Electronic Supplementary Material
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Title: Establishing a governance threshold in small-scale fisheries to achieve sustainability

Alba Aguión, Elena Ojea, Lucía García-Flórez, Teresa Cruz, Joxe Mikel Garmendia, Dominique Davoult, Henrique Queiroga, Antonella Rivera, José Luis Acuña-Fernández, Gonzalo Macho
Figure S1. Relationship between the governance score and the levels of the four governance elements analyzed per stalked barnacle fishery in Southwest Europe. Governance elements include the spatial scale of management (see levels in Table S3), co-management (Table S4), fisher’s participation (Table S5) and the access structure (Table S6).
**Figure S2.** Relationship between the number of sustainability attributes and the levels of the four governance elements analyzed per stalked barnacle fishery in Southwest Europe. Governance elements include the spatial scale of management (see levels in Table S3), co-management (Table S4), fisher’s participation (Table S5) and the access structure (Table S6).
**Figure S3.** Presence of sustainability attributes per group (GS= governance system, U= users system) per stalked barnacle fishery in Southwest Europe.
**Table S1.** Responsible bodies of the nine stalked barnacle fisheries analyzed in the study. Responsible bodies are the ultimate institutions on charge of the political, economic and administrative authority of the resource.

| Fishery | Responsible body                                                                 | Level  |
|---------|---------------------------------------------------------------------------------|--------|
| Morbihan| Comité National des Pêches Maritimes et des Élevages Marins (CNPMEM)            | National |
| Galicia | Dirección Xeral de Pesca, Acuicultura e Innovación Tecnolóxica da Xunta de Galicia | Regional |
| Asturias-West | Dirección General de Pesca Marítima del Principado de Asturias | Regional |
| Asturias-East | Dirección General de Pesca Marítima del Principado de Asturias | Regional |
| Basque Country General | Dirección de Pesca y Acuicultura del Gobierno Vasco | Regional |
| Orio and Bakio | Dirección de Pesca y Acuicultura del Gobierno Vasco | Regional |
| Portugal General | Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos (DGRM) | National |
| Reserva Natural das Berlengas (RNB) | Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos (DGRM), Instituto da Conservação da Natureza e das Florestas (ICNF) | National |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos (DGRM), Instituto da Conservação da Natureza e das Florestas (ICNF) | National |
| Fishery                                      | Fishers                                      | Landings volume                                  | Landings value and price                        |
|---------------------------------------------|----------------------------------------------|-------------------------------------------------|------------------------------------------------|
| Morbihan                                    | Active 2013-2016 CNPMEM                       | Reported landings 2013-2016 CNPMEM              | No data CNPMEM and fishers estimate             |
| Galicia                                     | Active. On boat fishers estimated assuming 2 fishers per active boat 2013-2016 Xunta de Galicia | Reported landings 2013-2016 Xunta de Galicia   | Reported value 2013-2016 Xunta de Galicia      |
| Asturias-West                                | Active 2013-2016 Centro Experimentación Pesquera (CEP) | Reported landings 2013-2016 Centro Experimentación Pesquera (CEP) | Market data 2013-2016 Centro Experimentación Pesquera (CEP) |
| Asturias-East                                | Active 2013-2016 Centro Experimentación Pesquera (CEP) | Reported landings 2013-2016 Centro Experimentación Pesquera (CEP) | Market data 2013-2016 Centro Experimentación Pesquera (CEP) |
| Basque Country General                      | -                                            | -                                               | -                                              |
| Orio and Bakio                              | Active 2013-2016 AZTI                         | Reported landings 2013-2016 AZTI                | -                                              |
| Portugal General and the combination of Portugal General, RNB and PNSACV | Active 2008-2014 DGRM (seen in Carvalho et al. 2017) | Reported landings 2008-2014 DOCAPESCA, 2016 (seen in Carvalho et al. 2017) | Reported value 2008-2014 DOCAPESCA, 2016 (seen in Carvalho et al. 2017) |
| Reserva Natural das Berlengas (RNB)         | Number of licenses 2012 (Sousa et al. 2013)  | Reported landings 2008-2012 (Cruz et al. 2015) | Estimate by interviews to professional fishers 2013 (Cruz et al. 2016) |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Number of licenses 2012 (Sousa et al. 2013) | -                                               | Estimate by interviews to professional fishers 2013 (Cruz et al. 2016) |
Table S3. Broad spatial scales recognized for the biology and management of small-scale benthic resources (Orensanz et al. 2016). Scales are ordered from a higher to a lower degree of spatial detail.

| Spatial scale       | Description                                                                 |
|---------------------|------------------------------------------------------------------------------|
| Microscale (Patch)  | Neighborhoods within local populations, usually corresponding to small portions of the fishing bed. Defined in the order of 1 kilometer |
| Mesoscale (Local)   | At the level of local populations, usually corresponding to the scale of fishing beds. Defined in the order of 10s kilometers, but below the mean larval dispersal distance |
| Macroscale (Regional)| Aggregate of local populations, defined in the order of 10s-100s kilometers. Average larval dispersal of stalked barnacles has been estimated in 100 km using an Individual-Based Model (maximum pelagic larval duration was set in 60 days and several larval behavior scenarios were used) coupled to a hydrodynamic model (Nolasco, Dubert and Queiroga, unpublished data). Both models have been successfully tested before in other species in the same area (Domingues et al. 2012; Gomes et al. 2016) |
**Table S4.** Self-governance, co-management levels (Sen and Nielsen 1996) and centralized management fisheries description. Regimes are ordered from a higher responsibility level of fishers in the decision-making to a gradually decreasing one.

| Fisheries regime | Description |
|------------------|-------------|
| **Self-governance*** | Government has done a total power devolution to the local users (e.g., traditional marine tenure systems) |
| Co-management | |
| Informative | Government has delegated authority to user groups, who are responsible for informing on the decisions taken |
| Advisory | Users advice government on the decisions to be taken and government endorses them |
| Cooperative | Government and users cooperate together as equal partners in decision-making |
| Consultative | Mechanisms exists for governments to consult with users but all decisions are taken by government |
| Instructive | Minimal exchange of information between government and users. Government informs the users on the decisions to be taken |
| Centralized management | Absence of mechanisms to dialogue with users |

* Some authors include self-governance or community-based management as a type of co-management
Table S5. Description of participatory levels ordered from a higher participation of users to a gradually decreasing one. Fisher’s participation is focused on the involvement of users in the monitoring, control and surveillance. Classification was originally designed for agriculture (modified from Pretty (1995)).

| Level of participation | Description |
|------------------------|-------------|
| Self-mobilization      | Users participate by taking initiatives independently of external institutions to change systems. Users develop contacts with external institutions for resources and technical advice they need, but retain control over how resources are used. |
| Interactive participation | Industry driven partnership. Participation is a right, not just a mean to achieve goals. Often, industry produces independent management advice and voluntarily participates in monitoring design, data collection and analysis. |
| Functional participation | Government driven partnership. Participation seen as a mean to achieve predetermine goals. Users might participate by forming groups to meet predetermined objectives related to the project. Such involvement tends to arise only after major decisions have already been made by external agents. |
| Participation for material incentives | People participate by contributing resources, for example, labour, in return for food, cash or other material incentives. People have no stake in prolonging practices when incentives end. |
| Participation by consultation | Users participate by being consulted or by answering questions. External agents define problems and information gathering processes, and so control analysis. |
| Passive participation | People participate by being told what has been decided or has already happened. Unilateral announcements by administration. |
Table S6. The access structure ordered from the most to the least exclusive forms (Hilborn et al. 2005).

| Level of access | Description |
|-----------------|-------------|
| TURF            | Long-term ownership rights over an area and its resources to particular users group excluding others from access. Rights that in some cases may come close to ownership |
| IQs (Individual Quotas) | The licenses granted do not only allow access but contain a proportion of the total catch or effort. IQs might be transferable or not. The most significant element is that by specifying what proportion of the resource each participant may catch, the race-to-fish is eliminated. The participants can then concentrate on reducing the costs of fishing and increasing the value of the product, both of which lead to increases in profitability |
| Limited entry   | There is usually a fixed number of licenses issued and to participate in the fishery one must either purchase a license from an existing participant or receive one through for example, a merits ranking. In limited entry fisheries there is no guarantee of catch, licenses simply permit the right to participate. Licenses might include a maximum catch per fisher to reduce harvest |
| Open access     | Any individual wishing to go fishing can do so, often with the purchase of a license for a nominal fee. Regulations of a gear and season are often introduced to reduce the level of harvest. Most commercial fisheries go through this period at their initial stages |
Table S7. Attributes known to promote long-term sustainability in co-managed fisheries (Gutiérrez et al. 2011). Definition, group (RS= resource system, RU= resource units, GS= governance system, U= users system) and the potential direct/indirect effects of each attribute are provided. For each attribute a reference to the table that justifies its presence or absence across the stalked barnacle fisheries in SW Europe is included.

| Group   | Name                          | Definition                                                                 | Potential direct/indirect effects                                                                                                                                                                                                                                                                                                                                                     | Table |
|---------|-------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| RS      | Defined boundaries            | Clearly defined geographic boundaries (e.g., lakes, coastal lagoons, fjords) | Facilitates protection against outsiders, restricts fishermen dynamics, improves users communication, decreases monitoring effort and costs, increases ecological knowledge. Well-defined boundaries favor the implementation of self-policing strategies and a voluntary cooperative action to avoid infringement of rules                                                                                                                          | S8    |
| RU      | Sedentary or low mobility resource | Comprises sessile, sedentary and reduced mobility adult stages species with limited behavioral responses to stimuli | Facilitates targeting rights and responsibilities and local and spatially-explicit management, easier access in well-defined areas and easier monitoring and enforcement                                                                                                                                                                                                                       | S9    |
| GS      | Co-management in law         | Co-management is supported by laws and decrees in the National Constitution | Gives users and their institutions the legal right to participate in the co-management process through management plans, enforcement of rules, etc.                                                                                                                                                                                                                                                   | S10   |
| GS      | Local authorities support    | Local government encourages, supports, and participates in the co-management process | Facilitates the process of implementation of co-management at the local level                                                                                                                                                                                                                                                                                                                                                                  | S11   |
| GS      | Long-term management policy  | Refers to sustainability in time and stability of management plans and/or management institutions | Implementation of a long-term policy in a co-management context generates a great incentive to fishers to adhere to and get involved with enforcing regulations, thus reducing the probability of occurrence of free-riders, illegal fishing, and short-term, profit maximizing behaviors                                                                                                                                                               | S12   |
| GS      | Scientific advice            | Implies scientific advice and participation of Universities, NGOs or governmental institutions in the implementation of the co-management system | Scientific knowledge and advice on the ecology and resilience of targeted stocks play important roles in guiding co-management policies and governance development processes. Quality and quantity of information is improved through cooperation and information flow                                                                                                                                | S13   |
| GS      | Monitoring, control and surveillance | Fishery control, monitoring and surveillance by co-management authorities/institutions | Favors reliable information flow from fishers to policy makers, lowering monitoring, enforcement and transaction costs, and providing continuous fine-grained signals about resource status (adaptive co-management)                                                                                                                                                      | S14   |
| GS      | Global catch quotas          | Resources are managed through assignment of global catch quotas (e.g. TACs) | Reinforces co-management if allocated together with other management tools in a context of management redundancy. Requires legislation and enforcement of legal frameworks, and cooperation of fisher-communities, which need to be adapted to countries and idiosyncrasies                                                                                                                                                  | S15   |
| Code | Strategy | Description | Effect | Page |
|------|----------|-------------|--------|------|
| GS   | Individual or community quotas | Resources are managed through individual, transferable or not, or community fishing quotas designed and implemented within the co-management regime | Creates incentives to self-management, self-enforcement and community empowerment | S16 |
| GS   | TURF     | Formal Territorial Users Rights of Fishing | Generates a sense of exclusive use and ownership among fishers, who perceive they are receiving the equivalent of a “land grant” which has the form of a highly productive aquatic area | S17 |
| GS   | Spatially explicit management | Separate areas of management and/or spatially-explicit tools (e.g., rotational harvest strategies) | Enhances the probability of co-management success, particularly in spatially-structured stocks with low mobility, where the spatial distribution patterns of abundance are heterogeneous, and the spatial dynamics of the fishing process follows closely spatial variations in abundance at the scale of small sub-areas | S18 |
| GS   | Minimum size | Minimum size regulations, through mesh sizes, traps, hooks, etc | Reduces fishing mortality of undesired individual sizes and increases survival of spawning stocks. Particularly useful under co-management regimes when implemented with the active participation of fishers, promoting compliance with regulations | S19 |
| GS   | Protected areas | Formal no-take areas, marine reserves and/or protected areas with a considerable degree of fishermen/communities involvement (community-based reserves) | Enhances fisheries management and conservation of biodiversity, particularly in multi-species or on sedentary stocks, or for which broader ecological impacts of fishing are an issue. Successful use of protected areas in a co-management context required in this study a case-by-case understanding of the spatial structure of impacted fisheries, ecosystems and human communities. | S20 |
| GS   | Seeding or restocking | Includes low-cost stock enhancement activities such as extensive culture, natural restocking or transplanting | Enhances stock productivity and population replenishment | S21 |
| U    | Social cohesion | Social cohesion including unity, trust, harmony, communication and cooperation given by common interests among users (e.g., effective participation of most community members in meetings). Generally related with community homogeneity | Enhances user’s cooperation, conflict resolution, collaboration with external partners, ability to exclude outsiders, and willingness to report rules breaking. Increases awareness and promotes co-management sustainability | S22 |
| U    | Leadership | Key influential users with entrepreneurial skills, highly motivated, respected as local leaders, and directly involved in management decisions | Promotes local self-organization, influences enforcement and rules compliance, alleviates attitudes towards destructive practices and helps conflict resolution. Improves communication, teamwork and systems thinking skills | S23 |
| U    | Self-enforcement | User’s ability and effectiveness in enforcing management regulations (e.g., clear and effective system of penalties imposed by strong operational rules specified, enforced and controlled by local fishers) | Encourages compliance on regulations resulting from management measures imposed in each co-managed site by the communities themselves, in agreement with the fishery management authorities, in order to sustain catch levels over | S24 |
| U | **Tradition in self-organization** | History and tradition in self-organization and self-governance. Traditional social hierarchies and local institutions (e.g. native, religious, etc.) | May facilitate implementation of co-management when fisher communities have taken the responsibility for managing resources, often building upon old or traditional roots that include strong community rules | S25 |
|---|---|---|---|---|
| U | **Influence in local market** | Users have influence in fish trading, rules and price control mechanisms | Co-management alters the power relations of different players, promoting shorter marketing chains and mitigating deleterious middlemen effects on economic returns perceived by fishers | S26 |
### Table S8. Defined boundaries.

| Fishery                        | Presence/Absence | Description                                                                 | Source                        |
|--------------------------------|------------------|-----------------------------------------------------------------------------|-------------------------------|
| Morbihan                       | Absence          | -                                                                           |                               |
| Galicia                        | Presence         | Restrictive boundaries contained in 37 management plans assigned to 33 fishers’ associations or cofradas (several cofradas have more than one management plan for the resource) | Pesca de Galicia 2019         |
| Asturias-West                  | Presence         | Restrictive boundaries contained in 8 management plans assigned to 12 fishers’ associations or cofradas (some cofradas share management plans) | BOPA No.185 25-IJ-2019       |
| Asturias-East                  | Absence          | -                                                                           |                               |
| Orio and Bakio                 | Presence         | Restrictive boundaries contained in 2 management plans recently approved (after an experimental phase since 2012) | BOPV No.96 23-V-2019          |
| Basque General Regulation      | Absence          | -                                                                           |                               |
| Portugal General               | Absence          | -                                                                           |                               |
| Reserva Natural das Berlengas (RNB) | Presence | Restrictive boundaries contained in 1 management plan assigned to one fishers’ association | Own expertise                |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence | -                                                                           |                               |
Table S9. Sedentary resource.

| Fishery                                | Presence/Absence | Description                                               |
|----------------------------------------|------------------|-----------------------------------------------------------|
| Morbihan                               | Presence         | Target stock (stalked barnacle) is a sessile intertidal crustacean |
| Galicia                                | Presence         | Target stock (stalked barnacle) is a sessile intertidal crustacean |
| Asturias-West                          | Presence         | Target stock (stalked barnacle) is a sessile intertidal crustacean |
| Asturias-East                          | Presence         | Target stock (stalked barnacle) is a sessile intertidal crustacean |
| Orio and Bakio                         | Presence         | Target stock (stalked barnacle) is a sessile intertidal crustacean |
| Basque General Regulation              | Presence         | Target stock (stalked barnacle) is a sessile intertidal crustacean |
| Portugal General                       | Presence         | Target stock (stalked barnacle) is a sessile intertidal crustacean |
| Reserva Natural das Berlengas (RNB)    | Presence         | Target stock (stalked barnacle) is a sessile intertidal crustacean |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Presence | Target stock (stalked barnacle) is a sessile intertidal crustacean |
## Table S10. Co-management in law.

| Fishery                        | Presence/Absence | Description                                                                                                                                                                                                 | Source                  |
|--------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Morbihan                       | Absence          | -                                                                                                                                                                                                          |                         |
| Galicia                        | Presence         | Law states that harvesting can only be conducted under the umbrella of a management plan developed by a fishers’ association or cofradía for its assigned territory. When the content of the plan is not adjusted to shellfish regulations, entails a resource subexploitation or does not align the biological criteria of the administration, managers have the right to modify the plan to achieve a more efficient resource use | DOGA No.13 20-I-1994   |
|                                |                  |                                                                hä                                               | DOGA No.56 21-III-2000  |
| Asturias-West                   | Presence         | Law states that management plans are elaborated by the administration in collaboration with the fishers’ associations or cofradías with the aim to preserve the resource and improve their commercialization. Plans are defined as agreements made between the administration and cofradías after subsequent modifications | BOPA No.185 25-IX-2019 |
| Asturias-East                   | Absence          | -                                                                                                                                                                                                          |                         |
| Orio and Bakio                 | Absence          | -                                                                                                                                                                                                          |                         |
| Basque General Regulation      | Absence          | -                                                                                                                                                                                                          |                         |
| Portugal General               | Absence          | -                                                                                                                                                                                                          |                         |
| Reserva Natural das Berlengas (RNB) | Absence          | -                                                                                                                                                                                                          |                         |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence          | -                                                                                                                                                                                                          |                         |
Table S11. Local authorities support.

| Fishery                                      | Presence/Absence | Description                                                                                           | Source                  |
|----------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------|-------------------------|
| Morbihan                                     | Presence         | The National Committee responsible of the fishery (CNPMEM) has delegated authority to the Regional Committee (CRPMEM du Morbihan), from where arrangements such as the harvesting calendar are annually subjected to vote among fishers | JORF No.0157 10-VII-2018 Own expertise |
| Galicia                                      | Presence         | Management plans are actively developed by the fishers' associations or cofradías with the advice of a technical assistant (i.e., biologist), who is hired by the cofradía with the financial support of the local government | Macho et al. 2013       |
| Asturias-West                                | Presence         | Management plans are designed by the local government in close collaboration with the fishers' associations or cofradías | BOPA No.185 25-IX-2019  |
| Asturias-East                                | Absence          | -                                                                                                       |                         |
| Orio and Bakio                               | Presence         | Implementation of 2 management plans in an attempt to mimic the close collaboration between the administration and fishers occurring in Galicia and Asturias-West. Project “Proyecto piloto para el estudio de la viabilidad en la aplicación de planes de explotación del percebe en la costa del País Vasco” coordinated by AZTI-Tecnalia with local authorities support | Own expertise           |
| Basque General Regulation                    | Absence          | -                                                                                                       |                         |
| Portugal General Absence                     | Absence          | -                                                                                                       |                         |
| Reserva Natural das Berlengas (RNB)          | Presence         | Implementation of the pilot project CO-PESCA 2 (2018-2020) with the objective to operationalize a co-management committee and provide with the tools to allow their continuity once the project finishes. Project CO-PESCA 2 coordinated by MARE-Instituto Politécnico de Leiria in collaboration with WWF (through ANP in Portugal), MARE-University of Évora and Instituto da Conservação da Natureza e das Florestas (ICNF), and including local authorities | Own expertise           |
| Parque Natural do Sudeste Alentejano e Costa Vicentina (PNSACV) | Absence | -                                                                                                       |                         |
Table S12. Long-term management policy.

| Fishery                        | Presence/Absence | Description                                                                                                                                                                                                 | Source                      |
|--------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Morbihan                       | Absence          | Licenses granted are annually suggested by the fishers' associations or cofradias, although it cannot exceed a number above from which harvesters do not obtain the minimum wage law. Harvesters annually renew their permits as long as they follow the requirements specified on them (if any); although by law, on foot harvesters have to work at least 70% of the harvesting days to be qualified for a renewal | DOGA No.56 21-III-2000      |
| Galicia                        | Presence         | Licenses granted are annually suggested by the fishers' associations or cofradias. Harvesters annually renew their permits as long as they follow the requirements specified on them (if any); although by law, harvesters have to assist at least from 10 or 20 (depending on the case) harvesting days to be qualified for a renewal | Rivera et al. 2014 BOPA No.185 25-IX-2019 |
| Asturias-West                  | Presence         | Licenses granted are annually suggested by the fishers' associations or cofradias. Harvesters annually renew their permits as long as they follow the requirements specified on them (if any); although by law, harvesters have to assist at least from 10 or 20 (depending on the case) harvesting days to be qualified for a renewal | Rivera et al. 2014 BOPA No.185 25-IX-2019 |
| Asturias-East                  | Absence          | -                                                                                                                                                                                                          |                             |
| Orio and Bakio                 | Absence          | -                                                                                                                                                                                                          |                             |
| Basque General Regulation      | Absence          | -                                                                                                                                                                                                          |                             |
| Portugal General               | Absence          | -                                                                                                                                                                                                          |                             |
| Reserva Natural das Berlengas (RNB) | Absence  | -                                                                                                                                                                                                          |                             |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence  | -                                                                                                                                                                                                          |                             |
Table S13. Scientific advice.

| Fishery                                      | Presence/Absence | Description                                                                                                                                                                                                 | Source          |
|----------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Morbihan                                     | Absence          | -                                                                                                                                                                                                          |                 |
| Galicia                                      | Presence         | Most fishers’ associations or cofradías count with scientific advice on a daily basis due to the presence of a technical assistant (i.e., biologist) that provides daily management advice to harvesters and has a key role in the design of the management plans | Macho et al. 2013 |
| Asturias-West                                | Presence         | Management arrangements, such as the establishment of temporal closures, are specifically proposed to each fishers’ association or cofradía by authorities based on annual monitoring data (and approved with the agreement of cofradías) | Rivera et al. 2014 |
| Asturias-East                                | Absence          | -                                                                                                                                                                                                          |                 |
| Orio and Bakio                               | Presence         | At least one annual meeting between harvesters, managers and scientists is held to decide on fishery arrangements based on monitoring data                                                                 | Own expertise   |
| Basque General Regulation                    | Absence          | -                                                                                                                                                                                                          |                 |
| Portugal General                             | Absence          | -                                                                                                                                                                                                          |                 |
| Reserva Natural das Berlengas (RNB)          | Presence         | Scientific advice has been occasionally involved in decision-making. Examples include in 2011 the cease of the rotational schemes and the reduction of the resource size limit asked by the harvesters with support from the scientists. Participation of institutions that provide scientific advice in a project that promotes the implementation of co-management (see Table S10) | Own expertise   |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence          | -                                                                                                                                                                                                          |                 |
Table S14. Monitoring, control and surveillance.

| Fishery                | Presence/Absence | Description                                                                                                                                                                                                 | Source                        |
|------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Morbihan               | Absence          | -                                                                                                                                                                                                           |                               |
| Galicia                | Presence         | Annual monitoring of catches, effort, CPUE and sales per fishers’ association or cofradia. In some cofradias monitoring of percentage coverage, density estimates and/or mean landing size. Insights of resource status thanks to the daily exchange of information between fishers and the technical assistant (i.e. biologist) of the cofradia. Control and surveillance done at a regional (Galicia) and local (cofradia) level | Molares and Freire 2003      |
| Asturias-West          | Presence         | Annual monitoring of catches, effort, CPUE and sales in several areas per fishers’ association. Summer monitoring of percentage coverage and stock biomass for a different fishers’ association each year. Government hires one surveillance officer per management plan that is on charge of controlling harvesters’ catch everyday that the activity occurs | Rivera et al. 2014           |
| Asturias-East          | Presence         | Annual monitoring of catches, effort, CPUE and sales. Harvesters are provided a logbook to register catches. Summer monitoring of percentage coverage and stock biomass, although usually not annually conducted | Own expertise                 |
| Orio and Bakio         | Presence         | Annual monitoring of catches. Harvesters are provided a logbook to register catches. Annual monitoring to estimate mean density, weight and size of the resource over a dozen of stations at each management plan | Own expertise                 |
| Basque General Regulation | Absence      | -                                                                                                                                                                                                           |                               |
| Portugal General       | Absence          | -                                                                                                                                                                                                           |                               |
| Reserva Natural das Berlengas (RNB) | Presence | Annual monitoring of catches and insights of resource status due to frequent research involving interviews with fishers and technical assessments. Monitoring and surveillance is done by institutions that promote the implementation of co-management | Own expertise                 |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence         | -                                                                                                                                                                                                           |                               |
**Table S15. Global catch quotas.**

| Fishery                                      | Presence/Absence | Description                                                                 | Source            |
|----------------------------------------------|------------------|-----------------------------------------------------------------------------|-------------------|
| Morbihan                                     | Absence          | -                                                                           |                   |
| Galicia                                      | Absence          | -                                                                           |                   |
| Asturias-West                                 | Absence          | -                                                                           |                   |
| Asturias-East                                 | Absence          | -                                                                           |                   |
| Orio and Bakio                               | Presence         | Annual global quota that changes annually/biannually based on monitoring data | BOPV No.96 23-V-2019 |
|                                              |                  | Global catch quotas of 1,985 kg in Orio and 2,000 kg in Bakio               | BOPV No.127 30-VI-2020 |
| Basque General Regulation                    | Absence          | -                                                                           |                   |
| Portugal General                             | Absence          | -                                                                           |                   |
| Reserva Natural das Berlengas (RNB)           | Absence          | -                                                                           |                   |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence | -                                                                           |                   |
Table S16. Individual or community quotas.

| Fishery                                      | Presence/Absence | Description                                                                 | Source                                      |
|----------------------------------------------|------------------|-----------------------------------------------------------------------------|---------------------------------------------|
| Morbihan                                     | Presence         | 120 kg per fisher per day                                                   | CRPMEM Bretagne Decision No.191-2017        |
| Galicia                                      | Presence         | 3 to 10 kg per fisher per day depending on the management plan, harvesting modalities (on foot vs. on boat), and time of the year | Pesca de Galicia 2019                       |
| Asturias-West                                | Presence         | 5 to 8 kg per fisher per day depending on the management plan and time of the year | BOPA No.185 25-IX-2019                     |
| Asturias-East                                | Presence         | 5 to 8 kg per fisher per day depending on the time of the year              | BOPA No.185 25-IX-2019                     |
| Orio and Bakio                               | Absence          | -                                                                           |                                             |
| Basque General Regulation                    | Absence          | -                                                                           |                                             |
| Portugal General                             | Presence         | 20 kg per fisher per day                                                    | Sousa et al. 2013                           |
| Reserva Natural das Berlengas (RNB)          | Presence         | 20 kg per fisher per day                                                    | Sousa et al. 2013                           |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Presence         | 10 to 15 kg per fisher per day depending on the time of the year            | Sousa et al. 2013                           |
| Fishery                        | Presence/Absence | Description                                                                 | Source                          |
|-------------------------------|------------------|-----------------------------------------------------------------------------|---------------------------------|
| Morbihan                      | Absence          | -                                                                           |                                 |
| Galicia                       | Presence         | System where management plans are spatially allocated to fishers' guilds or cofradías | Molares and Freire 2003         |
| Asturias-West                 | Presence         | System where management plans are spatially allocated to fishers' guilds or cofradías | Rivera et al. 2014              |
| Asturias-East                 | Absence          | -                                                                           |                                 |
| Orio and Bakio                | Absence          | -                                                                           |                                 |
| Basque General Regulation     | Absence          | -                                                                           |                                 |
| Portugal General              | Absence          | -                                                                           |                                 |
| Reserva Natural das Berlengas (RNB) | Absence         | -                                                                           |                                 |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence         | -                                                                           |                                 |
Table S18. Spatially explicit management.

| Fishery                          | Presence/Absence | Description                                                                                                                                                                                                 | Source            |
|----------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Morbihan                         | Absence          | -                                                                                                                                                                                                           |                   |
| Galicia                          | Presence         | Over half of the fishers’ associations or cofradías subdivide their areas in usually between 3 and 5 zones. Total or partial closures are established within each zone during the year to promote stock recovery and maximize economic revenues (best quality areas are opened in the high season) | Own expertise     |
| Asturias-West                     | Presence         | Subdivision of the area of the fishers’ associations or cofradías in 267 zones. Total or partial closures are established within each zone during the year to promote stock recovery and maximize economic revenues (best quality areas are opened in the high season) | Rivera et al. 2014|
| Asturias-East                     | Absence          | -                                                                                                                                                                                                           |                   |
| Orio and Bakio                   | Absence          | -                                                                                                                                                                                                           |                   |
| Basque General Regulation        | Absence          | -                                                                                                                                                                                                           |                   |
| Portugal General                 | Absence          | -                                                                                                                                                                                                           |                   |
| Reserva Natural das Berlengas (RNB) | Absence         | -                                                                                                                                                                                                           |                   |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence | -                                                                                                                                                                                                           |                   |
Table S19. Minimum size. Owing to the particular morphology of stalked barnacles there are different ways to measure the individuals, usually using the calcareous plates that conform its triangular carapace or capitulum. The different morphological variables found in the European fisheries are RC (rostro carina length), DBC (diameter of the base of the capitulum) and TL (total length). DBC and TL have been converted into RC respectively (Parada et al. 2013; Parada et al. 2012).

| Fishery                                      | Presence/Absence | Description                                      | Source                        |
|----------------------------------------------|------------------|--------------------------------------------------|-------------------------------|
| Morbihan                                     | Absence          | -                                                |                               |
| Galicia                                      | Presence         | 18.3 mm (RC) on 60% of the catch                 | DOGA No.226 27-XI-2012       |
|                                              |                  | Original biometric: 15 mm (DBC)                   |                               |
| Asturias-West                                | Presence         | 18 mm (RC) on 60% of the catch                    | BOPA No.185 25-IX-2019       |
| Asturias-East                                | Presence         | 18 mm (RC) on 60% of the catch                    | BOPA No.185 25-IX-2019       |
| Orio and Bakio                               | Presence         | 13.4 mm (RC) on 60% of the catch                  | BOPV No.96 23-V-2019         |
|                                              |                  | Original biometric: 40 mm (TL) without stretching  | BOPV No.127 30-VI-2020       |
| Basque General Regulation                    | Presence         | 13.4 mm (RC) on 60% of the catch                  | BOPV No.94 20-V-1997         |
|                                              |                  | Original biometric: 40 mm (TL) without stretching  |                               |
| Portugal General                             | Presence         | 20 mm (RC) on 75% of the catch                    | Sousa et al. 2013            |
| Reserva Natural das Berlengas (RNB)          | Presence         | 23 mm (RC) on 50% of the catch                    | Sousa et al. 2013            |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Presence   | 20 mm (RC) on 75% of the catch                    | Sousa et al. 2013            |
Table S20. Protected areas.

| Fishery                          | Presence/Absence | Description                                      | Source                        |
|----------------------------------|------------------|--------------------------------------------------|-------------------------------|
| Morbihan                         | Presence         | 2 no-take areas in Groix Island                  | CRPMEM Bretagne Carte 17     |
| Galicia                          | Absence          | -                                                |                               |
| Asturias-West                    | Absence          | -                                                |                               |
| Asturias-East                    | Absence          | -                                                |                               |
| Orio and Bakio                   | Absence          | -                                                |                               |
| Basque General Regulation        | Presence         | Gaztelugatxe Marine Reserve (no-take area)       | Borja et al. 2006             |
| Portugal General                 | Presence         | Luis Saldanha Marine Park (no-take)              | Sousa et al. 2013             |
| Reserva Natural das Berlangas (RNB) | Presence       | Permanent no-take areas                          | Sousa et al. 2013             |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Presence       | Permanent no-take areas                          | Sousa et al. 2013             |
**Table S21. Seeding or restocking.**

| Fishery                                                  | Presence/Absence | Description                                                                 |
|----------------------------------------------------------|------------------|-----------------------------------------------------------------------------|
| Morbihan                                                 | Absence          | There is no seeding or restocking practice for stalked barnacles            |
| Galicia                                                  | Absence          | There is no seeding or restocking practice for stalked barnacles            |
| Asturias-West                                            | Absence          | There is no seeding or restocking practice for stalked barnacles            |
| Asturias-East                                            | Absence          | There is no seeding or restocking practice for stalked barnacles            |
| Orio and Bakio                                           | Absence          | There is no seeding or restocking practice for stalked barnacles            |
| Basque General Regulation                                | Absence          | There is no seeding or restocking practice for stalked barnacles            |
| Portugal General                                         | Absence          | There is no seeding or restocking practice for stalked barnacles            |
| Reserva Natural das Berlangas (RNB)                     | Absence          | There is no seeding or restocking practice for stalked barnacles            |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence          | There is no seeding or restocking practice for stalked barnacles            |
Table S22. Social cohesion.

| Fishery                              | Presence/Absence | Description                                                                                                                                                                                                 | Source                      |
|--------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Morbihan                             | Absence          | -                                                                                                                                                                                                          |                             |
| Galicia                              | Presence         | Fishers are organized in 33 fishers' associations or cofradías with an assigned territory. From cofradías fishers usually participate and speak in a united voice, sharing relatively homogeneous interests in the resource | Molares and Freire 2003    |
| Asturias-West                         | Presence         | Fishers are organized in 12 fishers' associations or cofradías with an assigned territory. Cofradías conduct regular meetings to determine the status of the management plan and zones. Fishers share relatively homogeneous interests in the resource and propose in a united voice changes in the measures when needed | Rivera et al. 2014         |
| Asturias-East                         | Absence          | -                                                                                                                                                                                                          |                             |
| Orio and Bakio                       | Absence          | -                                                                                                                                                                                                          |                             |
| Basque General Regulation            | Absence          | -                                                                                                                                                                                                          |                             |
| Portugal General                     | Absence          | -                                                                                                                                                                                                          |                             |
| Reserva Natural das Berlengas (RNB)  | Presence         | Fishers belong to one fishers' association allocated to the territory of RNB and conduct regular meetings to discuss about the management plan or other fishery issues                                           | Cruz et al. 2015            |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence | -                                                                                                                                                                                                          | Own expertise                |
### Table S23. Leadership.

| Fishery                                      | Presence/Absence | Description                                                                                                                                                                                                 | Source                  |
|----------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Morbihan                                     | Absence          | Fishers’ associations or cofradías count with a junta general (i.e., general shareholders meetings), responsible of the decision-making. In addition, fishers usually aggregate in agrupaciones sectoriales (i.e., sectoral working groups) to promote an efficient extraction and commercialization of the resource. Fishers leaders are in charge every year of the design and daily implementation (in collaboration with technical assistants of the cofradías) of a very adaptive management plan                     | Own expertise           |
| Galicia                                      | Presence         | Fishers’ associations or cofradías count with a junta directiva (i.e., general shareholders meetings), responsible of the decision-making. Fishers that are highly motivated usually collaborate in decision-making process with the junta directiva | Rivera et al. 2019      |
| Asturias-West                                 | Presence         | Fishers’ associations or cofradías count with a junta directiva (i.e., general shareholders meetings), responsible of the decision-making. Fishers that are highly motivated usually collaborate in decision-making process with the junta directiva | Own expertise           |
| Asturias-East                                 | Absence          | -                                                                                                                                                                                                          |                         |
| Orio and Bakio                               | Absence          | -                                                                                                                                                                                                          |                         |
| Basque General Regulation                    | Absence          | -                                                                                                                                                                                                          |                         |
| Portugal General                             | Absence          | -                                                                                                                                                                                                          |                         |
| Reserva Natural das Berlengas (RNB)          | Absence          | -                                                                                                                                                                                                          |                         |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence | -                                                                                                                                                                                                          |                         |
Table S24. Self-enforcement.

| Fishery                        | Presence/Absence | Description                                                                                                                                                                                                 | Source                      |
|--------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Morbihan                       | Absence          | Fishers invest their own resources in the enforcement of the resource by setting a local surveillance services (marine guards directly hired by the cofradías but co-paid between fishers/cofradía and fisheries administration), collaborating with governmental officers to prevent poaching. Fishers also participate in the enforcement activities personally. However, users often declare that many cases go unpunished or with small fines.  | Molares and Freire 2003     |
|                               |                  |                                                                                                                                                                                                            | Macho et al. 2013           |
|                               |                  |                                                                                                                                                                                                            | Own expertise               |
| Galicia                        | Presence         | Fishers occasionally carry out surveillance in special interest areas. In 3 of the TURFs, all users have agreed on personally carrying out surveillance. However, according to users many cases go unpunished or with small fines. | Rivera et al. 2014          |
| Asturias-West                  | Presence         | Fishers occasionally carry out surveillance in special interest areas. In 3 of the TURFs, all users have agreed on personally carrying out surveillance. However, according to users many cases go unpunished or with small fines. | Rivera et al. 2014          |
| Asturias-East                  | Absence          | -                                                                                                                                                                                                          |                             |
| Orio and Bakio                 | Absence          | -                                                                                                                                                                                                          |                             |
| Basque General Regulation      | Absence          | -                                                                                                                                                                                                          |                             |
| Portugal General               | Absence          | -                                                                                                                                                                                                          |                             |
| Reserva Natural das Berlengas (RNB) | Absence       | -                                                                                                                                                                                                          |                             |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence | -                                                                                                                                                                                                          |                             |
**Table S25.** Tradition in self-organization.

| Fishery                                | Presence/Absence | Description                                                                                                                                                                                                 | Source          |
|----------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Morbihan                               | Absence          | -                                                                                                                                                                                                           |                 |
| Galicia                                | Presence         | Harvesters have been organized in local fishers’ associations or **cofradias** since Middle Ages, which had religious bases. Traditional exploitation of the resource in the region | Taboada 2007    |
| Asturias-West                          | Absence          | -                                                                                                                                                                                                           |                 |
| Asturias-East                          | Absence          | -                                                                                                                                                                                                           |                 |
| Orio and Bakio                         | Absence          | -                                                                                                                                                                                                           |                 |
| Basque General Regulation              | Absence          | -                                                                                                                                                                                                           |                 |
| Portugal General                       | Absence          | -                                                                                                                                                                                                           |                 |
| Reserva Natural das Berlangas (RNB)    | Absence          | -                                                                                                                                                                                                           |                 |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence         | -                                                                                                                                                                                                           |                 |
### Table S26. Influence in the local market.

| Fishery                                             | Presence/Absence | Description                                                                                                                                                                                                 | Source                        |
|-----------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Morbihan                                            | Absence          | -                                                                                                                                                                                                        |                               |
| Galicia                                             | Presence         | Most fishers’ associations or cofradías have the capacity to commercialize the catch, managing the first sale markets. Fishers’ guilds that conduct spatially explicit management open the best quality areas during the high season (i.e., summer and Christmas) ensuring that good quality barnacles are sold at its highest price. In order to increase the price, fishers regularly decide not to go fishing, or not to sell, when prices are considered too low. | Molares and Freire 2003       |
| Asturias-West                                       | Presence         | Most fishers’ associations or cofradías have the capacity to commercialize the catch, managing the first sale markets. Through the establishment of spatially explicit management the best quality areas are open during the high season (i.e., Christmas) ensuring that good quality barnacles are sold at its highest price. | Rivera et al. 2014            |
| Asturias-East                                       | Absence          | -                                                                                                                                                                                                        |                               |
| Orio and Bakio                                      | Absence          | -                                                                                                                                                                                                        |                               |
| Basque General Regulation                           | Absence          | -                                                                                                                                                                                                        |                               |
| Portugal General                                    | Absence          | -                                                                                                                                                                                                        |                               |
| Reserva Natural das Berlangas (RNB)                 | Absence          | -                                                                                                                                                                                                        |                               |
| Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV) | Absence          | -                                                                                                                                                                                                        |                               |
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