

CCVA Report for CMM 2019-05 (Mobulid Rays)

Executive Summary

The Climate Change Vulnerability Assessment (CCVA) for CMM 2019-05 (mobulid rays) results in a **HIGH** overall climate risk rating, driven by medium hazard, high exposure and high vulnerability rating. Identified information gaps (“unknown” indicator scores) ranged between 1 and 10, with adaptive capacity carrying the highest number (10), highlighting the general lack of information on mobulid rays in respect of climate change capacity and the need for further investigation to strengthen the assessment findings.

The known biological characteristics of mobulid rays in the WCPFC Convention Area, together with the lack of in-depth knowledge about key life traits, results in them having a high sensitivity to identified climate hazards and low adaptive capacity to effectively respond. Together, these create an overall high vulnerability score that drives the climate risk result.

Given the vulnerable or endangered IUCN status of WCPFC mobulid species, the existing management framework appears adequate in terms of prohibiting targeting, fishing in the presence of, transshipping or landing mobulid rays, and best handling requirements, as a means of protection. However, there is limited scientific understanding of key biological traits, environmental dependencies and ecology of mobulid rays, required to properly assess the health status of individual species, in addition to understanding how mobulid rays may react, be impacted or adapt to climate change.

In light of this, the WCPFC has taken meaningful steps towards addressing these issues with planned activities for assessing fishery characteristics, stock status and the biology of key WCPFC mobulid species (see 2021-2030 Shark Research Plan). This information should help to enable some information gaps in the CCVA to be addressed once it becomes available.

Priority actions within WCPFC's scope could include: enhanced observer monitoring requirements (longline fleets in particular), continued effort to advance planned mobulid ray research projects (refer 2021-2030 Shark Research Plan), advancing collaboration efforts to improve global understanding and available information, addressing identified CCVA information gaps, and considering further adaptive management requirements (e.g., integration of environmental indicators into planned mobulid ray stock assessments).

Introduction

Conservation and Management Measure (CMM) 2019-05 relates to the conservation and management of mobulid rays including all species of the family Mobulidae, including manta rays and mobula rays in the WCPFC Convention Area. The principal objective of this measure is to ensure the long-term conservation of mobulid rays in the recognition that:

1. manta and mobula rays are listed in Appendix I and Appendix II of the Convention on the Conservation of Migratory Species of Wild Animals, and

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2. manta and mobula rays are listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

The CMM specifically sets out prohibition requirements of targeted fishing, intentional setting with mobulid rays in the area, onboard retention, transshipping or landing any part or whole carcasses of mobulid rays caught in the Convention Area. In addition, specific reporting and handling requirements are set out for landing mobulid rays in the case it is required, and best handling practices for the safe release of mobulid rays when fishing.

Due to a lack of available information, there are currently no mobula stock assessments available, and therefore there is high uncertainty of the current health status of all mobula ray species in the WCPF Convention Area.

Climate change poses various threats to Mobula rays through direct impacts such as ocean warming, changes in ocean chemistry (e.g., ocean acidification), and altered current patterns, as well as indirect effects including shifts / declines in prey distribution, seasonal cues, and altered ecosystem productivity.

This assessment aims to evaluate the climate change vulnerability of CMM 2019-05 using the WCPFC Climate Change Vulnerability Assessment (CCVA) Framework, providing evidence-based insights to support adaptive management and enhance the climate resilience of WCPFC's mobulid rays conservation measure – CMM 2019-05.

Method

The climate change vulnerability assessment for CMM 2019-05 was conducted using the WCPFC Climate Change Vulnerability Assessment (CCVA) Framework, an Excel based assessment tool. The assessment followed the approach and methodology outlined in the CCVA Framework guidance and information document.

Each of the four climate risk components (Hazard, Exposure, Sensitivity, and Adaptive Capacity) was evaluated using specific indicators grouped by theme. Indicators were scored using a five-point scale (High, Medium, Low, Unknown, N/A) based on available evidence.

For each indicator, supporting rationale was documented to justify scoring decisions and to identify information gaps. Where data were insufficient or uncertain, indicators were scored as "Unknown" to highlight areas requiring further research or assessment.

The assessment employed the standard five-year time horizon provided in the framework to evaluate potential climate change impacts and management responses within a policy-relevant timeframe.

Data Sources and Approach

The assessment drew upon multiple data sources to evaluate climate vulnerability across the four risk components:

- Peer-reviewed scientific literature on Mobulid ray biology, ecology, and potential hazards, including climate change and pollution

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- WCPFC scientific committee documents
- International scientific reports and articles on Mobulid rays both in the Pacific and globally
- WCPFC technical reports and meeting documents related to Mobulid rays.

Scope and Limitations

The assessment scope encompasses the high seas and EEZs of the WCPF Convention Area as described in CMM 2019-05. The five-year assessment timeframe focuses on near-term climate change impacts and management responses.

Key limitations include a lack of robust information on mobulid rays both within the Pacific and globally, limited available scientific information on climate change and mobulid rays, spatial resolution of some climate projections, and high uncertainty with identified information and conclusions for WCPFC mobulid rays due to identified information gaps.

Results

Climate Risk Assessment

The CCVA yielded a **HIGH** overall climate risk rating for CMM 2019-05 (Sharks), determined by the combination of:

- **Hazard: Medium** (11% High indicators, 45% Medium, 44% Low)
- **Exposure: High** (44% High indicators, 33% Medium, 22% Low)
- **Sensitivity: High** (50% High indicators, 39% Medium, 11% Low)
- **Adaptive Capacity: Low** (25% High indicators, 25% Medium, 50% Low)
- **Vulnerability: High** (combination of High sensitivity and Low adaptive capacity)

Component Analysis

Hazard (Medium Rating) – The medium hazard rating reflects a moderate level of identified climate-related threats relevant to mobulid rays. Only increased sea surface temperature scored as "High", with temperature extremes scored as "Low", and remaining biological and ecological indicators scored as "Medium" (with the exception of ocean acidification which was scored as "Unknown"). The high levels of 'Medium' scores reflected the high mobility and distribution of mobulid rays, while acknowledging that they are reliant on zooplankton as a prey species. Other identified hazards including extreme weather events scored low.

Exposure (High Rating) - The high exposure rating was mainly driven by "High" scores for habitat exposure, food web exposure, fishing fleet exposure and lack of information. Habitat and food web exposure were classified 'High' in the recognition that despite their wide distribution, mobulid ray habitats (pelagic, coastal and shelf) and their primary food source (zooplankton) will be exposed to the identified climate hazards. Importantly, a total of six indicators (35%) were scored as "unknown" as a result of identified information gaps related to operations.

Sensitivity (High Rating) – The high sensitivity rating resulted in a range of "High" indicator scores across the majority of themes. Biological and ecological indicators that were scored "High",

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included thermal range, productivity, reproduction and prey, reflecting the level of sensitivity to increased temperatures, a dependence on a single prey species (with some exceptions), and low levels of fecundity. Management based indicators that scored “High” included health status, resource and governance, and information availability, noting limited information impedes required understanding to inform decision-making.

Adaptive Capacity (Low Rating) – The low adaptive capacity rating is driven by “Low” indicator scores across both biological and management indicator themes. “Low” biological and ecological indicators included thermal range and prey, whereas management indicators included fishing gear, observer coverage, agile decision making, and resource and governance. Again, many of these “Low” adaptive capacity scores reflect the level of information available for WCPFC mobulid rays. Importantly, a significant number (n=10: 45%) of indicators were scored “Unknown”, including biological and ecological themed indicators, due to a lack of available information. These indicators identify information gaps through which insights into targeted adaptive capacity activities can be identified.

Discussion

Interpretation of Climate Risk Assessment Results

The **HIGH** overall climate risk rating for mobulid rays is representative of known biological and ecological traits, coupled with low available information and certainty. The resulting high vulnerability rating directly drives the resulting climate risk.

These assessment findings align well with recent scientific literature, however there are a clear number of identified information gaps (“Unknown” indicator scores) that require attention to increase overall confidence in the climate risk score.

Concordance with Scientific Literature

The high climate risk assessment is consistent across available scientific literature on mobulid rays both within the Pacific and globally. Scientific studies and available reports detail the need for improved information to help bridge the understanding of the current health status and vulnerability (to fishing and climate change) of mobulid rays, noting their listings as vulnerable or endangered by the IUCN and relevant Conventions. However, there is a decent amount of general knowledge on mobulid ray distribution, feeding habitats and potential vulnerability to climate change impacts notably in the form of food web and distribution disruptions – this information was drawn on to inform the CCVA.

Assessment Limitations and data gaps

The assessment enables the identification of indicator information gaps while also reflecting indicator scores based on best available information, generating a climate risk rating that reflects understanding across available literature. In addition, the assessment directly identifies the WCPFC's management, research and capacity requirements, helping to improve overall understanding and management of mobulid rays in the WCPF Convention Area. The following assessment limitations and data gaps were found:

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Limited information – As previously outlined, there are identified information limitations across available information on key biological and ecological traits required to effectively understand both the status of mobulid ray populations and their potential vulnerability to fishing and climate change.

Species-specific Understanding – Although the CCVA drew on available information for WCPFC mobulid rays, general information on mobulid rays was also used to help fill in specific indicator scores. Understanding species-specific differences will help deliver a more robust CCVA.

Ecosystem-Level Interactions - The assessment focused primarily on direct impacts to mobulid rays, however climate change will likely directly affect food distribution of direct importance to mobulid rays, which may result in changes to broader ecosystem functionality, distributional patterns and behaviours. These cumulative impacts somewhat go beyond the capability of the CCVA Framework to provide insights on in respect of mobulid rays.

Compounding effects – In addition to understanding the effect of climate change on mobula rays, there are also numerous other identified hazards, including fishing activities, vessel strikes, pollution (e.g., heavy metals and micro plastics) and loss of habitat to list a few, for which limited information is known. These creates a key limitation in understanding the level of observed changes or patterns being driven solely by climate related impacts.

Long-term Projections – The five-year assessment timeframe, while appropriate for management planning, may not capture longer-term climate change impacts that could become more pronounced over decades. The general longevity of mobulid ray species means that some climate effects may manifest over longer time scales than the current assessment provides for.

Member-Specific Capacity Variations – The adaptive capacity assessment relied on general WCPFC-level information, but individual member capacity for monitoring, research, and management response varies, with clear evidence of members requiring capacity support to improve compliance found in annual compliance reporting. Some members may have greater or lesser capacity to implement adaptive management measures, potentially affecting overall system resilience.

Management Implications

Maintaining Management Effectiveness – The High climate risk rating suggests that the current CMM requirements are appropriate and will remain effective at minimizing the risk from fishing operations on modula rays, helping WCPFC species to maintain healthy stock status required to provide improved adaptive capacity. However, it is well documented that continued monitoring and strengthening of information is required to better understand the modula ray species (all aspects) found within the WCPF Convention Area.

Addressing Data Gaps – The significant scientific information gaps and relatively large number of "Unknown" scores, particularly for adaptive capacity (45%), highlights the importance of targeted research and monitoring to reduce uncertainty. Priority areas include:

- Enhanced monitoring of environmental-biological traits and relationships
- Improved observer coverage requirements to understand longline fishing interactions

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- Improved understanding of mobulid ray stock health
- Improved understanding of ecosystem considerations for mobulid rays, including seasonal cues, competition and food-web dynamics
- Assessment of member-specific adaptive capacity

Strengthening Adaptive Management – While the current management framework reflects low adaptive capacity, much of this is driven by the need for improved information. As information availability improves over time, opportunities to further enhance climate resilience of mobulid rays should be considered, including:

- Integration of environmental indicators into mobulid ray stock assessments
- Development of climate-informed reference points
- Enhanced early warning systems for detecting climate-related changes
- Improved coordination with other RFMOs managing mobulid rays

Proactive Conservation Approaches – The high vulnerability rating suggests proactive management is required. The CMM currently provides strict prohibition, landing and best practice handling requirements, based on currently available information. As further information becomes available on the status, biology and ecology of mobulid rays, further proactive management considerations should be explored including:

- Protection of critical habitats and migration corridors
- Minimization of other stressors that could or are known to compound climate impacts
- Greater investment in research and monitoring activities to strengthen available information

Future Assessment Considerations

Regular reassessment using the CCVA Framework will be important to track changes in vulnerability status as better information becomes available. Future assessments should prioritize:

- Incorporation of new WCPFC mobulid ray specific biology, fishery characteristics and stock assessment information
- Integration of ecosystem-level impact assessments
- Enhanced spatial analysis of vulnerability patterns, related to SST, reproduction, prey distribution and distribution
- Updated evaluation of adaptive capacity as management and research continues to evolve

Conclusions

The Climate Change Vulnerability Assessment for CMM 2019-05 (Mobulid rays) reveals a **HIGH** overall climate risk, driven by high exposure and sensitivity ratings, coupled with a low adaptive capacity rating. This outlook reflects the current state of knowledge of WCPFC mobulid rays, which is a current Achilles heel in understanding their biological and ecological traits, and in enabling effective adaptive management. The high climate risk rating reflects current global concern for mobulid rays in general, and in the knowledge that climate change is likely to impact these species into the future.

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