Institutional restructuring of fisheries management system for humphead wrasse (Cheilinus undulatus RÜPELL 1835) in Anambas and Natuna, Riau Archipelago Province, Indonesia

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Abstract. This policy analysis paper revisits the existing traditional institutions concerned with Humphead wrasse management in Anambas and Natuna, Riau Archipelago Province. It provides an analysis and synthesis of policies that could give direction to the formation and/or strengthening of existing institutions for the benefit of this endangered fish species and all concerned parties. Local community’s active involvement and participation is key to the sustainable development of fisheries resources. However, the local community’s economic empowerment would be impossible to achieve without institutional strengthening. The paper recommends that community-based institutional empowerment or the “group approach” should be considered in Anambas and Natuna’s fisheries management system for Humphead wrasse. Organized fishing communities can be effective government partners in the management of open fishing areas in their jurisdictions. Fishing communities also have a vision, mission or resource management strategy specific to their own needs, values and aspirations. Defining and articulating the community’s vision, mission and values are therefore crucial to the success of any community initiatives concerning fisheries revitalization programs. The paper also proposes a logical plan for Community-Based Coastal Resource Management (CBCRM) system for consideration of the local government units in Anambas and Natuna.

1. Introduction
Humphead wrasse (Cheilinus undulatus Ruppel 1835), also known as Napoleon fish (Indonesian name) or katipas (local name in Anambas and Natuna), belongs to Laridae family. It is widely distributed on coral reefs in Indonesia, the main exporter of this fish by the sea with little enforcement [1]. The fish was considered to be actually or potentially threatened by prevailing exploitation levels and has been included in the list of endangered fish species by the International Union for Conservation of Nature (IUCN) [2] and in the list of species protected by Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) since
IUCN has established development policy fishing that does not harm Indonesia. For the reason, the Indonesian government has been setting Humphead wrasse harvest quota on the caution principle [3]. However, an increase in illegal, unregulated, and unreported (IUU) fishing activities is counterproductive to quota regulations and can certainly cause further fish population decline, which can be detrimental to the poor communities relying upon the fishing industry.

At present, protecting for Indonesian coastal resources is responsibly managed by respective governmental units of provincial interests. Therefore, a control for sustainably fishing is more excessive for the regional government then that for the central government. Given that nationally management control might only be considered as problem solvable approaches for a specific region or for a limited time [4]. The community as a public partner was one of the strategic steps in the management of coastal and marine resources, irrespective of partnership, whether community-oriented [26] or partnerships such as shared management [5]. Achieving sustainable production of aquatic resources and objectives have been agreed [6].

Some restricting factors coming from inside and outside the system of Community-Based Resource Management (CBRM) were some time to be self-dissolution to community integration in any programmed implementation. The failure of community participation so far was due to the lack of a clear master plan for integrated communities. Outside influence was associated with the deregulation of zoning, "political patron" over the use of territory or population changes, and increasing market demand at high prices for a commodity ([7]; [8]). Anambas and Natuna fishermen were very frail in the bargain of fishing destination problems [9]. The resource management zone was site-specific, focusing only on inshore fishing activities or operating in tightly protected areas [8]. Spatial intensification then occurs within the zone, which when applied together with co-management approaches [10] coastal resources can be widely protected and conserved for use. This paper provides an analysis and synthesis of policies aimed at giving direction for the formation and/or strengthening of existing customary institutions in the context of improving the management of Humphead Wrasse (*Ceilings undulates* Ruppel 1835) or Napoleon fish (Indonesian name) stocks in Anambas and Natuna.

2. Materials and methods
The research method used was a qualitative descriptive approach. According to [11], a qualitative descriptive approach is a research method that can provide a clearer picture of social situations. Qualitative research seeks to understand phenomena as experienced by test subjects, for example, their behaviours, perception, motivation and action. It is presented through descriptions in the form of words and language [12].

Secondary data were obtained from literature and various document sources, such as research reports for 2014-2016 at Research Institute for Fisheries Enhancement and Conservation (see Fig. 1), electronic media, journals and books. The collected data and information were described in the form of narration, and analyzed and interpreted based on the results of research, theories and concepts of good governance and process management [13].
Figure 1. Research observation locations in Anambas and Natuna waters Riau Archipelago Province, Indonesia

3. Results and discussion
According to [25], the management of Humphead wrasse (Cheilinus undulatus Rüppell 1835) at this time did not suit the concept of resource conservation. The management of Humphead wrasse (Cheilinus undulatus Rüppell 1835) in historical series in Anambas and Natuna are summarized in Table 1 [24]. The story is shown about time exploitation and the time for Humphead wrasse was started to get a regulation from Indonesia Government.

Fish stocks will naturally replenish themselves if their reproduction is not disturbed. However, the nature of the common ownership of fish stocks encourages sporadic management, which will occur under the conditions of overfishing and conflict in the “open access” management system [21]. According to [20], fisheries management has to undergo fundamental changes, from supply-side management to people management. The business constraint element (input, including policy) should be given priority. Fisheries policy can be a determining factor in the amount of production.

Import restrictions, lack of capital, the effect of environmental damage but the production system becomes sporadic, the outside of standard and effect of environmental damage. Conversely, a large investment would create overcapacity in fishing activities and encourage overfishing. [20] Indicates that both environmental damage and overcapacity were the factors causing the crisis in the fishing industry.

There are many aspects to consider to ensure that the proposed development of Humphead wrasse cage culture in Anambas and Natuna can meet the legal requirements and regulations concerning Humphead wrasse fisheries management. These include designing, building and operating appropriate cage culture for the breeding of the fish based on several considerations, such as productivity, sustainability, stability, traceability, equity, and legality. This development modification emphasizes the agro-ecosystem properties or ‘building with nature’ principles from [24]. Analysis of the strengths and weaknesses or obstacles to this proposed development is described in Table 2.
Table 1. Timeline occasions of humphead wrasse fisheries management based on research notes from 1980 to 2018 in Anambas and Natuna, Riau Archipelago Province.

| Year | Information |
|------|-------------|
| >1980 | Humphead wrasse (*Cheilinus undulatus* Rüppell 1835) was very easy to catch and not classified as a commodity by the local community [24]. |
| >1990 | Humphead wrasse had commenced being the commercial success since the live reef fish trading collectors came from Hong Kong. Humphead wrasse production rose sharply as approximately 100 household units began to engage in Humphead wrasse cage culture [24]. |
|       | Utilization of Humphead wrasse seeds from the wild increased. Juvenile mortality was very high during the post-harvest process. The survival rate of juvenile Humphead wrasse caught in nature was only about 12% to 20% [14]. In the process of culturing Humphead wrasse, other fish resources that were used as feed did not count well for biomass. The economic viability of the cage culture business was not calculated in terms of the use of feed. It can only be assumed that the cage culture effort was profitable because it continued to this day [14]; [24]. |
| >2010 | An issue on the catching rules in the Ministry of Marine Affairs and Fisheries Regulation No. 37/2013 was the selling size of Humphead wrasse cultivated in cages. The regulation takes into account the marketable size of fish captured in nature but not the marketable size of fish harvested in cage culture. |
|       | Since the issuance of the Ministry of Marine Affairs and Fisheries Regulation No. 37/2013, Humphead wrasse production from Anambas and Natuna cage culture has increased. Meanwhile, the pickup ships started to decrease because of a moratorium on foreign ships concerning loading, unloading and shipping of aquaculture at sea. The provisions on Humphead wrasse exports require embarkation through airports to replace embarkation through seaports, although from the beginning exports to several countries were carried out by the sea. |
|       | The state of Humphead wrasse population in the wild was still low. A population survey in Anambas waters in 2013 found only 4 individual fish in four glasses of water from four sub-districts [18]. The Humphead wrasse population survey conducted in Natuna waters in April 2019 showed that its density was 0.7 individuals/ha with the total census area of 26.24 km [19]. |
| >2015 | The year 2015 was the peak of the event "stock fail" of fish from cage culture activities. The data on Humphead wrasse from aquaculture production in 2015 was 37,000 individuals/year in Anambas and 20,000 individuals/year in Natuna. The maximum available export quota for Indonesia was 8,000 individuals/year [15]. In 2017, Humphead wrasse stocks recorded in the Anambas and Natuna regions was 114,000 individuals/year [16]. However, Humphead wrasse recorded in “fail stock” status was 300,000 individuals/year. |
|       | After waiting for more three years, the Indonesian Government finally issued a permit to export Humphead wrasse marine products by sea from Natuna and Anambas with special requirements. The first export of 1,000 individuals took place in Sedanau Island, Natuna District in February 2018 from a quota of 40,000 individuals for the two regions [17]. |

Source: According [24] which be expanded base on some results of research at the site study
Table 2. Strengths and weaknesses agro-ecosystem properties of the proposed development of Hamphead wrasse cage culture in Anambas and Natuna.

| Strength                          | Property     | Weakness                                                                 |
|----------------------------------|--------------|--------------------------------------------------------------------------|
| Cage culture system has the      | **Productivity** | High production cost.                                                   |
| potential to increase productivity|              | Constraints in water and feed mangement.                                |
| compared to open fisheries.      |              | High dependency on natural resources.                                    |
| Spawning ex-situ (inside of cage  | **Sustainability** | Poor quality of natural seed after harvest; the low survival rate of |
| culture).                         |              | natural seed.                                                            |
| Spillover effects.                |              |                                                                          |
| suitable juvenile habitat.        |              |                                                                          |
| Be careful to catch?             |              |                                                                          |
| Conservation; high survival rate |              |                                                                          |
| by extension.                     |              |                                                                          |
| Sea lane export.                  |              |                                                                          |
| High sale price.                 |              |                                                                          |
| Availability of natural food.     |              |                                                                          |
| Availability of seed in nature.   |              |                                                                          |
| Economic value.                   |              |                                                                          |
| Social and cultural value.        |              |                                                                          |
| Seeds around the cage area most   | **Stability** | Policy changes may cause pressure to prestigious consumers in destination |
| likely come from spawning and    |              | markets.                                                                 |
| caging; certificate of origin may |              |                                                                          |
| be issued by the concerned       |              |                                                                          |
| authority.                        |              |                                                                          |
| Easier product certification due  |              |                                                                          |
| to documentation of post-harvest  |              |                                                                          |
| cultivation process.              |              |                                                                          |
| A fishing license may be         |              |                                                                          |
| renegotiated with clear           |              |                                                                          |
| documentation on the origins of   |              |                                                                          |
| marketing channels.              |              |                                                                          |
| Easy to monitor.                 |              |                                                                          |
| The law is binding and applies to|              |                                                                          |
| everyone without exception.      |              |                                                                          |
| The performance of floating cage  | **Traceability** | Further research (i.e. parental and sex tests) still needed to prove   |
| culture (sea ranching) will be    |              | the origin of seeds.                                                    |
| the basis for even distribution of|              |                                                                          |
| results and exceptions to         |              |                                                                          |
| regulations.                     |              |                                                                          |
| Formation of Hamphead wrasse      |              |                                                                          |
| floating cage culture (sea       |              |                                                                          |
| Equitability                      |              |                                                                          |
| Exceptions to the implementation |              |                                                                          |
| of regulations may lead to conflict. |          |                                                                          |
| Limits for harvest size and/or    |              |                                                                          |
| sales at sea are restricted by    |              |                                                                          |
| regulations.                     |              |                                                                          |
| Clear boundaries, zoning plan,    |              |                                                                          |
| and definition of terms between   |              |                                                                          |
| capture fishery and floating cage |              |                                                                          |
| Strength                                                                 | Property                                                                 | Weakness                                                                 |
|------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------|
| ranching) entrepreneurs’ association will provide greater access to equity and opportunity for all separation of floating cage culture (sea ranching) and capture fishery will easily facilitate certification. | culture are needed.                                                      | Additional information is needed in other regions with the same business pattern and the same resources as Anambas and Natuna. |
| • Institutionalization of floating cage operators’ associations will easily legalize all interests created by mutual understanding between the organizations and partner government, non-governmental, and people’s organizations. | Legality                                                                 | Legality (i.e. agreement, contract) can only be given to well documented floating cage culture (sea ranching) operators. |
| • With cooperation, both rights, and obligations will be easy to manage. |                                                                         | • Clear rules, zoning plan, and definition of terms between aquaculture and capture fisheries are needed. |
| • Associations can act as government partners, develop social capital, and maintain good performance to gain the trust of the CITES authorities for the animal permit in Indonesia (Natural Resources and Ecosystem Conservation, Ministry of Environment and Forestry); and authorities for the fish transfer process, such as BKIPM (Fish Quarantine Agency, Fishery Product Quality and Safety Control, Fisheries Supervisor); MMAF, and other concerned agencies. |                                                                         | • Policy coordination is a major challenge. |

Source: According [24] which be expanded base on some results of research at the site study

Community-Based Coastal Resource Management (CBCRM) is intended as a simple concrete system to implement the marine and fisheries programs set out in the regional development plan [23]. Institutional restructuring of marine and fisheries affairs is necessary to overcome the backwardness of the local community’s economy. CBCRM will provide the communities not only access and control over coastal resources but also equal distribution of development results. The community was left behind in the past because their institutional rights were being attacked. It would be appropriate to empower them socially, culturally, politically, and economically [22].

Concrete measures from both the government and the communities are necessary to address the sustainable management and conservation needs of Humphead wrasse stocks. Based on the understanding of existing Humphead wrasse management system and the analysis of its strengths and weaknesses, a realistic set of policy alternatives are suggested (see table 3) [15]; [23]; and [24].
Table 3. Policy options for humphead wrasse management.

| For the government | For the communities |
|--------------------|---------------------|
| 1. Facilitate, authorize and legalize existing institutions to enable them to be independent in the management of their fish stocks, consistent with the principle of equality and non-discrimination. | 1. Harmonize perceptions on the need for sustainable development of Humphead wrasse fisheries. |
| 2. Urge the existing institutions to restructure themselves to become an independent CBCRM institution without discrimination on numerous grounds (i.e. economic status, gender, language, religion, political, birth and another status) to ensure equal opportunity, treatment and distribution of development results among all groups involved. | 2. Create a consensus in the village via a traditional forum to build a CBCRM system regarding the use and conservation of Humphead wrasse and other fish stocks. |
| 3. Synchronize all fishing programs for coastal community development with the CBCRM. | 3. Develop leadership patterns in CBCRM that should form the basis for morality and behaviour, such as the involvement of opinion leaders, religious leaders, and respected community leaders; and organizing discussion forums for fishing groups and village forums for village heads and their constituents. |
| 4. Guide healthy investment patterns to avoid overcapacity and low economic performance in fisheries. | 4. Form fishermen groups/associations according to the specialization of the ‘mina business’ in integrated areas (i.e. catchers, collectors, authorities, vendors, bait seekers, suppliers of production input, skilled workers, etc.). |
| 5. Establish healthy leadership patterns for stakeholders in Humphead wrasse fisheries to deter “political patronage” that may violate the system of participation in CBCRM. | 5. Develop the vision, mission, and short and long-term strategic plans of the CBCRM, which should be merged with the business plans of each association. The process shall involve village consultation forums or workshops under the guidance of experts to consider people's opinions and livelihoods. |
| 6. Build a master plan for the management of Humphead wrasse fisheries in a broader sense highlighting other purposes other than just catching the fish, so that the global impact of economic equality can be created through other sectors, i.e. Humphead wrasse can be used as a culinary icon for tourism development in the region of Anambas. | 6. Document all the above components on paper and by photo and video if possible. These records will then be legalized and followed up by the government. |
| 7. Place or periodically send professionals and specialists, such as implementers and mentors, in the field to conduct CBCRM training to guide the community in preparing CBCRM programs and strategic plans. | |
| 8. Build zoning plans that can be used as a basis by the community for their zoning plans for CBCRM. | |
| 9. Identify superior fisheries resources or another non-marine biota that can be managed by the community under CBCRM system. | |
| 10. Legalize the CBCRM documents proposed by the community so they become a legal basis for the implementation of fisheries management programs (i.e. Humphead wrasse) and, at the same time, as a basis for the revitalization of the strategic programs developed in the CBCRM plan. In this case, local and central governments should facilitate a three-day workshop with fishermen and traditional institutions to discuss the CBCRM strategic plan. | |
| 11. Local authorities should reward the success of CBCRM driving actors to promote the | |
For the government

accomplishments of water resource conservation efforts.

For the communities

Fisheries revitalization will be meaningless if community institutions are weak and fishermen are marginalized, even if the resources and the environment are supportive. It requires not only reliable individuals to manage the resources and the environment, but also strong and solid institutions. The local government should facilitate the development of CBCRM systems required documents in all fisheries production and development centres along the local government coast. The local government should also facilitate the implementation of the CBCRM system. For instance, the local government of Riau Archipelago Province can use CBRCM document to assess financial capability needs and provide aid, subsidies or soft loans to qualified programs and projects of legitimate community associations. The success of this CBCRM approach, therefore, depends largely on the management, monitoring and evaluation by government officers (i.e. professional social workers or field counsellors) and community leaders.

4. Conclusion

This paper has argued that institutional empowerment or the “group approach” should be considered in Anambas and Natuna’s fisheries management system for Humphead wrasse. Without institutional strengthening, local community economic empowerment will be difficult to achieve. Without organization, it would be impossible to pool resources, mobilize economically disadvantaged people, and distribute production inputs and results within the framework of community. Local community’s active involvement and participation is thus the key to the sustainable development of fisheries resources.

Community-based institutional empowerment is a strategic approach to the management of endangered Humphead wrasse and it should be considered in light of the following reasons:

1. Fishing communities can become effective government partners in the management of open fishing areas in their jurisdictions.
2. Communities are largely responsible for their Humphead wrasse fisheries, particularly in securing and maintaining local rights or licenses for the construction, establishment and operation of the floating fish cages to grow and culture Humphead wrasse fish to various sizes.
3. Fishing communities have a vision, mission or resource management strategy specific to their own needs, values and aspirations. Defining and articulating the community’s vision, mission and values are crucial to the success of community initiatives on fisheries revitalization program.
4. Increased awareness and involvement of the fishing communities and the public in the rules and regulations on fish cages for aqua/maricultural of Humphead wrasse can lead to sustainable fisheries policy and hopefully to the anticipated behaviour shift.
5. Community participation is crucial in coastal infrastructure management (i.e. embankments, marine walls, soft mud walls). Community members can be mobilized and provided with remuneration for infrastructure management and protection.

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