**Table 1**. Indicators and proxies used to characterize social aspects of vulnerability of fisheries cooperatives. References in grey refer to studies that have used that indicator to assess vulnerability in fisheries and to the sources of the data to use to evaluate a given proxy.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Component | Indicator | Proxy | Definition of the proxy | Original scale |
| **Social adaptive capacity** | **Social capital**  Cinner et al., 2013 | Programs for cooperative formation  Ovando et al., 2013 | Presence of program, in the form of legislation or NGO action, promoting the development of cooperative fisheries management for the fishery in question. | Yes = 1, No = 0 |
| Number of cooperative behaviors  Ovando et al., 2013 | The number of cooperative behaviors (from those listed in **Table X, SI**) in which the members of the fishery engage. | Count from 0 to 18. |
| Umbrella organization  Ovando et al., 2013 | Whether the fishery represents other smaller fisheries organizations. | Yes = 1, No = 0 |
| **Diversification** | Number of targeted species  Ovando et al., 2013 | The total number of species primarily targeted by the fishery. | Count starting at 1. |
| **Change anticipation and capacity to change**  Cinner et al., 2013 | MSC certification  Ovando et al., 2013 | Whether the target species has been MSC certified. | Yes = 1, No = 0 |
| Information support  Ovando et al., 2013 | The government provides means for disseminating or collecting information relevant to the success of the cooperative. | Yes = 1, No = 0 |
| Stock assessment  Ovando et al., 2013 | Whether a stock assessment is available for the target species. | Yes = 1, No = 0 |
| **Governmental support to the cooperative** | Financial services  Ovando et al., 2013 | The government provides financial support to the cooperative. | Yes = 1, No = 0 |
| Legal protection  Ovando et al., 2013 | The government provides legal protection and standing to the cooperative. | Yes = 1, No = 0 |
| Enforcement  Ovando et al., 2013 | The government provides support for enforcement, in the form of enforcement agents, or enforceable penalties for violations of cooperative rules. | Yes = 1, No = 0 |
| **Material style of life**  Cinner et al., 2013 | Poverty index (Inverse)  Ovando et al., 2013 | The Human Poverty Index of the host country, as defined by the human performance indicator criteria of the United Nations Development Program. Reflects the percentage of the population without safe water, and children that are underweight. | Continuous from 0 to 1 |
| **Social sensitivity** | **Economic dependence** | Percentage of GDP from fishing  Ovando et al., 2013 | The total amount of a host country’s GDP made up from fishing. | 0 to 100% |
| **Food dependence** | Subsistence fishing  Ovando et al., 2013 | Whether the catch is used for subsistence | Yes = 1, No = 0 |
| **Labor dependence** | Number of fishers  Ovando et al., 2013 | Number of participants operating within the cooperative | Count starting from 1. |

**Table 2**. Indicators and proxies used to characterize ecological aspects of vulnerability of fisheries cooperatives. References in grey refer to studies that have used that indicator to assess vulnerability in fisheries and to the sources of the data to use to evaluate a given proxy.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Component | Indicator | Proxy | Definition of the proxy | Original scale |
| **Ecological sensitivity** | **Habitat susceptibility** | Sea level vulnerability score  Halpern et al., 2007 | Score built considering experts’ opinion on scale, frequency, functional impact, resistance, recovery time and certainty of the effects of changes in sea level on a given marine ecosystem. | Continuous from 0 to 4 (increasing vulnerability) |
| Sea temperature vulnerability score  Halpern et al., 2007 | Score built considering experts’ opinion on scale, frequency, functional impact, resistance, recovery time and certainty of the effects of changes in sea temperature on a given marine ecosystem. | Continuous from 0 to 4 (increasing vulnerability) |
| Ocean acidification vulnerability  Halpern et al., 2007 | Score built considering experts’ opinion on scale, frequency, functional impact, resistance, recovery time and certainty of the effects of changes in sea level on a given marine ecosystem. | Continuous from 0 to 4 (increasing vulnerability) |
| Ozone/UV vulnerability score  Halpern et al., 2007 | Score built considering experts’ opinion on scale, frequency, functional impact, resistance, recovery time and certainty of the effects of changes in Ozone concentrations on a given marine ecosystem. | Continuous from 0 to 4 (increasing vulnerability) |
| **Overfishing** | Recorded fishery closure  Ovando et al., 2013 | Whether the fishery has been closed at some point since 1960. | Yes = 1, No = 0 |
| **Species susceptibility**  Cinner et al., 2013 | Species vulnerability to climate change index  Jones and Cheung, 2017 | Index that integrates information on species’ biological and ecological traits to characterize its vulnerability to impacts of climate change. | Discrete from 0 to 100 |
| **Ecological exposure** | **Sea surface temperature change**  Blasiak et al., 2017 | Sea surface temperature projected anomalies  NASA |  |  |
| **Ecological recovery potential** | **Habitat recovery potential** | Inverse of ecosystem’s recovery time score  Halpern et al., 2007 | Average time of ecosystem’s recovery according to experts’ opinion across different anthropogenic stressors. | Continuous from 0 to 4 (increasing in years) |
| **MPA** | Marine protected area Ovando et al., 2013 | Fishing is restricted in portions of the fishing. | Yes = 1, No = 0 |

**Table X in SI.** List of potential cooperative behaviors (from Ovando et al., 2013)

|  |  |
| --- | --- |
| **Cooperative Behavior** | **Description** |
| Marketing Marketing | Cooperation to collectively market or brand catch |
| Profit Sharing Profit\_Sharing | Pooling system to distribute proceeds from fishing among fishery members |
| Coordinated Harvesting co\_harvest | Coordination of fishing strategy among fishery members |
| Cooperative Administration Cooperative\_Administration | The cooperative engages in voluntarily development of on-shore cooperative administration. Examples would include division of the group into fishers, accountants, managers, etc, and the creation of bylaws (formal or informal) to manage these institutions (e.g. rules regarding the entry of new members). |
| Catch Limits Cooperative\_TAC | Implementation of self-imposed catch limits above and beyond any similar governmental restrictions |
| Gear Restrictions Cooperative\_Gear\_Restrictions | Implementation of gear restrictions, e.g. the prohibition of dynamite, beyond any similar governmental regulations |
| Size Limit Cooperative\_Size\_Limit | Implementation of self-imposed size limits above and beyond any similar governmental regulations |
| Gear Sharing Gear\_sharing | Collective ownership or use of fishing gear, such as boats, nets, or landing facilities |
| Direct Enforcement Direct\_Enforcement | Collective action to physically enforce fishery regulations, for example organization of patrols |
| Codified Penalties Codified\_Penalties | Collectively determined set of defined penalties for infractions of fishery regulations |
| Temporal Restrictions Temporal\_No\_Take | Voluntary cessation or restriction of fishing activities for the fishery as a whole, or for a defined spatial region, for a given period of time |
| Spatial Marine Protected Areas Spatial\_No\_Take | Voluntary closure or restriction of spatially defined portions of the fishery |
| Restocking Restocking | Collective action to restock the fishery, for example through the seeding of juveniles |
| Habitat Restoration Habitat\_Restoration | Voluntary efforts to restore fishery habitat, for example planting of mangroves |
| Gear Shift Gear\_Shift | Collective choice to switch to more environmentally friendly gear types |
| By-catch avoidance By\_catch\_avoidance | Cooperative actions to reduce by-catch above and beyond any government stipulations |
| Research Support Research\_support | Cooperative support of fishery research activities, such as data collection or science funding |
| Information sharing Information\_sharing | Cooperative information sharing consists of organized collective behavior by fishers to share information relevant to fishing activities. Examples include sharing knowledge of fishery conditions or location of productive fishing grounds. |