

Critical coastal fish habitats in the WIO - focus to small scale fisheries



SWIOFC-Nairobi Convention
Partnership Meeting on the
Fisheries Environment Nexus 26-
28 September in Mombasa.



Food and Agriculture
Organization of the
United Nations

Salomão Bandeira



Outline

1. Socio-economic and ecological importance
2. Habitat quality linked fisheries production, pressures
3. Connections to upriver and off-shore ecosystems and human activities/impacts
4. Key management and policy tools that can be used to maintain and improve status of critical coastal habitats and fisheries potential/productivity
5. Case study
6. Future priorities for fisheries-environment inter-sectoral /agency collaboration in the protection and restoration of critical coastal fish habitats

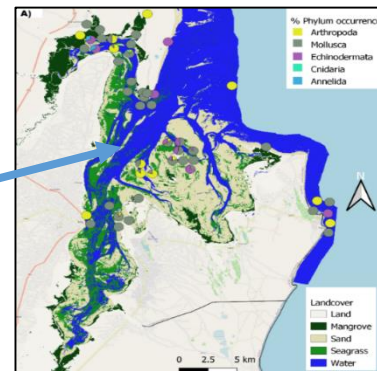
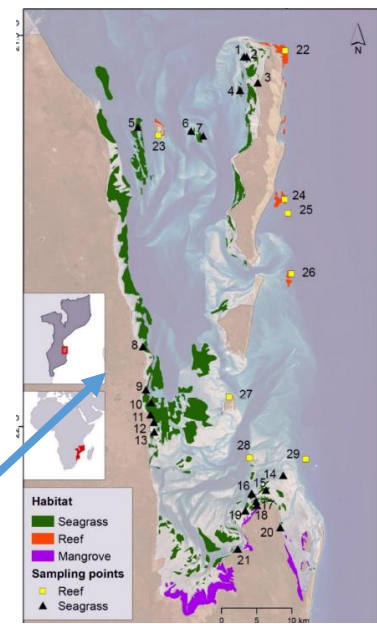
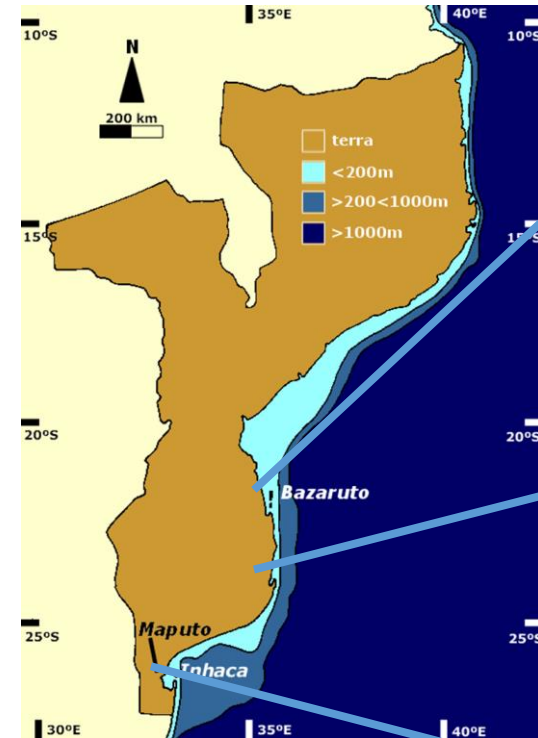


Critical coastal fish habitats in WIO



Ecological importance of the critical fish habitats, case of seagrass meadows 1

1. **Nurseries**, also **biodiversity**. Seagrass meadows harbour **several times** more gleaning material. Fish and crustaceans increase in seagrass areas near mangroves (Jelbart et al 2015);
2. Trade-offs between critical habitats, with coral reef having more fish species than seagrasses (e.g. Richmond 2011);
3. **Research to ascertain species assemblages and trade-offs (Inhambane Bay with largest seagrass concentration in the southern Mozambique. Comparative with Vilanculos/Bazaruto and Maputo Bay (here with larger mangrove, 2nd largest shrimp fishing)**



Ferreira & Bandeira 2014,
Eggertsen et al 2020, Amone-Mabuto 2017

Ecological importance 2 – significance of elected species

Elected fish species by communities (Inhambane)

-*Gerres filamentous* (Gerreidae), plâncton eater



-*Sillago sihama* (Sillaginidae) pescadinha, **more seagrass depended, carnivorous**



-*Crenidens crenidens* (Sparidae) **more seagrass depend fish, carnivorous**



-*Alepes djedaba* (Caranjidae), “carapau”, pelagic species than benefic form being closed to seagrasses



-*Litrus variegatus*, predator and eat benthic areas enjoys seagrasses, sandy areas and coral reefs.



Litrus variegatus

-*Siganus sutor* (Siganidae)– “mbapé” highly dependent on seagrasses



Parrot fish (Scaridae) are herbivorous: grazers, browsers, scrapers, excavators and constitutes an important link between microorganisms, detritus and plant material with the higher trophic levels:



Leptoscarus vaigiensis



Scarus sp.



Leptoscarus vaigiensis

Scarus ghobban

Eggertsen et al. 2020

<https://doi.org/10.3390/d12110434>

Socio-economic importance of the critical fish habitats, gleaners

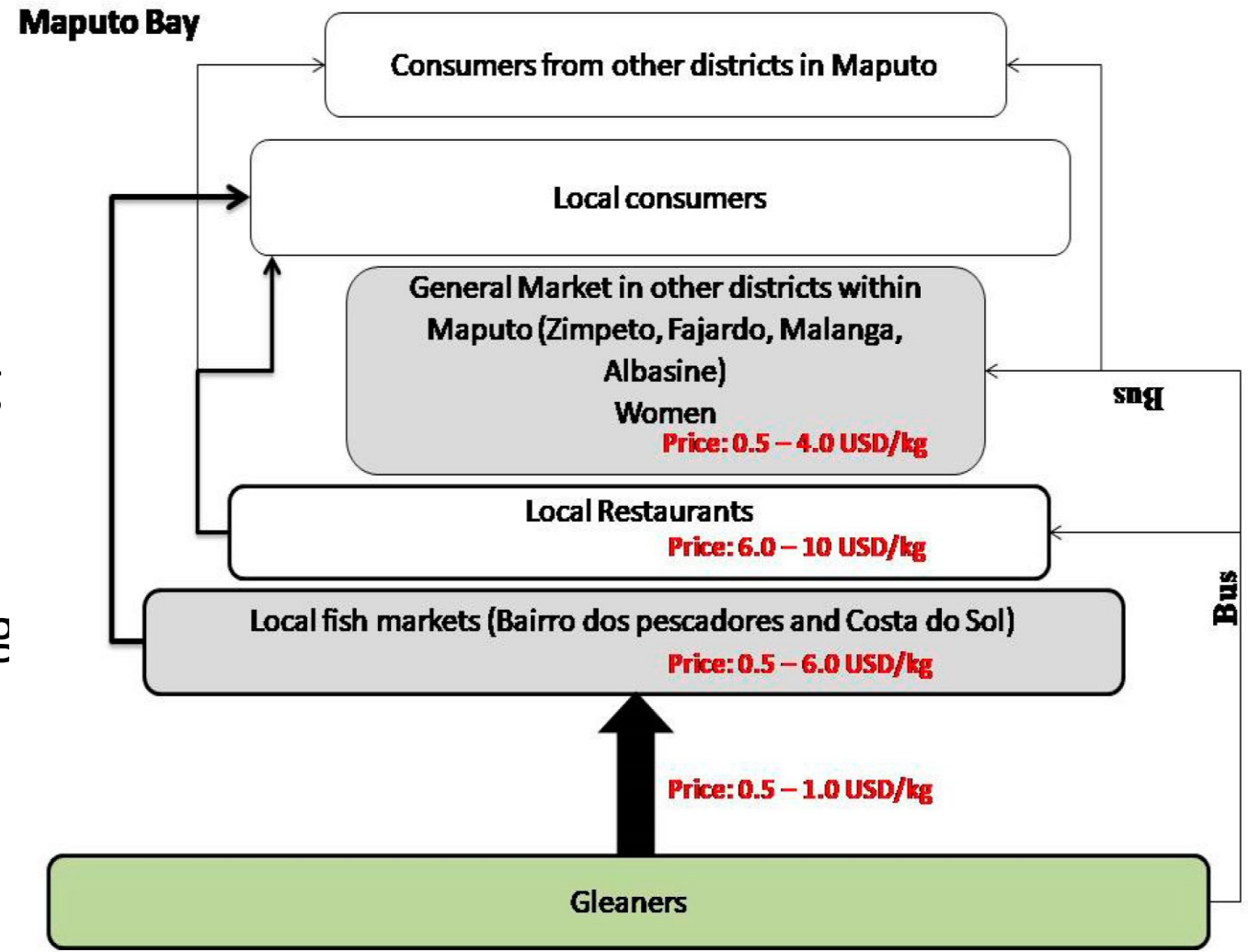
1st stage:

Community **subsistence through artisanal fisheries** (Protein source /food security/self employment)

Gender dimention: man in the fisheries and woman in the gleaning

2nd stage:

Business side, gender dimention (e.g in processing of marine resources including salting, **value chains of gleaning** (Moz.), **revenues**

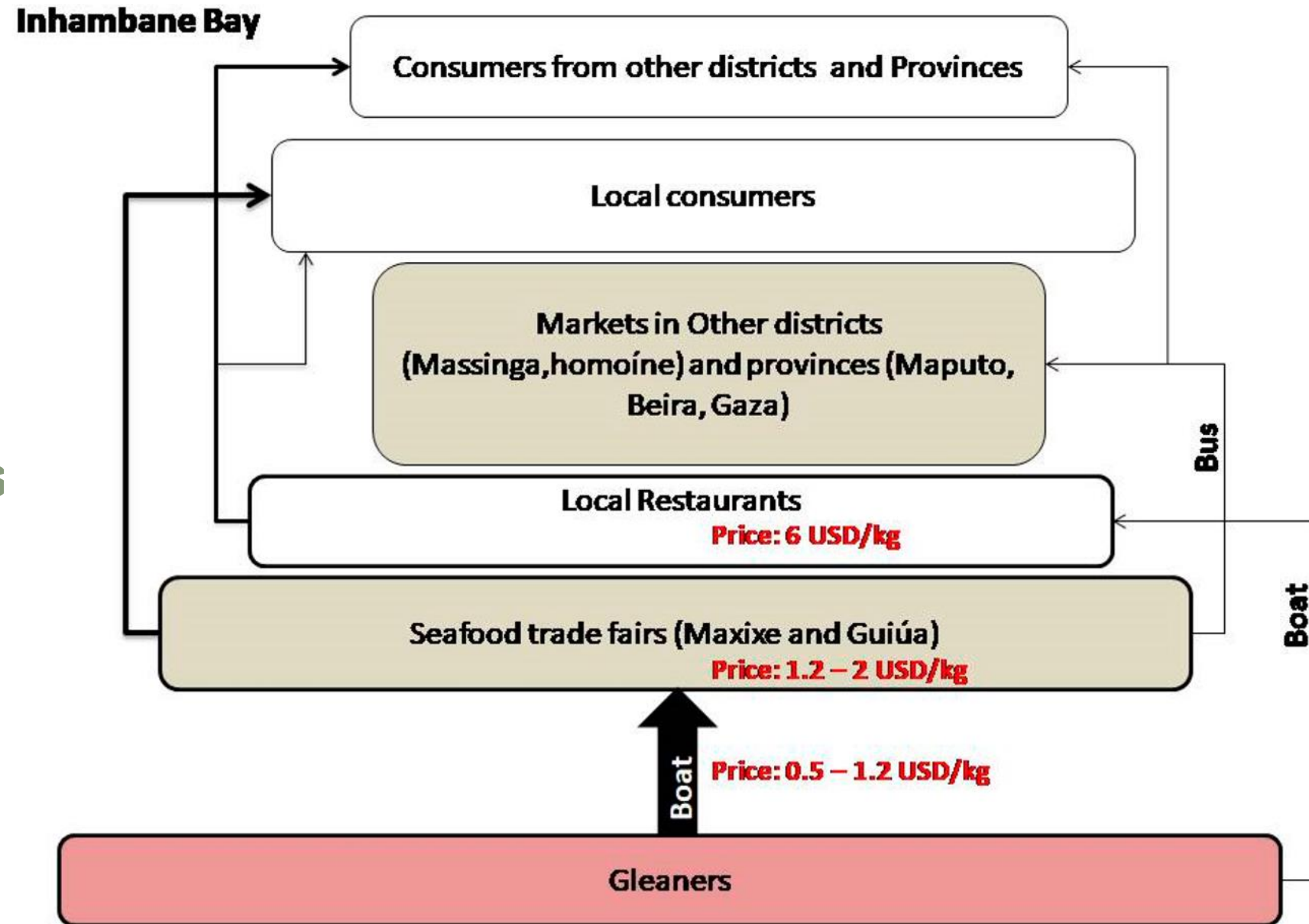


<https://doi.org/10.3390/d14030170>,

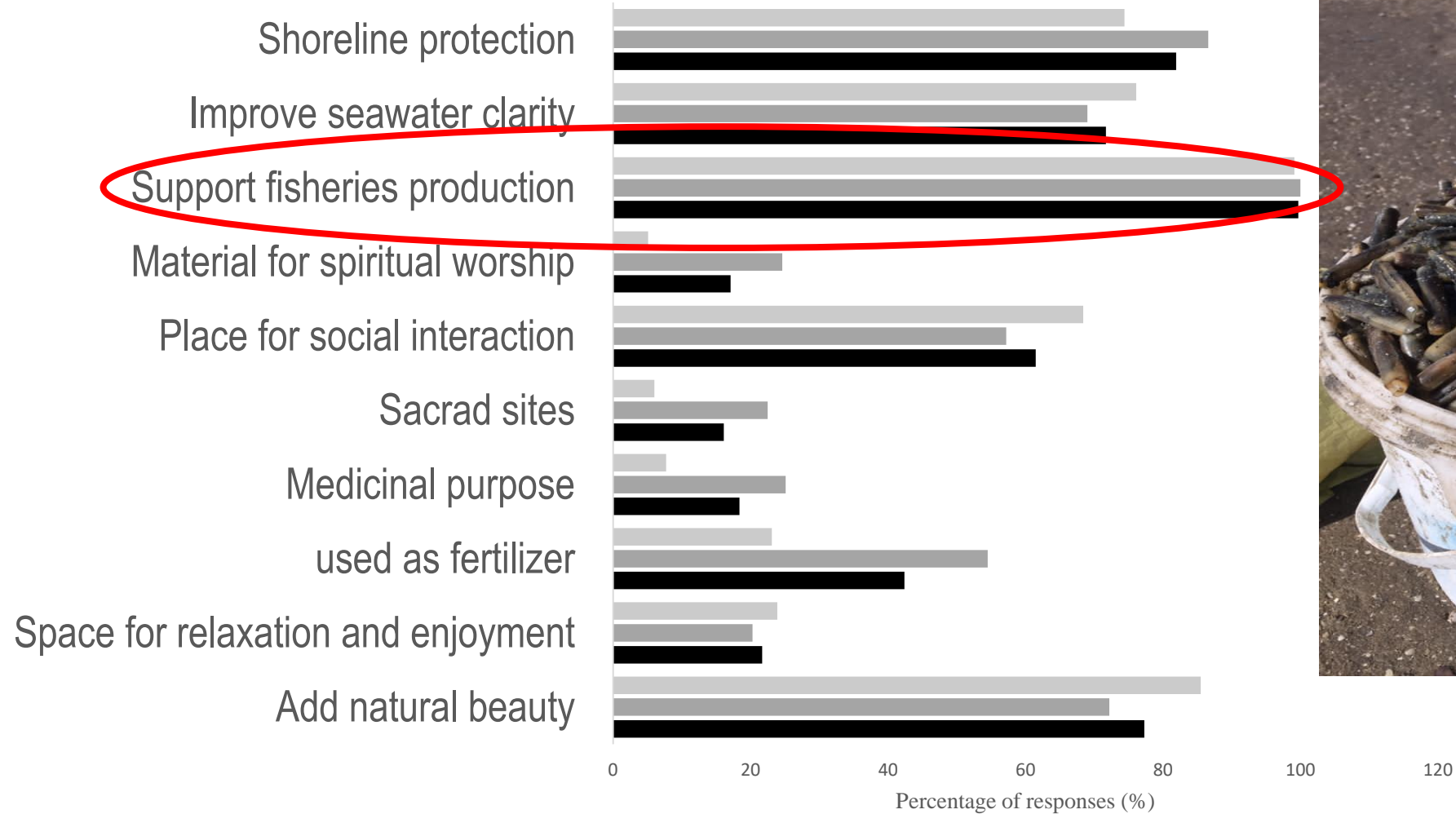
Chitará-Nhandimo et al 2022

Value chain IB

- 6 stakeholders
- 4 provinces
- + 3 marketplaces
- Restaurants



Fishers Communities' perception on Socio-ecological functions of seagrass meadows matters



■ Inhambane Bay ■ Maputo Bay ■ Overall



Mwakha Alati et al 2020

<https://doi.org/10.1016/j.ocecoaman.2020.105285>

GLEANING in KENYA

- 158 invertebrate species

- 74% of gleaning for tourism and 24 for subsistence

- fishery conducted by both women and men is present in Kenya

- many exploited shells have markedly declined in the last four decades

- overfishing perceived as the main cause of the decline in shell populations.

Octopus closures – game changer?

- ❑ **Octopus cyanea**, *O. vulgaris*, *O. aegina* and *Cistopus indicus*
- ❑ 2500 hectares closure in 3 months earned over 12 MT of octopus (also 8 MT of fish)
- ❑ Return per person soared from 1.5 USD to 234 USD)



<http://119.78.100.173/C666/handle/2XK7JSWQ/347222>

Mangroves /"Crab land"

Most valuable crab: *Scylla serrata*

-residence species: Gobidae with little/no known value to communities

REGULATION: carbon storage and disaster risk reduction

PROVISION

SUPPORTING

CULTURAL

Bimrah et al 2022, MPDI: Sustainability

<https://doi.org/10.3390/su141912051>

Examples mangrove depend species for communities in Mozambique for subsistence:



Mud crab, *Scylla serrata*

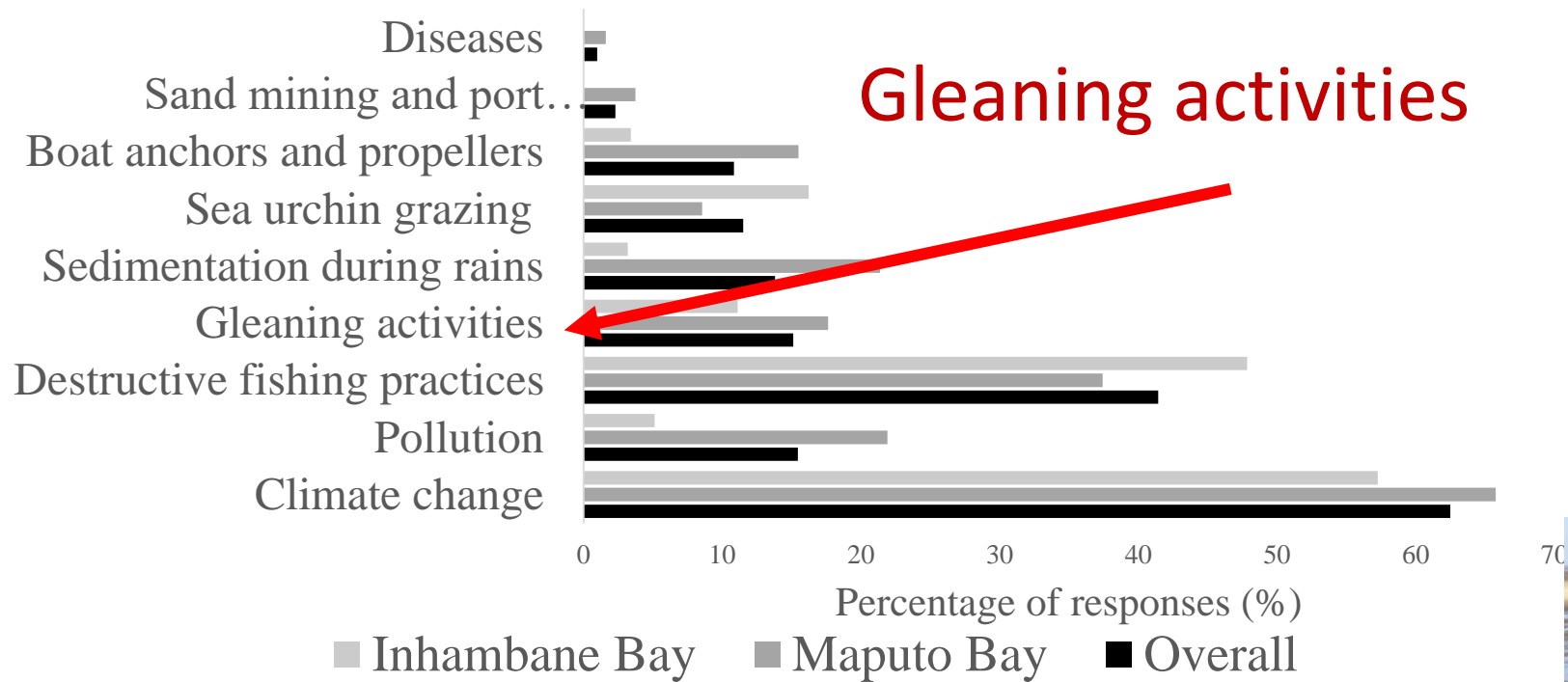


Terapon Jarbua



Pelates quadrilineatus

Perception response regarding seagrass degradation:



Amoné-Mabuto et al, revision
Chissico thesis, 2021

Habitat quality linked fisheries production – relevance through lifecycle stages, geographical connectivity

Elected fish species within Bazaruto archipelago

- Squid: *Loligo* sp.
- Decapterus* sp. (Carranjidae), “carapau”
- Sardinella gibbosa* (Clupeidae)
- **41 fish species** caught on seagrasses beach seine nets (in 26 families of families Carangidae, Clupeideae, Sillaginidae, Sparidae, Mullidae, Lethrinidae). **High diversity**

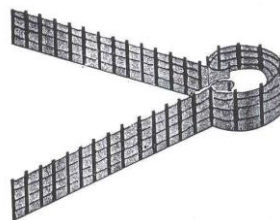
(Hermnina Vilanculos, Licenciatura thesis 2022)



Habitat quality linked with fisheries production – relevance vulnerability and pressures

- Most fish resources in seagrass meadows are over exploited, high pressure, therefore tend to find mostly pelagic species that come and go.
- Pressure increase as population density increases - high demand of resources
- Issues of gear? Mostly gear is non selective which may have impact on production and habitat quality.
- Challenge of banning beach seine from 2023/2024 (REPMAR regulation)

Some fo the
best gear :
cages/made
ma, palisade
trape net
“gamboa”,
also line
fishing



CPUE – gear used and interpretation

Bazaruto: 48-180 Kg per drag net, standard net , 200 m dragging.

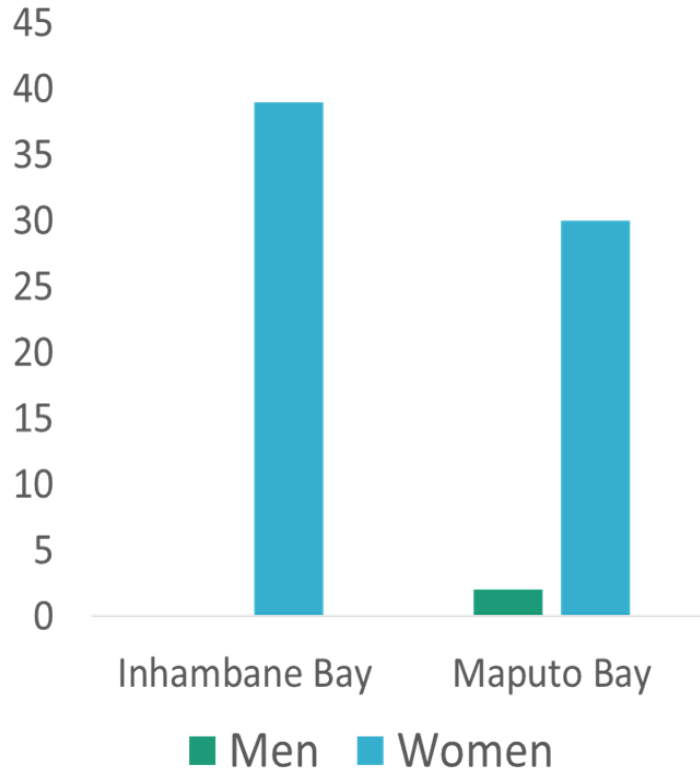
Dragging for 1-2 km (Vilanculos, Inhassoro), reflex of decreasing habitat quality caused by over-exploitation. Region: cradde of Moz. CCP

Gleaning: over 7 m.ton per week/lunal cycle, issue of destructive technique in Maputo Bay

Dragg fishng impact of juvenils. The management site: to increase mesh size (unpopular, lack of resources and risk for not getting the desired catches for fisherman) or ban the fishries technique

Impact of transforming artesanal fishers to the pelagic semi-industrial?

Seagrass shellfish fisheries, degradation and implications

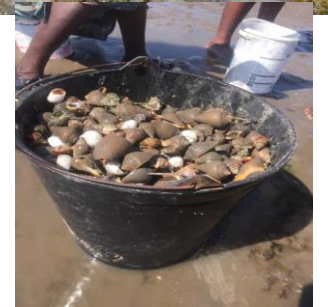


Maputo Bay

- N of species: 23
- N of gleaners: 80
- Estim. catch/week: **7.7 ton**

Inhambane Bay

- N of species: 11
- N of gleaners: 40
- Estim. catch/week: **7.6 ton**



	Cause of Disturbance	Daily Disturbed Area/Gleaner	Seagrass Communities Affected
MB	Excavation, uprooting, trampling	163.27 ± 26.98 m²	+++ Zc & Hu +++ Zc, Ho & Hu ++ Ho & Hu + HO
IB	Trampling, cut	524.18 ± 2.07 m²	+ Os & Hu + Os, Cr & Hu +Os & Tc

Pressures on fisheries-case of Moz.

Popular species disappearing/reducing in the last 1-2 decade in parts of Mozambique:

- *Hilsa Keely*, Maputo Bay sardine
- *Acetes* sp., “tépuè” coastal small shrimp, Beira
- Reduced size of rocky lobster
- *Macoma litoralis* (NW Maputo Bay)



***Zostera capensis* IUCN RED List seagrass, going together with key clams & gastropoid in NW Maputo Bay: *Eumarcia paupercula*, *Meretric meretric*, *Volema pyrum* (gastropoid)**



Fish reducing in size: Lobster, Groupers, Letrinidade, Lutjanidae, Sparidae, Sellaginidae (*Sillago sihama*)

Recent history (4 decades ago):

- 3-fold population increase (~12-31 million people)
- Fisheries contribution reduced from 1/3 of GDP to just 3% or less (now shrimp fisheries dominating -Sofala Bank/Maputo Bay mainly)
- Issue of IUU; what we know regarding fisheries agreements



Connections to upriver and off-shore ecosystems and human activities/impacts

Coastal fisheries is dependent on habitats but also on river flows (with few upwelling systems, away from coastline in Moz). Floods increase shrimp production, also *Siganus sutor*



Need to have water management bodies especially related to rivers with dams as cycles of waters are no more natural, not synchronized with fish production

Land based pollution (agriculture, cities, ...). What do we know?

Key management and policy tools that to maintain and improve status of critical coastal habitats and fisheries potential/productivity – Habitats, MSP, BE

Need to adopt, at regional level, the **habitat-based management plan**. We have for mangroves, coral reefs. Need for seagrasses

Need to **modeling MSP**. Rather than documenting current activity (fishing zones). **Reproduction areas, migration areas, sanctuaries are not mapped**

MSP and Blue Economy should go together and need to transit from a policy document to an implementation doc. Where is the entity for BE?

Discussion/stakeholder forum? Decisions? What are the sectors? Emerging issues like climate change?

WIO and blue bonds. Seychelles lessons. Moz Blue bonds /Ematum??

Key management and policy tools that to maintain and improve status of critical coastal habitats and fisheries potential/productivity- ICZN

Background for Moz.

1. Inter institutional committee of the coastal zone that included fisheries sector and the Coastal zone management unity then transformed into CDS-ZC

2. Issues in need of decision had to transit to the national council of sustainable development /CONDES (Prime Minister office)

3. 2015: Seas Ministry: MIMAIP. Incorporation of MSP and Ocean Governance discussions
Did we profit from the best practices of the Coastal Zone Unity and CONDES (PM officer)?

Other platforms:

-A lot to gain from SDG14: targets, restoration/NbS,

-gleaning /SSC has compliance with other agenda 2030 such as Gender - SDG

-Decade of Ecosystem restoration, NbS: need to bring indicators such as restoration should lead to employment and livelihoods opportunities



Gleaning in Unguja, Tanzania

1. Gleaning is important for food security, local culture and livelihood.
2. The local intertidal zone is degrading and that the gleaned catch is changing.
3. Economically important bivalves (*Modiolus* spp.) and gastropods (*Strombus* spp.) are in decline, which was paralleled with low abundances (survey of the intertidal and catch landing assessment).
5. Mainly carried out by women
4. Recommendation: invertebrate gleaning, should be included in fisheries management.



Stiepani, J., Jiddawi, N. & Mtwana Nordlund, L. Social-ecological system analysis of an invertebrate gleaning fishery on the island of Unguja, Zanzibar. *Ambio* (2022). <https://doi.org/10.1007/s13280-022-01769-1>

Seagrass fishery has a face of woman !

How vulnerable is a gleaner?

Link to invertebrate fisheries management



Revenue and at what cost?

Bivalves: Clams, Oysters, Razor clams: Fresh and processed

Crabs (*Portunus sp*)



Revenues:

USD 2630 /month for Maputo Bay

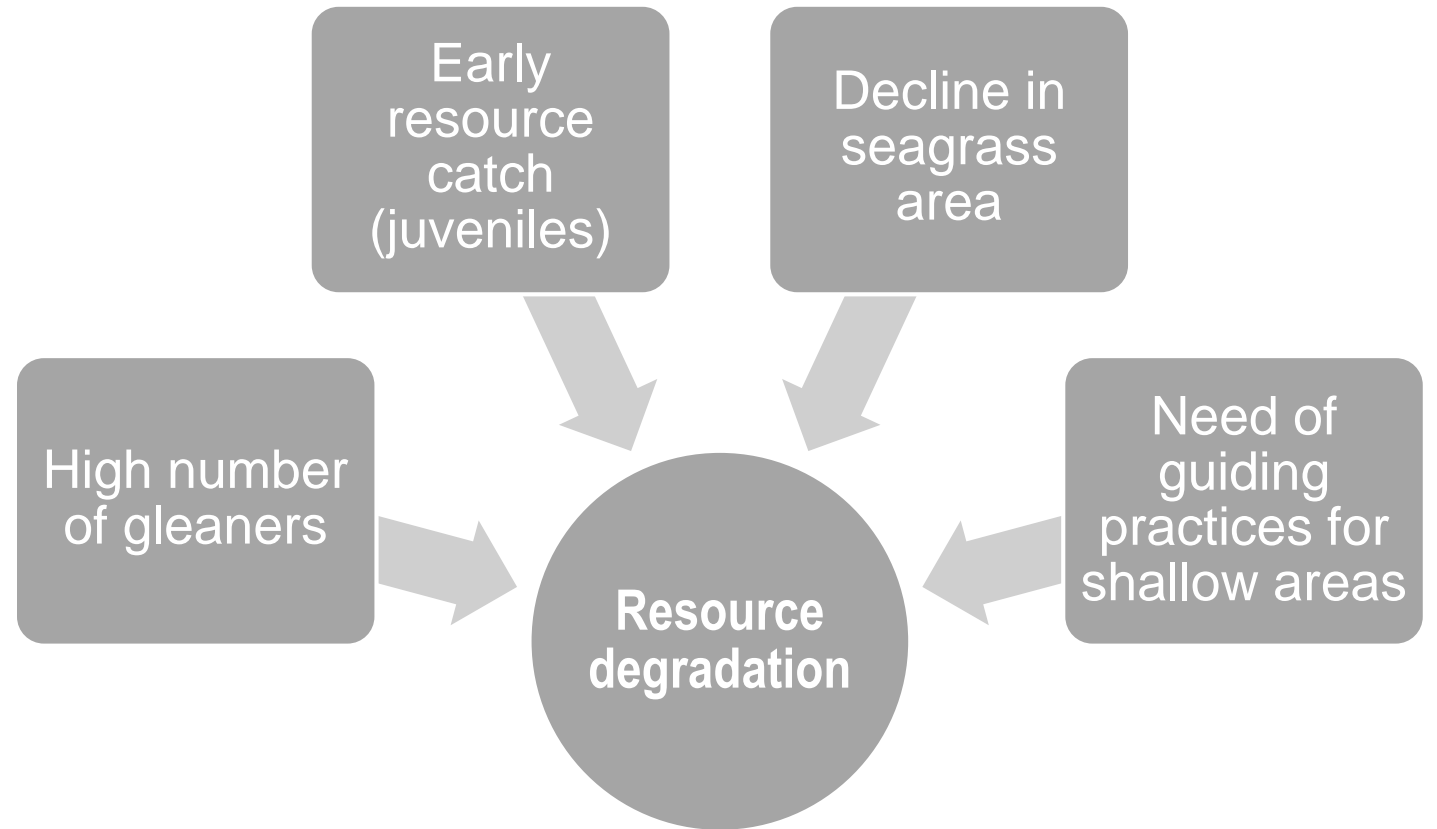
USD 1229.7 / month for Inhambane

The road to sustainability of the coastal communities, Role of seagrass in providing food security and sustainability of shellfish fisheries!



Inhambane, Moz: gleaner & student

Risk factors to shellfish fisheries sustainability



Shellfish fisheries management in Inhambane Bay (1)

Measures implemented based on the
Local Ecological Knowledge (LEK)



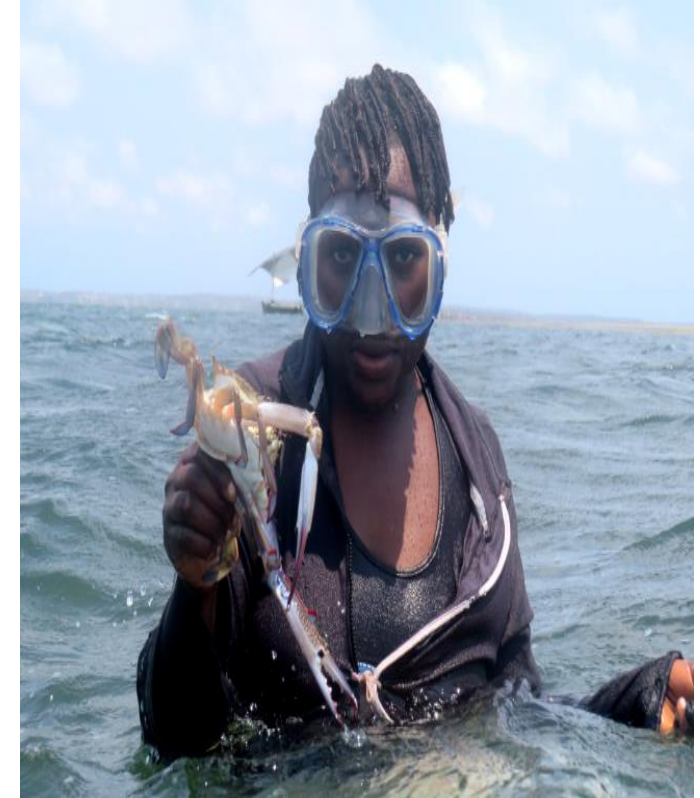
Seagrass
Restoration



Establishment
of harvesting
closure periods

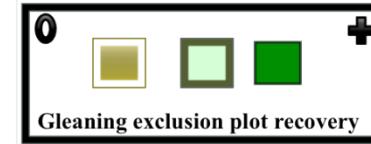
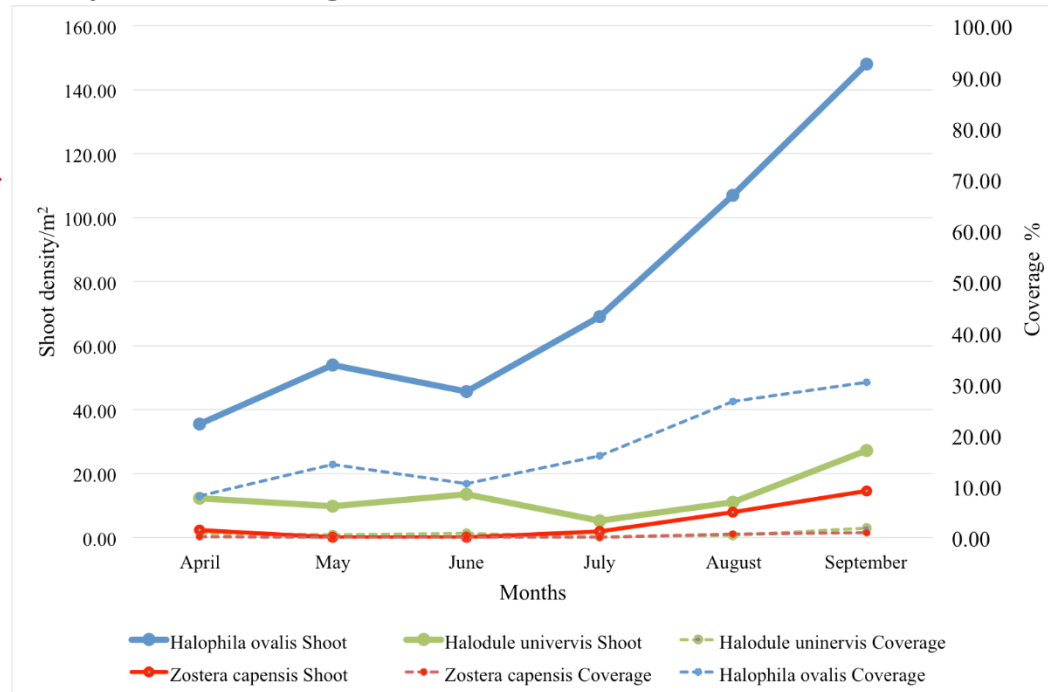
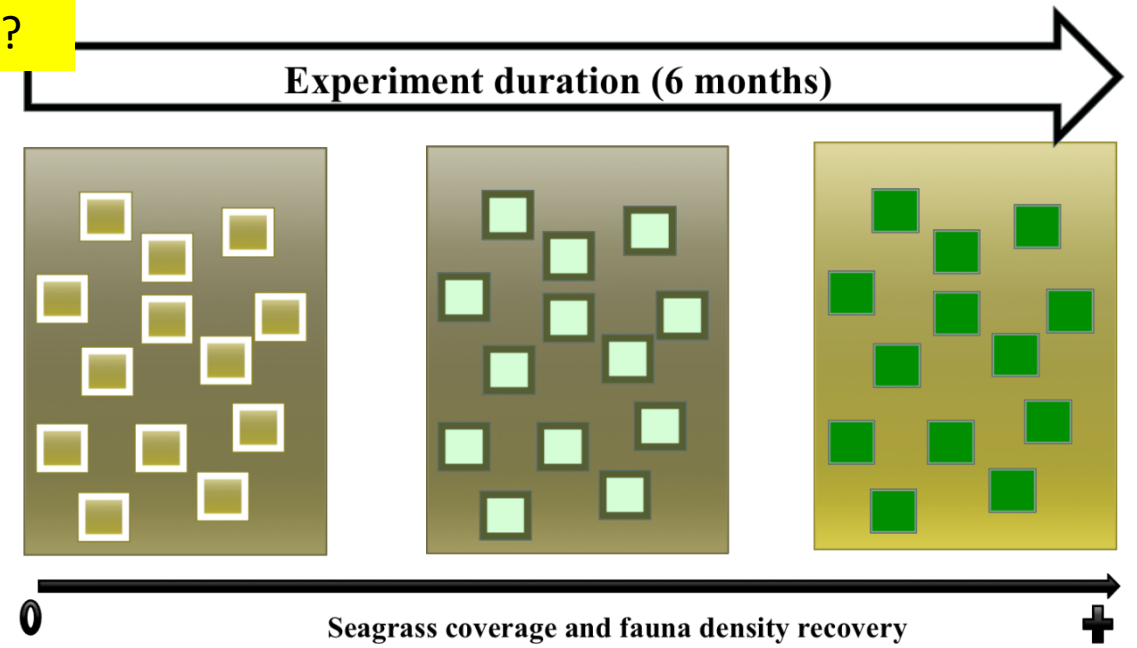


Establishment
and
dissemination
of minimum
catch size



WHAT HAPPEN WHEN YOU HALT DEDRADATION?

Assisted restoration testing conducted in NW Maputo Bay. A suppression in a destructive practice (of collecting clams by means of hoe and machete) enabled a recovery of seagrass.



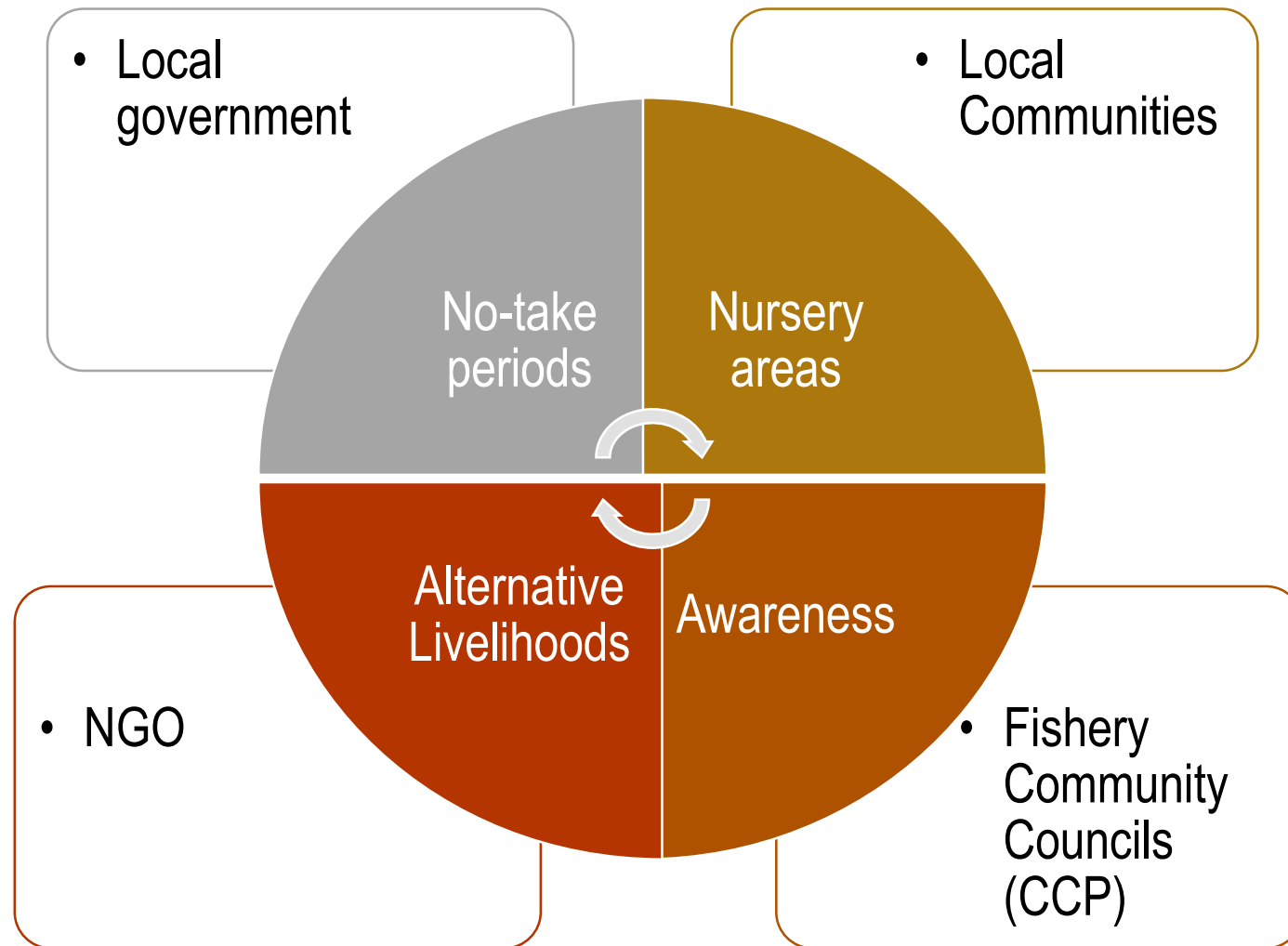
Fanoro et al, revision Maputo Bay

Role of LMMAs in Seagrass fisheries Management in Inhambane Bay (2)

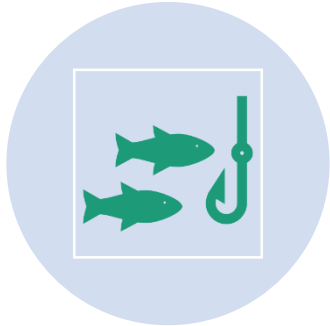
1172 ha of 12 Locally
Managed Marine Areas
(proclaimed in 2017) are at
the center of tangible
invertebrate fishery
management.



LMMA's matrix for sustainability of coastal communities in Inhambane Bay: Stakeholders and main actions



What's next for coastal communities relying in shellfish fisheries? Next avenue: drafting of a seagrass management plan



The development of **community-based management (CBM)** for invertebrate fisheries— a bottom-up approach is needed to secure the sustainability of this fishery; also livelihoods to communities



Conservation area authorities, municipalities, NGOs, and research/academic institutions need to **guarantee the appropriate implementation** and **wider best practices**, as well as social adaptation to guarantee long-term sustainability and a change in the culture of clam collection.



Wider **awareness/sensitization** on seagrass meadows and their fisheries is needed;



Promote discussion on resource extraction, gear used, and possible discussion on quotas, value chains, and community development.

Future priorities for fisheries-environment inter- sectoral/agency collaboration in the protection and restoration of critical coastal fish habitats – What can we do differently?

Need to engage stakeholders incl. communities representative in this dialogue

Need approach to pair management and livelihood generation

Resilience option for fishers including gleaners (better understanding of value chains and tilt it in support of vulnerable communities and resource revenues

Link with applied research: socio-ecological research, experimentation, livelihoods acquisition; improve research that link habitats and elected important fisheries

Maintreaming BE/ICZN with sector activities

- No take season, no take zones, LMMAs
- The region needs guardian of IUU in the coastal zone
- Public awareness to discourage consumption of depleted fish species, also from unsustainable practices
- Link with other global initiatives: citizen science, circular economy (holistic vision..)



Thank you
Asante
Merci
Obrigado

Beira, Moçambique