

CHOICE EXPERIMENT ON COLD WATER CORALS

Name on focus group

Date

Off the coast of Norway we find one of the densest occurrences of cold water corals (CWC) in the world. Over 1100 coral reefs have so far been detected (fig 1) and new reefs are regularly discovered. As of today verified coral reefs automatically get some degree of protection, i.e. it is prohibited to destroy them and activities around them must be executed with care. While this offers some protection, implementation of Marine Protected Areas (MPAs) are regarded as the best way of securing CWC. To determine an appropriate management of CWC, input from off-shore commercial activities (fish harvesting and oil/gas exploration and exploitation) and from the Norwegian population in general is necessary. This survey will give input from the Norwegian population to the Norwegian fisheries authorities.

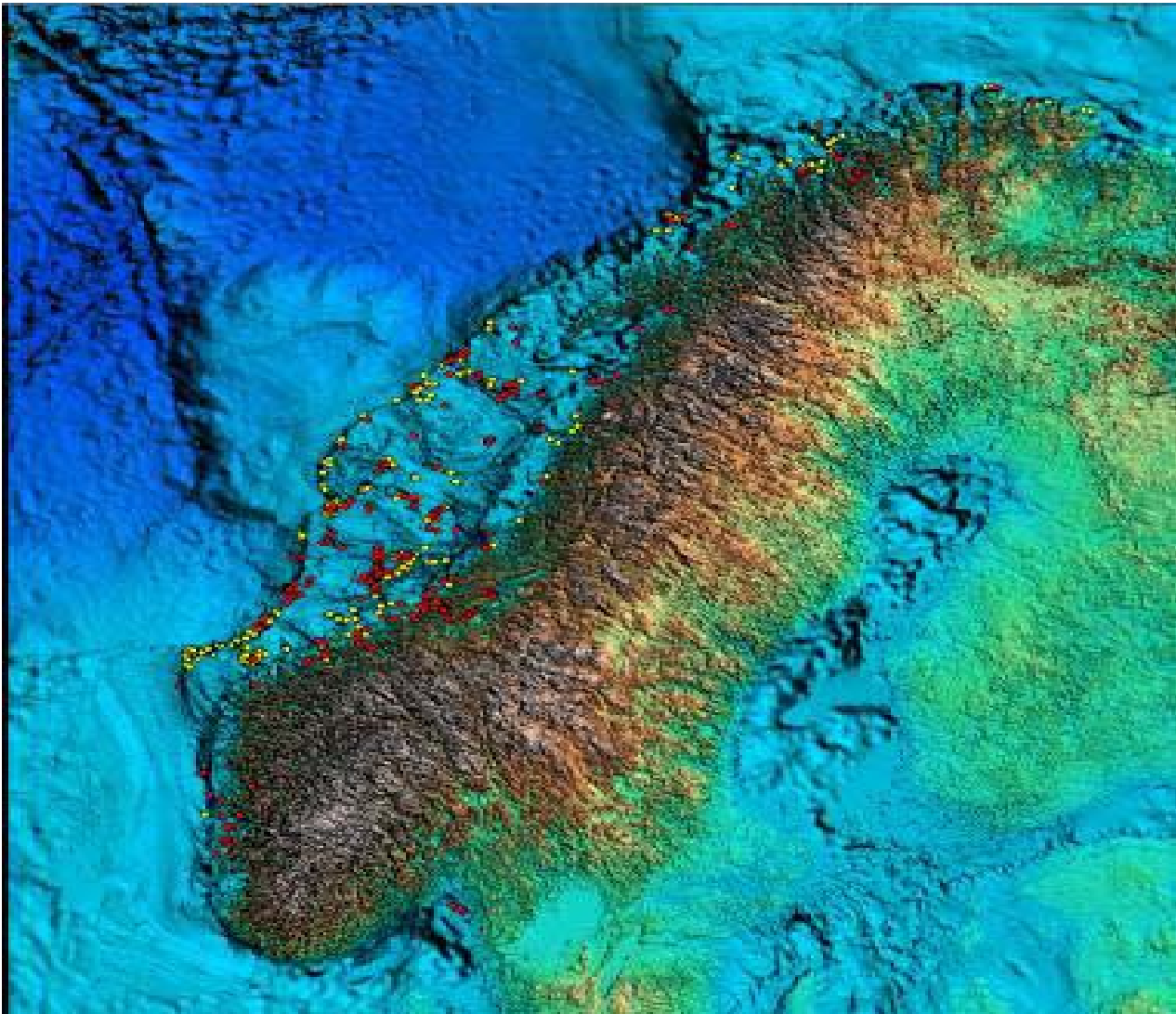


Figure 1 Yellow points are reported occurrences, whereas red points are verified occurrences of CWC off the Norwegian coast.

SECTION A: QUIZ

Question 1: What is a coral?

1. *an animal*
2. a plant
3. a fungus
4. don't know

Question 2: At which depths do we find most cold water coral reefs?

1. < 30 meters
2. 30-100 meters
3. *> 100 meters*
4. *don't know*

Question 3: How much do cold water corals grow annually?

1. *4-25 mm*
2. 25-100 mm
3. >100mm
4. don't know

Question 4: What do cold water corals eat?

1. They emit secretions that attract fish that they catch and eat
2. *They filter small organisms and suspended matter that happens to pass by*
3. They photosynthesise with the help of a symbiotic algae
4. Don't know

Question 5: What is the main threat to cold water coral reefs?

1. Predation by fish
2. Destruction by wave action
3. *Bottom trawling (Physical destruction by humans)*
4. don't know

Question 7: At what temperature range do cold water corals grow?

1. *4°C to 13°C*
2. 13°C to 18°C
3. -4°C to 0°C
4. don't know

Question 8: How do cold water corals reproduce?

1. Asexually through budding where a polyp divides into two genetically identical pieces
2. *Sexually where a sperm fertilizes an egg that develops into a larva*
3. Both sexually and asexually
4. don't know

Question 9: How old is the oldest cold water coral reef found off the Norwegian coast?

1. Less than 1000 years old
2. Between 1000 and 8000 years old
3. *Between 8000 to 10 000 years old*
4. don't know

SECTION B: ATTITUDES TO THE NORWEGIAN MANAGEMENT OF MARINE HABITATS AND TO ENVIRONMENTAL PROTECTION

B.1 How well do you think Norwegian coastal and sea areas are managed?

The coastal zone

Poorly		Medium		Well		Don't know		Don't care
<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>			<input checked="" type="radio"/>

The fiords

Poorly		Medium		Well		Don't know		Don't care
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>

The deep sea

Poorly		Medium		Well		Don't know		Don't care
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>

B.2 How important do you think it is that people engage in order to protect the environment?

- ☒ Very important, if people had not engaged in environmental protection much of our rare and vulnerable nature would be lost
- ☐ Important, because much of our rare and vulnerable nature is threatened and we have a responsibility to protect what is left
- ☐ Somewhat important, as sometimes it helps and at least it does no harm
- ☐ Not very important, and sometimes it makes things even worse
- ☐ Not important at all, the environment will recover by itself from any harm human beings have inflicted upon it

B.3 I think the Norwegian government should prioritize the environment above all other policy areas, such as health, employment and education

☒ agree ☐ partly agree ☐ partly disagree ☐ disagree

SECTION C: Attributes and Attribute levels

Cold water corals (CWC) are found along the Norwegian coast from Hvaler in the southeast to Sørøya in the north, with the main occurrences along the coast from Stavanger in the south to Sørøya in the North. The main bulk of the CWC are found in the deep sea, but there are also a few occurrences in the fiords.

New coral reefs are regularly detected. Upon detection the reef must first be verified by scientists by the use of subsurface video equipment (ROVs). When verified the reef area is put on the map and marked as an area where special care must be taken when activities such as fish harvesting are exercised. A set of scientific criteria determines if a new reef shall be protected further in the form of a MPA.

As of today there are 3 MPAs containing CWC, and 6 reefs are protected against all bottom fish harvesting activities. The protected areas cover 2,445 km², which corresponds to the size of Vestfold county. It is not an option to reverse the protection of already protected CWC areas. The lowest extent of CWC protection is thus the status quo situation. The future management of CWC is in the shaping, and will be based upon scientific advice and input from relevant stakeholders. In this connection we ask you to assess a few options for protecting CWCs, including consequences of the protection for commercial activities and the importance of the protected areas as habitat for fish and for potential future use. The options for future protection can be described by the following characteristics.

Attribute 1: Size of protected area

- Small increase in protected area (from 2.445 km² to 3.000km²)
- Medium increase in protected area in order to protect all known coral reefs (from 2.445 km² to 5.000 km²)
- Large increase in protected area in order to protect all known reefs and areas where it is likely we will find coral reefs (from 2.445 km² to 10.000 km²)

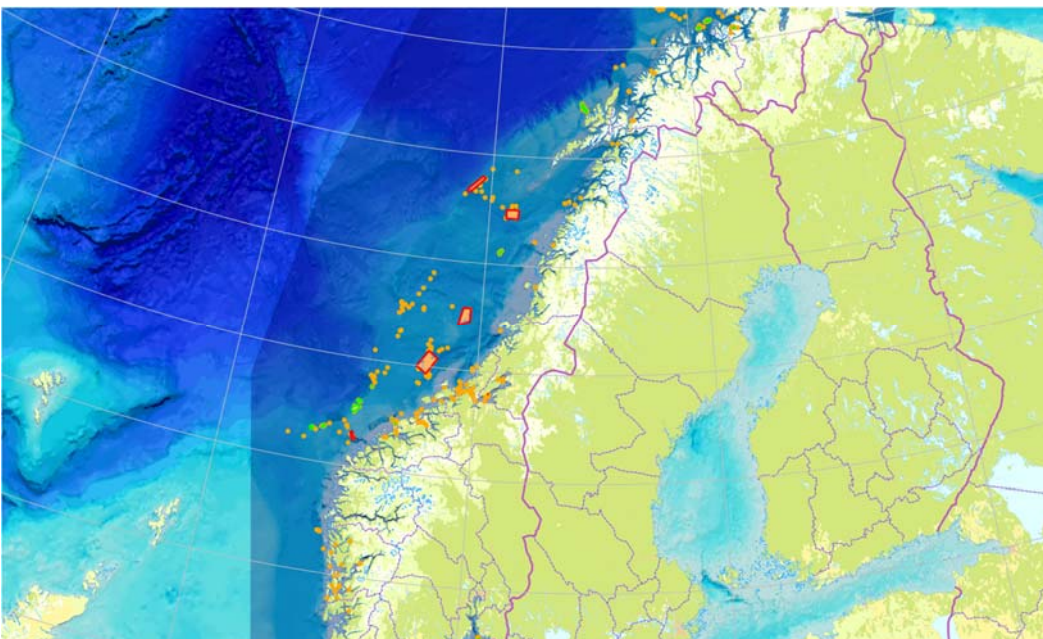


Fig 2 Red squares indicate protected CWC areas as of today (a few are missing from the map), green spots are verified coral reefs whereas orange spots are detected coral reefs. Grey shaded areas are under investigation.

Protecting CWC will imply that commercial activities such as certain types of fish harvesting, oil and gas exploration and exploitation, and off-shore wind energy will be hampered, if not prohibited. In some cases this will not be a problem because the protected area is not attractive, neither for fishing nor for off-shore energy activities. In other cases protected areas will be of significant interest for commercial activities.

Attribute 2: Trade-offs between coral protection and the possibility for off-shore commercial activities (fish harvesting, oil/gas exploration and exploitation, off-shore wind and wave energy)

- The areas suggested for protection are of *insignificant* interest for off-shore commercial activities
- The areas suggested for protection are of *some* interest for off-shore commercial activities
- The areas suggested for protection are of *significant* interest for off-shore commercial activities

As of today there is no actual use of cold water corals. Research and fishermen's knowledge indicate that CWC may be a preferred habitat for fish, but this is not scientifically verified.

Attribute 3: Importance of CWC for fish (Indirect use values of the CWC)

- The areas suggested for protection are *insignificant* habitat for fish
- The areas suggested for protection are of *some* importance as habitat for fish
- The areas suggested for protection are *significant* as habitat for fish

In the future we may make more extensive use of CWC, e.g. as ingredient in medicines and health foods, or in industrial processes. For the moment the knowledge necessary for understanding CWC and its potential use for human beings does not exist.

Attribute 4: Importance of the CWC for future use (Option and quasi option values of the CWC)

- The areas suggested for protection will have *insignificant* potential for human use in the foreseeable future
- The areas suggested for protection will have *some* potential for human use in the foreseeable future
- The areas suggested for protection will have *significant* potential for human use in the foreseeable future

Attribute 5: Costs (per person per year)

Increases in the future protection of CWC imply increased costs connected to the verification of new reefs. This demands increased funding for managing authorities (Fiskeridirektoratet). In order to cover such costs the government must increase the federal tax rate on income. The average annual individual income in Norway is about NOK 450.000, and the federal tax rate on income is about 15% (excluding the special tax on high incomes, which is an additional 8%).

- 500 NOK (Norwegian kroner)/year (equals 0,0075% increase in average federal income tax)
- 750 NOK/year (equals 0,011% increase in average federal income tax)
- 1000 NOK/year (equals 0,015% increase in average federal income tax)

Below are 6 choice cards, and we ask you to assess whether you would prefer alternative 1, alternative 2, which both imply increased protection of CWC, or the status quo with no further protection of CWC. Take as an example choice card 1: If you prefer alternative 1 this means that you prefer to increase the protection of CWC up to 3,000 km² and pay a maximum of 500 NOK annually for this, given that the new protected areas implies insignificant conflict with off-shore commercial activities, that the reefs in these areas are insignificant as habitat for fish, and that the

potential future use of the CWC in these areas is insignificant. You prefer this to no further protection of coral reefs, and to an alternative with a larger protection area, higher costs, where the protection cause some conflict with off-shore commercial activities, and the CWC in the protected areas has some importance as habitat for fish and may be of some potential use in the future.

Choice card 1

Attribute	Alternative 1	Alternative 2	I do not want to protect more CWC
Protected area	3,000 km ²	5,000 km ²	2,445 km ²
Conflict with industrial activities	Insignificant	Some	Insignificant
CWC's importance as habitat for fish	Some	Some	Unknown
CWC's potential use in the future	Insignificant	Significant	Insignificant
Costs	500 NOK/year	750 NOK/year	0
I prefer			

Choice card 2

Attribute	Alternative 1	Alternative 2	I do not want to protect more CWC
Protected area	5,000 km ²	10,000 km ²	2,445 km ²
Conflict with industrial activities	Some	Significant	Insignificant
CWC's importance as habitat for fish	Significant	Insignificant	Unknown
CWC's potential use in the future	Some	Some	Insignificant
Costs	750	1000	0
I prefer			

SECTION D: REASONS FOR CHOICES AND PREFERRED WAY TO PAY FOR INCREASED PROTECTION

D.1 Which of the attributes were important when you made your choice among the alternatives on the choice cards?

Attribute 1: size of protection area

Very important

some importance

Not important Don't know



Attribute 2: conflict with off-shore commercial activities

Very important

some importance

Not important Don't know



Attribute 3: CWC's significance as habitat for fish

Very important

some importance

Not important Don't know



Attribute 4: Potential future use of CWC

Very important some importance Not important Don't know

Attribute 5: costs

Very important some importance Not important Don't know

0% 20% 40% 60% 80%

D.2 Which of the following characteristics are most in accordance with your attitudes to the CWC?

- ☐ Cold water corals have a value of its own and we have no right to destroy them
- ☐ Cold water corals have a value of its own and we should be careful such that our industrial activities to a smallest possible degree destroy them
- ☐ We should take CWC into consideration in our industrial activities, but we also have to accept that some of them may get lost as a consequence of industrial activities
- ☐ Cold water corals are part of nature and we have the right to utilise nature to acquire food and other necessities even if this implies that some CWC gets lost as a consequence of these activities
- ☐ We do not need to take special care of cold water corals because they will recover by themselves from any harm human beings have inflicted upon them

D.3 Regarding the financing of the CWC protection, there are alternatives to a general increase in tax on income. If you are willing to pay for the protection of the CWC, which type of payment would you prefer?

- ☐ value-added tax (tax on goods and services)
- ☐ as part of the water and sewage bill (kommunale avgifter)
- ☐ By the use of the market (paying more for fish)
- ☐ Voluntary donation to a fund
- ☐ I would prefer a general, federal tax on income

SECTION E: PERSONOAL INFORMATION

E.1 Are you a member of an environmental organisation?

Yes

No

E.2 Postal code where you live _____

E.3 Age

- ☐ Older than 65 years
- ☐ 50-65 years
- ☐ 35-49 years
- ☐ 20-34 years
- ☐ younger than 20 years

E.4 Highest completed education (number of years)

- ☐ Primary and secondary school (0-9 years)
- ☐ High s school (10-12 years)
- ☐ University college, technical high school, University lower degree (13-15 years)
- ☐ University, higher degree (more than 15 years)

E.6 Present work status

- ☐ Work full time
- ☐ Work part time
- ☐ Student
- ☐ Doing unpaid work at home/housework
- ☐ Retired
- ☐ Unemployed
- ☐ Other

E.7 Type of work

- ☐ Working in the fisheries sector

- ☐ Working in the agriculture sector
- ☐ Working in mining, oil/gas extraction/exploration
- ☐ Working in the industry
- ☐ Working in the private service sector
- ☐ Working in the public sector
- ☐ Other

E.8 Household size

- ☐ The number of people above the age of 18 years living together with parents: _____

The number of people above the age of 18 years old not living with their parents: _____

The number of people younger than the age of 18 years old: _____

E.9 Gross income per person (your income) per year

- ☐ less than 100 000 NOK
- ☐ 100 000 – 200 000 NOK
- ☐ 201 000 – 300 000 NOK
- ☐ 301 000 – 400 000 NOK
- ☐ 401.000 – 500.000 NOK
- ☐ 501.000 – 600 000 NOK
- ☐ More than 600 000 NOK

E.10 Gross income per household per year

- ☐ less than 100 000 NOK
- ☐ 100 000 – 200 000 NOK
- ☐ 201 000 – 300 000 NOK

- ☐ 301 000 – 400 000 NOK
- ☐ 401 000 – 500,000 NOK
- ☐ 501 000 – 600 000 NOK
- ☐ 601 000 – 800 000 NOK
- ☐ 801,000 – 1 million
- More than 1 million

TAKK FOR HJELPEN!

