Public Perceptions of Deep-Sea Environment: Evidence from Scotland and Norway

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Public perception/acceptance is important to avoid protests like yellow vests in the streets.

Personal values, norms and institutional trust affects acceptance of political decisions: literacy is essential.

Ocean literacy lags environmental literacy and deep sea literacy is less well-known (spatially and temporally distant)
Objective

To explore public perceptions of the deep sea environment among Scottish and Norwegian public.

Specifically:
- Knowledge and Awareness of Marine Ecosystems
- Deep sea changes connection
- Deep sea condition and management rating
- Pro-environmental concerns

Socio-Economics and Attitudinal factors effect
Method

Online survey

Sample: 1,025 (Scotland) and 1,024 (Norway)

Survey design

- Prior knowledge and awareness
- Deep sea condition, management
- Pro-environmental concerns
- Attitudinal questions

Knowledge Information:
- Climatic and anthropogenic impact on seas and wildlife
- Government responsible for management and cost implications
- Marine Economy & Ecosystems
- MRC-LoVe CW coral reefs:
  - Importance
  - Opportunities
### Method: Pro-environmental concerns

| Items | Item Short Phrase | Source |
|-------|-------------------|--------|
| The balance of marine biodiversity is very delicate and easily upset | Delicate marine biodiversity | NEP |
| Human activities are severely abusing marine ecosystems such as marine organism abundance and diversity, and biological integrity of the sea-floor | Human abuse | NEP |
| The key pressures on marine biodiversity are fisheries | Fisheries pressure | MFSDGES (D1) |
| The key pressures on marine biodiversity are physical damage to the sea-floor | Sea floor damage | MFSDGES (D1) |
| All commercial fish stocks should be sustainably exploited in order to secure high long-term yield and healthy stocks | Sustainable exploitation | MFSDGES (D3) |
| Marine litter is one of the key challenges to the marine environment and biodiversity | Marine litter challenge | MFSDGES (D10) |

Healthy seas are central to our well-being

- Strongly Agree (5)
- Strongly Disagree (1)
- Tend to Agree
- Tend to Disagree
- Neither agree nor disagree

Marine litter is one of the key challenges to the marine environment and biodiversity

Economic growth is more important than protecting the marine environment

Establishment of marine protected areas is one important measure for protecting valuable, vulnerable or threatened organisms

As humans we are responsible to protect natural resources to benefit future generations

Economic growth

Environmental citizenship

Author
| Variable                                      | Mingulay-Scotland | LoVe - Norway |
|----------------------------------------------|-------------------|---------------|
|                                              | Mean  | Std. Dev.   | Mean  | Std. Dev. |
| Age 18-35                                    | 0.101 | 0.302       | 0.168 | 0.374     |
| Age 36-55                                    | 0.493 | 0.500       | 0.394 | 0.489     |
| Age 56 and above                             | 0.406 | 0.491       | 0.438 | 0.496     |
| Male                                         | 0.440 | 0.497       | 0.572 | 0.495     |
| Tertiary Education                           | 0.518 | 0.500       | 0.864 | 0.343     |
| Full time employed                           | 0.380 | 0.486       | 0.592 | 0.492     |
| Part time employed                           | 0.133 | 0.339       | 0.092 | 0.289     |
| Student                                      | 0.064 | 0.246       | 0.052 | 0.222     |
| Unemployed                                   | 0.044 | 0.205       | 0.021 | 0.145     |
| Resident of Highlands and Islands            | 0.063 | 0.244       | -     | -         |
| Marine Sports                                | 0.384 | 0.487       | 0.466 | 0.499     |
| Visit to Sea Areas                           | 0.276 | 0.447       | 0.639 | 0.481     |
| Have visited island of Mingulay [or LoVe]    | 0.023 | 0.151       | 0.639 | 0.481     |
| Have visited island of Barra                 | 0.119 | 0.324       | -     | -         |
| Have visited elsewhere in the Outer Hebrides | 0.238 | 0.426       | -     | -         |
| Have seen Blue Planet II                     | 0.549 | 0.498       | 0.429 | 0.495     |
Results: Knowledge and Awareness

**Knowledge (1-5)**

| Knowledge Level          | Mingulay | LoVe |
|--------------------------|----------|------|
| I knew none of it        | 49.6     | 84.4 |
| I knew a little          | 29.7     | 41.1 |
| I knew some of it        | 15.5     | 15.6 |
| I knew most of it        | 3.3      | 0.3  |
| I knew everything        | 0.3      | 2.2  |

**Awareness**

| Awareness Level | Mingulay | LoVe |
|-----------------|----------|------|
| No              | 51.8     | 15.6 |
| Yes             | 28.0     | 41.1 |

**Means Scores**

- Mingulay = 1.75
- LoVe = 3.13

**Median Scores**

- Mingulay = 2
- LoVe = 3
## Results: Knowledge and Awareness

| Variables                     | Mingulay – Scotland | LoVe - Norway |
|-------------------------------|---------------------|---------------|
|                               | Knowledge (Ologit)  | Awareness (Logit) | Knowledge (Ologit)  | Awareness (Logit) |
| Male                          | Coef                | Coef           | Coef                | Coef               |
| 0.134                         | 0.089               | -0.113         | 0.224               |
| Age 36-55                     | 0.066               | 0.911**        | 0.223               | 0.174              |
| Age 56 and above              | 0.289               | 1.571***       | 0.414**             | 0.285              |
| Tertiary Education            | 0.322***            | -0.198         | 0.575***            | 0.275              |
| Blue Planet II                | 0.495***            | 0.473**        | 0.543***            | 0.870***           |
| Highlands and Islands         | 0.677**             | 0.349          | 0.612***            | 0.572***           |
| Sea Industry                  | 1.088***            | 0.902***       | 0.612***            | 0.572***           |
| Marine Sport                  | 0.488***            | 0.252          | 0.614***            | 0.481***           |
| Visit to Sea Areas            | 0.874***            | 1.209***       | 0.451***            | 0.547***           |
| Member of Env. Org            | -                   | -              | 0.551***            | 0.624**            |
| Constant                      | -                   | -3.761***      | -                   | -1.255***          |
| Observations                  | 1.025               | 1.025          | 1.024               | 1.024              |
| Wald Chi2                     | 133.71***           | 89.14***       | 100.59***           | 104.84***          |
| Pseudo R2                     | 0.061               | 0.113          | 0.049               | 0.087              |
Results: Deep sea (DS) CONDITION and MANAGEMENT Rating

### CONDITION

| Condition          | LoVe | Mingulay |
|--------------------|------|----------|
| Very poor          | 0.2  | 1.0      |
| Fairly poor        | 13.8 | 7.4      |
| Neither good nor poor | 25.4 | 18.0    |
| Fairly good        | 49.8 | 46.2     |
| Very good          | 5.1  | 4.3      |
| Don’t know         | 5.8  | 23.0     |

### MANAGEMENT

| Management          | LoVe | Mingulay |
|---------------------|------|----------|
| Well                | 33.5 | 22.1     |
| Neither             | 21.2 | 11.7     |
| Poorly              | 76.3 | 33.7     |
| Don’t know          | 7   | 1.3      |
| Don’t care          | 0.4  | 0.4      |

### DS changes Effect on people

| Effect on People     | LoVe | Mingulay |
|----------------------|------|----------|
| NO EFFECT ON ME      | 28.59| 12.40    |
| SOME EFFECT ON ME    | 60.59| 61.91    |
| MAJOR EFFECT ON ME   | 10.83| 21.09    |
| DON'T KNOW           | 4.59 | 4.59     |
## Results: Deep sea (DS) CONDITION and MANAGEMENT Rating

| Variables                     | Condition (Ologit) | Management (Logit) | Effect on me (Ologit) |
|-------------------------------|--------------------|--------------------|-----------------------|
|                               | Mingulay Coef | LoVe Coef | Mingulay Coef | LoVe Coef | Mingulay Coef | LoVe Coef |
| Male                          | 0.029     | 0.593*** | 0.042     | 0.735*** | -0.104     | -0.777*** |
| Age 36-55                     | 0.463**   | 0.440**  | 0.230     | 0.268     | 0.213      | 0.400**   |
| Age 56 and above              | 0.629***  | 0.385**  | 0.300     | 0.304     | -0.223     | 0.127     |
| Tertiary Education            | 0.202     | 0.122    | -0.156    | -0.338    | 0.324**    | 0.124     |
| Blue Planet II                | 0.401***  | 0.009    | 0.353**   | 0.274*    | 0.140      | 0.572***  |
| Highland and Islands          | 0.309     | -        | -0.302    | -         | 0.117      | -         |
| Sea Industry                  | -0.416    | 0.502*** | -0.320    | 1.104***  | 0.528**    | 0.157     |
| Marine Sport                  | 0.074     | -0.068   | 0.106**   | 0.795***  | 0.044      | 0.768***  |
| Visit to Sea Areas            | 0.273*    | 0.285**  | 0.322***  | 0.700***  | 0.610***   | 0.274*    |
| Member of Env. Org            | -         | -0.274   | -         | 0.671***  | -         | 0.982***  |
| Constant                      | -1.149    | -3.006   | -         | -         | -         | -         |
| Observations                  | 789       | 965      | 1,025     | 1,024     | 1,025      | 977       |
| Wald Chi2                     | 31.54***  | 47.92*** | 17.18**   | 105.97*** | 41.58***   | 105.28*** |
| Pseudo R2                     | 0.016     | 0.023    | 0.014     | 0.11      | 0.03       | 0.072     |
| Variables              | Condition (Ologit) | Management (Logit) | Effect on me (Ologit) |
|------------------------|--------------------|--------------------|-----------------------|
|                        | Mingulay          | LoVe               | Mingulay             | LoVe                | Mingulay | LoVe |
| Coef                   | Coef              | Coef               | Coef                 | Coef                | Coef     | Coef |
| Male                   | 0.029             | 0.593***           | 0.042                | 0.735***            | -0.104   | -0.777*** |
| Blue Planet II         | 0.401***          | 0.009              | 0.353**              | 0.274*              | 0.140    | 0.572*** |
| Member of Env. Org     | -                 | -0.274             | -                    | 0.671***            | -        | 0.982*** |
### Results: Pro-environmental Concerns

| Item Code                          | Observations | Mean | SD   | AGREE (Tend to + Strongly) | Observations | Mean | SD   | AGREE (Tend to + Strongly) |
|------------------------------------|--------------|------|------|-----------------------------|--------------|------|------|-----------------------------|
| Delicate marine biodiversity       | 942          | 4.31 | 0.71 | 80.88                       | 1,024        | 4.09 | 0.77 | 82.52                       |
| Human abuse                        | 964          | 4.31 | 0.77 | 81.18                       | 1,024        | 4.30 | 0.72 | 89.26                       |
| Fisheries pressure                 | 812          | 3.59 | 0.87 | 44.19                       | 1,024        | 3.23 | 0.79 | 33.1                        |
| Sea floor damage                   | 806          | 3.87 | 0.82 | 53.27                       | 1,024        | 3.49 | 0.79 | 49.03                       |
| Sustainable exploitation           | 937          | 3.97 | 1.04 | 67.03                       | 1,024        | 4.34 | 0.77 | 88.87                       |
| Marine litter challenge            | 969          | 4.47 | 0.70 | 86.93                       | 1,024        | 4.15 | 0.78 | 82.52                       |
| Central to our well-being          | 988          | 4.38 | 0.74 | 85.07                       | 1,024        | 4.52 | 0.72 | 92.48                       |
| Central to economic security       | 948          | 4.14 | 0.80 | 75.22                       | 1,024        | 4.19 | 0.80 | 83.01                       |
| MPA is important                   | 973          | 4.36 | 0.72 | 83.8                        | 1,024        | 4.12 | 0.87 | 80.47                       |
| Economic growth                    | 979          | 3.86 | 1.06 | 65.85                       | 1,024        | 4.04 | 0.93 | 75.49                       |
| Environmental citizenship           | 1,002        | 4.62 | 0.62 | 91.22                       | 1,024        | 4.54 | 0.75 | 92.48                       |
| Mean                               | 4.17         | 0.31 |      |                             | 4.09         | 0.40 |      |                             |

What are the Socio-Economic variants?
Results: Pro-environmental Concerns MIMIC Model

GSEM: A MIMIC Model of Single Latent Variable: Pro-Environmental Concern

- Pro-Env. Concern Scale
- Observed ordinal indicators
- Control variables: respondent characteristics
- Covariate 1
- Covariate 2
- ... Covariate K
- Item 1
- Item 2
- ... Item 11
## Results: Influencers of Pro-environmental Concerns

|                          | LoVe            | Mingulay       |
|--------------------------|-----------------|----------------|
| **Structural**           | Coeff           | Coeff          |
| Male                     | -0.64***        | -0.01          |
| Age 36-55                | 0.17            | 0.28           |
| Age 56 and above         | 0.14            | 0.54**         |
| Tertiary Education       | 0.39*           | 0.20           |
| Blue Planet II           | 0.69***         | 0.73***        |
| Member of Env. Organization | 1.13***     | -              |
| Highland and Islands     | -               | 0.28           |
| Sea Industry             | -0.82***        | -0.54**        |
| Marine Sport             | 0.10            | -0.05          |
| Visit to Sea Areas       | 0.06            | 0.30*          |
| Deep-sea changes effect on me | 0.71***   | 1.38***        |
| At least some prior knowledge | 0.38***    | 0.38**         |
| **Obs**                  | 1024            | 1005           |
| **Loglik**               | -10479          | -11311         |
| **BIC**                  | 21415           | 19679          |
Conclusion

- Public knowledge of the deep sea is low for Scottish and moderate for Norwegians

- Awareness of cold-water corals was high for LoVe and low for Mingulay

- Deep sea condition is perceived to be “fairly good” but people are dissatisfied with the management of it (*low institutional trust*)

- There are ecocentric attitudes towards the marine environment – implying support for conservation goals
Further Inquiry ....

- Does acceptance translate into Financial commitments?

- Visit the ATLAS POSTER:

**Economic Valuation of New Deep-Sea Management Options: A Latent Class Comparison of Norway and Scotland**

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Thank You

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