



Law enforcement and conservation at Bunaken National Park, North Sulawesi, Indonesia as perceived by the local coastal communities

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Abstract. This paper describes the status of enforcement at Bunaken National Park (BNP), North Sulawesi, Indonesia. Using informal interviews with 66 respondents, fishery laws are still poorly implemented partly due to lack of participation among stakeholders. Enforcement of fishery laws and regulations at Bunaken National Park remains problematic, mainly due to lack of cooperation from the coastal communities. More than half (53%) of the respondents agreed that they are aware of the conservation efforts at BNP (mainly due to mass media such as television and trusted public figures) as well as pertinent laws and regulations (e.g. zoning and fishery laws). However, most respondents (73%) claimed that they disagree with these laws and regulations and even viewed these as not profitable to fishers and not part of the solution to conserve BNP. In addition, willingness to comply with fishery laws is still low based on interviews with respondents. Willingness to participate with BNP's enforcement body was also notably low (< 25% of the respondents). As expected, all respondents agreed that BNP lacks facilities to enforce the laws and regulations. A brief comparison of management histories between Bunaken National Park and few successful examples such as those in central Philippines is also provided.

Key Words: regulation, fishery, zoning, participation, poaching.

Introduction. The marine biodiversity of Bunaken National Park (BNP) has been described by a number of studies. For example, Turak & DeVantier (2003) listed 390 species of reef-building corals. Moreover, it was noted that the present status of the coral reef condition in BNP are generally in a moderate Life Form Category (Kusen & Tioho 2009). The molluskan fauna of BNP is highly diverse with at least 323 species (Burghardt et al 2006). There were 325 species of reef fishes identified by Du et al (2016). Since its establishment in 1991 by the Ministry of Environment and Forestry, Bunaken National Park (Taman Nasional Bunaken) is well-known as a major tourist destination in Southeast Asia. In 2006 alone, a total of 32,000 visitors (10,229 foreign) were reported with total revenue of Rp 1,395,158.00. Dive tourism, which depends on the conditions of marine environment, is one of the main tourist activities at BNP (Davis 2005; Hakim et al 2012).

Live hard coral cover ranged from ~10% to > 75% (Turak & DeVantier 2003; Fuad 2010). However, with increasing tourist arrivals coupled with increased fishing pressure from local fishers and burgeoning human population (> 500,000 people in Manado City alone), managing BNP is a huge challenge (Hakim et al 2012).

A number of studies tackled the socio-economic and management aspects of BNP (e.g. Sievanen 2008; Berliarang & Fang 2013). Marine conservation at BNP began in 1991 with biological effects described by DeVantier et al (2006). However, Christie (2004) described the case of BNP as an example, along with other cases in Southeast Asia, of a biological success but a social failure.

In this paper, the authors investigated the status of enforcement at BNP as perceived by randomly selected respondents. In addition, the information contained in this study is hoped to stimulate more research as to how BNP enforcement can be improved.

Material and Method

Description of the study sites. Bunaken National Park is located 1°40'N, 124°39'E, in northern Sulawesi, Indonesia (Figure 1). It has a total area of 79,056 hectares of land and marine area (BNP). As already pointed out, BNP is one of the world's leading tourist destinations. Since the focus of this research was to gather impressions from community members as to how they perceive BNP in terms of management and enforcement, interviewers precluded tourism operators (e.g. dive shops) as they will be studied separately. Thus, representative respondents from the following villages were randomly selected: Bunaken (N = 21), Alung Banua (15), Arakan (10), Manado Tua 1 (10), and Manado Tua 2 (10).

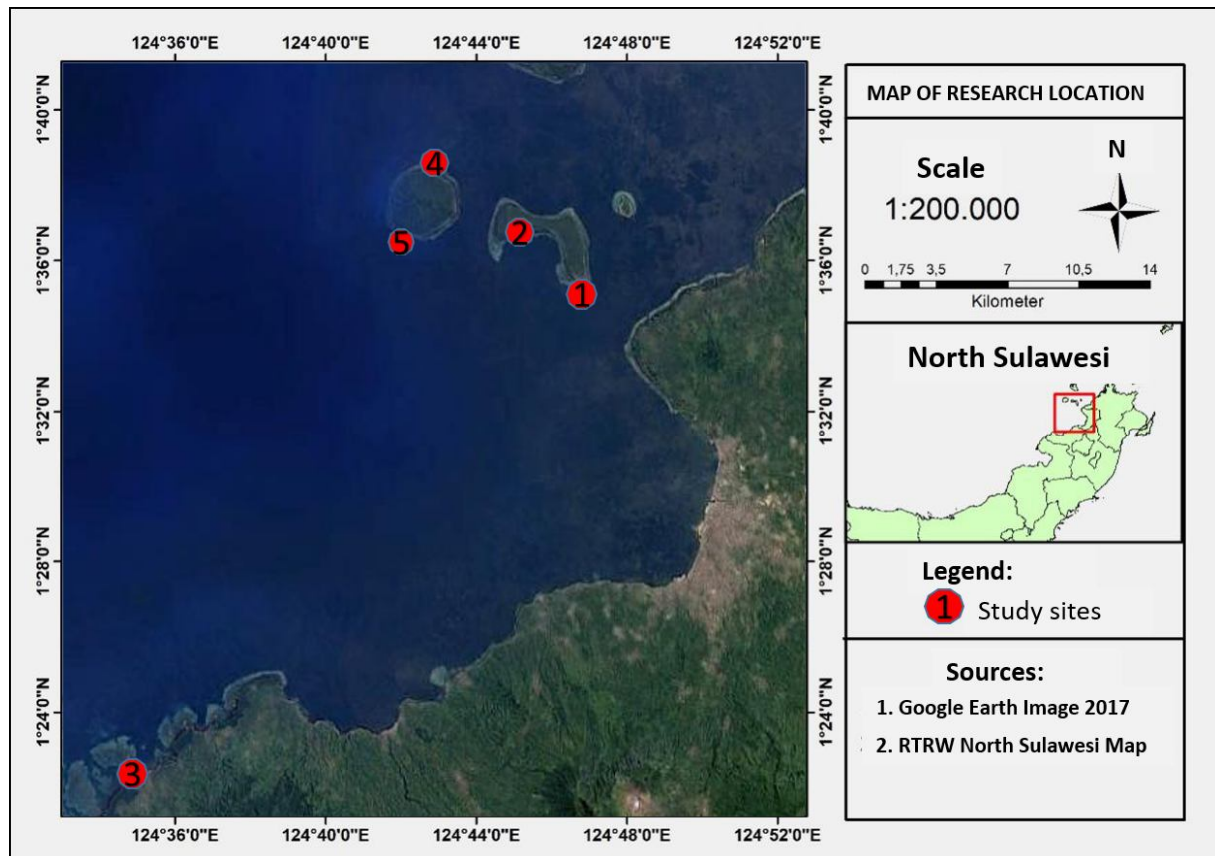


Figure 1. Map of Bunaken National Park showing the sites visited during data collection: Bunaken (1), Alung Banua (2), Arakan (3), Manado Tua 1 (4), and Manado Tua 2 (5).

Data collection and analyses. A total of 66 respondents were interviewed from August 08-09, 2017. The interviewers were trained in handling interviews and made sure that the key questions were familiarized prior to each interview. In all cases, interviews were semi-structured and free-flowing and questionnaires or notebooks were not shown so as not to intimidate the subjects. Upon arrival at the interviewers' house/station and in between interviews, data were filled-up and compiled.

Aside from basic descriptive statistics, the authors performed non-parametric tests such as the Cochran's Q test (with α level at 0.05; $df = k-1$) to determine whether there were significant differences in responses of respondents across similar questions. P-values and Q-Critical were computed using the CHIDIST and CHIINV functions in Excel (as described by Siegel & Castellan 1988 and <http://www.real-statistics.com>). Cochran's Q test was chosen due to binomial responses such as "yes" or "no" or "agree or disagree" and "trusted or not trusted" and questions were asked more than two times for each respondent. These responses were coded as 1s for "yes" or 0s for "no" responses. The form of the equation is given below:

$$Q = \frac{(k-1) \left[k - \sum_{j=1}^k G_j^2 - \left(\sum_{j=1}^k G_j \right)^2 \right]}{k \sum_{i=1}^N Li - \sum_{i=1}^N Li^2} \quad (\text{Equation no. 1})$$

where: G_j = total number of yes or agree responses in the j th column;
 k = number of grouped data;
 G = mean of the G_j ;
 Li = total number of yes or agree responses in the i th column.

Results

Profile of the respondents. The 66 key respondents were from the following villages: Bunaken ($N = 21$), Alun Banua (15), Arakan (10), Manado Tua 1 (10), and Manado Tua 2 (10). There were 37 and 29 male and female respondents, respectively. The breakdown of gender distributions of respondents are shown in Figure 2. Of the 66 respondents, 29 (43.94%) were local fishermen while the remaining 37 (56.06%) non-fishers described their occupation as housewives (14), students (11), entrepreneurs (6), PNS (civil Servant) (6).

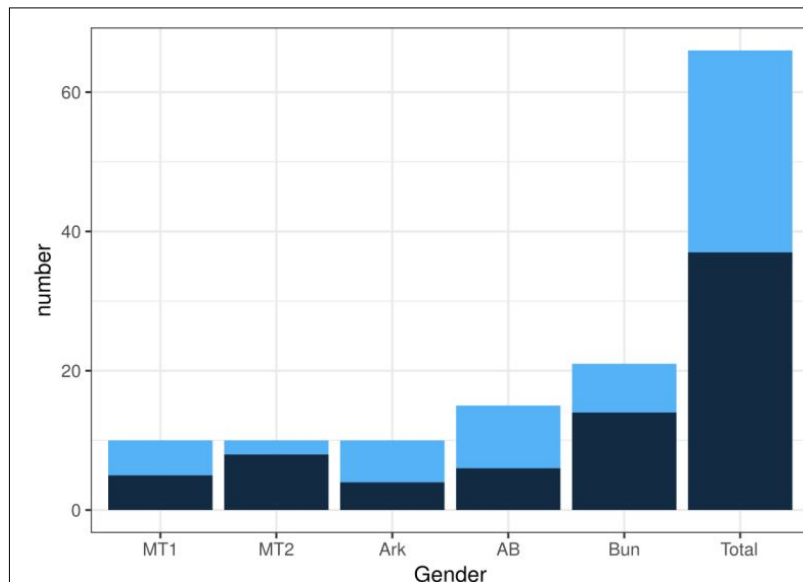


Figure 2. Gender (dark blue: males; light blue: females) of respondents across the villages of Bunaken National Park (MT1 - Manado Tua 1, MT2 - Manado Tua 2, Ark - Arakan, AB - Alung Banua, Bun - Bunaken).

Figure 3 shows the educational attainment of the respondents: SD (elementary school) (54.5%), followed by SMA/SMK (High School) (34.8%), university or higher education (6.1%), while only 4.5% indicated as not educated.

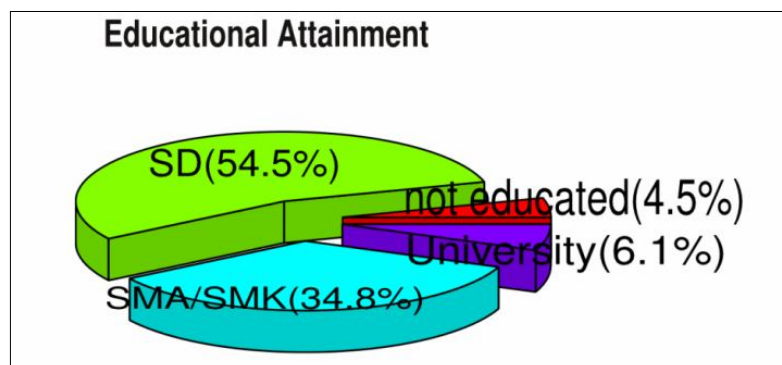


Figure 3. Educational attainment of the respondents (SD-elementary school, SMA/SMK-High School).

In terms of the age structure, the respondents of this study were mainly 17-25 years of age followed by ages 36-45, although younger (17 below) and older (56 above) age categories were also represented (Figure 4).

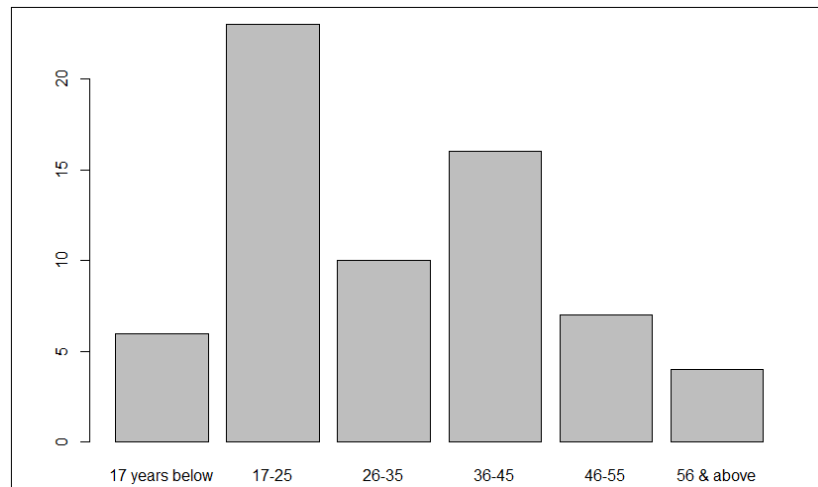


Figure 4. Age distribution of the 66 respondents.

Awareness of conservation efforts at Bunaken National Park (BNP). Of the 66 respondents, more than half (35 = 53%) identified television as their main source of information with regards to marine conservation efforts at BNP (Table 1). Other media sources such as radio (10.6%) and newspaper (1.5%) were less perceived as sources of information. Government agencies thru designated officers (21.2%) as well as personal sources (friends/family/colleagues) were also moderately rated perceived as important sources of information. The respondents were also asked whether non-media sources (e.g. public figures, officers, and fishermen) were trusted or not (Figure 5). Cochran's Q test revealed a significant difference (p -value < 0.05; Q-Crit = 15.51). Interestingly, as shown in Figure 5, high profile persons such as Regent (83.3%), Camat (72.7%), Lurah (62.12%), Police (54.55%), Manager of BNP (59.09%) as well as non-government organizations (77.27%) were perceived as trusted sources of information while the Department of Fisheries (21.21%), head of neighbourhood (27.27%) were rated as less trusted or neutral, even lower than local fishers (30.3%).

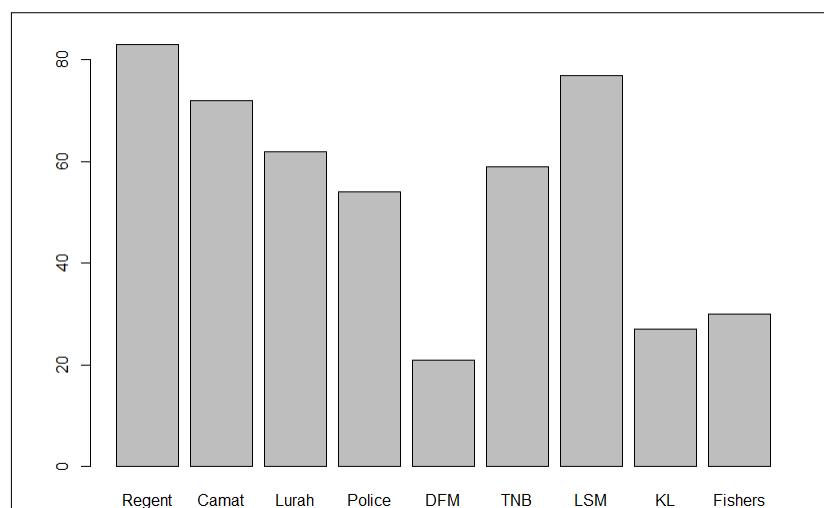


Figure 5. Reliability (%) of sources on marine conservation efforts at Bunaken National Park (Regent - Mayor; Camat - District Head; Lurah - village chief; DFM - Dept. of Fisheries and Marine; TNB - Manager of Taman Nasional Bunaken/BNP; LSM - Lembaga Swadaya Masyarakat or non-government organizations; KL - Kepala Lingkungan or Head of Neighbourhood).

Table 1

Sources of information about marine conservation efforts at Bunaken National Park

<i>Source of information</i>	<i>Number</i>	<i>%</i>
Friends/family/colleagues	9	13.6
Government/local government officer	14	21.2
Newspaper	1	1.5
Radio	7	10.6
Television	35	53.0

Awareness of zoning and fishery laws. A total of 56 (84.85%) respondents were aware of the zoning implemented by BNP while the remaining 10 (15.15%) claimed they have not heard or unaware of the said zoning system. Majority of the respondents (53 (80.3%)) respondents identified themselves as aware of Law no. 27 of 2007 and 15 (22.7%) persons were aware of Law no. 1 of 2014 and Regulation no. 1 of 2017. According to the respondents, they have learned about these laws either directly disseminated by the local government (16.7%) or through the newspaper (7.6%).

Awareness of zoning and the two laws above were asked separately with “yes” and “no” responses. Cochran’s Q test, revealed significant difference (p -value < 0.05) in the “yes” (meaning = aware of each regulation). This further means that the respondents have varied perspectives as to they are aware of the zoning and the two laws.

Of the 53 persons aware of Law no. 27, s. 2007, only 14 (26.42%) said they agreed with the law. Of the remaining 52 persons who did not agree with the law, 38 (73.08%) claimed that these regulations are not profitable to fishermen, in other words, not fair. Another 11 (21.15%) persons stressed that such prohibitions are not part of the solution. Only one person (1.92%) claimed that these laws actually sided with the private sector and not for them.

Willingness to comply with laws and regulations. When asked if they are willing to participate or to comply with the fishery laws mentioned above, only 14 (21.2%) said they are willing while 25 (37.9%) said they are not yet willing to comply and another group, 24 (36.4%) said they are not driven at all.

Enforcement effectiveness. A total of eight key questions are shown in Table 2. It is noteworthy that despite the relatively high percentage of respondents who disagreed with the pertinent laws, they rated management indicators relatively high (86-100% agreed), including punishing perpetrators. However, one should note that one question included, which all of the respondents agreed, is the lack of sufficient facilities to enforce the no-take areas (core zones).

Table 2

Management criteria for enforcement effectiveness as perceived by the respondents

<i>Management criteria</i>	<i>Number respondents agreed</i>	<i>%</i>
Clear plan to manage no-take areas	63	95.5
Local fishermen regularly participate in management and decision-making	64	97.0
Sufficient funding	61	92.4
Communities know the no-take areas	64	97.0
Perpetrators punished	66	100
Regulations on the banned catch areas are clear and fishermen understands	57	86.4
Lack of infrastructure, equipment, and facilities to enforce the rules of no-catch areas	66	100
Supervision and management of no-catch areas is effective	62	93.9

Willingness to participate in enforcement. In terms of the respondents' willingness to participate in enforcing laws and regulations at BNP, it was evident that only 15 (18%) and 12 (23%) of the respondents (Table 3) are willing to participate in the supervision of the no-catch areas (= core zones) and to take part in a patrol team of BNP or police, respectively. Moreover, only 1-2 persons said they are willing to report or capture violators or even to make his/her own patrolling/surveillance. Notably, the latter initiatives are understandably risky and time consuming, considering about half of the respondents are women.

Table 3

Key questions for respondents' willingness to participate in enforcement of BNP

<i>Key questions</i>	<i>Agreed</i>	<i>%</i>
Are you willing to:	15	22.7
- participate in the supervision of no-catch areas (areas/islands that are not allowed to catch fish)?		
- report violators to BNP authorities?	1	1.5
- capture violator?	1	1.5
- take part in a patrol by Bunaken National Park / Police?	12	18.2
- make your own patrolling/surveillance?	2	3.03

Discussion. The main implication of this study is that enforcement of fishery laws and regulations at Bunaken National Park remain problematic, mainly due to lack of cooperation from the coastal communities. This study also showed that willingness to comply with fishery laws is still low based on interviews with respondents. Willingness to participate with BNP's enforcement body was also notably low (< 25% of the respondents). It can be recalled that Berliarang & Fang (2013) highlighted a range of management problems in BNP, including poor management planning, lack of management intervention and inadequate monitoring.

As described by Christie (2004), the management history of BNP was unique compared to most marine reserves in neighbouring countries like the Philippines. BNP was declared as a protected area (as a national park) in 1991, principally by the Indonesian government. This suggests a top-bottom approach. Hind et al (2010) argued that, approach such as this, which is centralized in terms of management, has several disadvantages such as not representing the local communities. Alcala & Russ (2006) described the history of Sumilon Marine Reserve in central Philippines which, like BNP, initially established by a national government agency in 1974.

The management histories of BNP and Sumilon Marine Reserve were a strong contrast to Apo Island Marine Reserve in the Philippines, which is probably the one of the world's well-documented community-based marine protected area. This was initially established in 1982 by the local community with technical support from Silliman University led by Dr. Angel C. Alcala, after realizing the disadvantages of a centralized top-bottom approach used in the management of Sumilon Marine Reserve. When the local town mayor of Oslob decided to end the long-term lease agreement between the LGU and Silliman University the reserve was fished out by the local fishers (Alcala & Russ 2006).

Problem of poaching at BNP. Despite enforcement of fishery laws, catching *Maming* or Napoleon/humphead wrasse (*Cheilinus undulatus*), which is considered an Endangered species by the International Union for the Conservation of Nature (IUCN 2017), still persists. This was partly due to the fact that officers and the fishermen do not know how to identify the fish species. Moreover, they do not know size limits (banned), what period/month that the fishes cannot be caught. Zonation remains unclear resulting to further exploitation of marine resources.

Poaching is still rampant at Bunaken National Park, especially near the boundaries. Mostly, fishers stationed their fishing boats outside the boundaries of no take zone but the fishermen, as free diver use *potas* to poison the fishes hiding in the coral, resulting to bleaching. Aside from these isolated accounts, certain fishers occasionally catch dugong

(*Dugong dugong*), another endangered marine mammal (IUCN 2017). The fishermen stressed that traditionally, they were already extracting marine resources even before the creation of BNP.

Lack of community participation. The apparent lack of participation among local community members might be a result of the top-bottom approach in management at BNP. Chassels & Bucol (2011) also pointed out that one of the reasons why community members are hesitant to participate in conservation efforts, including enforcement, is social dichotomy. In such case, marginalized stakeholders would feel that they are not part of the conservation program or project as they perceived it as not representing their interest(s) or concern (e.g. fishing).

Conclusion and Recommendations. As far as can be ascertained, based on the results of this study, community members seemed reluctant in terms of their willingness to participate in enforcement activities implemented by the BNP despite intensive education campaign through local mass media (television, newspapers, etc). One plausible explanation is the lack of involvement of stakeholders who have been marginalized as a result of zoning and fishing restrictions. Another factor might be the establishment and management histories of BNP since management was principally initiated by the Indonesian national government (top-bottom approach) unlike in other well-known cases (e.g. Apo Island Reserve in central Philippines) where protection was initiated and even to this day actively participated by the local communities.

While rules and regulations have been implemented at BNP (though there are limitations in enforcing such laws), it appears that local community members (fishermen in particular) lack the willingness to comply with the laws and more importantly lack the motivation to participate in law enforcement activities. We recommend that a thorough socio-anthropological study be carried out with the primary goal to gain a much wider perspective from key community members. In such way, management of BNP can be refined and therefore minimizing bipolarity of stakeholders (e.g. small-time fishers).

Acknowledgements. We are grateful to acknowledge the encouragement and support of all the faculty members in Legal Study Program, Faculty of Law UNSRAT. We would like also to extend our appreciation to the local coastal community in Bunaken National Park who participated during this survey.

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Received: 15 September 2017. Accepted: 11 November 2017. Published online: 24 November 2017.

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How to cite this article:

Kalalo F. P., 2017 Law enforcement and conservation at Bunaken National Park, North Sulawesi, Indonesia as perceived by the local coastal communities. *AAFL Bioflux* 10(6):1413-1420.