

Supplementary Material

Table 1. Description of social-ecological system dimensions (in bold), variables (in italics) and indicators (underlined) analysed, their corresponding weights, position in the social-ecological framework [1], working definition and motivation for their inclusion in the analysis.

Dimensions, variables and indicators	Code	Tier	Definition	Motivation for inclusion
1. Governance System (1.00)	GS	i	Organisations and rules established to manage the resource system (RS) and to regulate harvesting of resource units (RU) by shaping the behaviour of resource users (Actors, i.e. the fishers) [1–3]	
<i>1.1 Organisations (0.50)</i>	GS5	ii	Community groups (Community Fishing Councils – CCPs) with responsibilities for managing the RS and regulating use of RU through existing legislation and own-defined resource management measures	Organisations play a key role in regulating the use of RU and managing the RS. [4]. Here we focus on CCPs, which are responsible for implementing, and to some extent defining, resource use rules and regulations in the context of fisheries co-management in Mozambique. Community organisations are widely recognised as key features of self-organisation for resource co-management [5,6]. CCP good governance and good functioning are indicators the level of community self-organisation for resources management.
<u>1.1.1 CCP governance</u>		iv	Extent to which CCPs achieve a number of targets that collectively describe 'good governance'. Relates mostly to administrative procedures, participation (including gender inclusion) and accountability to members and the wider community.	
<u>1.1.2 CCP functioning</u>		iv	Extent to which CCPs achieve a number of targets that collectively describe 'good functioning'. Relates mostly to the extent CCPs are implementing certain activities such as enforcement of rules and regulations, awareness raising, sharing information, data collection	
<i>1.2 Rules-in-use (0.50)</i>	GS6	ii	Formal and informal rules defining access to resources, including who, where, how, when, how much. These are often accompanied by sanctions for rule breakers [1]. Here we consider criteria related to two types of Fisheries Restricted Areas (temporary and permanent closures) and gear restrictions.	The existence of such rules indicates the ability of users to self-organise to regulate the use and protect resources in some manner [1].
<u>1.2.1 Temporary closures</u>		iv	Fishing management measure that communities may choose to implement to enhance the reproduction and growth of short life-cycle species such as octopus. The size, location, closed and open periods, sanctions for rule breakers and who can harvest resources are defined by the communities, facilitated by CCPs.	The establishment of temporary and permanent closures reflects the ability of local communities to develop measures to regulate the use of, and conserve fisheries resources.
<u>1.2.2 Permanent closures</u>		iv	Fisheries management measures that communities may decide to implement to protect resources and sensitive areas (i.e. spawning aggregations). Size, location and sanctions for closure violation are decided by communities, facilitated by CCPs.	
<u>1.2.3 Awareness of gear regulations</u>		iv	Extent to which the local population is aware of prohibitions to use of fishing gears considered damaging to the environment, as defined locally and the national fisheries legislation.	Existence of gear restrictions on its own does not indicate whether users are aware of, and comply with, those regulations. Measures of awareness and

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<u>1.2.4 Compliance with gear regulations</u>		iv	Level of compliance with prohibited fishing gear regulations as perceived by the population.	compliance (perceived compliance) provide a better indication of the level of implementation of prohibited gear regulations.
2. Actors (1)	A	i	Users (i.e. fishers) in the social-ecological system that participate in harvesting the resource units [2]	
<i>2.1 Number of relevant actors (0.25)</i>	A1	ii	Number of actors within the social-ecological system involved in fishing activities, also referred to the literature as group size	Group size has impacts on the probability of successful collective action [7], although there is no consensus on whether it increases or decreases the likelihood of self-organisation and its success [8]. Number of users may have different effects, for example, it may be easier to generate trust and facilitate collective action amongst a smaller number of users. On the other hand, mobilising labour and other resources for rule monitoring and enforcement, particularly in larger resource systems may be facilitated by larger numbers of users [8]
<u>2.1.1 Number of fishers</u>		iii	Level of involvement of the local population in fishing.	
<i>2.2 Socio-economic attributes of users (0.25)</i>	A2	ii	Key social and economic characteristics of users affecting fishing dynamics [1]	Heterogeneity/homogeneity may have an important effect on collective action and sustainability trajectories. Studies have found mixed effects [8]. The presence of migrants may pose challenges for collective action as migrants may not have the same level of incentive to manage resources. On the other hand, the presence of migrants may be an incentive for local communities to develop measures to regulate resource use, including exclusion of outsiders or controlling their use of resources [9,10].
<u>2.2.1 Migration</u>	A2.1	iii	Permanent or semi-permanent resettlement, including seasonal movements of fishers [11,12]	
<i>2.3 Importance of resource (0.25)</i>	A8	ii	Extent to which the resource units constitute a source of cash income and plays a role in sustaining fishers' livelihoods [1]	When the economic dependence of users is high, they are likely to have more incentive to devise and implement rules and measures to ensure the long-term sustainability of the resource [1,3]. Here we combine two measures of economic importance of the resource, the contribution of fishing to
<u>2.3.1 Economic dependence</u>	A8.1	iii	The extent to which fishers are economically dependent on the resource for livelihoods	
<u>2.3.2 Livelihood diversity</u>		iii	The combination of different occupations contributing to household income.	

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<u>2.3.3 Livelihood diversification</u>		iii	The level of diversification of sources of household income beyond fishing.	household income and livelihood diversification or the extent to which fishing households have other sources of income beyond fishing.
<i>2.4 Social capital (0.25)</i>	A6	ii	Features of social organization such as networks, norms, trust and reciprocity that facilitate coordination and cooperation for mutual benefit [13]. We focus on trust as a component of social capital.	Savings group membership was used as an indication of social capital [14]. We hypothesise higher levels of saving group membership is an indicator of trust, given that the functioning of these groups is based on norms of trust between group members.
<u>2.4.1 Trust</u>	A6.1	iii	Trust is a measure of the extent to which members of a community feel confident that other members will live up to their agreements [1]	
3. Resource Units (1.0)	RU	i	The resources (i.e. fish) that can be harvested from the resource system, which users (i.e. fishers) can then consume or sell [2]	
<i>3.1 Number of units (0.5)</i>	RU5	ii	Variety of resource units harvested or that could be potentially harvested from the resource system [1]	The larger the number of taxa harvested, the most likely are fishers to be able to switch to another species should the abundance of a given species decrease because of human or natural factors [2]
<u>3.1.1 Diversity of targeted taxa</u>		iii	Number of fish taxa harvested by users (i.e. fishers in the different villages [2]	
<i>3.2 Economic value (0.5)</i>	RU4	ii	Economic value of resource units harvested by users, expressed as landings per fishing gear.	Economic benefits of resource harvesting have been associated with interest of users to create arrangements to effectively manage those resources [2,15]
<u>3.2.1 Landings (kg/fisher/trip)</u>		iii	Average fish landings (kg/fisher/trip) as an indication of the economic returns of fishing	
4. Resource System (1.0)	RS	i	The biophysical system (including the various habitats) that sustain the resource units harvested by users [2]	
<i>4.1 Productivity of the system (0.33)</i>	RS4	ii	Rate at which the system is able to generate resource units, determined by a range of oceanographic, biogeographic or geomorphological factors [1,2]	The productivity of a system affects the level at which resources can be exploited sustainably and provide benefits to users. Total fish biomass offers important information on trophic structure and overall reproductive output of fish on the reef, thus providing an indication of overall stock status, fishing pressure, habitat conditions, and recruitment success. However, different users will target different resources, meaning that species diversity in the system also becomes an important consideration.
<u>4.1.1 Stock status</u>	RS4.1	iii	Mass of fish species at a given site or habitat type at a given time.	
<u>4.1.2 Species diversity</u>		iii	Number of fish species at a specific ecological community.	

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<i>4.2 Equilibrium properties (0.33)</i>	RS5		Capacity of the system to return to its equilibrium state (recover) following stresses [16]	Reefs were selected since they are present in all villages and are a key habitat. More resilient reefs are better able to withstand fishing pressure and natural disturbances and therefore maintain productivity [17].
<u>4.2.1 Reef resilience</u>		iii	The ability of a system to maintain key functions and processes in the face of stresses or pressures by either resisting to or adapting to change	
<i>4.3 Size of resource system (0.33)</i>	RS3	ii	Absolute or relative spatial extent of a resource system [1]. Area under management was used as indicator of size of resource system.	The size of the resource system has important implications for governance [2]. In this study, we use the area placed under total and temporary protection as an indication of the progress of local communities in advancing fisheries management and conservation measures.
<u>4.3.1 Area under management as a permanently closed zone (ha)</u>			Area in hectares suggested by CCP to be under management as a temporarily closed (or replenishment) zone (totally protected area)	
<u>4.3.2 Area under management as temporary zone (ha)</u>			Area in hectares suggested by CCP to be under management as temporarily closed zones to enhance catches of certain species such as octopus)	

Table S2: Rankings for each of the indicators based on the primary data from Table 2. Refer to Table S1 for detailed description of the variable and indicator.

Variable	Indicator	Weight	Quirinde	Quiwia	Lalane	Quifugue	Nsangué Ponta	Malinde
Dimension 1: Governance System		1						
Organisations	CCP governance	0.25	1	0.9	0	0.25	0.5	0.5
	CCP functioning	0.25	1	0.25	0	0.5	0.75	0.75
Rules in use	Temporary closures	0.13	0	1	1	0	1	0
	Permanent closures	0.13	0	0	1	0	1	0
	Awareness of gear regulations	0.13	0	1	0.25	0.5	0.9	0.25
	Perceived compliance with gear regulations	0.13	0.25	1	0.75	0	0.5	0.5
Dimension 2: Actors		1						
Number of relevant actors	Number of fishers (%)	0.25	0	0.5	0.75	1	0.25	0.25
Importance of resource	Economic dependence	0.08	0	0.25	0.5	0.5	0.75	1
	Livelihood diversity	0.08	1	0.5	1	0	0.5	0
	Livelihood diversification	0.08	1	0.5	1	0	0.5	0
Socio-economic attributes of users	Origin of household head	0.25	1	0.75	0.5	0	0.25	0.9
Social capital	Trust	0.25	0.75	0.75	0	0.5	1	0
Dimension 3: Resource Units		1						
Number of taxa	Number of taxa	0.5	1	0.75	0	0.75	0.25	0.5
Landings (kg/fisher/trip)	Basket trap	0.06	0.5	0	0.5	1	1	0.25
	Beach seine	0.06	0.25	0.75	1	0.5	0.5	0
	Gill net	0.06	0.25	0	0.75	0.75	0.5	1
	Gillnet (jarife)	0.06	0	0	0.9	0	0	1
	Gleaning	0.06	0.75	0	0	0.5	0.75	1
	Harpoon	0.06	0.25	0.25	0.75	1	0.75	0
	Handline	0.06	0.25	0.25	0.75	1	0.5	0
	Mos. Net	0.06	0.25	0	1	0.75	0.5	0.5
	Speargun	0.06	0	0.75	0.25	1	0.25	0.5
Dimension 4: Resource System		1						
Productivity of the system	Stock status (kg/ha)	0.17	0.9	0.75	0	1	0.25	0.5
	Species diversity	0.17	0.9	1	0	0.5	0.25	0.5
Equilibrium properties	Reef resilience	0.33	0.75	1	0	0.75	0.25	0.25
Size of resource system	Permanently closed zone area (ha)	0.17	0.75	1	0.5	0.5	0	0.1
	Temporarily closed area (ha)	0.17	0.25	0.5	0.1	0.75	0	1

Table S3: Weighted scores for each variable based on the ranked data reported. The four first-tier variables, or dimensions, are in bold. Scores for variables with multiple indicators were averaged before weighted.

Variable	Indicator	Quirind e	Quiwi a	Lalan e	Quifuqu e	Nsangue Ponta	Malind e
Dimension 1: Governance System		0.53	0.66	0.38	0.25	0.74	0.41
Organisations	Good governance	0.25	0.23	0.00	0.06	0.13	0.13
	Good functioning	0.25	0.06	0.00	0.13	0.19	0.19
Rules in use	Existence of temporary closures	0.00	0.13	0.13	0.00	0.13	0.00
	Existence of permanent closures	0.00	0.00	0.13	0.00	0.13	0.00
	Awareness of gear regulations	0.00	0.13	0.03	0.06	0.11	0.03
	Perceived compliance with gear regulations	0.03	0.13	0.09	0.00	0.06	0.06
Dimension 2: Actors		0.60	0.60	0.52	0.42	0.52	0.37
Number of relevant actors	Economically active population involved in fishing	0.00	0.13	0.19	0.25	0.06	0.06
Importance of resource	Contribution of fishing to household income (fishing households)	0.00	0.02	0.04	0.04	0.06	0.08
	Number of non-fishing occupations (fishing households)	0.08	0.04	0.08	0.00	0.04	0.00
	Number of occupations	0.08	0.04	0.08	0.00	0.04	0.00
Socio-economic attributes of users	Origin of household head	0.25	0.19	0.13	0.00	0.06	0.25
Social capital	Saving group membership	0.19	0.19	0.00	0.13	0.25	0.00
Dimension 3: Resource Units		0.64	0.49	0.33	0.74	0.39	0.49
Number of taxa	Number of taxa	0.50	0.38	0.00	0.38	0.13	0.25
Landings (kg/fisher/trip)	Basket trap	0.03	0.00	0.03	0.06	0.06	0.01
	Beach seine	0.01	0.04	0.06	0.03	0.03	0.00
	Gill net	0.01	0.00	0.04	0.04	0.03	0.06
	Gillnet (jarife)	0.00	0.00	0.05	0.00	0.00	0.06
	Gleaning	0.04	0.00	0.00	0.03	0.04	0.06
	Harpoon	0.01	0.01	0.04	0.06	0.04	0.00
	Handline	0.01	0.01	0.04	0.06	0.03	0.00
	Mosquito Net	0.01	0.00	0.06	0.04	0.03	0.03
	Speargun	0.00	0.04	0.01	0.06	0.01	0.03
Dimension 4: Resource System		0.72	0.88	0.10	0.71	0.17	0.43
Productivity of the system	Fish biomass	0.15	0.13	0.00	0.17	0.04	0.08
	Species diversity	0.15	0.17	0.00	0.08	0.04	0.08
Equilibrium properties	Reef resilience	0.25	0.33	0.00	0.25	0.08	0.08
Size of resource system	Permanently closed (replenishment) area (ha)	0.13	0.17	0.08	0.08	0.00	0.02
	Temporarily closed area (ha)	0.04	0.08	0.02	0.13	0.00	0.17

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