



**ICES**  
—  
**CIEM**

International Council for  
the Exploration of the Sea

Conseil International pour  
l'Exploration de la Mer

You are receiving this survey as part of the ICES workshop on pathways to climate-aware advice (WKCLIMAD). This workshop is exploring how the short-, medium-, and long-term impacts of climate change on aquaculture, fisheries, and ecosystems can be accounted for in ICES advice. This is Part 2 of the first Delphi Survey to identify and rate the likelihood and magnitude of climate change forced impacts to aquaculture. This topic was explored during the first day of the virtual workshop on September 29th, 2021 for finfish, shellfish and seaweeds as separate industries. The MIRO board can be found [here](#).

ICES has identified you or your organization, or you have nominated yourself as a stakeholder or knowledge holder in the fields of climate, fisheries, or aquaculture.

Information gathered via this questionnaire is subject to the ICES data privacy statement.

The information provided by you will be used to assist ICES to outline actionable strategies and approaches that can be taken to promote resiliency in fisheries, aquaculture, and ecosystems. This information will be published online and made available to the public. Data will be aggregated so you will not be identifiable; in the event direct quotes are used, these will be identified by an alias/pseudonym.

You may withdraw from the research at any time, without the need to explain, without penalty, and your personal data will be immediately deleted. Anonymized research data will be archived by ICES. All personal data will be deleted 5 years after the WKCLIMAD report is published.

By responding to this survey you acknowledge and consent to your personal data being used as described above.

We expect this survey to take 4 hours to complete. You may save the form and come back to it later using the SAVE button at the bottom. An email will be sent to you with a link that you can use to work on it later.

Name

First Name

Last Name

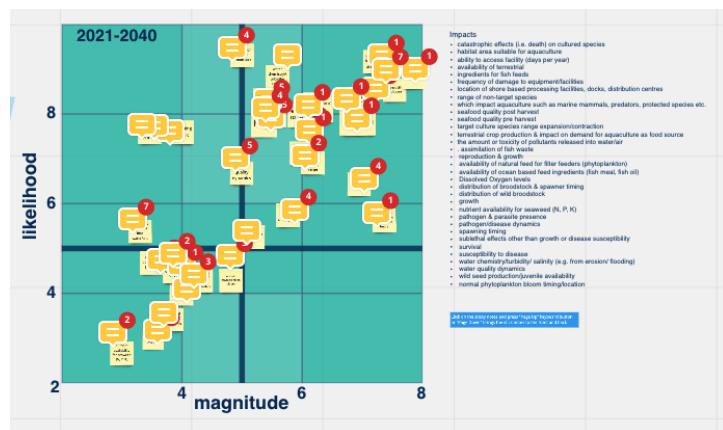
Email

example@example.com

## Aquaculture impacts due to Climate Change

Aquaculture and fisheries are captured on separate forms. These impacts on aquatic organisms and the aquaculture or fisheries system are based on the examples provided from the previous round of homework for WKCLIMAD and during the virtual workshop. Mean ratings from the workshop are given following the impact (mean score) in the first column and/or you may refer to the MIRO board at the link provided for further information related to the group discussions. NOTE: it is not necessary to agree with the mean score, the idea is to record your opinion following the discussion. Assume that climate change continues without mitigation but adaptation does occur. Using your expert judgement, please rate for each impact the likelihood (1 -none to 10 -extremely likely) and magnitude (from 1 -zero to 10 -extreme) separately for the near, middle and far time periods. Also indicate in the confidence column your confidence in your rating. Further information on each impact can be found in the spreadsheet that contains all the submissions, some with examples. Note many of the impacts are overlapping, causally related.

or a subset of others. However, each contains a specific context and link to potential advice and most have some published evidence on their impact. Also some will be direct impacts and others indirect impacts. Please consider both direct and indirect impacts in your ratings. Impacts may have negative and/or positive magnitudes (beneficial or harmful). These will vary depending on the specific circumstances of those being impacted (e.g. range shifts, changes in market access). So please rate magnitude by the strength of the impact, not by positive or negative. E.g. for a very beneficial impact, requiring a rating of highest positive magnitude, please rate 10. Likewise for a very harmful impact, requiring a rating of highest negative magnitude, please also rate 10. However, please do provide some separation in levels so not everything is rated 10. Climate drivers can impact in any part of the fisheries and aquaculture socio-ecological system (ecology, fisheries, agronomy, markets, consumption, governance). There are three sheets for likelihood and three for magnitude, for each species group (18 total for aquaculture). These are for 3 timeframes: short (2021-2040), medium (2041-2060) and long term (2061-2100). NOTE: you must rate all impacts. If the impact is out of your area of expertise or you do not know then indicate low confidence in your answer for those impacts. There is space for further comment at the end of the survey and at the end of each row. You may save the form and come back to it later using the SAVE button at the bottom. An email will be sent to you with a link that you can use to work on the rest later.



## FINFISH

The following 6 sheets relate to finfish. The final scores from the MIRO board exercise are given in the first column after the impact. For example when you see "Changes in assimilation of fish waste 4" in the first column it indicates that the value for the sticky note ended around level 4 in the plot on the right. Feel free to go back to the MIRO board if you want to zoom in and read the comments

Please rate on a scale from 1 (unlikely) to 10 (Highly likely), the LIKELIHOOD that

each of the impacts listed in the first column will occur over the time period from 2021 until 2040, and indicate your confidence in the estimate. \*

	1	2	3	4	5	6	7	8	9	10	Confidence	Oth Thou
Changes in Reproduction and Growth 5	<input type="radio"/>	▼										
Changes in Seafood quality pre-harvest 4.5	<input type="radio"/>	▼										
Changes in assimilation of fish waste 4	<input type="radio"/>	▼										
Changes in Location of shore based processing facilities, docks, distribution centers 6	<input type="radio"/>	▼										
Changes in Ability to access facility (days per year) 4.5	<input type="radio"/>	▼										
Changes in Range of non target species which impact aquaculture 6.5	<input type="radio"/>	▼										
Changes in Catastrophic effects (i.e. death) on cultured species 6.5	<input type="radio"/>	▼										
Changes in availability of natural feed for filter feeders (phytoplankton) 4	<input type="radio"/>	▼										
Changes in Water quality dynamics 6.5	<input type="radio"/>	▼										
Changes in Target culture species range expansion/contraction 7	<input type="radio"/>	▼										
Changes in The amount or toxicity of pollutants released into water/air 5.5	<input type="radio"/>	▼										
Changes in Availability of terrestrial ingredients for fish feeds 5.5	<input type="radio"/>	▼										
Changes in Survival 8	<input type="radio"/>	▼										
Changes in Habitat area	<input type="radio"/>	▼										



Changes in Pathogen and parasite presence 9	<input type="radio"/>										
Changes in Terrestrial crop production and impact on demand for aquaculture as a food source 3.5	<input type="radio"/>										
Changes in Distribution of wild broodstock 9	<input type="radio"/>										
Changes in Susceptibility to disease 8.5	<input type="radio"/>										

Please rate on a scale from 1 (unlikely) to 10 (Highly likely), the LIKELIHOOD that each of the impacts listed in the first column will occur over the time period from 2041-2060, and indicate your confidence in the estimate. \*

	1	2	3	4	5	6	7	8	9	10	Confidence	Other Thoughts
Changes in availability of natural feed for filter feeders (phytoplankton) 4	<input type="radio"/>											
Changes in Seafood quality pre-harvest 4.5	<input type="radio"/>											
Changes in Distribution of wild broodstock 9	<input type="radio"/>											
Changes in Frequency of damage to equipment/facilities 8.5	<input type="radio"/>											
Changes in Susceptibility to disease 8.5	<input type="radio"/>											
Changes in Spawning timing 7.5	<input type="radio"/>											
Changes in Availability of ocean based feed ingredients (fish meal, fish oil) 8.5	<input type="radio"/>											
Changes in Other sublethal effects other than growth or disease susceptibility 7.5	<input type="radio"/>											



Please rate on a scale from 1 (unlikely) to 10 (Highly likely), the LIKELIHOOD that each of the impacts listed in the first column will occur from 2061 until 2100, and indicate your confidence in the estimate. \*





Please rate on a scale from 1 (None) to 10 (Extreme), the MAGNITUDE that each of the impacts listed in the first column will have on the aquaculture industry over the time period from 2021 until 2040, and indicate your confidence in your estimate \*

	1	2	3	4	5	6	7	8	9	10	Confidence	Otr Thou
Changes in Distribution of broodstock and spawner timing 5.5	<input type="radio"/>											
Changes in Seafood quality post harvest 4	<input type="radio"/>											
Changes in Reproduction and Growth 5	<input type="radio"/>											
Changes in Susceptibility to disease 7.5	<input type="radio"/>											
Changes in normal phytoplankton bloom timing/location 5	<input type="radio"/>											
Changes in Seafood quality pre-harvest 3.5	<input type="radio"/>											
Changes in Range of non target species which impact aquaculture 5.75	<input type="radio"/>											
Changes in Habitat area suitable for aquaculture 6	<input type="radio"/>											
Changes in Wild seed production/juvenile availability 6	<input type="radio"/>											
Changes in Spawning timing 4	<input type="radio"/>											
Changes in Frequency of damage to equipment/facilities 7	<input type="radio"/>											
Changes in Catastrophic effects (i.e. death) on cultured species 7	<input type="radio"/>											
Changes in availability of natural feed for filter feeders (phytoplankton)	<input type="radio"/>											



Impacts	1	2	3	4	5	6	7	8	9	10	Confidence	Other
Changes in Availability of ocean based feed ingredients (fish meal, fish oil) 5.5	○	○	○	○	○	○	○	○	○	○	▼	
Changes in assimilation of fish waste 4	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Distribution of wild broodstock 5	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Other sublethal effects other than growth or disease susceptibility 3.5	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Water quality dynamics 5	○	○	○	○	○	○	○	○	○	○	▼	

Please rate on a scale from 1 (None) to 10 (Extreme), the MAGNITUDE that each of the impacts listed in the first column will have on the aquaculture industry over the time period from 2041 until 2060, and indicate your confidence in your estimate \*

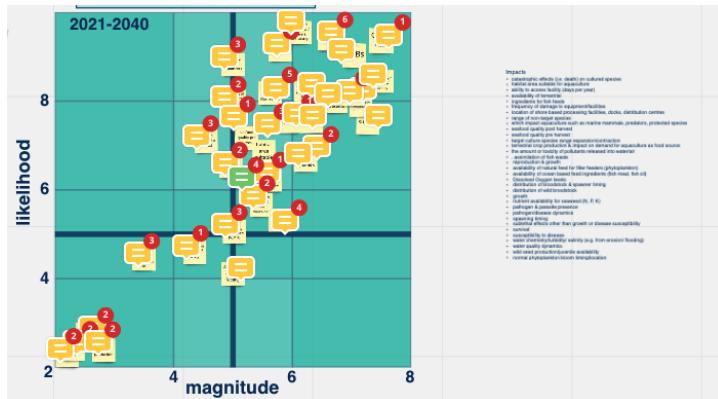
Impacts	1	2	3	4	5	6	7	8	9	10	Confidence	Other
Changes in Reproduction and Growth 5	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Distribution of broodstock and spawner timing 5.5	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Range of non target species which impact aquaculture 5.75	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Seafood quality post harvest 4	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Habitat area suitable for aquaculture 6	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Susceptibility to disease 7.5	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Location of shore based processing facilities, docks, .....	○	○	○	○	○	○	○	○	○	○	▼	



Please rate on a scale from 1 (None) to 10 (Extreme), the MAGNITUDE that each of the impacts listed in the first column will have on the aquaculture industry after 2061 until 2100, and indicate your confidence in your estimate \*







# SHELLFISH

The following 6 sheets relate to Shellfish. The final scores from the MIRO board exercise are given in the first column after the impact. For example when you see "Changes in spawn timing 5" in the first column it indicates that the value for the sticky note ended around level 5 in the plot on the right. Feel free to go back to the MIRO board if you want to zoom in and read the comments

Please rate on a scale from 1 (unlikely) to 10 (Highly likely), the LIKELIHOOD that each of the impacts listed in the first column will occur over the time period from 2021 until 2040, and indicate your confidence in the estimate. \*



Please rate on a scale from 1 (unlikely) to 10 (Highly likely), the LIKELIHOOD that each of the impacts listed in the first column will occur over the time period from 2041-2060, and indicate your confidence in the estimate. \*

1	2	3	4	5	6	7	8	9	10	Confidence	Other Thou
---	---	---	---	---	---	---	---	---	----	------------	---------------





Please rate on a scale from 1 (unlikely) to 10 (Highly likely), the LIKELIHOOD that each of the impacts listed in the first column will occur from 2061 until 2100, and indicate your confidence in the estimate. \*



	<input type="radio"/>										
Changes in normal phytoplankton bloom timing/location 8	<input type="radio"/>	▼									
Changes in Reproduction and Growth 9	<input type="radio"/>	▼									
Changes in Dissolved O <sub>2</sub> levels 7.5	<input type="radio"/>	▼									
Changes in Spawning timing 5	<input type="radio"/>	▼									
Changes in Habitat area suitable for aquaculture 7	<input type="radio"/>	▼									
Changes in Water quality dynamics	<input type="radio"/>	▼									
Changes in Pathogen disease dynamics 8	<input type="radio"/>	▼									
Changes in Survival 7.5	<input type="radio"/>	▼									
Changes in Catastrophic effects (i.e. death) on cultured species 7.5	<input type="radio"/>	▼									

Please rate on a scale from 1 (None) to 10 (Extreme), the MAGNITUDE that each of the impacts listed in the first column will have on the aquaculture industry over the time period from 2021 until 2040, and indicate your confidence in your estimate \*

	1	2	3	4	5	6	7	8	9	10	Confidence	Off Thou
Changes in Distribution of wild broodstock 5	<input type="radio"/>	▼										
Changes in Habitat area suitable for aquaculture 6	<input type="radio"/>	▼										
Changes in Survival 7.5	<input type="radio"/>	▼										
Changes in Dissolved O <sub>2</sub> levels 6.5	<input type="radio"/>	▼										
Changes in Location of shore based processing facilities, docks,	<input type="radio"/>	▼										

distribution centers 3.5																			
Changes in Spawning timing 6	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Nutrient availability for seaweed (N, P, K) 5	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in normal phytoplankton bloom timing/location 6	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Seafood quality post harvest 4.5	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Water quality dynamics	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Range of non target species which impact aquaculture 5.5	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Reproduction and Growth 6	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Terrestrial crop production and impact on demand for aquaculture as a food source 3	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Target culture species range expansion/contraction 5	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in availability of natural feed for filter feeders (phytoplankton) 5.5	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Availability of ocean based feed ingredients (fish meal, fish oil) 2.5	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Pathogen and parasite presence 7	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Other sublethal effects other than growth or disease susceptibility 5.5	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	
Changes in Seafood quality pre-harvest 5	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▼	

Changes in Pathogen disease dynamics 7	<input type="radio"/>	▼									
Changes in Susceptibility to disease 7	<input type="radio"/>	▼									
Changes in Availability of terrestrial ingredients for fish feeds 2.5	<input type="radio"/>	▼									
Changes in Catastrophic effects (i.e. death) on cultured species 6	<input type="radio"/>	▼									
Changes in Ocean Acidification 7.5	<input type="radio"/>	▼									
Changes in HABs 7	<input type="radio"/>	▼									
Changes in assimilation of fish waste 2	<input type="radio"/>	▼									
Changes in Water chemistry/turbidity/salinity (e.g. from erosion/flooding) 7.5	<input type="radio"/>	▼									
Changes in Wild seed production/juvenile availability 6	<input type="radio"/>	▼									
Changes in The amount or toxicity of pollutants released into water/air 5.5	<input type="radio"/>	▼									
Changes in Ability to access facility (days per year) 5	<input type="radio"/>	▼									
Changes in Frequency of damage to equipment/facilities 5	<input type="radio"/>	▼									
Changes in Distribution of broodstock and spawner timing 4.5	<input type="radio"/>	▼									
Changes in Growth 6.5	<input type="radio"/>	▼									

Please rate on a scale from 1 (None) to 10 (Extreme), the MAGNITUDE that each of the impacts listed in the first column will have on the aquaculture industry over

the time period from 2041 until 2060, and indicate your confidence in your estimate

\*

	1	2	3	4	5	6	7	8	9	10	Confidence	Other Thought
Changes in Water quality dynamics	<input type="radio"/>											
Changes in The amount or toxicity of pollutants released into water/air 5.5	<input type="radio"/>											
Changes in availability of natural feed for filter feeders (phytoplankton) 5.5	<input type="radio"/>											
Changes in Catastrophic effects (i.e. death) on cultured species 6	<input type="radio"/>											
Changes in Reproduction and Growth 6	<input type="radio"/>											
Changes in Distribution of wild broodstock 5	<input type="radio"/>											
Changes in Seafood quality post harvest 4.5	<input type="radio"/>											
Changes in Habitat area suitable for aquaculture 6	<input type="radio"/>											
Changes in Pathogen and parasite presence 7	<input type="radio"/>											
Changes in Growth 6.5	<input type="radio"/>											
Changes in Other sublethal effects other than growth or disease susceptibility 5.5	<input type="radio"/>											
Changes in Frequency of damage to equipment/facilities 5	<input type="radio"/>											
Changes in Susceptibility to disease 7	<input type="radio"/>											
Changes in Survival 7.5	<input type="radio"/>											
Changes in Target culture												

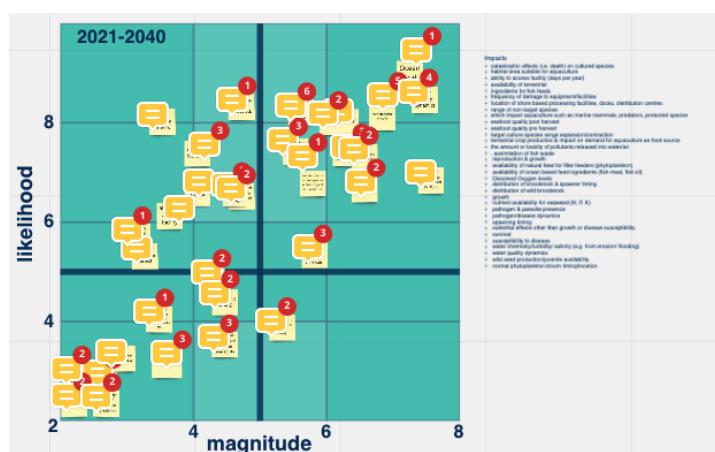
| Changes in target culture species range expansion/contraction 5                                | <input type="radio"/> | ▼ |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---|
| Changes in Terrestrial crop production and impact on demand for aquaculture as a food source 3 | <input type="radio"/> | ▼ |
| Changes in Seafood quality pre-harvest 5   | <input type="radio"/> | ▼ |
| Changes in Dissolved O <sub>2</sub> levels 6.5   | <input type="radio"/> | ▼ |
| Changes in normal phytoplankton bloom timing/location 6  | <input type="radio"/> | ▼ |
| Changes in assimilation of fish waste 2  | <input type="radio"/> | ▼ |
| Changes in Location of shore based processing facilities, docks, distribution centers 3.5      | <input type="radio"/> | ▼ |
| Changes in Nutrient availability for seaweed (N, P, K) 5                                       | <input type="radio"/> | ▼ |
| Changes in HABs 7  | <input type="radio"/> | ▼ |
| Changes in Pathogen disease dynamics 7   | <input type="radio"/> | ▼ |
| Changes in Availability of terrestrial ingredients for fish feeds 2.5                          | <input type="radio"/> | ▼ |
| Changes in Spawning timing 6   | <input type="radio"/> | ▼ |
| Changes in Ability to access facility (days per year) 5  | <input type="radio"/> | ▼ |
| Changes in Ocean Acidification 7.5   | <input type="radio"/> | ▼ |
| Changes in Water chemistry/turbidity/salinity (e.g. from erosion/flooding) 7.5                 | <input type="radio"/> | ▼ |

Changes in Wild seed production/juvenile availability 6	<input type="radio"/>											
Changes in Availability of ocean based feed ingredients (fish meal, fish oil) 2.5	<input type="radio"/>											
Changes in Distribution of broodstock and spawner timing 4.5	<input type="radio"/>											
Changes in Range of non target species which impact aquaculture 5.5	<input type="radio"/>											

Please rate on a scale from 1 (None) to 10 (Extreme), the MAGNITUDE that each of the impacts listed in the first column will have on the aquaculture industry after 2061 until 2100, and indicate your confidence in your estimate \*

	1	2	3	4	5	6	7	8	9	10	Confidence	Oth Thou
Changes in Water quality dynamics	<input type="radio"/>											
Changes in Target culture species range expansion/contraction 5	<input type="radio"/>											
Changes in Seafood quality pre-harvest 5	<input type="radio"/>											
Changes in Ocean Acidification 7.5	<input type="radio"/>											
Changes in Survival 7.5	<input type="radio"/>											
Changes in Reproduction and Growth 6	<input type="radio"/>											
Changes in Distribution of wild broodstock 5	<input type="radio"/>											
Changes in Ability to access facility (days per year) 5	<input type="radio"/>											
Changes in Availability of terrestrial ingredients for fish feeds 2.5	<input type="radio"/>											

Changes in Spawning timing 6	<input type="radio"/>	▼															
Changes in Range of non target species which impact aquaculture 5.5	<input type="radio"/>	▼															
Changes in normal phytoplankton bloom timing/location 6	<input type="radio"/>	▼															
Changes in Other sublethal effects other than growth or disease susceptibility 5.5	<input type="radio"/>	▼															
Changes in Location of shore based processing facilities, docks, distribution centers 3.5	<input type="radio"/>	▼															
Changes in The amount or toxicity of pollutants released into water/air 5.5	<input type="radio"/>	▼															
Changes in availability of natural feed for filter feeders (phytoplankton) 5.5	<input type="radio"/>	▼															
Changes in Growth 6.5	<input type="radio"/>	▼															
Changes in Seafood quality post harvest 4.5	<input type="radio"/>	▼															
Changes in Susceptibility to disease 7	<input type="radio"/>	▼															
Changes in Pathogen disease dynamics 7	<input type="radio"/>	▼															
Changes in Frequency of damage to equipment/facilities 5	<input type="radio"/>	▼															
Changes in Dissolved O2 levels 6.5	<input type="radio"/>	▼															
Changes in Pathogen and parasite presence 7	<input type="radio"/>	▼															
Changes in Catastrophic effects (i.e. death) on cultured species 6	<input type="radio"/>	▼															



## SEAWEED

The following 6 sheets relate to Seaweed. The final scores from the MIRO board exercise are given in the first column after the impact. For example when you see "Changes in Distribution of wild broodstock 8" in the first column it indicates that the value for the sticky note ended around level 8 in the plot on the right. Feel free to go back to the MIRO board if

you want to zoom in and read the comments

Please rate on a scale from 1 (unlikely) to 10 (Highly likely), the LIKELIHOOD that each of the impacts listed in the first column will occur over the time period from 2021 until 2040, and indicate your confidence in the estimate. \*

	1	2	3	4	5	6	7	8	9	10	Confidence	Oth Thou
Changes in availability of natural feed for filter feeders (phytoplankton) 6	<input type="radio"/>											
Changes in The amount or toxicity of pollutants released into water/air 5	<input type="radio"/>											
Changes in Seafood quality post harvest 5	<input type="radio"/>											
Changes in Nutrient availability for seaweed (N, P, K) 7	<input type="radio"/>											
Changes in Ability to access facility (days per year) 6	<input type="radio"/>											
Changes in Other sublethal effects other than growth or disease susceptibility 8	<input type="radio"/>											
Changes in Pathogen and parasite presence 7.5	<input type="radio"/>											
Changes in Catastrophic effects (i.e. death) on cultured species 8	<input type="radio"/>											
Changes in Location of shore based processing facilities, docks, distribution centers 4	<input type="radio"/>											
Changes in normal phytoplankton bloom timing/location 2	<input type="radio"/>											
Changes in Growth 8	<input type="radio"/>											

Changes in Distribution of wild broodstock 8	<input type="radio"/>	v
Changes in Ocean Acidification 9	<input type="radio"/>	v
Changes in HABs 3	<input type="radio"/>	v
Changes in Susceptibility to disease 7.5	<input type="radio"/>	v
Changes in Distribution of broodstock and spawner timing 4	<input type="radio"/>	v
Changes in Wild seed production/juvenile availability 3.5	<input type="radio"/>	v
Changes in Availability of ocean based ocean based feed ingredients (fish meal, fish oil) 2.5	<input type="radio"/>	v
Changes in assimilation of fish waste 3	<input type="radio"/>	v
Changes in Reproduction and Growth 6.5	<input type="radio"/>	v
Changes in Spawning timing 4.5	<input type="radio"/>	v
Changes in Pathogen disease dynamics 6.5	<input type="radio"/>	v
Changes in Dissolved O <sub>2</sub> levels 7.5	<input type="radio"/>	v
Changes in Range of non target species which impact aquaculture 7	<input type="radio"/>	v
Changes in Frequency of damage to equipment/facilities 6.5	<input type="radio"/>	v
Changes in Water quality dynamics 8.5	<input type="radio"/>	v
Changes in Water chemistry/turbidity/salinity (e.g. from erosion/flooding) 7.5	<input type="radio"/>	v

Changes in Seafood quality pre-harvest 5	<input type="radio"/>	▼										
Changes in Survival 8	<input type="radio"/>	▼										
Changes in Availability of terrestrial ingredients for fish feeds 3	<input type="radio"/>	▼										
Changes in Target culture species range expansion/contraction 6.5	<input type="radio"/>	▼										
Changes in Terrestrial crop production and impact on demand for aquaculture as a food source 3	<input type="radio"/>	▼										
Changes in Habitat area suitable for aquaculture 8	<input type="radio"/>	▼										

Please rate on a scale from 1 (unlikely) to 10 (Highly likely), the LIKELIHOOD that each of the impacts listed in the first column will occur over the time period from 2041-2060, and indicate your confidence in the estimate. \*

	1	2	3	4	5	6	7	8	9	10	Confidence	Otr Thou
Changes in Wild seed production/juvenile availability 3.5	<input type="radio"/>	▼										
Changes in The amount or toxicity of pollutants released into water/air 5	<input type="radio"/>	▼										
Changes in availability of natural feed for filter feeders (phytoplankton) 6	<input type="radio"/>	▼										
Changes in Terrestrial crop production and impact on demand for aquaculture as a food source 3	<input type="radio"/>	▼										
Changes in HABs 3	<input type="radio"/>	▼										
Changes in Availability of ocean based ocean based feed ingredients (fish)	<input type="radio"/>	▼										

Food ingredients (fish meal, fish oil) 2.5																					
Changes in Other sublethal effects other than growth or disease susceptibility 8	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Spawning timing 4.5	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Ability to access facility (days per year) 6	○	○	○	○	○	○	○	○	○	○									▼		
Changes in assimilation of fish waste 3	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Location of shore based processing facilities, docks, distribution centers 4	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Ocean Acidification 9	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Habitat area suitable for aquaculture 8	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Target culture species range expansion/contraction 6.5	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Susceptibility to disease 7.5	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Range of non target species which impact aquaculture 7	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Seafood quality post harvest 5	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Water qualitey dynamics 8.5	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Availabitly of terrestrial ingredients for fish feeds 3	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Distribution of broodstock and spawner timing 4	○	○	○	○	○	○	○	○	○	○									▼		
Changes in Seafood quality dynamics 5	○	○	○	○	○	○	○	○	○	○									▼		

Please rate on a scale from 1 (unlikely) to 10 (Highly likely), the LIKELIHOOD that each of the impacts listed in the first column will occur from 2061 until 2100, and indicate your confidence in the estimate. \*





timing 4													
Changes in Nutrient availability for seaweed (N, P, K) 7	<input type="radio"/>												

Please rate on a scale from 1 (None) to 10 (Extreme), the MAGNITUDE that each of the impacts listed in the first column will have on the aquaculture industry over the time period from 2021 until 2040, and indicate your confidence in your estimate \*

	1	2	3	4	5	6	7	8	9	10	Confidence	Oth Thou
Changes in Water qualitey dynamics 7.5	<input type="radio"/>											
Changes in Catastrophic effects (i.e. death) on cultured species 7	<input type="radio"/>											
Changes in Reproduction and Growth 4	<input type="radio"/>											
Changes in Wild seed production/juvenile availability 4.5	<input type="radio"/>											
Changes in availabitly of natural feed for filter feeders (phytoplankton) 3	<input type="radio"/>											
Changes in Frequency of damage to equipment/facilities 5	<input type="radio"/>											
Changes in Target culture species range expansion/contraction 4.5	<input type="radio"/>											
Changes in Other sublethal effects other than growth or disease susceptibility 3.5	<input type="radio"/>											
Changes in Water chemistry/turbidity/salinity (e.g. from erosion/flooding) 5.5	<input type="radio"/>											
Changes in Ocean Acidification 7	<input type="radio"/>											



Please rate on a scale from 1 (None) to 10 (Extreme), the MAGNITUDE that each of the impacts listed in the first column will have on the aquaculture industry over the time period from 2041 until 2060, and indicate your confidence in your estimate

\*



Please rate on a scale from 1 (None) to 10 (Extreme), the MAGNITUDE that each of the impacts listed in the first column will have on the aquaculture industry after 2061 until 2100, and indicate your confidence in your estimate \*

	1	2	3	4	5	6	7	8	9	10	Confidence	Otr Thou
Changes in HABs 3.5	<input type="radio"/>		▼									
Changes in Dissolved O2 levels 4	<input type="radio"/>		▼									
Changes in Reproduction and Growth 4	<input type="radio"/>		▼									
Changes in availability of natural feed for filter feeders (phytoplankton) 3	<input type="radio"/>		▼									
Changes in Growth 6	<input type="radio"/>		▼									
Changes in Seafood quality post harvest 4.5	<input type="radio"/>		▼									
Changes in Target culture species range expansion/contraction 4.5	<input type="radio"/>		▼									
Changes in Distribution of wild broodstock 5	<input type="radio"/>		▼									
Changes in Frequency of damage to equipment/facilities 5	<input type="radio"/>		▼									
Changes in Location of shore based processing facilities, docks, distribution centers 3.5	<input type="radio"/>		▼									
Changes in Water chemistry/turbidity/salinity (e.g. from erosion/flooding) 5.5	<input type="radio"/>		▼									
Changes in Other sublethal effects other than growth or disease susceptibility 3.5	<input type="radio"/>		▼									
Changes in assimilation of fish waste 3	<input type="radio"/>		▼									
Changes in The amount or toxicity of pollutants released into water/air 6	<input type="radio"/>		▼									
Changes in Wild seed	-	-	-	-	-	-	-	-	-	-		

production/juvenile availability 4.5	<input type="radio"/>	▼									
Changes in Habitat area suitable for aquaculture 5.5	<input type="radio"/>	▼									
Changes in Availability of terrestrial ingredients for fish feeds 2.5	<input type="radio"/>	▼									
Changes in Catastrophic effects (i.e. death) on cultured species 7	<input type="radio"/>	▼									
Changes in Spawning timing 4.5	<input type="radio"/>	▼									
Changes in Ability to access facility (days per year) 3.5	<input type="radio"/>	▼									
Changes in Ocean Acidification 7	<input type="radio"/>	▼									
Changes in normal phytoplankton bloom timing/location 2	<input type="radio"/>	▼									
Changes in Water quality dynamics 7.5	<input type="radio"/>	▼									
Changes in Susceptibility to disease 6.5	<input type="radio"/>	▼									
Changes in Range of non target species which impact aquaculture 6	<input type="radio"/>	▼									
Changes in Survival 6	<input type="radio"/>	▼									
Changes in Terrestrial crop production and impact on demand for aquaculture as a food source 2	<input type="radio"/>	▼									
Changes in Pathogen and parasite presence 6.5	<input type="radio"/>	▼									
Changes in Seafood quality pre-harvest 3	<input type="radio"/>	▼									
Changes in Nutrient	<input type="radio"/>										

availability for seaweed (N, P, K) 7.5	<input type="radio"/>										
Changes in Distribution of broodstock and spawner timing 5.5	<input type="radio"/>										
Changes in Pathogen disease dynamics 6.5	<input type="radio"/>										
Changes in Availability of ocean based feed ingredients (fish meal, fish oil) 2.5	<input type="radio"/>										

Please add any impacts we might have missed or any other comments below

Type here...

You may save the form and come back to it later using the SAVE button at the bottom. An email will be sent to you with a link that you can use to work on it later.