCS Rank	Response categories	Before		After	
1	Plastic pieces	10	(4%)	18	(8%)
2	plastic caps or lids	5	(2%)	16	(7%)
3	polystyrene pieces	2	(1%)	9	(4%)
4	crisp / sweet / lolly wrappers	26	(11%)	17	(7%)
5	string & cord	3	(1%)	3	(1%)
6	plastic drink bottles	33	(13%)	16	(7%)
7	glass pieces	5	(2%)	4	(2%)
8	cotton bud sticks	4	(2%)	0	(0%)
9	fishing net and pieces	32	(13%)	57	(25%)
10	plastic cutlery	0	(0%)	1	(0%)
	Another valid category in MCS survey not in the top 10	71	(29%)	23	(10%)
	Too vague / NA	54	(22%)	63	(28%)

The second task asked participants to *rate the seven different sources of marine litter according to how much litter found annually on the UK coastline is from each source*. See Table K.2 for the results:

Table K.2. *The frequency (and percentage) of correct rankings for the seven sources of litter (n = 87).*

MCS Rank	Sources of Litter	Before		After	
1	Public	37	(45%)	25	(31%)
2	Non-sourced	15	(19%)	14	(18%)
3	Fishing	9	(11%)	5	(6%)
4	Sewage Related Debris	16	(19%)	6	(8%)
5	Shipping	7	(8%)	9	(11%)
6	Fly-tipped	16	(21%)	11	(15%)
7	Medical	3	(4%)	5	(6%)

See Table K.3 and K.4 for the descriptives for each of the individual items.

Table K.3. *The frequency (and percentage) of correct responses for each of the objective marine awareness questions on marine litter (n = 90).*

Question	Condition	Baseline		After		Follow-up	
Q: What do you think was the most common type of litter found on the UK coastline in 2011? A: Public litter (left by the public on the coast or inland, which is carried by winds and rivers)	BC	24	(80%)	21	(70%)	22	(73%)
	RR	27	(90%)	24	(80%)	27	(90%)
	CW	22	(73%)	24	(80%)	26	(87%)
	Total	**73**	**(81%)**	**69**	**(77%)**	**75**	**(83%)**
Q: Regarding individual items, what do you think were the most common items found on the UK coastline in 2011? A: Plastic pieces	BC	14	(47%)	12	(40%)	15	(50%)
	RR	7	(23%)	9	(30%)	10	(33%)
	CW	13	(43%)	11	(37%)	17	(57%)
	Total	**34**	**(38%)**	**32**	**(36%)**	**42**	**(47%)**
Q: Over the last 10 years, plastic bottles found on UK beaches have… A: Increased by 33%	BC	15	(50%)	17	(47%)	14	(47%)
	RR	12	(40%)	8	(27%)	8	(27%)
	CW	14	(47%)	15	(50%)	14	(47%)
	Total	**41**	**(46%)**	**40**	**(44%)**	**36**	**(40%)**
Q: On average in 2011, how many pieces of litter were found per kilometre? A: 1,741 pieces	BC	14	(47%)	14	(47%)	15	(50%)
	RR	15	(50%)	11	(37%)	13	(43%)
	CW	7	(23%)	9	(30%)	12	(40%)
	Total	**36**	**(40%)**	**34**	**(38%)**	**40**	**(44%)**
Q: How long do you think a disposable nappy (diaper) takes to decompose? A: 75-450 years	BC	12	(40%)	11	(37%)	11	(37%)
	RR	11	(37%)	15	(50%)	14	(17%)
	CW	11	(37%)	9	(30%)	13	(43%)
	Total	**34**	**(38%)**	**35**	**(39%)**	**38**	**(42%)**

Table K.4. *The frequency (and percentage) of correct responses for each of the objective marine awareness questions on biodiversity (n = 90).*

Question	Condition	Baseline		After		Follow-up		Question	Condition	Baseline		After		Follow-up	
Q: The scientific study of interactions among organisms and between organisms and their environment is….? A: Ecology	BC	22	(73%)	24	(80%)	27	(90%)	Painted top shell	BC	10	(33%)	12	(40%)	16	(53%)
	RR	26	(87%)	22	(73%)	24	(80%)		RR	13	(43%)	21	(70%)	28	(93%)
	CW	25	(83%)	27	(90%)	25	(83%)		CW	8	(27%)	10	(33%)	10	(33%)
	Total	**73**	**(81%)**	**73**	**(81%)**	**76**	**(84%)**		**Total**	**31**	**(34%)**	**43**	**(48%)**	**54**	**(60%)**
Common prawn	BC	26	(87%)	25	(83%)	27	(90%)	Purple sea urchin	BC	19	(63%)	11	(37%)	17	(57%)
	RR	28	(93%)	24	(80%)	27	(90%)		RR	16	(53%)	18	(60%)	21	(70%)
	CW	25	(83%)	25	(83%)	27	(90%)		CW	13	(43%)	12	(40%)	11	(37%)
	Total	**79**	**(88%)**	**74**	**(82%)**	**81**	**(90%)**		**Total**	**48**	**(53%)**	**41**	**(46%)**	**49**	**(54%)**
Cushion star fish	BC	20	(67%)	15	(50%)	19	(63%)	Rock goby	BC	26	(87%)	19	(63%)	27	(90%)
	RR	20	(67%)	18	(60%)	24	(80%)		RR	25	(83%)	19	(63%)	18	(60%)
	CW	19	(63%)	20	(67%)	19	(63%)		CW	25	(83%)	23	(77%)	23	(77%)
	Total	**59**	**(66%)**	**53**	**(59%)**	**62**	**(69%)**		**Total**	**76**	**(84%)**	**61**	**(68%)**	**68**	**(76%)**
Dog whelk	BC	30	(100%)	29	(97%)	30	(100%)	Sea scorpion	BC	9	(30%)	10	(33%)	12	(40%)
	RR	28	(93%)	29	(97%)	30	(100%)		RR	12	(40%)	8	(27%)	11	(37%)
	CW	28	(93%)	23	(77%)	28	(93%)		CW	7	(23%)	6	(20%)	12	(40%)
	Total	**86**	**(96%)**	**81**	**(90%)**	**88**	**(98%)**		**Total**	**28**	**(31%)**	**24**	**(27%)**	**35**	**(39%)**
Green sea urchin	BC	13	(43%)	12	(40%)	13	(43%)	Snakelocks anemone	BC	4	(13%)	6	(20%)	12	(40%)
	RR	20	(67%)	14	(47%)	22	(73%)		RR	12	(40%)	22	(73%)	24	(80%)
	CW	17	(57%)	13	(43%)	16	(53%)		CW	12	(40%)	9	(30%)	12	(40%)
	Total	**50**	**(56%)**	**39**	**(43%)**	**51**	**(57%)**		**Total**	**28**	**(31%)**	**37**	**(41%)**	**48**	**(53%)**

Behavioural intentions

To examine participants' intention to perform activities similar to those experimentally manipulated, three separate mixed 3 (time: baseline, immediately after, follow-up) x 3 (activity: beach clean, rock pool, coastal walk) ANOVAs were used[12]. See Table K.5 for the descriptives.

Table K.5. *The overall behavioural intention ratings (M and SD) and specific activity focused intentions over the different time points for Study 7 (n = 90).*

	Baseline	Immediately After	Follow-up
Overall Intention	**2.81 (0.49)**	**3.21 (0.55)**	**3.09 (0.58)**
Beach Clean	*2.85 (0.47)*	*3.35 (0.45)*	*3.18 (0.51)*
Rock Pooling	*2.81 (0.53)*	*3.24 (0.61)*	*3.11 (0.68)*
Coastal Walk	*2.76 (0.47)*	*3.06 (0.57)*	*2.99 (0.55)*
Beach Cleaning Specific	**1.98 (0.75)**	**2.53 (0.84)**	**2.35 (0.87)**
Beach Clean	*2.10 (0.86)*	*2.98 (0.78)*	*2.64 (1.01)*
Rock Pooling	*1.83 (0.59)*	*2.27 (0.87)*	*2.23 (0.85)*
Coastal Walk	*2.02 (0.77)*	*2.33 (0.70)*	*2.20 (0.70)*
Rock Pooling Specific	**3.06 (0.94)**	**3.40 (0.92)**	**3.22 (0.90)**
Beach Clean	*3.30 (0.84)*	*3.47 (0.90)*	*3.24 (0.83)*
Rock Pooling	*3.10 (0.96)*	*3.50 (1.01)*	*3.33 (1.03)*
Coastal Walk	*2.77 (0.97)*	*3.23 (0.86)*	*3.10 (0.84)*
Coastal Walking Specific	**3.41 (1.08)**	**3.75 (0.92)**	**3.64 (0.98)**
Beach Clean	*3.57 (1.19)*	*3.73 (0.87)*	*3.69 (0.89)*
Rock Pooling	*3.43 (1.17)*	*3.90 (0.92)*	*3.63 (1.03)*
Coastal Walk	*3.23 (0.86)*	*3.62 (0.98)*	*3.60 (1.04)*

Note. Scale ranged from *never* (1) to *all of the time* (5).

Beach cleaning – First, when examining intentions to volunteer to participate in future beach cleans, an overall effect of time was found to be statistically significant, F (1.85, 159.47) = 27.58, $p < .001$, partial $\eta^2 = .24$ (medium effect). Specifically, intention to do beach cleans in the future increased from baseline to immediately after the visit to the coast ($p < .001$) but declined slightly a week later ($p = .03$), yet still remaining higher than baseline ($p = .001$). As well as intention to do a beach clean varying over time, there

[12] A mixed MANOVA (Multivariate Analysis of Variance) replicated these conclusions. However, the power of this analysis was questionable as some assumptions were not entirely met. Consequently, the more conservative individual ANOVAs have been reported.

were also significant differences between activities, F (2, 86) = 3.84, p = .03, partial η^2 = .08 (small effect). Post-hoc analyses highlighted that the beach cleaning group overall had greater intentions compared to the rock pooling group (p = .03). An interaction between time and activity was also found to be statistically significant, F (3.71, 159.47) = 3.19, p = .02, partial η^2 = .07 (small effect). Simple effects analysis found that the effect occurred immediately after the visit, whereby the beach cleaning group had greater intention compared to the rock pooling and walking group at that time (ps < .006), but all three activities were reasonably similar during baseline (p = .37) and a week later (p = .10).

Rock pooling – For the rock pooling based intention, fewer patterns emerged. A main effect of time was statistically significant, F (2, 172) = 6.26, p = .002, partial η^2 = .07 (small effect). Post-hoc tests found that the intention to go rock pooling increased significantly immediately after a visit to the coast (p = .004), with this intention remaining high a week later (p = .16). However, there was no statistical effect on activity (p = .25) and the interaction between activity and time was also found to not be statistically significant (p = .59).

Coastal walking – Similarly to the rock pooling based intention, intention to go on a coastal walk only had one statistically significant effect. Intention was seen to change over time, F (1.95, 165.62) = 9.40, p < .001, partial η^2 = .10 (small effect), whereby intention significantly increased from baseline to immediately after a visit to the coast (p < .001; see Table K.5) and remained higher than baseline one week later (p = .03). Both main effect of activity and interaction were, again, not found to be statistically significant (ps > .53).

What are the most important factors?

Table K.6. *Regression 1 examining the predictive value of demographic & visitor characteristic variables on overall satisfaction (n = 90)*

	B	***SE B***	***β***	***p-value***
Step 1 –Demographics				
R^2 = .08 | Adjusted R^2 = .05 | F_{change} (3, 85) = 2.58, p = .06				
Constant	5.66	1.05		
Gender (male)	-0.34	0.48	-0.08	.48
Age	-0.02	0.03	-0.07	.55
Connectedness	0.69	0.25	0.29	.01
Step 2 –Demographics & Past Experiences				
R^2 = .14 | Adjusted R^2 = .05 | F_{change} (6, 79) = 0.91, p = .49				
Constant	6.25	1.11		
Gender (male)	-0.30	0.49	-0.07	.54
Age	-0.03	0.03	-0.09	.42
Connectedness	0.54	0.28	0.23	.05
Visit rocky shores (everyday)	2.00	1.94	0.11	.31
Visit rocky shores (several)	-0.87	1.10	-0.08	.43
Visit rocky shores (weekly)	0.26	0.63	0.05	.68
Visit rocky shores (monthly)	-0.46	0.61	-0.08	.45
Visit rocky shores (couple of months)	-0.10	0.57	-0.02	.87
Visit rocky shores (yearly - ref)	-	-	-	-
Visit rocky shores (never)	1.29	0.81	0.17	.12
Step 3 – Demographics & Past Experiences & Visit Characteristics				
R^2 = .14 | Adjusted R^2 = .03 | F_{change} (1, 78) = 0.04, p = .85				
Constant	6.11	1.36		
Gender (male)	-0.30	0.50	-0.07	.55
Age	-0.03	0.04	-0.10	.41
Connectedness	0.54	0.28	0.23	.06
Visit rocky shores (everyday)	2.03	1.96	0.11	.30
Visit rocky shores (several)	-0.83	1.14	-0.08	.47
Visit rocky shores (weekly)	0.26	0.63	0.05	.69
Visit rocky shores (monthly)	-0.49	0.63	-0.09	.44
Visit rocky shores (couple of months)	-0.12	0.58	-0.02	.84
Visit rocky shores (yearly - ref)	-	-	-	-
Visit rocky shores (never)	1.28	0.82	0.17	.12
Group size	0.02	0.09	0.02	.85

Exploratory mediation analyses:

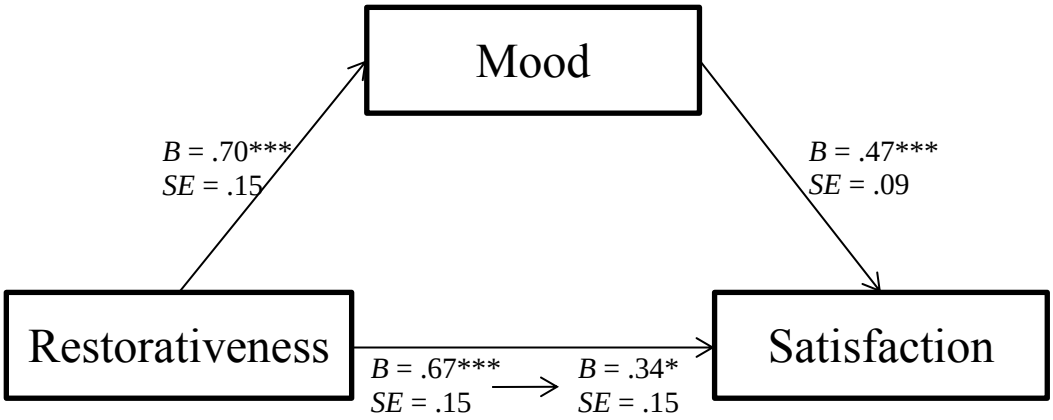


Figure K.1. The exploratory mediation effect between perceived restorativeness, mood (after) and overall satisfaction.
Note. Asterisks indicate the significance of the coefficients: *$p < .05$; **$p < .01$; ***$p < .001$. A bootstrapping procedure (Preacher & Hayes, 2004) found that mood had a partial mediating effect on restorativeness on satisfaction (.33; 95% confidence interval = [0.18, 0.51]).

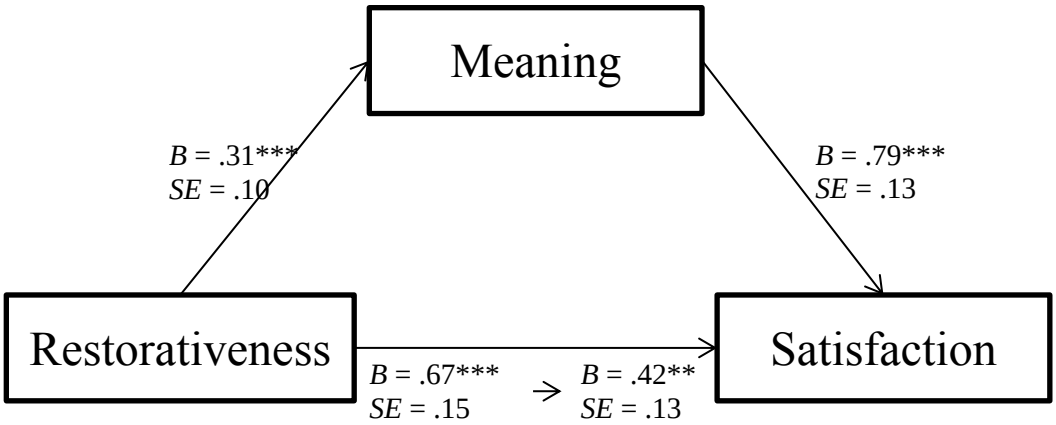


Figure K.2. The exploratory mediation effect between perceived restorativeness, meaning and overall satisfaction.
Note. Asterisks indicate the significance of the coefficients: ***$p < .001$. A bootstrapping procedure (Preacher & Hayes, 2004) found that meaning had a weak partial mediating effect on restorativeness on satisfaction (.24; 95% confidence interval = [0.06, 0.43]).

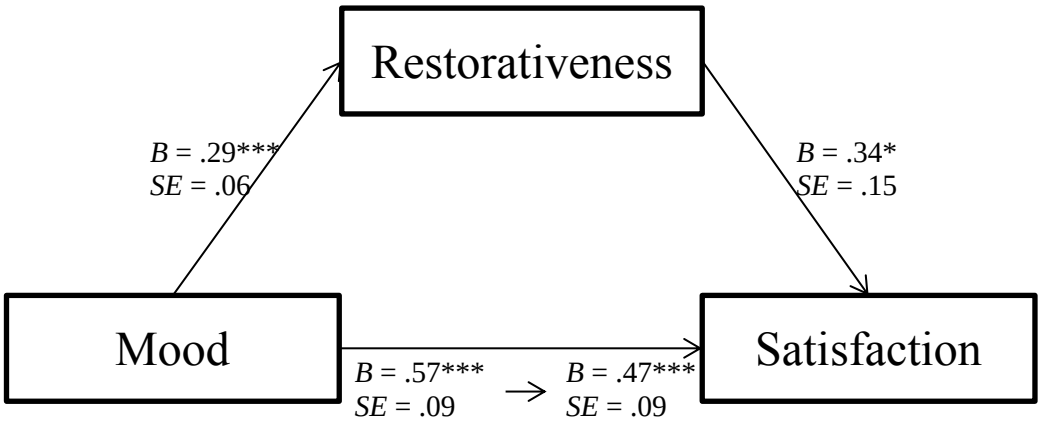


Figure K.3. The exploratory mediation effect between mood (after), perceived restorativeness and overall satisfaction, exploring the other direction.
Note. Asterisks indicate the significance of the coefficients: *p < .05; ***p < .001. A bootstrapping procedure (Preacher & Hayes, 2004) did not find a statistically significant mediating effect on satisfaction (.10; 95% confidence interval = [0.03, 0.20]).

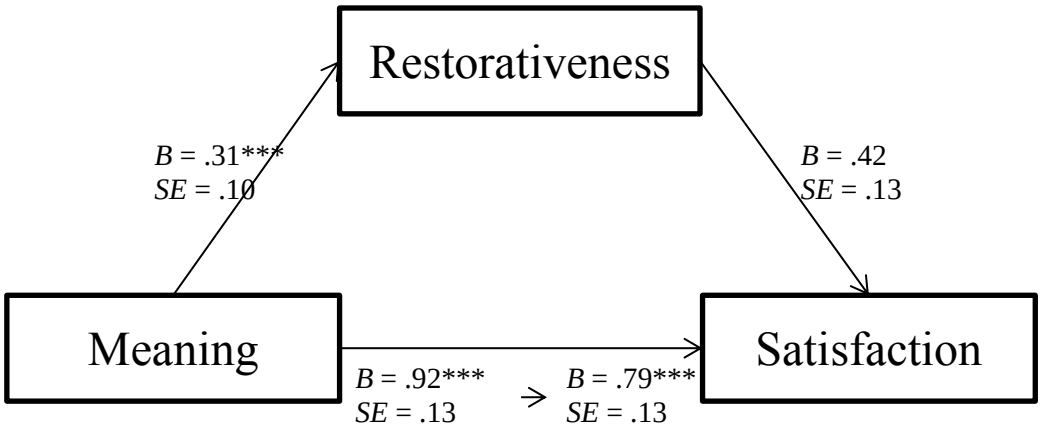


Figure K.4. The exploratory mediation effect between meaning, perceived restorativeness and overall satisfaction, exploring the other direction.
Note. Asterisks indicate the significance of the coefficients: ***p < .001. A bootstrapping procedure (Preacher & Hayes, 2004) did not find a statistically significant mediating effect on satisfaction (.13; 95% confidence interval = [0.03, 0.27]).

L. Summary of Methods and Findings

Table L.1. *Summary of methods and significant findings across all studies*

	Method	Findings
Chapter 3 (Studies 1 & 2)	**Design**: perception-based survey (general visit) **Participants**: 97 rocky shore users (Study 1), 25 coastal experts (Study 1), 44 international academics (Study 2) **Main measures**: mood & arousal, subjective marine awareness, perceived risk (perceived frequency x potential harmfulness).	**WB**: Visits seen to increase well-being (extent seen to depend on activity). **MA**: Visits seen to increase marine awareness (extent noted to depend on individual experience and level of interpretation). **HT**: Impact on the environment varies with activity and behaviour. Littering and unsustainable rock pooling were noted the worst. **Other**: NA
Chapter 4 (Study 3)	**Design**: before-after field survey (current recreational visits) **Participants**: 214 current rocky shore users **Main measures**: activity-level mood & arousal; change in overall mood, perceived restorativeness, meaningfulness, subjective marine awareness.	**WB**: Individual activities did not vary in mood but did vary in arousal ratings. Overall, mood increased after a visit, the environment was rated highly according to ART, and visits were seen to be meaningful with individuals feeling satisfied. The most influential predictors of whether people were satisfied were the distance travelled to the site, the duration of their visit, their mood levels and how meaningful they found it. **MA**: Subjective marine awareness increased after a visit. **HT**: Not investigated in this chapter. **Other**: NA
Chapter 5 (Studies 4 & 5)	**Design**: laboratory studies within-subject design (scenes that were clean, or with seaweed, public- or fishing-litter) **Participants**: 79 students (Study 4) and 19 general public (Study 5) **Main measures**: mood, arousal, preference, perceived restorativeness	**WB**: Rocky shores that were clean or have drift seaweed were rated similarly high on well-being (mood, preference and perceived restorativeness) and were often associated with psychological benefits, familiarity, and positive aspects of the scene. In contrast, littered scenes were rated negatively, with public-litter consistently rated the lowest, and was seen to demonstrate human's disrespect for nature, physical risks linked to rubbish and symbolising urban life. **MA**: Not investigated in this chapter **HT**: The habitat threat (marine litter) was the manipulation of this chapter. **Other**: Participants with a greater connectedness to nature experienced greater well-being benefits from natural scenes (clean & seaweed) than those with lower connectedness.
Chapter 6 (Studies 6 & 7)	**Design**: before-after field survey on beach cleans and a longitudinal experimental design (comparing beach cleans, rock pool rambles and coastal walks) **Participants**: 87 volunteers (Study 6) and 90 students (Study 7) **Main measures**: change in mood, perceived restorativeness, meaningfulness, subjective & objective marine awareness, pro-environmental behaviours	**WB**: Even though mood did not change, well-being was rated positively after a visit to the coast. The restorative quality of the environment was perceived differently depending on the activity. Meaningfulness was found to be greater for beach cleaning volunteers but other well-being measures were rated highly regardless of activity. **MA**: Subjective marine awareness improvements were greater for people who engage in beach cleans or rock pool rambles, however the objective measures did not always replicate these findings. **HT**: When doing activities that help tackle or reduce the impacts noted in Chapter 3, they still have beneficial impacts on the individuals. **Other**: Pro-environmental intentions also increased after an experience on the rocky shore, regardless of activity. People who have not participated in a beach clean also demonstrated greater improvements in marine awareness.

Note. WB = Well-being, MA = Marine Awareness; HT= Habitat Threat