Intertidal zone management in the Western Indian Ocean: Assessing current status and future possibilities using expert opinions

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Appendix S1

Questionnaire for experts working with questions related to the intertidal zone in the Western Indian Ocean

General information

Gender: Male or Female

Title: Prof. / Assoc. Prof. / Dr. / PhD student / MSc / BSc / Student / Manager/ Other

Countries you are working in (optional):

Name (optional):

Affiliation (optional):

E-mail (optional):

Check box if you want to be acknowledged in the outcome of this work (i.e. otherwise you will remain anonymous).

Check box if we may NOT contact you after the WIOMSA symposium to discuss further

Area of work/interest (circle the 3-5 most relevant alternatives)
Fisheries / Forestry / Management / Climate Change / Social-ecological systems/ Seagrass / Mangrove / Oceanography / Chemistry / Education / Coral reefs / Pollution / Biodiversity / Food webs / Politics / Socio-Economics / Invertebrates / Aquaculture / Conservation / Resilience / Vulnerability / Adaptation / Genetics / Connectivity / MPA / Policy / Livelihood /Policy maker / Other:

Introduction to intertidal management:
In the Western Indian Ocean (WIO) the tidal range is very large and semidiurnal (two peaks per day). The intertidal zones are very diverse containing/including many different habitats, such as seagrass meadows, mangroves and unvegetated soft and rocky bottoms. The environment is constantly changing due to the submersion of the habitats during high tide and exposure during low tide. This creates extreme conditions in most variables. For example, temperature changes and may reach very high level at noon, salinity ranges broadly, i.e. from fresh to saline water, and physical dynamics might be extreme, e.g. high wave action. The intertidal zone is thus complex and dynamic, and requires special management attention.

PART I

Please answer the questions below:

1. Which values of the intertidal zone do you consider to be of significance and why so?

2. Are you aware of any current and potential threats to the intertidal zone in your area of work? If so, what threats?

3. Are you aware of any current and potential threats to the intertidal zones in the WIO region (other areas than in your work)? If so, what threats?
4. List 3 current and potential threats to the intertidal zones in the WIO that you think are the most serious.

5. List 3 important habitats in the intertidal zone, and state why they are important.

6. Are you aware of any ongoing monitoring activities and needs for management measures in the intertidal zone? If so, what kind?

7. Are you aware of any specific aspects that need to be managed to become/remain sustainable within the intertidal zone? If so, which?

8. Are you aware of various types of management of the intertidal zone? If so, what types? And where?

9. Are you aware of any best practices in resolving conservation issues across the suite of intertidal ecosystems? If so, please give examples.

10. Why do you think the intertidal zones are often not included in management plans?

11. Do you think there is enough knowledge about intertidal zones? If yes or no, why so?
   Among government officials dealing with coastal areas? If yes or no, why so?
   Among managers dealing with coastal areas? If yes or no, why so?
   Among researcher working in adjacent habitats? If yes or no, why so?
   Among the local population? If yes or no, why so?
   Comments:

12. Do you think there are enough monetary resources allocated towards intertidal zone management? Please explain.

13. How do you think the intertidal zone is prioritized when it comes to management of the coastal zone? Please explain.

Is there anything else that you would like to mention before we move on to PART II?

**PART II**

For the following section please check the boxes under level of confidence; level of feasibility; level of importance, and answer the questions if applicable. Here, there is a specific focus at the intertidal zones in the Western Indian Ocean, but if you are aware of any relevant projects in other parts of the world, you are welcome to mention them as well.

*What do you think of the following management approaches and future possibilities?*

1) **Integrated mariculture**

What is integrated mariculture?
Integrated mariculture of e.g. mussels is performed to increase the availability of edible animal protein or of seaweeds (red algae) to increase the production.
Do you know of any integrated mariculture projects and do you have suggestions for integrated mariculture in your area work, in the WIO region or globally? Please, briefly explain.

2) Small enclosures to boost larvae production

What is creation of small enclosures as a measure to boost larvae production? Small enclosures with aggregated invertebrates may act as a “source” for the surrounding area, e.g. a big aggregation of oysters that would increase the amount of larvae dispersing to other areas and settling there.

Do you know of any projects dealing with creation of small enclosures to boost larvae production in the intertidal zone, or anywhere in the WIO region or globally? Please explain briefly.

3) Awareness campaigns and education programmes

What is awareness campaigns and education programmes? Awareness campaigns and education programmes are carried out to inform the community about different issues and threats, since many locals possess different perceptions and traditional believes e.g. animals are brought to earth by rain or sea cucumbers have come through “spontaneous generation”. This could be done by e.g. educational meetings, distribution of posters and pamphlets.

Do you know of any projects dealing with awareness campaigns and education programmes for the intertidal zone, or anywhere in the WIO region or globally? Please explain briefly.
Level of confidence – Could establishing size limits for the organisms harvested/fished be done in the WIO region?

Very confident | Confident | Fairly confident | Not confident | I don’t know

Level of Feasibility – Would it be possible to establishing size limits for the organisms harvested/fished in the intertidal zone?

Very possible | Possible | Maybe possible | Not possible | I don’t know

Level of importance – How important is it to test establishing size limits for the organisms harvested/fished in the intertidal zone?

Very important | Important | Fairly important | Not important | I don’t know

Do you know of any entity establishing size limits for the organisms harvested/fished in the intertidal zone?

5) Establish no-take zones in highly degraded areas together with the community

What is establishing no-take zones in highly degraded areas together with the community? This has been partly tested in Fumba, southern Zanzibar. No-take zones have recently been initiated in Fumba due to overexploitation of cockles and other mollusks to prohibit harvesting of all animals. This has been done together with the community, especially the women that are harvesting the mollusks. Results are positive in some of the areas, while there is still needed to test how such no-take zones work in the long term and in various settings.

Level of confidence – Could no-take zones be established in highly degraded areas together with the community in the WIO region?

Very confident | Confident | Fairly confident | Not confident | I don’t know

Level of Feasibility – Would it be possible to establish no-take zones in highly degraded intertidal zones together with the community?

Very possible | Possible | Maybe possible | Not possible | I don’t know

Level of importance – How important is it to test the efficiency of no-take zones in highly degraded intertidal zones together with the community?
Do you know of any entity establishing no-take zones in highly degraded intertidal zones together with the community?

6) **Strengthening and encouraging the use of traditional and local ecological knowledge**

What is strengthening and encouraging the use of traditional and local ecological knowledge? Strengthening and encouraging the use of traditional and local ecological knowledge that is passed from older to younger generations.

Level of confidence – Could strengthening and encouraging the use of traditional and local ecological knowledge be useful in the WIO region?

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Level of Feasibility – Would it be possible to improve the intertidal zone by strengthening and encouraging the use of traditional and local ecological knowledge?

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Level of importance – How important is it to test strengthening and encouraging the use of traditional and local ecological knowledge as a measure to improve the intertidal zone?

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Do you know of any projects working with strengthening and encouraging the use of traditional and local ecological knowledge to improve the intertidal zone?

7) **Laws against trade of key species and education for tourists**

What are laws against trade of key species and education for tourists? Create laws against selling key species as well as make it illegal to buy them, e.g. ban curio-trade. Further increase awareness among tourists about key species, e.g. posters at the airport explaining about key species such as the triton (gastropod) that is an important crown of thorn predator.

Level of confidence – Could laws against trade of key species and education for tourists decrease the exploration of these species in the WIO region?

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Level of Feasibility – Would it be possible to create laws against trade of key species and educate tourists as a measure to protect the intertidal zone?

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Level of importance – How important is it to test creating laws against trade of key species and educate tourists as a measure to protect the intertidal zone?

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Do you know of any projects that educate tourists and prohibit selling/buying key species as a measure to protect the intertidal zone?

8) **Conduct research on important species and their relation to intertidal ecosystems**

What is conduct research on important species and their relation to intertidal ecosystems?
E.g. conduct research focusing on specific key-invertebrate species and their relation to seagrass, another example would be conducting species inventories of areas with mixed densities of mangrove.

**Level of confidence** – Could research on important species and their relation to the ecosystems be done in the WIO region?

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**Level of feasibility** – Would it be possible to conduct research on important species and their relation to intertidal ecosystems?

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**Level of importance** – How important is it to perform research on important species and their relation to intertidal ecosystems?

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Do you know of any entities conducting research on important species and their relation to intertidal ecosystems?

**9) Informal institutions and traditional practices**

What is meant by informal institutions?
Informal is not written in formal laws or documents; for example local knowledge among fishers or traditional management systems. To investigate the possibility of informal institutions, could be done through e.g. within the fishing community alternate who, when and/or where to fish, e.g. ”rotating fishing” or closed season. Also traditional issues can be important, for example when there are taboos against eating certain species.

**Level of confidence** – Could informal institutions used in the WIO region?

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**Level of feasibility** – Would it be possible to investigate the potential use of informal institutions for the intertidal zone?

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**Level of importance** – How important is it to test the use of informal institutions to improve the intertidal zone?

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Do you know of any entity developing/using informal institutions/ to improve management of the intertidal zone?

**10) By-laws**

What is meant with by-laws?
By-laws are designed for specific problems at local scales. They are created for specific issues and applications passed under the authority of a higher law specifying what things may be regulated by the by-law, e.g. villagers can create laws for their village regarding how to fish, what ecosystems to be used and what species to be target.

**Level of confidence** – Could creation of by-laws be done in the WIO region?
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**Level of Feasibility – Would it be possible to create by-laws as a measure to improve the intertidal zone?**

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**Level of importance – How important is it to test by-laws as a measure to improve the intertidal zone?**

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Do you know of any entity developing informal institutions/using informal institutions and creations of by-laws to improve management of the intertidal zone?

**11) Developing integrated coastal zone management plans involving local people**

What is developing integrated coastal zone management plans involving local people? E.g. when planning to manage the coastal zone, the users (local people) should be involved in the whole process. Thus a co-management approach is needed.

**Level of confidence – Could developing integrated coastal zone management plans involving local people be done in the WIO region?**

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**Level of Feasibility – Would it be possible to develop integrated coastal zone management plans including the intertidal zone involving local people?**

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**Level of importance – How important is it to test integrated coastal zone management plans for intertidal zones involving local people?**

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Do you know of any projects working with integrated coastal zone management plans where the intertidal management involves local people?

**12) Temporal and/or spatial closures**

What are temporal and/or spatial closures? This is e.g. when a defined area is closed during certain seasons (such as no access to the beach when turtles are nesting or no fishing when species spawn) or certain areas are closed within a large fishing ground (such as known spawning grounds).

**Level of confidence – Could temporal and/or spatial closures of natural ecosystems/natural resources be done in the WIO region?**

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**Level of Feasibility – Would it be possible to create temporal and/or spatial closures in the intertidal zone to improve this environment?**

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**Level of importance – How important is it to test temporal and/or spatial closures in the intertidal zone?**
Do you know of any temporal and/or spatial closures as a measure to improve the intertidal zone or other environments?

13) Habitat maps and remote sensing

What is habitat maps and remote sensing?
Habitat maps can e.g. show distribution of habitats, remote sensing can e.g. a give detailed picture of a large area (from afar), and pictures in a time series of the same area can be used to detect changes in e.g. habitat distribution.

Level of confidence – Could habitat maps and remote sensing be useful in the WIO region?

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Level of Feasibility – Would it be possible to create/use habitat maps and remote sensing for the intertidal zone to improve this environment?

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Level of importance – How important is it to test habitat maps and remote sensing for the intertidal zone to improve this environment?

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Do you know of any entity using habitat maps and remote sensing as a measure to improve the intertidal zone or other environments?

Can you suggest further potential management tools/strategies/ideas?

Any other comments/suggestions/feedbacks (please use the back of this paper if needed):