

Whose sustainability? Top-down participation and emergent rules in marine protected area management in Indonesia

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ABSTRACT

A review of a major community-based marine protected area programme (CB-MPA) in an Indonesian island archipelago is the point of departure for this article. Despite a well-designed institutional structure to facilitate local participation, local knowledge about the CB-MPA is found to be low and resource access and influence on decision-making in the programme is negligible for the majority of islanders. At the same time, most of those who know about the programme consider it as pertaining to the public authority only. These findings stand in contrast to evidence on non-formal ways of protecting and managing marine areas in the same geographical area but outside the formal MPA institutional framework. In particular, the article identifies a number of emergent rules-in-use in marine management, which operate parallel to legally established MPAs. It is argued that emergent forms of marine area protection such as non-formal self-organising island exclusion zones (IEZ) offer as yet mostly unused potentials for formal MPA development, particularly in those coastal and marine areas without traditional forms of marine and coastal management.

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1. Introduction

Indonesia's coral reefs are among those with the highest biodiversity on earth. With some 51,020 km², the country has about one-fifth of the coral reefs on the earth [1]. These ecosystems can benefit from effectively protected areas and, as a consequence of better marine protected area management, ecosystem-dependent human populations can also reap benefits including increased catch per unit effort and food security [2]. In Indonesia, marine area protection is implemented in various legal forms, such as Marine Nature Tourism Park (Taman Wisata Perairan), Strict Marine Reserve (Suaka Perairan), Marine Sanctuary (Daerah Perlindungan Laut), Regional Marine Conservation Area (Kawasan Konservasi Laut Daerah), Coastal Reserve (Suaka Pesisir), Fisheries Reserve (Suaka Perikanan) and Marine National Parks (Taman Nasional Perairan), the administration of which is currently being transferred from the Forestry Ministry to the Ministry of Marine Affairs [3,4]². The total marine area covered by National Parks in Indonesia is about 62,600 km², or about 1.08% of the Indonesian marine area [5–7]. Currently, the World Database on Protected Areas (WDPA) lists 248 marine protected areas for Indonesia,

covering 1.94% of the territorial seas [7]. This number still excludes the newly declared areas in Berau/East Kalimantan, the Togean Islands and in the Savu Sea. However, even many of these formally gazetted MPA areas are not effectively managed for fisheries or habitat protection [8]. The aims of the Indonesian government for future marine area protection are ambitious: 10 million hectare of marine area was to be under MPA frameworks by 2010, a goal which was reached with the declaration of an extra 3.5 million hectare of protected area in the form of the Savu National Park in May 2009. For 2020, 20 million hectare of Indonesian sea territory is to be under formal protection frameworks [9].

Institutional reorganization to support these objectives is ongoing. While in previous decades, the Government of Indonesia's Departments of Forestry and of Agriculture both had duties concerning MPAs, in the year 2009, the responsibility for marine protected areas was assigned to the Ministry of Marine Affairs and Fishery [10,11].

According to the most recent definition by the IUCN, a protected area is “a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values” [12].

This latest IUCN definition explicitly incorporates forms of protected area management that operate outside the formal legal frameworks established by the nation state. The integration of traditional ecological knowledge into protected area management and intercultural approaches to the linking of knowledge systems has thus become possible [13,14].

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² The legal forms of protected marine areas were renamed and restructured recently by Government Regulation No. 60/2007 and Regulation No. 17/2008 of the Minister for Marine Affairs and Fisheries.

However, in many areas of the globe, and especially in marine and coastal territories, local customary management is either absent or inadequate while challenges such as demographic growth, coastal urbanisation, sea level rise and other facets of global change require effective institutional responses. An apparent gap in local institutional capacity exists in coastal and marine areas where traditional customary forms of management are weak or lacking. Despite varying adequacy of local traditions for formal MPA design under contemporary conditions, there is a fairly strong consensus that formal MPAs without any local inputs to institutional development tend to be inflexible and unable to incorporate the rationales and priorities of local ecosystem stakeholders [16]. So how do we achieve greater flexibility of MPA design in the face of diverse and complex local and regional realities in places where no ready local traditions are available?

Ferse et al. [15] suggest that a combination of formal MPAs as the more rigid formal frame and community-based natural resource management as the adaptive core will provide more effective protected area management. In order to achieve such a combination of stability and adaptability, the local elements that make up the adaptive core need to be identified and evaluated in each specific case.

This article starts out by evaluating the participatory element of a major Indonesian marine conservation programme (COREMAP) that aims to implement community-based no-take areas, and proceeds to identify other approaches and rationales for ecosystem use and protection and management found in the same region. The article analyses some of the principles behind locally successful rules-in-use to assess how formal MPA design might integrate these rationalities.

1.1. The study area

The Spermonde Archipelago in South Sulawesi consists of a large number of small islands located between 119° 6' 52 E and 4° 52' 32 S in the Makassar strait. Its physical boundaries and the number of small islands it comprises have been subject to a number of different definitions. Moka [17] describes the Spermonde Archipelago as consisting of about 120 islands with a total area of 400,000 hectares. Other authors mention between 121 [18] and 150 [19] islands. These discrepancies probably relate to the various approaches to defining what constitutes an island and what are the physical boundaries of the Spermonde Archipelago. Jompa et al. [18] suggest that the Spermonde Archipelago covers the area from Takalar regency to Mamuju in West Sulawesi. We have defined the Spermonde Archipelago as covering the coral islands in five different administrative regions: the municipality of Makassar, the regency of Pangkajene Kepulauan, Takalar regency, Barru regency and Maros regency. Makassar municipality and all four regencies are situated in the Indonesian province of South Sulawesi.

Until the 17th century, only naval use of the Spermonde coral islands was permitted while ordinary settlements were forbidden. In the early 18th century, some islands attracted settlements by becoming outposts for traders of Malayan, Indian and Arabic descent [21]. Today, about 54 of the islands, including most of those with freshwater sources (M.N., fieldwork information), are densely inhabited.

Over past decades, the Spermonde Archipelago has become increasingly affected by destructive fishing including the use of explosives and cyanide [20]. With the exception of a minority of Bajau people (sea gypsies or Sama)³, the region lacks local

³ Bajau traditions are associated with lower social status and are not readily admitted to in Spermonde archipelago. Bajau and Buginese traditions often intermingle.

traditions in marine tenure and protected area management. With the added difficulties of supporting active local participation in a hierarchical society such as Indonesia [22], the development of marine protected area has thus struggled to involve local fishing communities. Nonetheless, local voices and norms in support of marine conservation are present on the island both among the respected elders and among the younger generation.

The Coral Reef Rehabilitation and Management (COREMAP) programme under the Ministry of Marine Affairs and Fishery of Indonesia is the largest programme supporting marine protected area development in Indonesia. It is funded by the Asian Development Bank and the World Bank. COREMAP aims to protect, rehabilitate and sustainably manage the use of coral reefs and related marine resources [23–25]. After an initiation phase from 1998 to 2004, COREMAP in 2010 is at the end of its second phase, the so-called “decentralization and acceleration phase”.⁴

1.2. Methods

This paper refers to findings from a number of field research periods.

1.2.1. Two ship-based research excursions

About 20 Indonesian and German researchers and students from the fields of anthropology, sociology, geography, spatial planning, fisheries economics, philosophy and reef ecology undertook two joint ship-based research excursions to the islands of Barrang Caddi, Badi, Saugi, Karanrang, Bonetambung and Jangang-Jangang in the Spermonde Archipelago (Fig. 1). The first of these two 10-day excursions took place in March 2009. Its overall objective was to generate scientifically sound and societally relevant information and to inform and “envoice” the more marginal groups of islanders, such as fisherfolk in the coastal conservation and management field. Specific research objectives were to explore seasonal, spatial dynamics and social network dynamics in livelihood and resource use and coping strategies and to investigate past human-nature dynamics and local visions for the future. A range of participatory methods (seasonal calendar, future visioning and back-casting) were used with focus groups, which differed by age, sex and socio-economic status. Individual interviews and larger open meetings were also conducted [22].

The second research excursion (May–June 2009) worked with a similar composition of researchers and students on demographic history, local economy including fisheries, local leadership, society, values and culture and ecological, social-ecological and technical knowledge. The islands and marine governance and management systems; islanders' problems, ideas and knowledge systems; reef-related interests and strategies to cope with crises and benefit from opportunities were also investigated. In-depth interviews, participant observation in the classical anthropological tradition and daily team discussions were used. A participatory board game to inform an agent-based model of the dynamics surrounding live reef food fishery (LRFF) dynamics was also tested.

1.2.2. Field work on participatory practice in MPA design and management

Initial field research was carried out during a two-week period in August 2008 by S.F. Interviews were conducted with COREMAP personnel, community leaders, NGO and business representatives

⁴ For further information see www.coremap.or.id.

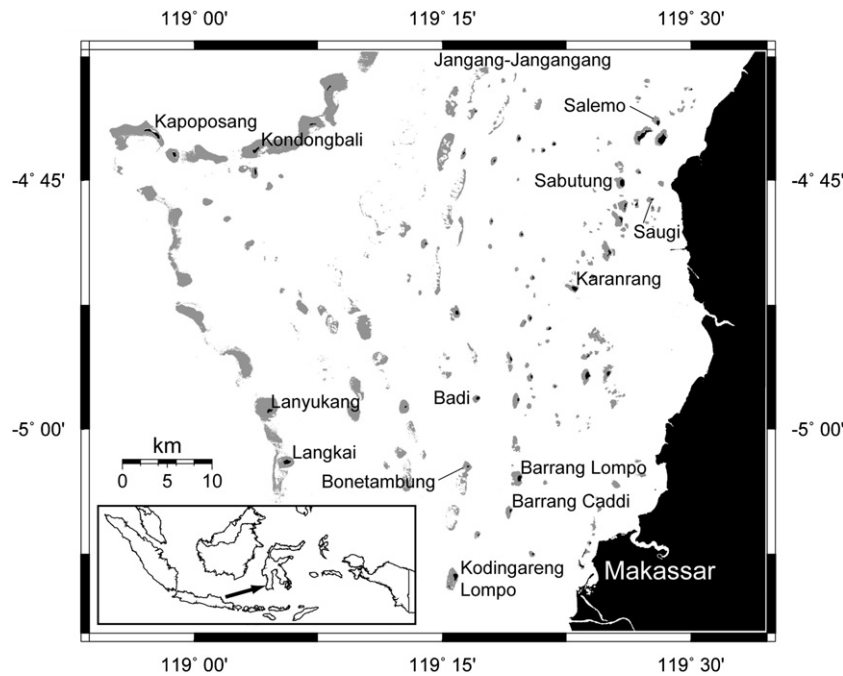


Fig. 1. Map of the study area, showing the locations of the research islands. Grey areas indicate coral reefs. The position within Indonesia is shown on the inset map.

and scientists from Hasanuddin University regarding mariculture introduction and the role of COREMAP on Badi Island.

This visit was followed by a more thorough field research period by W.B., which lasted six months from September 2008 until February 2009 and covered five islands, i.e. Salemo, Sabutung, Karanrang, Kondongbali and Kapoposang (Fig. 1). 238 people from the villages were randomly selected and interviewed regarding the implementation of CB-MPA at the village level. Villagers were interviewed with a semi-structured questionnaire, which started with *Do you know about the No-Take Area in your village?*⁵ Follow-up questions were then based on the answer to the first question. The interviews were conducted with individuals and in natural focus-groups [26].

A longer-term, in depth field research was carried out by R.D. on Barrang Lompo, Barrang Caddi, Kodingareng Lompo, Bonetambung, Langkai and Lanyukang Islands on the local institutional aspects of fisheries (Fig. 1). During a six-month period, in-depth interviews, participant observation and focus group discussions were used to collect and validate data.

In the following section, we examine the effectiveness of the different ways of managing and protecting marine territory, which we encountered “on the ground” in our study area.

2. Results and discussion—forms of marine area protection

This article defines **protected area management** as any action limiting the use of a marine area and its resources, and **protected areas** as any areas affected by such actions, either permanently or temporarily. The IUCN only considers management actions, which result in conservation. In order to analyse the rationales and logic behind effective rules-in-use, we will here examine all institu-

tions that regulate marine resource use. We aim for an improved understanding of the larger complex of marine resource use rules. These can then be used to formulate marine conservation institutions that are more appropriate to their respective social-ecological contexts.

A number of ways that at least partially protect marine areas were evident in Spermonde Archipelago. The five most prominent ones are discussed in more detail below:

1. Formally declared no-take areas intended by government as part of planned larger MPAs.
2. Incidental forms of protection.
3. Myths or taboos.
4. Influential interests in favour of conservation.
5. Newly emergent non-formal rules developed outside the formal institutional framework of MPAs.

2.1. MPAs and no-take areas

Despite their limited impact to date, formal MPAs are the major tool in ocean and coastal management today. There are about 5000 MPAs world-wide. Indonesia alone has about 248 MPAs, of which seven have Marine National Park status, covering about 13.5 million hectare [7].

At the World Ocean Conference in May 2009 in Manado, the Indonesian government announced a new major MPA initiative in the Savu Sea which on its own covers 3.5 million hectare [5]. As we discuss below, the formally gazetted MPAs in Spermonde do not constitute an effective form of marine area protection for a number of reasons.

2.1.1. Background

In its Community-Based Marine Protected Area (CB-MPA) programme, COREMAP explicitly aims to facilitate an active

⁵ The protected areas introduced by COREMAP are no-take areas (NTAs). Thus they are MPAs according to our generic definition but not according to the Indonesian government definition.

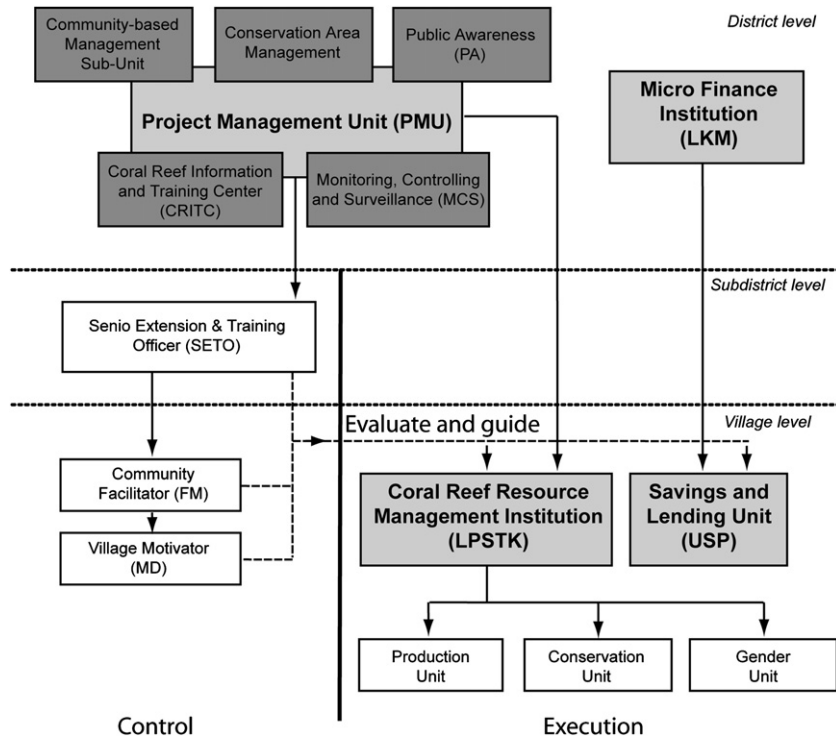


Fig. 2. Organizational structure of COREMAP CB-MPA (modified after [24,28]).

community role in MPA management. With the concept of district-level marine area management *Kawasan Konservasi Laut Daerah (KKLD)*, objectives such as the decentralization of political powers, the effective protection of marine areas and the abatement of declining fish catches are to be addressed at the village level through the CB-MPAs. The small-scale village-level MPAs under the COREMAP programme prohibit all fishery activities: In general MPA terminology, they are 'core zones' or 'no-take areas'. In the Spermonde Archipelago, some of COREMAP's local no-take areas (NTAs) are to be the core zones of the larger scale district-level MPA [23,24,27–29]. In order to achieve higher-scale ecological objectives, the COREMAP CB-MPA programme has declared one NTA per village⁶ in the Spermonde Archipelago.

2.1.2. MPA definition and management process under COREMAP

In order to define a village-level NTA under the COREMAP programme, the residential community was gathered for a Focus Group Discussion (FGD). In one single session at village-level, villagers were asked to define their (i) fishing grounds; (ii) mariculture areas if any and (iii) marine transportation routes. These areas were recorded on a map. Those who attended the FGD meeting in their village were then asked to select areas with good coral cover as the local no-take area. Generally, an area with high coral coverage, which was also visible and easily accessed from the island, was selected [26].

The "in-the-water" demarcation of the selected area in the research sites was later undertaken by an external contractor reportedly without coordination with the local communities or the members of the FGD group who had taken initial siting decisions [26].

⁶ A village in the Spermonde Archipelago is an administrative unit that can comprise one or more islands.

2.1.3. COREMAP institutional structure and activities

The COREMAP programme operates in about 274 villages in Indonesia, and in 15 villages on 42 islands in the Spermonde Archipelago, comprising around 29,957 inhabitants. An elaborate formal organizational and rule framework supports its community-based MPA programme (CB-MPA). The organizational structure illustrated in Fig. 2 applies to all COREMAP MPAs in Indonesia.

COREMAP's CB-MPA programme has three levels of community workers:

- (i) Senior Extension and Training Officer (SETO), responsible for coordinating activities at the subdistrict level.
- (ii) Community Facilitator (*Fasilitator Masyarakat*, FM), responsible for supporting and facilitating the CB-MPA activities at the village level. The FM also acts as the liaison officer between SETO and
- (iii) Village Motivators (*Motivator Desa*, MD). Each village has a male and a female MD who are residents of the respective village. They facilitate the CB-MPA at the village level ([24], see Fig. 2).

The formal CB-MPA rules are part of the Coral Reef Management Plan (CRMP) valid for all islands in the Spermonde Archipelago where the COREMAP programme operates. A voluntary organization, the Coral Reef Resource Management Institution (*Lembaga Pengelola Sumberdaya Terumbu Karang*, LPSTK, see Fig. 2) is to locally implement the CRMP. Included in the CRMP are 11 Chapters of Village Regulations. Box 1 presents those regulations that concern CB-MPAs and village waters.

Implementation of the above listed COREMAP marine conservation rules was merely at the formal level—they were signed by local government representatives (head of sub-district and village heads) and are thus theoretically valid. However, on several of the researched islands, the existence of the rules was neither widely known nor were they applied on a regular basis, e.g. fishing took place in some NTAs. One main reason for this is

Box 1–Selection of village-level formal COREMAP CB-MPA rules.

Chapter 2 on the no take area (NTA) site. The NTA is a closed area. Only research activity is allowed after prior approval by the LPSTK (see Fig. 2) and the villagers.

Chapter 4 on legal and illegal fishing gears. Legal fishing gear in village waters are: hook-and-line, purse seine and traditional lift net. Bombs, cyanide and trawls are illegal.

Chapter 5 on extractive activities by outsiders. The term ‘outsider’ refers to people who live outside the respective village. Outsiders have to seek approval from the village authority for conducting extractive activities.

Chapter 6 on sanctions. Any violation will be subject to a fine according to village regulations. Three consecutive violations will be fined and the offender will be banned from any further extractive activities in the waters of the respective village.

Chapter 8 on the rights and responsibilities of the local community. The local community has rights and responsibilities in village environmental management. It is responsible for the monitoring and surveillance of the NTA, and is asked to discourage and discontinue any illegal extractives activities within the NTA.

Chapter 11 on conflict resolution. Any dispute will be resolved by discussion and negotiation at village level. If discussion and negotiation fail to produce consensus, local cultural norms shall be evoked. If these are not effective, the formal legal provisions will be used.

that the rules were not crafted by the local people themselves but introduced by the COREMAP project in one-off village level meetings, which were attended by a selection of people whose claim to speak for the whole village apparently was never established. When several of the signatories were asked about the document, they stated that it was only kept in the COREMAP district office but not in the island. Interviews with responsible staff indicate that lack of time and resources for participatory rule development were a major constraint. The resulting CB-MPA rules may thus have missed important local economic, social and cultural aspects. This reduces the chances for a locally grounded participatory implementation.

Under the currently operative CB-MPA programme, COREMAP provides funds for coral reef management and village infrastructure. Under the so-called “Village Grant”, one hundred million Rupiah (around €6700) per village can be allocated and managed by LPSTK (see Fig. 2). Three purposes may be supported by the Village Grant [24]:

- i. Village infrastructure and facilities (e.g. pier development, wave breakers, information centre, freshwater supply facility).
- ii. Conservation and rehabilitation measures (e.g. marine markers, information board, poster printing, mangrove plantation).
- iii. Capacity building for the village community (e.g. coral reef assessment training, financial management training and tourist guide training).

A second type of COREMAP CB-MPA funding, the Seed Fund, is a revolving fund for communities to provide start-up loans to individual islanders. Fifty million Rupiah (around €3300) is available per village. Each individual recipient receives a maximum loan of one million Rupiah (around €66.60). The Seed Fund is managed by a village organization called Savings and Lendings Unit (*Unit Simpan Pinjam*, USP), an extension of the regional Micro Financial Institution (*Lembaga Keuangan Mikro*, LKM) (see Fig. 2). Four people are appointed as chairman, vice chairman, secretary and treasurer. These people are appointed by SETO, FM and MD. The LKM workers’ salaries are paid from the interest generated by the loans [24].

COREMAP village-level activities under the CB-MPA programme include training, the provision of surveillance facilities and support to alternative livelihoods that will decrease pressures on coral reefs and resources. Various trainings had been provided such as training for teachers, gender training, and training for preachers. For surveillance activities, patrol boats, digital cameras,

binoculars, communication radios and snorkeling gear were provided. A computer and printer were also given to each village under the Village Grant scheme while support for alternative livelihoods was given under the Seed Fund scheme [24].

2.1.4. Status of COREMAP’s community-based marine protected areas/no take areas (CB-MPA/NTAs)

The level of local knowledge about CB-MPAs in the islands visited was low. While all of those who were involved with COREMAP activities knew something about the CB-MPA, over half (53%) of village interviewees were not involved with COREMAP and were not even aware that there was a marine protected area nearby. Even the 47% interviewees who stated they knew something about the CB-MPA were usually unable to explain its function—they tended to ask the researcher (W.B.) about it. It was difficult to obtain information on the MPA rules, even from local COREMAP participants. The researcher was told: “*I am not sure. The rules are in the district offices of COREMAP*”. If one person in a discussion group did have some information based on their affiliation with COREMAP, others appeared to simply repeat that person’s statements. Thus, although some people not involved with COREMAP stated that they knew about the MPA, this answer was ‘guided’ and hence does not necessarily indicate independent knowledge of the CB-MPA. Almost half (44%) of those who said they knew about the CB-MPA were influenced in this way [26].

Local acceptance of the no-take CB-MPA concept was mixed. About three-quarters of respondents stated their support for a non-extractive MPA. This included all members of COREMAP as well as 57% of those respondents who had not known anything about the local CB-MPA. The main stated reason for support was that a fish spawning and nursery ground is needed. Even fishermen who use destructive techniques gave this reply, although it was often unclear whether the answer was merely polite. Other reasons to support CB-MPAs were local food security and fishermen’s need for resource sustainability. However, 43% of those who were unaware of the CB-MPA did not support a non-extractive MPA since they saw neither its relevance to their own work nor any other reason for it (Fig. 3).

COREMAP funds to support local capacitation and livelihood mainly provided benefits to an influential minority. Resource access and decision-making influence were not open to the majority of villagers. Although according to the COREMAP rules, small loans available through the Micro Finance Institution should be distributed to the wider community by members of the

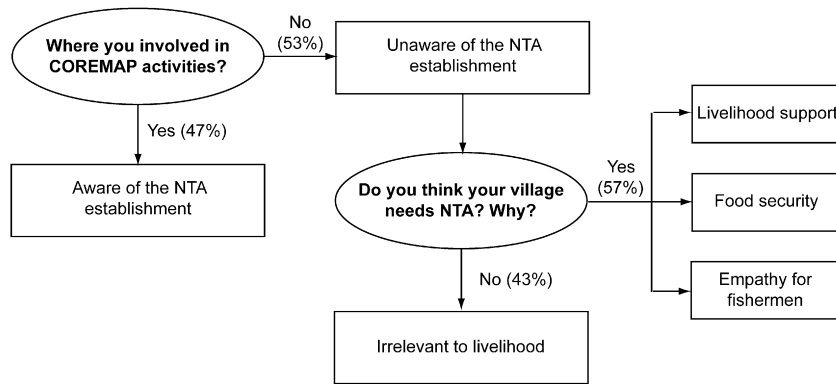


Fig. 3. Answers on NTA status. The 47% “aware of NTA establishment” include the “guided” answers of people who were not necessarily involved in COREMAP ($n=238$).

Table 1
Status of CB-MPA marker buoys in five islands of Spermonde [26].

No.	Island	Visit date	Status
1	Salemo	4th week of October 2008	3 markers remained
2	Sabutung	1st week of November 2008	No markers remained
3	Gondongbali	3rd week of November 2008	1 marker remained
4	Kapoposang	4th week of November 2008	No markers remained
5	Karanrang	3rd week of January 2009	The only remaining marker was floating away during the visit

community groups under the LPSTK, in some cases the group of recipients was re-arranged to include relatives of the LPSTK leadership at the expense of the wider community. The Village Grant for capacity building was primarily used for patrol boat and computer procurement, for the construction of Village Information Centres and for sports gear and uniforms.

None of the patrol boats, which were under the supervision of LPSTK chairman, was used exclusively for patrolling. Respondents stated that “*When the fishermen go out to sea, they will also patrol along the NTA*”. Seaweed farming, fishing and/or travel by the village chief or other village officers were other common uses of the COREMAP-MPA patrol boats. Clear agreements on boat maintenance did not exist, and in one case a broken boat was docked with no-one responsible for repairing it. The perception that the COREMAP patrol boat was provided for the LPSTK chairman’s or other village officers’ needs prevailed in the islands [26]. Those who received material assistance from COREMAP related their level of support for the CB-MPA to this. The village leader of one of the islands said: “*I was given a radio (Walkie-talkie). We expected a boat*”. Consequently, the no-take area in this village was without markers and reportedly subject to trawling and other extractive uses.

The Village Grant was not used according to the priorities voiced by the majority of residents. Much of it was privately appropriated rather than employed for more generally recognized community welfare [26]. No COREMAP grants were used for pier rehabilitation or wave breaker establishment—despite these being the two most common requests by villagers in our interviews. Seed Fund loans were used for purposes that had no direct relation to coral reef use such as to add to existing grocery stalls or to fund clothes trade. Access to Seed Fund money was obtained via private contacts with LPSTK and LKM members – public local announcements about loan availability were not made.⁷ While the COREMAP structure does include independent branches for programme execution and control (Fig. 2), there were cases of collusion between the two branches. In one island, the head of the LPSTK had close ties to the Community Facilitator

(FM) and Senior Extension & Training Officer (SETO). When the Village Motivator (MD) submitted a report to his superiors about irregularities in the LPSTK and its subgroups, this report did not reach the regional COREMAP office.

Local people appeared to increase their social status by involvement with the COREMAP programme, the ministry or the politician who locally promoted the CB-MPA. This “personalisation” of CB-MPA engagement overshadowed any personal, longer-term commitment of local people to the CB-MPA concept as such.

“*The new mayor gave me the responsibility [to protect the CB-MPA]*” said a village leader. However, long-term commitment beyond a project or political cycle was rare on other islands as well: “*I used to take care of the MPA. But that project is over*” (Statement from islander, from island with non-COREMAP MPA).

The boundaries of the designated CB-MPAs/NTAs were unclear. Marker buoys had shifted with the currents or disappeared with little local responsibility taken for maintenance. Table 1 describes the status of the markers in five islands. Each site had initially been provided with four marker buoys.

Even the village leader in the island with the best reputation for protecting the CB-MPA and who was known for personally sanctioning infringements by beating up rule-breakers in island waters said: “*The CB-MPA was put here by some college students. Last time, the signs were stolen a year ago, but the same thing happened before that also...*” No clear responsibility for marker maintenance existed.

The majority of respondents in our study villages who knew about the non-extractive CB-MPAs considered them a public authority programme, which provided benefits to a select section of the village population only. A fisherman who was not a member of the local COREMAP programme said: “*Every month there is a report [from COREMAP] to the government. I am afraid that*

⁷ Debtors from other loan schemes were officially excluded to prevent the repayment of previous loans from other loan schemes with COREMAP money ([26]).

my opinion and that of the COREMAP group differ. So I prefer not to make any statements". Another fisherman stated: "I am not part of the COREMAP group; I do not know the rules". In contrast, a leader from the same island argued: "We need resources (boats, radios, salaries) to monitor the MPA". The CB-MPA and associated support structure was clearly a source of money and materials for some villagers. The use of programme resources (village grant, loans, seed fund, etc.) did not occur in accordance with the preferences of the majority of residents or ecosystem users. Programme resources were privately appropriated or used according to the preferences of local elites rather than for more generally agreed objectives [26].

"As soon as the money was spent, people were not interested any more [in the CB-MPA]" (village head).

Not surprisingly, villagers considered the rules of CB-MPA as only relevant for the beneficiaries of COREMAP support. The fact that this support was unevenly distributed and not in accordance with majority priorities undermined COREMAP conservation objectives. There was no general community support to COREMAP objectives evident in the islands and some interviewees on one of the islands even talked about organising resistance to the restrictions imposed by COREMAP. Thus despite its elaborate, multi-level organizational structure that was carefully designed to support community capacitation and participation in marine protected area management, the success of the COREMAP CB-MPA programme has been limited in the studied islands so far. Since, at the time of our study, the COREMAP programme in the Spermonde Archipelago had only run for less than a year in the reported form, scope for improvement still exists. However, other forms of marine area management existed in the study area. It is to their analysis that we now turn.

2.2. Effective, non-formal ways of marine area protection

Effective or partially effective forms of marine area protection and management existed in our Spermonde study area outside the COREMAP programme. These fell into four categories: (1) incidental forms of protection and management, (2) traditions, myths and taboos, (3) powerful, well-connected interests in favour of conservation and (4) newly emergent rules.

2.2.1. Incidental protection

In incidental forms of protection, the protection effect on the marine area is circumstantial rather than intended. Such effects can be linked to the physical characteristics of a protected area or to the characteristics of the human communities associated with it. Thus, the proximity of a marine area to a larger town or a police station, the long distance of a protected site from markets or required inputs for production such as fuel and the inappropriateness of a site for locally prevailing fishing techniques reduced human utilization of marine areas. Box 2 lists interview quotations which indicate such incidental effects.

2.2.2. Traditions, myths and taboos

Traditional or *adat* type of management systems, which have been described for a number of areas in Indonesia, e.g. Panglima

Laot in Aceh [30] or *sasi* in Maluku [31], are not found in the Spermonde Archipelago. However, single taboos and myths that circumscribe or prevent the use of nature in particular locations do occur. These myths and taboos thus support the sustainable use of ecosystems and their resources. The protection effect occurs within the so-called "enchanted sphere" [32], often without the stated intention of protecting nature, rather than on the basis of any scientific understanding of human-nature dynamics [33–35]. Box 3 lists some examples of myths and taboos with a positive effect on marine area protection from the Spermonde Archipelago.

Local perceptions of specific marine areas as locations of dangerous spirits are also mentioned by Lowe [32] for coral capes the Togeian Islands in Central Sulawesi and are also common in North Brazilian mangrove and marine areas (M.G., personal observation).

Such prohibitions of nature use from the "enchanted sphere" need to be understood in their rationale and dynamics to judge their likely potentials of contributing to an increased effectiveness of formal marine area protection [37].

2.2.3. Influential interests in favour of conservation

Companies and individuals with coinciding commercial interests strengthened local marine conservation. In one island, an ex-military resort owner successfully supported the local implementation of conservation laws. In another island, which used to serve as a holiday retreat for foreign "beach guests" of a large nearby cement company, ecotourism values and environmentally-oriented sustainable nature use practices on land and under water were conspicuously prominent and impressively implemented. In a case elsewhere in Indonesia, mariculturists who believed that cyanide harms their seaweed cultures prevented poison fishing (J. Jompa, personal communication 25.4.2010).

2.2.4. Newly emergent rules

A fourth and very dynamic field of effective marine area protection and management are the locally constructed, non-formal rules. Rules and institutions emerge locally in response to altered demographic, technical or ecological conditions. Ecosystem users react to change with altered behaviour and societies react by designing new rules, not only in the formal (legislative) realm but also at the non-formal, locally constructed level. Interactions between fishermen in diverse and dynamic environmental settings provide opportunities for local rule construction [38]. Particularly in coastal areas with a large proportion of migrants from other ecological zones among local residents, long-standing local resource management traditions generally do not exist. Without customary, traditional management structures, newly emergent local rules come to fill the void between top-down, scientifically guided conservation frameworks and local rationales and realities [15].

In holistic systems theory, emergence arises from the capacity of systems to self-organize without external direction [39,40]. In ecological theory, emergence occurs where ecological interaction networks arise from scale-dependent self-organised interaction patterns [41]. In the analysis of complex social systems, group phenomena are analysed as emerging from communication pro-

Box 2—Interviewees in the Spermonde Archipelago describing examples of incidental protection of marine areas.

"Mini-trawls do not go there (to the CB-MPA in one of the islands), they are afraid to damage their nets on the coral".

"It is too close to the mainland (i.e. to the police), people are afraid to fish with illegal methods here".

"People from [the neighbouring island] come to fish here, but only using lines. They are afraid to use illegal techniques because they fear the police [because of proximity to Pangkajene town]".

Box 3—Some taboos and myths affecting the use of marine areas and resources in Spermonde Archipelago.

The *penjaga taka* (guardian of the reef), *penjaga laut* (guardian of the sea), *hantu laut* (sea ghost) *penghuni taka* (inhabitants of the reef) and *setan je'ne* (water demon) are part of the cosmology of island inhabitants. Martens [36] reports that “only one informant denied the existence of these spirits” and that “... the good will of these spirits is believed to be crucial not only for the physical well-being of the fishermen but also for their economic performance” (p. 93). “The *penjaga taka* are believed to live in the largest corals... As the reefs are destroyed, these spirits also disappear. Where the reefs are dead there are no *penjaga taka* any more. An offering the *pa'rappo* (gift to a superior) is prepared” (p. 93). Even in the island which was most diverse culturally and least inclined towards protecting the marine environment, the belief that each coral reef has its guardian prevailed (field notes, May 2009).

On a fishing trip, the captain asked for permission to fish from the guardian of the coral reef (*Penjaga Laut*) by throwing a pack of cigarettes, bananas, eggs and *sirih* leaf (betel leaf) into the water. He also threw water on their boat three times, then washed his head with water three times.

A fisherman said that bananas and eggs are given to the *penjaga laut* to protect fishermen from danger (field notes, May 2009)

In the island of Bonetambung, people believe in a monster octopus shaped like a house with red eyes (*gurita raksasa*) which grabs and sinks boats. In 2006 a ship was said to have been sunk this way. Therefore, fishermen are afraid to go fishing at night in certain areas (e.g. Papandangan island). Pak U., a former sea *punggawa* (In the *punggawa-sawi* relation *punggawas* (capital owners/traders of marine products) offer security, loans and emergency help to *sawis* (workers) in exchange for loyalty and for the supply of marine products below the market price) reported that “people say that Bonetambung fishermen saw this”. Now fishermen from Bonetambung do not go to that area (field notes, May 2009).

Pak B. tells a story about a huge alligator (bigger than a *Jolloro* boat) in a hole in the sandbanks between Saugi and Sagara islands (a place called *Gudong Empang*). Some people have seen the alligator at low tide on special days. People believe that the alligator is half-human because it has five toes and throw cigarettes to it to appease it. It comes out on Sundays, Thursdays and Fridays. It does not attack people but people are afraid to catch fish near there (field notes, May 2009).

cesses among individuals [42]. Humans regulate their relations to nature in accordance with their cultural systems. Emergence is a key characteristic of human-nature relations in the institutional realm [43]. While formal rules and laws are more a product of cross-scale institutional interplay between national resource regimes and powerful non-resident stakeholders [44] while local interests play a minor part, local “rules in use” are much more directly the result of self-organised emergence in accordance with local socio-economic and cultural features [34]. The local rules which are applied “on the ground” thus develop as ecosystem users adapt to social and ecological conditions via trial and error. Emergent, locally constructed rules are therefore usually well-understood locally and complied with, but often remain in the non-formal realm [44,45].

In geographically more remote locations, such as the Spermonde islands, and in societies where the nation state is institutionally weak, the emergence of non-formal rules to deal with change is a particularly strong influence on social-ecological change patterns.

A number of institutional arrangements in Spermonde Archipelago can be classified as locally constructed and newly emergent. In our study area, these are:

1. locally agreed temporary full or partial closures of fishing grounds;
2. territorial subdivisions (with sticks or flags);
3. a number of innovative arrangements to share catches and
4. self-defined “Island exclusion zones” subject to locally constructed use rules.

All these non-formal coastal management rules have developed outside and parallel to formal legislative frameworks, in response to ecological, economic, technological or demographic change and apparently in isolation from formal institutional arrangements such as the COREMAP CB-MPAs described in Section 2.1 above. We will now present three examples in more detail.

2.2.4.1. Emerging territoriality in fishing. “The sea is open to all”, i.e. *mare liberum* [46], was the norm most frequently mentioned by Spermonde islanders in discussions about ownership or use rights to marine territory. However, fishermen in a temporary fishing camp on the uninhabited island of Jangang-Jangang also explained that people from all corners of the Spermonde Archipe-

lago regularly came to fish in the areas surrounding this remote island. “...because the island is not inhabited, there are no local rights restricting fishing”. A leader also stated that “...if a village settlement started to appear here, we would have to stay further out...” (Group interview in Jangang-Jangang, May 2009).

In the Spermonde islands, competition for fish is increasing, catch is falling and most good fishing places are now far from the inhabited islands. All interviewees reported that these better fishing spots officially “belong to everybody”. However, an incipient concept of local territoriality is also mirrored in statements such as:

No-one owns the sea but outsiders may come into village waters only with permission.

Fishermen from several villages stated that reefs and reef flats around inhabited islands are island territory but that other “outside” marine areas are open to everybody. Some local leaders had decided that only islanders may fish and use traps around their island, and that outsiders may not do so unless they have permission. The waters around one island were open to anyone who used non-destructive methods as defined by the local leader. The right of local communities to define rules for their territorial waters is actually confirmed under the COREMAP rules (see Box 1).

Fishing technology affects the character of such emerging territoriality. For blast fishermen in the Spermonde Archipelago, the *rumpon*, a fish attracting device, also functions to claim the right to a fishing spot. Fishermen install simple flags on the tops of their *rumpon* to mark their areas. The owner of a *rumpon* also has the right to bomb the area surrounding it. The convention is that whoever bombs fish surrounding another person's *rumpon* must obtain the *rumpon* owner's permission first and must divide the catch so that the owner of the *rumpon* gets two thirds of the total [47].

Temporary gear restrictions in selected marine areas are further evidence of an emerging territoriality in Spermonde. A Saugi island fisherman reported that “*Lanra* (gill-net) fishermen put markers on their areas for the day. *Renreng* (mini-trawl) fishermen then do not enter those areas during that time” (but fish there at night). According to one informant, this temporary gear restriction was no longer effective because decreasing crab catches were increasingly forcing the fishermen to fish during night and day time. A flag now served as the territorial division between gillnet (*lanra*) and minitrawl (*renreng*) areas.

2.2.4.2. *Newly emerging rules surrounding blast fishing.* The use of explosives to catch fish (“bomb fishing”) is reported to have begun in the colonial era of Indonesian history. Different local stories pinpoint either the Dutch or the Japanese as having introduced the technique (see also [47]). Since blast fishing is illegal, the rules which guide it have emerged as the result of self-organised, interconnected social, technical and ecological dynamics. Quite clearly, blast fishing is not conservation-oriented. Nonetheless, an analysis of the rules emerging around this activity elucidates the local rationales surrounding marine resource use and conservation. Some of the rules surrounding blast fishing in the Spermonde Archipelago are:

- Bomb fishers do not operate if divers engaged in life reef food fishery are operating in the area.
- Bomb fishers share their catch with other “non-bombing” fishermen present in the area. Fishers’ boats which follow bomb fishing boats have a right to a share of the fish collected after bombing. In some areas, the species not targeted by bomb fishers can be claimed by locally present “non-bombing” fishermen, in other areas all catch is pooled and divided between those present in a bombed locality, with extra shares allocated to those who actually did the bombing [47].

The above rules were locally developed and they are complied with. The preparedness of fishermen to engage in further institution-building was also clear: “*If the government gave us the responsibility, we would zone for bombing, cyanide and hand lines – so that there is less interference between them. But we would need support...*” (statement of a leader in a meeting with fishermen in the fishing camp on the uninhabited island of Jangang-Jangang, May 2009).

1.1.1.1. *Self-defined “island exclusion zones”.* The prevailing norm in Indonesian marine areas is open access. The sea is open to all (*mare liberum*) is the first rule mentioned by fishermen. “*There is no ownership, everybody can enter the sea*” (fisherman, about 50 years old, March 2009).

In the current context of strong demand from regional and global demand for marine products, this causes sustainability problems. In one island known throughout the Spermonde Archipelago for the destructive fishing techniques used by its resident fishermen, the consensus of a fishermen’s meeting was that “*If someone will buy it, we will take it from the sea*”.

However, upon closer questioning, a number of clear deviations from the open access norm become apparent in Spermonde:

Residents are laying claims to the waters surrounding their island. “*Rules are made by the people from this island. No bombs or cyanide are allowed in order to protect the island*”⁸ (fisherman, about 50 years old, March 2009).

In a small island located close to one of the centres of destructive fishing, a local conservation ethic covered both the land (“*The old coconut trees are passed on to us from our ancestors, and it is forbidden to cut them*”) and the marine areas “*No fishermen fish around the corals, and outsiders are not allowed to come in. If outsiders come, they are chased off by villagers. Some outsiders asked for permission to bomb previously, but the villagers didn’t allow it*” (Interview with village head, May 2009).

In another island, where the COREMAP CB-MPA zone had been conspicuously neglected, the local leader strongly fought against destructive fishing in the IEZ waters surrounding the island.

That these observations are not exclusive to our study area is shown by Lowe [32] who describes an attempt by village leaders

in Central Sulawesi to arrest non-local fishers using cyanide to defend “local territorial claims to fish” (p. 136). Local demands for “villagers to have the right to defend their territories from outsiders who use harmful methods to meet short-term interests” (p. 152) underlie such emerging territoriality concerning marine areas adjoining inhabited coastal areas.

We have denominated areas as “self-defined island exclusion zones” (IEZ) that surround inhabited islands and are protected on a non-formal, locally constructed institutional basis. In the Spermonde islands, these territories are historically and institutionally outside the formal MPA rule framework. The rules that protect them have emerged in the local context and they are respected and locally enforced. Where IEZ overlapped with the CB-MPA no-take zone of a village, the latter benefited from the non-formal local rule framework of the former.

Interviewed islanders made it clear that, in contrast to the externally designed MPA rules, in the local IEZ, “*Rules were made... before the CB-MPA was put into place and local people made the rules themselves*” (fisherman, about 30 years old, May 2009). The COREMAP rules (Box 1) implicitly support locally-evolved IEZs by allowing for the local management of island waters.

Statements indicating the existence of such emergent self-defined island exclusion zones were made on several other islands. Thus, although the prevailing local rhetoric pronounces the sea and its resources as open-access to all (i.e. *mare liberum*), probably also in defence against formal access regulations, which protect more powerful non-local interests [32], there was a definite and frequently confirmed sense of local ownership over the waters surrounding inhabited islands. On some islands, this was said to cover about 3 miles (4.8 km) from the island into the sea, in line with recent legislation [48] which allocates 12 nautical miles starting from the coastline towards the sea to the province and the right to manage 1/3 of this to the district.

Local rules on island exclusion zones differed in line with the main locally used fishing technology and, where there were several fishing techniques in use, in line with the externalities generated between these. For instance, hand-line fishermen on Langkai Island prohibited cyanide fishing in the waters surrounding their island reportedly because divers chase off the fish and cyanide harms the resources. In one island, where villagers use low-impact gear (bamboo traps (*bubu*)), outsiders were reportedly not allowed at all in the local IEZ. This island received no formal support in enforcing their strict local no-entry rule to the IEZ; they “chased off” intruders on an entirely self-initiated and self-organised basis even when conflicts with other villages and gear damage occurred. Similar dynamics were reported in locations where locals employed hand-lines in fishing.

In another island, trawling is the major fishing technique. This would be endangered through bombing or poison fishing. With reference to the local IEZ, a resident reported that “*people can fish here but cannot use bombs or poison. Then we would kick them out*” (field notes, March 2009). While the surrounding waters of this particular island were probably never a target for bomb or poison fisheries, this statement indicates the way local rules evolve in line with local priorities.

3. Conclusion

The first part of this article outlines a sophisticated and well-structured formal institutional framework which was explicitly designed to involve fishing communities in marine protected area conservation. Despite internal checks and balances and elaborate provisions for local involvement, this formal institutional framework shows some serious shortcomings in implementation. The second part of the article identifies some non-formal marine

⁸ The repercussions of bombs can structurally damage island houses.

conservation and management institutions, which are being implemented outside of and often parallel to the formal rule framework of the official conservation programme in the same geographical area. The article points to the importance of locally constructed, non-formal rules for on-the-ground outcomes in marine conservation and management. While our analysis needs deepening with further research, a number of conclusions can be drawn from this initial juxtaposition of parallel institutional approaches in marine conservation and management:

- **Distributive justice:** It is important to ascertain who bears the costs and who obtains the gains from formal MPA establishment and operation. This relates both to material (loans, grants and equipment) and to non-material (power and status) benefits. Approaches to distributing loans and seed grants need to be supported by procedures which are locally considered open and fair.
- **Transparency and representativeness:** At the local level, the development of rules and programmes, staff selection and training needs to be undertaken in an open, inclusive way that explicitly involves marginalized groups rather than reinforcing the influence of those in power. The exclusion of distinct sections of the local population is likely to produce undesirable conservation outcomes.
- **Local culture:** Myths and taboos surrounding the community use of marine resources need to be identified and their functionality for MPA design examined.
- **Comprehensive participation:** An active role for the resource user community is needed along every procedural step from the conceptualisation through to the implementation of conservation measures. This includes a more systematic approach to inviting islanders in the NTA siting process and ensuring that marker buoy placement and maintenance are locally rooted and, not least, that ample time is allocated to local participation. Linking the siting of no-take-areas to scientific data is also vital as a part of collaborative learning between scientists and local fisherfolk.
- **Linking knowledge systems:** Scientific results, local ecological knowledge and other local priorities need to be understood and effectively linked. Exchange visits between successful innovative protected area initiatives and communities are also needed. Dutton et al. [2] mention a successful coral community-based reserve in North Sulawesi which has sparked off at least 46 others in Indonesia. Where communities are enabled to observe and discuss success elsewhere, they take the first step towards locally adapting successful innovations to their own conditions. With over 6000 coastal villages in Indonesia, innovative strategies to deal with coastal and marine conservation and development and in particular with the implications of change in coastal and island locations are likely to emerge from the self-organising locally diverse change patterns.
- **Locally emergent rules:** A thorough examination of the rationales and lessons to be drawn from locally emergent rules is needed. Whether longer-standing, traditional forms of community management of marine resources exist or not, non-formal rules need to be identified, understood and integrated into MPA design. Locally evident phenomena such as emerging territoriality and innovative rules in response to technological change need to be better integrated into formal institutional frameworks [15]. The current focus on static institutional frameworks where “one rule serves all” needs to be replaced with a form of resilience management which recognises and uses the self-organising forces of social-ecological systems to support sustainability. If the principles of “working with nature against poverty” [49] as well as “with

people for nature” are simultaneously pursued, this may generate a creative tension between the *emergence* of non-formal rules and the *design* of a formal institutional framework to guide a social-ecological system into desired directions [50].

One remote island in Spermonde Archipelago shows how this might work. Emergent rules which embody local knowledge and effective law enforcement are complementing each other into effective MPA management in the island of Kapoposang. At the very outside tip of the Spermonde Archipelago, this island is far from any strong land-based implementation capabilities of public authorities and part of a Marine Tourism National Park. Park rangers are based on the island. The elders on this island are particularly respected and local zoning of fishing areas is effectively implemented [26]. Rule violators, especially cyanide fishers, are controlled since the local community confiscates *hookah* (diving compressor and attached hose) imposing a painful financial loss on apprehended cyanide fishers. Local rules are part of an integrated formal-non-formal institutional complex here and, as a result, the local community cooperates effectively with National Park rangers to the point of even co-financing local MPA surveillance activities. Where new formal rules, such as those drawn up by COREMAP, complement locally-evolved institutions, their acceptance and effectiveness is likely to be much higher. A further example of effective complementarity between locally emergent rules and formal institutional frameworks in conservation is the recent official demarcation of the informally evolved “Island Exclusion Zone” (IEZ) in the island of Karanrang (field interview, April 2010). Positive local reactions to this facet of the COREMAP programme suggest future potentials.

Further investigations into local marine protection and management rules that are emerging “from the bottom up” are needed. Even if they do not always lead to successful conservation, an improved understanding of locally constructed rules that are effectively implemented and locally sanctioned can contribute to the quality of formal MPA management and design. Non-formal emergent rules therefore need to be identified and examined. This is especially important for areas without explicit customary marine management traditions where the emergent non-formal institutional set-up needs to fill a particularly large void in the non-formal adaptive core within the formal MPA framework. In this context even effective rules which are achieving undesirable outcomes need to be examined for underlying rationales and incentives.

A thorough understanding of emerging local institutional patterns and an incorporation of the rationales which underlie them into the design of formal coastal management and conservation may go a long way to improve the quality of the large expansion of MPA area planned for the Indonesian Archipelago and for other parts of global coasts in future years.

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