Marine Policy 36 (2012) 1255–1264

Contents lists available at SciVerse ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

# Corruption and regulatory compliance: Experimental findings from South African small-scale fisheries

Aksel Sundström *

*Department for Political Science, the Quality of Government Institute, University of Gothenburg, Box 100, S-405 30 Gothenburg, Sweden*

ARTICLE INFO

*Article history:*
Received 18 January 2012
Received in revised form
24 March 2012
Accepted 26 March 2012
Available online 11 May 2012

*Keywords:*
Corruption
Regulatory compliance
Small-scale fisheries
South Africa

ABSTRACT

Although corruption is often mentioned as an obstacle to fisheries management, its negative effects have seldom been investigated empirically in a systematic manner. This article examines the impact of corruption on regulatory compliance among South African small-scale fishermen. Results from scenario experiments with 181 participants confirm that perceived corruptibility of the enforcing authority corrodes the willingness to comply with regulations. Both grand and petty types of corruption have significant effects. Attitudes related to moral support of the regulations, perceived inclusion in the decision making leading to regulations and an individual record of law breaking all affect the willingness to comply. However, these effects are trumped by the relative size of the negative impact of corruption. These findings underline the importance of curbing corruption involving public officials in the small-scale fisheries sector.



## 1. Introduction

Corruption in the fisheries sector has been singled out as a severe threat to the effectiveness of marine resource management. In the FAO publication, *A Fishery Manager's Guidebook*, it is stated that if the public perceives the fishery management authority as corrupt, this will affect fishermen's compliance [1]. Furthermore, corruption has been described as having severe welfare implications as millions of US dollars are lost annually due to the distortion of the trade in fisheries products stemming from bribery of enforcement officials [2]. Yet, despite these calls regarding the negative effects of corruption and its widespread presence in public administrations in developing countries, empirical investigations on the impact of corruption are generally missing in the literature on fisheries management.

It is here argued that the literature studying compliance behavior in fisheries has largely ignored the effect of corruption within the authority responsible for enforcing fisheries regulations. Although corruption has been mentioned as one of the factors hampering an efficient management of marine resources by policymakers and alike, its impact has seldom been studied empirically in a systematic manner. Moreover, while research has studied the effect of numerous normative aspects on compliance, it has rarely included the effect of corruption. The present article contributes by investigating this issue on the micro-level. The aim is to examine the effect of corruptibility of the enforcing authority empirically, using scenario experiments with South African small-scale fishermen.[1] South Africa is one of the countries where the fisheries management is plagued by widespread corruption and hence a suitable case for this investigation.

The article proceeds as follows. Section 2 review previous research on how corruption affects fisheries management. Section 3 gives an account of South African fisheries. Section 4 discusses methodology and data. In Section 5 the empirical evidence is reported. The final section of the article concludes and discusses the implications of the findings on policy.

## 2. Corruption and fisheries management

### 2.1. Previous studies on corruption and the environment

Ever since Garrett Hardin's [4] seminal contribution it has been cautioned that corruption threatens the management of the commons: "…administrators, trying to evaluate the morality of acts in the total system, are singularly liable to corruption, producing a government by men, not laws" [4, p. 1246]. Following this idea, a body of empirical research has demonstrated that national levels of corruption affect biodiversity, success of conservation, and deforestation rates, and correlate negatively with

[1] The term "small-scale" is used here to encapsulate the sometimes fuzzy categories of "artisanal", "traditional" and "subsistence" fishermen [3]. Not including industrial or commercial actors is a conscious choice as these actors can be seen as active in a completely different type of resource harvesting.

* Tel.: +46 317861607.
*E-mail address:* aksel.sundstrom@pol.gu.se

0308-597X/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.marpol.2012.03.013

aggregated measures of sustainability [5–16].[2] Theoretical accounts of causal mechanisms in this literature consist of two strands of explanations. One argues that corruption affects the substantial stringency of environmental policy, as policy is shaped by bribery and lobbying in corrupt societies [12–14]. Another explanation focuses on the fact that corruption hampers law enforcement, thus allowing emitters to evade responsibility for pollution or encouraging the overexploitation of resources [7,15,19,20].

Interestingly, this field of research has largely had a terrestrial bias, seldom examining the impact of corruption on the marine environment. A few but notable studies have found that national governance capacity and occurrence of corruption tend to correlate with levels of illegal, unreported and unregulated (IUU) fishing [21–23]. National prevalence of corruption has been found to decrease the likelihood of sustainable fisheries management [24]. Corruption has furthermore been mentioned as an obstacle to effective fisheries management in some national settings. Young (2001) discusses how the pervasiveness of corruption in Mexico has enabled fishermen from distant communities to encroach on local marine resources, contributing to overharvesting [25]. Similarly, the lack of enforcement in the fisheries of Indonesia is credited to corruption within the coastal police force [26]. In Pacific Island States, corruption is described as disturbing fisheries management through licensing and access agreements as well as in monitoring and inspection [27]. Moreover, there are examples from African nations' industrial fisheries, where the effectiveness of monitoring schemes has been hampered since official observers regularly accept bribes not to report misconduct [28]. On a general level it is stated that corruption in fisheries "makes it more likely that fisheries managers will approve total allowable catches that are higher than those recommended by scientists (i.e., management failure), and makes it attractive for monitors of fish catch to deliberately allow fishers to catch more than their approved quotas (i.e., implementation failure)" [29, p. 8]. Although this body of research presents evidence of the negative effects of corruption on the management of marine resources this relationship has seldom been investigated empirically on the micro-level.

### 2.2. Corruption and compliance

The present article follows the vein of research on how corruption affects enforcement and compliance dynamics, focusing on the effect of corruption on regulatory compliance among small-scale fishermen. Assuming that any attempts of governments to regulate marine resources are "worthless without compliance" [30, p. 75], the decision of fishermen to either follow or break these rules is a critical concern. The statement that "rule-breakers must be taken seriously as ecological agents with potentially complex and possibly even beneficial implications for biodiversity" [31, p. 165] is the rationale underpinning the focus on compliance in this article.[3] Corruption is here defined as "the misuse of public office for private gain" [34, p. 399]. Corruption in monitoring institutions is often separated from political decisions and bureaucratic or petty corruption is often contrasted to political or grand corruption [35].[4] In this article, both types of corruption are scrutinized.

The literature on individuals' motives for compliance with regulations has been described as containing two perspectives, one instrumental and one normative [38–40]. The more rationalist view focuses on individual behavior as calculating between costs and benefits [41,42]. This approach assumes people to "assess opportunities and risks and disobey the law when the anticipated fine and probability of being caught are small in relation to the gains from noncompliance" [43, p. 188]. The other view suggests that attitudes, norms and moral obligations are important in explaining compliance behavior [44–47]. Among these norms, procedural justice and its relation to the wide concept of legitimacy has been given a central part [48]. This strand of the literature has pointed towards the important role of trust in and trustworthiness of government institutions: "The more trustworthy citizens perceive governments to be, the more likely they are to comply with or even consent to its demands and regulations" [49, p. 491].

A review article focusing on economic theories on fisheries law enforcement concludes that "little work has been done when it comes to including corruption and bribery into formal models of compliance in fisheries" [50, p. 299]. However the literature provides many reasons to believe that corruption is important for compliance behavior of fishermen. According to the rationalist approach, corruption weakens enforcement measures since it affects the risk assessment of getting caught: "bribery dilutes deterrence because it results in a lower payment by an offender than the sanction for the offense" [42, p. 2]. The other perspective – focusing on trust heuristics – has pointed towards the corroding impacts of corruption on trust and hence on compliance. Levi et al. [32] conclude that "corruption undermines citizens' willingness to comply with the law" [32, p. 359]. However, there are different views on the impact on compliance with regard to the *scale* of corruption. The reasoning of Rothstein [51] stands in sharp contrast to the one proposed by Uslaner [52]. According to Rothstein, citizens' trust in authorities is negatively affected when government officials demand petty bribes [51, p. 176]. While Uslaner describes corruption of a grand kind as negative for trust, he assigns a different role for bureaucratic, or small-scale, corruption: "No measure of petty corruption – be it the education system, custom officials, giving gifts, or being asked to by workers in the education or medical systems – leads ordinary citizens to be less likely to trust their government" [52, p. 177].[5] This difference has important implications for policy as the view of Uslaner could imply that countering petty corruption among public officials should be less prioritized than addressing "grand thefts".

It is here argued that the negative impact of corruption on compliance among small-scale fishermen has rarely been examined empirically. Furthermore, an important insight is that the effect of corruption has seldom been studied in relation to other factors influencing compliance, such as normative aspects of inclusion in decision making leading to regulations, support of the regulations and the sanctioning regime. The aim of this article is to empirically examine two issues largely left out in the previous literature. Firstly, the effect of the enforcing authority

[2] The few but notable examples of related studies using a more qualitative approach have studied the impact of corruption on deforestation in local case studies [16–19]

[3] A delimitation here is to study resource willingness to comply with regulations. An assumption is that the willingness to comply eventually will translate in to actual behavior. This is based on the argument by Levi et al. [32]. In their framework the willingness to comply (also called *value based legitimacy*) will translate in to actual compliance with governmental regulations (*behavioral legitimacy*) [32]. Previous studies on compliance indicate that *compliance intentions* are an empirically valid proxy for *actual compliance* [33].

[4] Concerning grand and petty corruption his distinction is quite established and generally refers to the level in the state (involving politicians, or involving the broad public administration) and on which magnitude corruption takes place [36]. "The former is defined as an attempt to influence the setting of policy by making payments to politicians, while the latter reflects payments made in an attempt to avoid the consequences of a given policy" [37, p. 517].

[5] These authors do not discuss compliance per se, but make important and contrasting assumptions regarding the impact of petty corruption on trust.

corruptibility on fishermen's willingness to comply is explored. Special interest is devoted to the *scale* of corruption and where it takes place. Secondly, the relative effect of corruption in comparison to other normative aspects thought to influence compliance is investigated.

## 3. South African fisheries

The productive and diverse fisheries in South Africa directly and indirectly employ approximately 43,000 individuals, and the annual value of the catch is estimated at about US$520 million [53,54].[6] A decline in important stocks in the 1960's, led to efforts to improve the managerial capacity of fisheries [56]. After independence in 1994, law reforms were set in progress. In 1998 the Marine Living Resources Act (MLRA) went into effect. The national fisheries now employ a wide set of management measures, including controls for capacity, catches, and gears as well as time restrictions [57–58]. Management tools include total allowable catches, total efforts, and protected or closed areas [59]. Small-scale fishermen hence have a number of regulations affecting them during harvesting. Enforcement measures of monitoring, control and surveillance (MCS) are carried out under the Fisheries Management (FM) branch of the Department for Agriculture, Forestry and Fisheries, DAFF.[7] The violation of fisheries laws is treated as a criminal offense [65], and authorities are entitled to revoke, suspend, or decrease the fishing rights of an actor who "is convicted of an offense in terms of [the MLRA]" [66, p. 28]. Besides this deterrence approach, there are also attempts to create a moral foundation for compliance, including measures to create trust, voluntary cooperation and delegation of authority [61,67,68]. These however seem to have had limited effect as fishermen are described as mistrusting the fisheries regime, creating a "'culture of non-compliance' in which there is little moral obligation to comply" [44, p. 214]. Currently, it is evident that the capacity of enforcement faces numerous challenges. Significant levels of IUU fishing remain prevalent in certain stocks and species, the cost of which has been estimated to US$ 815 million annually [69]. Poaching of abalone is the most profitable illegal fishery [69,70].[8]

When the national MCS measures were evaluated a decade ago, a number of problems hindering compliance were was identified, including perceptions of inspectors as corrupt [76]. IN the years since then, the administration has been described as having a strategy of "anti-corruption techniques—directed to corruption among officials within the MCM" [61, p. 79]. Yet, a number of corruption scandals however have indicated that the problems remain. For example, in 2009 an ANC district treasurer was stopped in his car by policemen in a roadblock. In the backseat of his car – which was covered with ANC branding, including a poster of president Jacob Zuma – the policemen found nearly 2500 shucked abalone worth about R390,000 in plastic bags [77]. Fisheries law enforcement capacity in South Africa is generally described as being tainted by corruption [78,44]. However, besides anecdotal discussions, the effect of corruption on regulatory compliance among South African fishermen has seldom been empirically examined.

## 4. Research design and material

The experimental approach is fruitful not the least because "experimental research on institutions can fundamentally address issues about the importance of institutions in affecting political behavior" [79, p. 15]. Since we are interested in examining the causal effect of corruption on compliance isolated from other factors this method is particularly useful. In the words of Elinor Ostrom: "experiments thus allow one to test precisely whether individuals behave within a variety of institutional settings as predicted by theory" [80, p. 5].

A survey was applied to a sample of 181 small-scale fishermen in the southern and western parts of the marine coast of South Africa.[9] The average length of work experience as a fisherman is 24 years among the predominantly male participants. They are mainly active in the line fishing (40.9%), rock lobster (35.3%), or the net fishing sector (14.9%). Some of the participants are also engaged in the abalone sector (3.3%). The sample includes crew members, skippers, boat owners and right holders (see Table 1).

As regards the procedure the author and an interpreter with knowledge of local conditions approached landing sites and asked if the fishermen would be willing to participate in a confidential survey concerning their perceptions of the fisheries in general. Care was taken to ensure that fishermen were selected randomly from landing sites known to inhibit both fishermen engaged in poaching and fishermen known to follow rules. Only a handful of fishermen declined participation, and this they motivated with having a lack of time. Participants proved willing to admit that they had broken rules, a fact indicating that not only compliant or rule-following fishermen were selected.[10] Of the participants, 38.7% had at some point violated fisheries regulations. The fishermen were guaranteed that information on violations against regulations and sensitive information of corrupt behavior of individual inspectors would not be held against them at any point. No reward was given upon completing the form. After finishing the data collection at landing site, participants were debriefed and the purpose of the experimental part of the survey was explained.

Using a static group comparison [81], the effect on the dependent variable is measured only once. Since this "only-after" design was used, great care was taken to ensure that assignment of the treatments was randomized. Through a number of one-way analysis of variance (ANOVA) it was concluded that there existed no statistically significant differences between the groups with respect to numerous background factors (see Table 2), indicating that the randomization was successful.

The survey was designed to consist of four between-subject vignette experiments and one control group.[11] The treatments were assigned randomly to the participating fishermen. Hence each

[6] Among the most common species includes: Cape anchovy (*Engraulis capensis*), South American pilchard (*Sardinops sagax*), Hakes (*Merluccius* sp.), Whiteheads round herring (*Etrumeus whiteheadi*), Cape horse mackerel (*Trachurus capensis*), Chub mackerel (*Scomber japonicus*), Snoek (*Thyrsites atun*), Cape rock lobster (*Jasus lalandil*), Kingklip (*Genypterus capensis*), Cape monk (*Lophius vomerinus*), Cutlass fishes (*Trachurus* sp.) and numerous others [55].

[7] The ultimate authority responsible for fisheries and marine resources in South Africa was previously the Department of Environmental Affairs and Tourism (DEAT). Management of fisheries was previously delegated to the MCM in Cape Town [60–63]. As currently understood the enforcement responsibility is now under the Fisheries Management (FM) branch of DAFF [64].

[8] The harvesting of abalone (*Haliotis*), or perlemoen as this edible mollusk is also known, was declared illegal and put on the CITES list in 2007. During this period, the MCM was described as having becoming economically dependent on selling confiscated abalone. During 2010 abalone fishing was again declared legal, yet heavy restrictions on permissions were imposed. The lucrative business of poaching abalone remains a big issue [71–75].

[9] The survey was conducted by the author in March–April 2011.

[10] Only at one point did the author not take the risk of approaching a group of fishermen engaged in abalone poaching, as the five individuals in question had a violent reputation and were said to have connections to criminal gangs engaged in the smuggling of abalone. However, among the fishermen who did participate in the experiments, three (of the six participants who indicated abalone was their main sector) stated that they had broken the laws governing their sector. Thus, sample is still deemed to reflect the opinions also of rule-breaking fishermen engaged in the abalone sector.

[11] The questionnaire was available in Afrikaans and English, depending on the preference of the participant. When illiterate, the author and an interpreter helped

**Table 1**
Description of participants in experiments—relevant characteristics.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sex | Man<br>95.6 (173) | Woman<br>4.4 (8) | | | | | |
| Religion | Christian<br>76.8 (139) | Muslim<br>16 (29) | No religion<br>1.1 (2) | Other<br>0.6 (1) | Khoi khoi<br>1.1 (2) | Rastafari<br>4.4 (8) | |
| Education | No formal<br>5.5 (10) | Primary<br>37 (67) | Secondary<br>54.7 (99) | Other<br>2.8 (5) | | | |
| Income (per year) | Subsistence some months<br>43.6 (79) | Subsistence more than six months<br>27.1 (49) | Subsistence the whole year<br>26.5 (48) | Financial surplus to invest and harvest<br>2.2 (4) | | | |
| Income (subjective) | Lower than most fishermen<br>25.4 (46) | Slightly lower than other fishermen<br>25.4 (46) | Average<br>42 (76) | Slightly higher than the average<br>5 (9) | Better off than most fishermen<br>2.2 (4) | | |
| Type | Boat owner<br>12.2 (22) | Skipper<br>16 (29) | Crew<br>61.3 (111) | Right holder<br>10.5 (19) | | | |
| Have had contact personally with officials from the department | Yes 56.4 (102) | No 43.6 (79) | | | | | |
| Sector | Abalone<br>3.3 (6) | Linefish<br>40.9 (74) | Not answered<br>3.3 (6) | Net fishing<br>14.9 (27) | Rock lobster<br>35.4 (64) | Tuna<br>0.6 (1) | Various poachings<br>1.7 (3) |

*Comments*: Figures are expressed in percent of the total number. The number in the parenthesis refers to the number out of the total sample of 181 participants.

**Table 2**
Control of randomization, using partial $\eta^2$ for a number of variables.

| Variables for control | Different groups (mean values) | | | | | All | Partial $\eta^2$ | Sign $F$ value |
|---|---|---|---|---|---|---|---|---|
| | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | | | |
| Sex (1 and 2) | 1.08 | 1.03 | 1.08 | 1.03 | 1.00 | 1.04 | 0.025 | 1.149 |
| Religion (1–6) | 1.39 | 1.26 | 1.59 | 1.47 | 1.60 | 1.46 | 0.012 | 0.556 |
| Education (1–4) | 2.75 | 2.66 | 2.46 | 2.45 | 2.43 | 2.55 | 0.041 | 1.875 |
| Income (per year) (1–4) | 1.83 | 2.03 | 1.86 | 1.82 | 1.91 | 1.89 | 0.007 | 0.308 |
| Subjective income (1–5) | 2.44 | 2.23 | 2.32 | 2.26 | 2.40 | 2.33 | 0.007 | 0.299 |
| Marital status (1–4) | 1.75 | 1.86 | 1.76 | 1.95 | 1.86 | 1.83 | 0.012 | 0.550 |
| Skipper/crew/own/Q | 2.44 | 2.23 | 2.32 | 2.26 | 2.40 | 2.33 | 0.038 | 1.751 |
| Contact with department | 1.44 | 1.43 | 1.51 | 1.42 | 1.37 | 1.44 | 0.009 | 0.380 |
| Sector | 3.91 | 3.23 | 3.29 | 3.29 | 3.60 | 3.46 | 0.030 | 1.382 |
| Year of fishing experience | 22.35 | 23.18 | 23.16 | 26.80 | 25.21 | 24.14 | 0.017 | 0.711 |

*Comments*: These questions of these different variables had the answers that are described in Table 1. "Year of fishing experience" is an open question. Marital status could be answered by the following alternatives: "single", "married", "divorced", or "widower".

participant received one of five versions of the questionnaire (four types having a treatment and one being the control) where a vignette experiment was embedded.[12] The vignette, placed near the end of the questionnaire, was designed as a description of a scenario that the participant was asked to read (or listen to) carefully. All five versions started as follows: "As you may be aware of your sector has a number of regulations that are decided by the department that the small-scale fishers of your community should follow. Now imagine that [sentence continues]". In the four different scenarios, the treatments consisted of a description related to *how these regulations are enforced* ending the sentence. They were:

1. "[continued] when the fisheries officials visit you to check whether you are compliant, they ask you to pay a small amount of money so that you can violate these regulations without being fined."
2. "[continued] the fisheries officials that are responsible for compliance have been known to ask your fellow fishermen to pay a small amount of money so that they can violate these regulations without being fined."
3. "[continued] the fisheries officials that are responsible for compliance have been known to ask fishermen in other parts of the country to pay a small amount of money so that they can violate these regulations without being fined."
4. "[continued] the larger fishing right holders in the country and influential politicians have been involved in corrupt deals and bribes to allow them to violate these regulations without being fined."

(*footnote continued*)
the participant complete the form. It was designed to firstly ask a number of questions tapping socio-economic factors and background variables.

[12] Random assignment is used since "if information is randomly assigned across subjects, then the factors that might interfere with the effects of the manipulation, such as whether the subjects actually received the information or already knew the information, are in expectation mitigated" [79, p. 48].

Besides these four treatments, a control group was also given a vignette. The rationale to include a vignette in the survey given to the control group was grounded in the assumption that to a make correct estimates of causal inferences it is crucial that the control group is used not only as a baseline or comparison, but as the "right" baseline [79]. Therefore the control group was given an embedded vignette, though one that was designed as a description of a non-corrupt procedure of enforcement.[13] It read as follows:

5. "[continued] when the fisheries officials visit you to check whether you are compliant, they enforce the rules in an honest manner, not taking bribes to look the other way."

The scenarios refer to "regulations" and not to any precise rules. Since fishermen from different sectors are affected by certain types of regulations, it was deemed unfit to choose a regulation that did not apply to all fishermen in the sample. The approach used was to design the experiments as a "realistic" scenario, where fishermen could easily identify the actors and whether the behavior of the enforcing officials in the scenario was corrupt or not. The first three scenarios are operationalisations of the theoretical concept of petty corruption (involving bribery to inspectors), whereas the fourth scenario corresponds with grand corruption (involving corrupt deals between right holders and politicians).

The main dependent variable in this study is measured with the question "How willing are you to follow the regulations of your sector?". The item is measured on a 7 point scale ranging from 1 (not at all willing) to 7 (very willing). The question followed in the form after the vignette. The questionnaire also contained five questions tapping attitudes related to regulations; "Have you on any occasion broken the laws governing your sector?", "Do you believe that fishermen violating regulations should be punished?", "Do you want a more forceful enforcement of fisheries regulations?", "Do you feel included by the department in the decision-making process leading to the fisheries legislations?", and finally "Do you believe that the government has the right to impose regulations on small-scale fisheries in order to sustain growth of stocks?". All five questions could be answered "yes" or "no" and were asked prior to the scenarios in the questionnaire.

## 5. Results

The analysis of the experimental results will proceed in three stages. Firstly, the overall effect of the treatments is identified. Secondly, the effects of the individual treatments are scrutinized in detail. The third part of the analysis proceeds to study the effects of the treatments while controlling for five variables identified as important for the decision of whether or not to comply. This part of the analysis briefly includes the results of an OLS-regression, where the effects of corruption are presented while controlling for a range of influencing factors.

The experimental results confirm that our treatments of perceived corruptibility have a negative effect on the willingness to comply among participants. The control group has a mean value of willingness to comply almost twice as high as those of the groups receiving any of the four treatments (6.23 as compared to 3.38). When articulated in terms of partial $\eta^2$, the effect size of perceived corruptibility is as high as 0.202 (a one-way analysis of variance (ANOVA) results in $F(4/176)=11.126$, $p<0.05$). These significant differences are illustrated in Fig. 1.

Findings from the experiments furthermore demonstrate two important differences between the four treated groups. First conclusion is that the treatments involving petty corruption (treatments 1–3) also have a negative impact on participants' willingness to comply. The mean values of willingness to comply in these three treated groups, 2.44, 3.31 and 3.97, are all significantly lower than the mean value of 6.23 in the control group. This implies that petty corruption also affects compliance negatively. These findings are presented in Table 3.

When comparing the four treated groups, a second point to be made is that the third and the first groups have different mean values, 2.44 in comparison to 3.97, significant on the 10% level. This indicates that perceived corruptibility of officers in a distant community is not as corroding on the willingness to comply as perceived corruptibility involving the fisherman himself.

When the effect of our corruption treatments is compared and contrasted with the effects from our five other variables thought to affect compliance, corruption interestingly comes out ahead in all cases:

a) Fishermen who state that they have violated fisheries regulations in the sector they are active in have a lower mean value of willingness to comply than the fishermen who state that they have not. The effect size in partial $\eta^2$ of this factor is 0.084 (a two-way analysis of variance (ANOVA) results in $F(1/171)=15.613$, $p<0.05$). Still, the effect (in partial $\eta^2$) of corruption is larger, 0.224 (two-way ANOVA, $F(4/171)=12.373$, $p<0.05$).
b) The participants who do not think that the government has the right to regulate marine resources in order to sustain stocks show a lower mean value of willingness to comply than fishermen who think the government does have the right to do so. Expressed in partial $\eta^2$, the effect is 0.044 (two-way ANOVA, $F(1/171)=7.822$, $p<0.1$). In comparison the effect of our corruption treatments (also in partial $\eta^2$) is 0.220 (two-way ANOVA, $F(4/171)=12.051$, $p<0.05$).
c) Feeling included in the decision-making process leading upto the fisheries legislations affects the willingness to comply among participants. The fisherman who do not feel included have a significantly lower mean value. The effect in terms of partial $\eta^2$ is 0.061 (a two-way analysis of variance (ANOVA) results in $F(1/171)=11.137$, $p<0.05$). However, in comparison with corruption, the effect of feeling included has a lower impact. The effect size (in partial Eta$^2$) of corruption is 0.138 (as generated by a two-way ANOVA test, $F(4/171)=6.829$, $p<0.05$).
d) Fishermen who do not believe that fishermen violating laws governing their sector should be punished have a lower mean value of willingness to comply. Expressed in partial $\eta^2$, the effect of this factor is 0.077 (two-way ANOVA, $F(1/171)=14.228$, $p<0.05$). Yet, this effect is still smaller than the effect stemming of corruption. An ANOVA two-way analysis of variance on the treatments in the experiment shows an effect (in partial $\eta^2$) of 0.151 ($F(4/171)=7.585$, $p<0.05$).
e) Finally, the willingness to comply seems to be affected also by whether or not the fishermen want a more forceful enforcement

[13] An alternative would have been to let this group receive no vignette at all. This existing design choice could be seen as a tradeoff between potential priming effects of the description in the existing vignette and the potential effects of not getting a treatment at all, the risk being that the control group would be the "wrong" baseline. However, to ensure that the control group was not affected positively, a separate and new sample of 35 participants was constructed using the same procedure as for the existing sample. These fishermen did not differ significantly from the fishermen in the main sample in terms of relevant group characteristics. This group received a survey with the following scenario "[continued] these are supposed to be enforced by inspectors which are assigned the responsibility to control whether you are compliant or not". Importantly this group shows the same mean willingness to comply as the control group indicating that our wording used for the control group is not priming the participant's willingness to comply in a positive manner. Further detailed information about characteristics of this sample of fishermen is available from the author upon request.

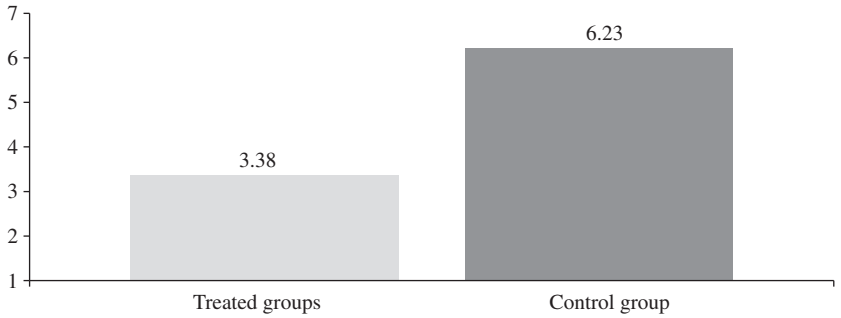


**Fig. 1.** Mean values of willingness to comply.
*Comment*: Treated groups $n=146$, control group $n=35$, total $n=181$.

**Table 3**
Mean values of willingness to comply—the five different groups.

| | Different treatments and the control group | | | | | Total | Partial $\eta^2$ | Sign $F$ value |
|---|---|---|---|---|---|---|---|---|
| | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | | | |
| Willingness to comply | 2.44 | 3.31 | 3.97 | 3.76 | 6.23 | 3.93 | 0.202 | 11.126** |

*Comments*: Group 1 $n=36$, Group 2 $n=35$, Group 3 $n=37$, Group 4 $n=38$, Group 5 $n=35$. Total $n=181$. *$p<0.1$.
** $p<0.05$.

of regulations. The ones who do not want a more forceful enforcement have a significantly lower mean value. The size of the effect of this factor can be articulated (in partial $\eta^2$) as 0.064 (two-way ANOVA, $F(1/171)=11.668$, $p<0.05$). However, also in this case the negative impact of corruption on the willingness to comply among participants is larger an effect (in partial $\eta^2$) of 0.183 (a two-way analysis of variance (ANOVA) results in $F(4/171)=9.575$, $p<0.05$).

These results are described in detail in Table 4 and illustrated in Fig. 2a and b.

To be able to fully control for these factors simultaneously, an OLS-regression is performed, using a model that includes a range of socio-economic factors and the five factors discussed above. The full description of the model is presented in Table 5. The regression analysis is conducted in two models. In the first model a number of socio-economic variables and different treatments of corruptibility are included. All the treatments have strong and significant negative effects, indicating a similar pattern as given in the analysis of the mean values. In this model the subjective level of income of the fishermen has a positive effect on compliance, whereas education has a negative impact. None of the other socio-economic variables result in any significant effects on compliance. In the second model, the five factors discussed above are also included. Now the effect of income loses significance and the negative effect of education decreases. The variables measuring whether the respondent feel included in the decision-making process leading to regulations and whether he or she supports the punishment of violators have a negative effect on compliance. This implies that the fishermen who do not feel included or do not support punishment tend to be less willing to comply. Having broken the law regulating fisheries gives a significant and negative effect on the willingness to comply. However, also when using this method of analysis, the negative effect of corruption is larger and trumps the strength of the other variables in the model. The four treatments actually increase in negative strength in the second model. As can be seen in Table 5, the value of adjusted $r^2$ is measured at 0.352. All in all, when using this method of analysis the results indicated in the analysis of variance (ANOVA) above are confirmed.

It is evident that our corruption treatments have a negative effect on the dependent variable in this study. This implies that not only the grand corruption treatment, but also the petty corruption treatments have a corroding effect on the willingness to comply. Five other factors related to moral support of the regulations, as well as inclusion in the decision-making process leading to legislation and an individual record of law breaking, significantly influence the willingness to comply. However, it is shown that the sizes of these effects are all trumped by the negative effect of our corruption treatments.

## 6. Conclusions

This article set out to investigate whether perceived corruptibility of the enforcing authority affects the willingness to comply with regulations among small-scale fishermen in South Africa. Results from scenario experiments show that both grand and petty corruption have significant and negative effects on participants' willingness to comply. This study can furthermore point to the relative impact of corruption in comparison to other aspects thought to influence compliance. Factors related to moral support of the regulations and their sanctions, inclusion in the decision-making process leading to legislation and an individual record of law breaking all have an effect on the willingness to comply among participating fishermen. However, the sizes of the effects of these factors are all trumped by the relative size of the negative effect of corruption in our experiment.

The contextual setting in which the empirical findings in this article were collected sets certain limitations to the results of this study. Being a closed-access regime with an existing – albeit corrupt – enforcing authority, the management of South African fisheries does exhibit some special features. One can for example imagine that the perceived corruptibility of the enforcing authority might not have the same meaning in a country or setting where fisheries are not governed by formal regulations or

**Table 4**
Effect of corruption on willingness to comply under control for five factors.

| Corruptibility | Have broken any of the fisheries legislations of the sector | | | |
|---|---|---|---|---|
| Groups | Yes | No | All | Effect, partial $\eta^2$ |
| 1 | 1.21 | 3.23 | 2.44 | |
| 2 | 2.25 | 4.21 | 3.31 | |
| 3 | 3.31 | 4.33 | 3.97 | |
| 4 | 2.83 | 4.19 | 3.76 | |
| 5 | 5.67 | 6.65 | 6.23 | |
| All | 3.07 | 4.48 | 3.93 | 0.084** |
| Effect, partial $\eta^2$ | | | 0.224** | |
| Corruptibility | The government has the right to regulate marine resources to sustain stocks | | | |
| Groups | Yes | No | All | Effect, partial $\eta^2$ |
| 1 | 2.72 | 2.17 | 2.44 | |
| 2 | 4.00 | 2.15 | 3.31 | |
| 3 | 4.52 | 3.25 | 3.97 | |
| 4 | 4.00 | 3.25 | 3.76 | |
| 5 | 6.69 | 5.85 | 6.23 | |
| All | 4.30 | 3.45 | 3.93 | 0.044* |
| Effect, partial $\eta^2$ | | | 0.220** | |
| Corruptibility | Feel included by the department in the process that leads to fisheries legislations | | | |
| Groups | Yes | No | All | Effect, partial $\eta^2$ |
| 1 | 3.78 | 2.00 | 2.44 | |
| 2 | 4.00 | 3.08 | 3.31 | |
| 3 | 6.11 | 3.29 | 3.97 | |
| 4 | 4.33 | 3.50 | 3.76 | |
| 5 | 7.00 | 6.10 | 6.23 | |
| All | 4.82 | 3.45 | 3.93 | 0.061** |
| Effect, partial $\eta^2$ | | | 0.138** | |
| Corruptibility | Believes that fishermen who break laws governing fisheries should be punished | | | |
| Groups | Yes | No | All | Effect, partial $\eta^2$ |
| 1 | 2.54 | 2.20 | 2.44 | |
| 2 | 3.83 | 2.33 | 3.31 | |
| 3 | 4.85 | 1.60 | 3.97 | |
| 4 | 4.00 | 3.10 | 3.76 | |
| 5 | 6.59 | 5.00 | 6.23 | |
| All | 4.39 | 2.74 | 3.93 | 0.077** |
| Effect, partial $\eta^2$ | | | 0.151** | |
| Corruptibility | Want to have a more forceful enforcement of marine resources | | | |
| Groups | Yes | No | All | Effect, partial $\eta^2$ |
| 1 | 2.63 | 2.08 | 2.44 | |
| 2 | 3.63 | 2.64 | 3.31 | |
| 3 | 4.75 | 2.54 | 3.97 | |
| 4 | 4.17 | 3.13 | 3.76 | |
| 5 | 6.83 | 5.08 | 6.23 | |
| All | 4.38 | 3.10 | 3.93 | 0.064** |
| Effect, partial $\eta^2$ | | | 0.183** | |

*Comments:* ($n=181$).

** $p<0.05$.

* $p<0.1$.

an enforcing authority. However, this example would be an exception since most countries do have formal regulations governing their marine resources, though with varying degrees of enforcement.

It should be pointed out that this study is a fairly exploratory attempt to investigate this sensitive issue on the micro-level. Although being a relatively unexplored approach, experimental methodology has the benefit that other researchers can reproduce it. However the findings from these experiments could also be complemented with other empirical examinations. To validate the findings this approach could be applied on other populations and different types of management regimes.

There are theoretical implications of the findings of this article. It has recently been proposed that compliance is largely shaped by the trustworthiness of the government, a concept in which absence of corruption is ascribed an important role [32]. The results from this article contribute to this line of research by adding certain nuances, concluding that both petty and grand corruption seem to affect compliance negatively. The finding that indicates that the perceived corruptibility has a relatively

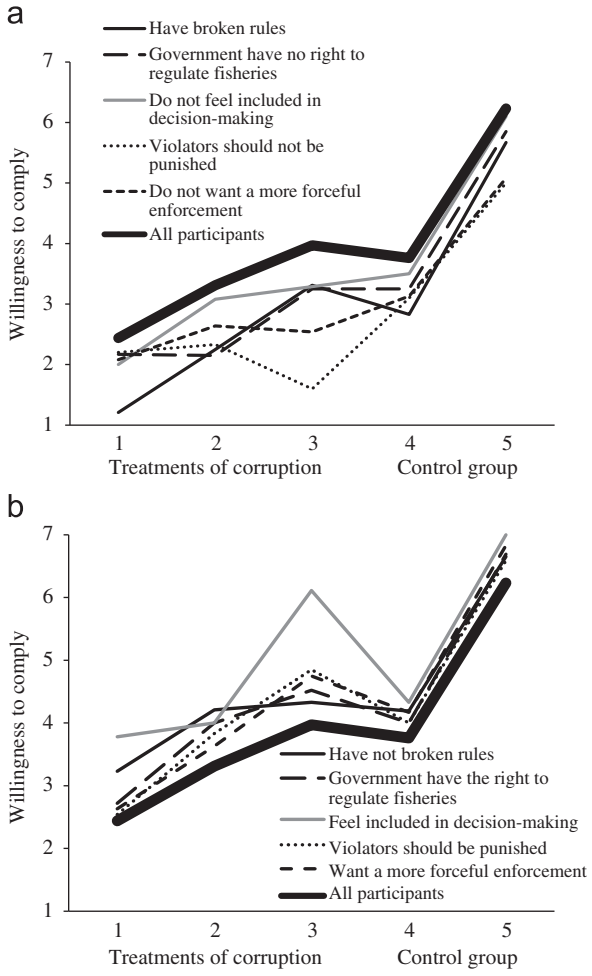


**Fig. 2.** (a) Effect of corruption on the willingness to comply among fishermen neither having support for regulations nor feeling included in decision making leading to legislation.
*Comment*: Here the fishermen are reported who answered "Yes" to the question: "Have you on any occasion broken the laws governing your sector?" and "No" to the following questions: "Do you believe that fishermen violating regulations should be punished?", "Do you want a more forceful enforcement of fisheries regulations?", "Do you feel included by the department in the decision-making process leading to the fisheries legislations?", and finally "Do you believe that the government has the right to impose regulations on small-scale fisheries in order to sustain growth of stocks?".
(b) Effect of corruption on the willingness to comply among fishermen having support for regulations and feeling included in decision making leading to legislation.
*Comment*: Here the fishermen are reported who answered "No" to the question: "Have you on any occasion broken the laws governing your sector?" and "Yes" to the following questions: "Do you believe that fishermen violating regulations should be punished?", "Do you want a more forceful enforcement of fisheries regulations?", "Do you feel included by the department in the decision-making process leading to the fisheries legislations?", and finally "Do you believe that the government has the right to impose regulations on small-scale fisheries in order to sustain growth of stocks?".

stronger effect on compliance than do factors related to support of regulations and inclusion in decision making should especially be important in relation to previous approaches to compliance which have focused on moral aspects of legitimacy and fairness [44–48]. It is here stressed that the literature on compliance behavior of fishermen would benefit from an examination of how corruption corrodes compliance and from an increased focus on the role of public officials.

The policy implications of finding support for the corroding impact of corruption on compliance are quite straightforward. This insight should be further evidence in the case of not making small-scale bribery in the fisheries sector to an issue of low priority. In order to increase compliance behavior among small-scale fishermen in contexts where bureaucratic corruption is a widespread malady, policy makers and practitioners increasingly need to focus their attention on the everyday bribery among the local administrations responsible for implementing marine policies. It has been stated that "in comparison to other resource sectors, corruption in fisheries has yet to gain the same level of scrutiny from researchers, civil society organisations, and the international donor community" [82]. The findings from this study are a reminder that curbing corruption in fisheries management needs to be addressed with renewed strength.

**Table 5**
Effect of corruptibility on the willingness to comply (OLS regression) Unstandardized *b*-coefficients, standard errors in parenthesis.

| | Willingness to comply | |
|---|---|---|
| Education | −1.680** (0.622) | −1.290** (0.606) |
| Subjective income | 1.978** (0.785) | 0.940 (0.796) |
| Right to regulate | – | −0.286 (0.382) |
| Feel included | – | −0.712* (0.421) |
| Support punishment | – | −0.755* (0.430) |
| More enforcement | – | −0.347 (0.402) |
| Have broken law | – | −0.878** (0.375) |
| Treatment 1 | −3.679*** (0.578) | −3.724*** (0.555) |
| Treatment 2 | −3.019*** (0.583) | −3.049*** (0.564) |
| Treatment 3 | −2.576*** (0.568) | −2.589*** (0.546) |
| Treatment 4 | −2.576*** (0.561) | −2.745*** (0.548) |
| Intercept | 7.449*** (1.523) | 7.120*** (1.505) |
| *N* | 181 | 181 |
| $R^2$ (adjusted) | 0, 292 | 0, 352 |

*Comments*: "Subjective income" was measured with the question "What statement best describes your income level in relation to other fishers in your community?" (1=lower than most fishers, 2=slightly lower than the average, 3=average, 4=slightly higher than the average, 5=better off than most fishers). These answers were treated as an interval scale. A number of variables are included in the two models which, due to space constraints, are not presented above. None of the variables which were left out gave significant effects. They were "Sex" (Male or Female), "Livelihood" (the question "What best describes the level of income that you get yearly from fishing?" (1=subsistence for some months, 2=subsistence for more than six months, 3=subsistence for the whole year, 4=financial surplus to invest and harvest)). Dummy variables were included for the type of sector the fishermen are involved in (7 different sectors, and a "various" category). The variables "Right to regulate" refer to the question "On a general level do you think that the government has the right to impose regulation through legislation on small-scale fisheries to ensure long term growth of fish stocks?". The variable "Feel included" refers to the question "Do you feel included by the department in the decision making process that leads to fisheries legislation?". The variable "Support punishment" refers to the question "Do you think that fishers who break the laws governing the fishing industry should be punished?". The variable "More enforcement" refers to the question "Do you want a more forceful enforcement of the marine resources?". The variable "Have broken law" refers to the question "Have you on any occasion broken the laws governing your sector?". These five variables are all dichotomous (Yes or No). All variables in the model were made to run from 0 to 1. With regard to the dependent variable, 1 means "Very willing to comply" and 0 means "Not at all willing".

*** $p<0.01$.
** $p<0.05$.
* $p<0.1$.

## References

[1] Berg PE, Davies S. Fishery monitoring, control and surveillance. In: Cochrane KL, editor. A fishery managers guidebook: management measures and their application. FAO fisheries technical article no 424. Rome: Food and Agriculture Organization of the United Nations; 2002.
[2] Duda AM. GEF support for the global movement toward the improved assessment and management of large marine ecosystems. Sustainable development of the world's large marine ecosystems during climate change: a commemorative volume to advance sustainable development on the occasion of the presentation of the 2010 Göteborg award. International Union for Conservation of Nature and Natural Resources (IUCN), 2010.

[3] Hauck M. Rethinking small-scale fisheries compliance. Mar Policy 2008;32:635–642.
[4] Hardin G. The tragedy of the commons. Science 1968;162:1243–8.
[5] Walpole MJ, Smith RJ. Focusing on corruption: a reply to Ferraro and Katzner. Oryx 2005;39:263–4.
[6] Morse S. Is corruption bad for environmental sustainability? A cross-national analysis Ecol Soc 2006;11(1):1–22.
[7] Leader-Williams N, Baldus RD, Smith RJ. The influence of corruption on the conduct of recreational hunting. In: Dickson B, Hutton J, Adams B, editors. Recreational hunting, conservation and rural livelihoods: science and practice. Hoboken, New Jersey: Wiley-Blackwell; 2009.
[8] Wright SJ, Sanchez-Azofeifa GA, Portillo-Quintero C, Davies D. Poverty and corruption compromise tropical forest reserves. Ecol Appl 2007;17:1259–66.
[9] Koyuncu C, Yilmaz R. The impact of corruption on deforestation: cross-country evidence. J Dev Areas 2009;42(2):213–22.
[10] Meyer AL, Cornelis Van Kooten G, Wang S. Institutional, social and economic roots of deforestation: further evidence of an environmental Kuznets relation? Int For Rev 2005;5(1):29–37.
[11] Ferreira S. Deforestation, property rights, and international trade. Land Econ 2004;80(2):174–93.
[12] Fredriksson P, Svensson J. Political instability, corruption and policy formation: the case of environmental policy. J Public Econ 2003;87(8):1383–405.
[13] Damania R, Fredriksson PG, Mani M. The persistence of corruption and regulatory compliance failures: theory and evidence. Public Choice 2004;12:363–90.
[14] Welsch H. Corruption, growth, and the environment: a cross-country analysis. Environ Dev Econ 2004;9:663–93.
[15] Esty D, Levy L, Srebotnjak T, de Sherbinin A. Environmental Sustainability Index. Columbia University; 2005 New Haven: Yale Center for Environmental Law & Policy, and Palisades, NY: Center for International Earth Science Information Network (CIESIN).
[16] Pellegrini L. Corruption, development and the environment. Dordrecht: Springer; 2011.
[17] Miller M. Persistent illegal logging in Costa Rica: the role of corruption among forestry regulators. J Environ Dev 2011;20(2):50–68.
[18] Smith J, Obidzinski K, Subarudi S, Suramenggala I. Illegal logging, collusive corruption and fragmented governments in Kalimantan, Indonesia. Int For Rev 2003;5:293–302.
[19] Robbins P. The rotten institution: corruption in natural resource management. Polit Geogr 2000;19:423–43.
[20] Smith RJ, Walpole MJ. Should conservationists pay more attention to corruption? Oryx 2007;39:251–6.
[21] Österblom H, Sumaila UR, Bodin Ö, Hentati Sundberg J, Press AJ. Adapting to regional enforcement: fishing down the governance index. PLoS ONE 2010;5(9):1–8.
[22] Agnew DJ, Pearce J, Pramod G, Peatman T, Watson R, Beddington JR, Pitcher TJ. Estimating the worldwide extent of illegal fishing. PloS ONE 2009;4(2):1–8.
[23] MRAG Ltd. Review of impacts of illegal, unreported and unregulated fishing on developing countries. Final report for the UK's Department for International Development (DFID) by the MRAG Ltd; 2005.
[24] Mora C, Myers RA, Coll M, Libralato S, Pitcher TJ, Sumaila RU, et al. Management effectiveness of the world's marine fisheries. PLoS Biol 2009;7(6):1–11.
[25] Young E. State intervention and abuse of the commons: fisheries development in Baja California Sur, Mexico. Ann Assn Am Geogr 2001;91:283–306.
[26] Erdmann M. Who's minding the reef? Corruption and enforcement in Indonesia SPC Live Reef Fish Inf Bull 2001;8:9–20.
[27] Hanich Q, Tsamenyi M. Managing fisheries and corruption in the Pacific Islands region. Mar Policy 2009;33:386–92.
[28] Standing A. Corruption and industrial fishing in Africa. Chr. Michelsen Institute; 2008 U4 issue 2008:7.
[29] Sumaila UR, Jaquet J. When bad gets worse: corruption and fisheries. Working article, Sea Around Us Project, 2008.
[30] Keane A, Jones JPG, Edward-Jones G, Milner-Gulland EJ. The sleeping policeman: understanding issues of enforcement and compliance in conservation. Anim Conserv 2008;11(2):75–82.
[31] Robbins P, McSweeney K, Waite T, Rice J. Even conservation rules are made to be broken. Environ Manage 2006;37(2):162–9.
[32] Levi M, Sacks A, Tyler T. Conceptualizing legitimacy, measuring legitimizing beliefs. Am Behav Sci 2009;53(3):354–75.
[33] Esseks JD, Kraft SE, Furlong EJ. Why targets of regulations do not comply: the case of conservation compliance in the Corn Belt. J Soil Water Conserv 1997;52(4):259–64.
[34] Treisman D. The causes of corruption: a cross-national study. J Public Econ 2000;76:399–457.
[35] Kolstad I, Søreide T. Corruption in natural resource management: implications for policy makers. Resour Policy 2009;34:214–26.
[36] The World Bank. Anticorruption in transition: a contribution to the policy debate. Report, Washington, D.C, 2000.
[37] Wilson JK, Damania R. Corruption, political competition and environmental policy. J Environ Econ Manage 2005;49(3):516–35.
[38] Raakjaer Nielsen J. An analytical framework for studying compliance and legitimacy in fisheries management. Mar Policy 2003;27:425–32.
[39] Hønneland G. A model of compliance in fisheries: theoretical foundations and practical applications. Ocean Coast Manage 1999;42:699–716.
[40] Kuperan K, Sutinen JG. Blue water crime: deterrence, legitimacy and compliance in fisheries. Law Soc Rev 1998;32(2):309–38.
[41] Becker G. Crime and punishment: an economic approach. J Polit Econ 1968;76:169–217.
[42] Polinsky AM, Shavell S. Corruption and optimal law enforcement. J Public Econ 2000;81:1–24.
[43] Murphy K. The role of trust in nurturing compliance: a study of accused tax avoiders. Law Hum Behav 2004;28(2):187–209.
[44] Hauck M. Rethinking small-scale fisheries compliance: from criminal justice to social justice. DPhil thesis. Department of Environmental and Geographical Science, University of Cape Town, 2009.
[45] Hatcher A, Jaffry S, Thébaud O, Bennet E. Normative and social influences affecting compliance with fishery regulations. Land Econ 2000;76(3):448–61.
[46] Hatcher A, Gordon D. Further investigations into the factors affecting compliance with UK fishing quotas. Land Econ 2005;81(1):71–86.
[47] Gezelius SS. Food, money, and morals: compliance among natural resource harvesters. Hum Ecol 2004;32(5):615–34.
[48] Jentoft S. Legitimacy and disappointment in fisheries management. Mar Policy 2000;24:141–8.
[49] Levi M, Stoker L. Political trust and trustworthiness. Annu Rev Polit Sci 2000;3:475–507.
[50] Nøstbakken L. Fisheries law enforcement: a survey of the economic literature. Mar Policy 2008;32:293–300.
[51] Rothstein B. Quality of government: corruption, social trust and inequality in an international perspective. Chicago: University of Chicago Press; 2011.
[52] Uslaner E. Corruption, inequality, and the rule of law: the bulging pocket makes the easy life. Cambridge: Cambridge University Press; 2008.
[53] Stop illegal fishing. Country profiles: South Africa. In: stop illegal fishing in South Africa. Report by the stop illegal fishing programme. Gaborone, Botswana, 2008.
[54] FAO. Fishery and aquaculture country profiles: South Africa. 〈http://www.fao.org/fishery/countrysector/FI-CP_ZA/en〉, 2010 [accessed May 2011].
[55] The Sea Around Us Project. 〈http://www.seaaroundus.org/eez/710/1.aspx〉, 2009 [accessed May 2011].
[56] FAO. Information on fisheries management in the republic of South Africa. 〈http://www.fao.org/fi/oldsite/FCP/en/ZAF/body.htm〉, 2001 [accessed May 2011].
[57] Branch GM, Clark BM. Fish stocks and their management: the changing face of fisheries in South Africa. Mar Policy 2006;30(1):3–17.
[58] Cunningham S, Bodiguel C. Subregional review: Southwest Indian Ocean. In: Review of the state of world marine capture fisheries management: Indian Ocean. FAO fisheries technical article, no 488. Rome: Food and Agriculture Organization of the United Nations; 2005.
[59] FEIKE Natural Resource Management Advisors. South African fisheries. 〈http://www.feike.co.za/rightsAllocations.html〉, 2008 [accessed May 2011].
[60] Kleinschmidt H. Report on the legislative, policy and governance frameworks in the BCLME region. For the BCLME Programme by FEIKE Natural Resource Management advisors, 2007.
[61] Hauck M, Kroese M. Fisheries compliance in South Africa: a decade of challenges and reform 1994–2004. Mar Policy 2006;30:74–83.
[62] Raemaekers S. Rethinking South Africa's small-scale fisheries management paradigm and governance approach: evidence from the Eastern Cape. PhD dissertation. South Africa: University of Rhodes; 2009.
[63] Japp D. Country review: South Africa (Indian Ocean). In Review of the state of world marine capture fisheries management: Indian Ocean. FAO fisheries technical article. no 488. Rome: Food and Agriculture Organization of the United Nations; 2005.
[64] Department of Agriculture, Forestry and Fisheries, DAFF. Briefing to the portfolio committee on agriculture, forestry and fisheries. Department of Agriculture, Forestry and Fisheries, South Africa, 〈http://www.pmg.org.za/files/docs/100601daff.ppt#294,18,Current functional arrangements〉, 2010 [accessed May 2011].
[65] Cacaud P, Kuruc M, Spreij M. Administrative sanctions in fisheries law.FAO legislative study 82. Rome: Food and Agriculture Organization of the United Nations; 2003.
[66] Republic of South Africa. Marine Living Resources Act. Act no 18 of 1998, Government Gazette 395 (18930), South Africa, 1998.
[67] Hauck M, Hara M, Mather D. Economic aspects of MCS in South Africa: compliance/legitimacy investigation, Report B working article, SA/B7-3200-99/01, the SADC-EU MCS programme. Namibia: South African Development Community; 2005.
[68] Hauck M, Sowman M. Coastal and fisheries co-management in South Africa: an overview and analysis. Mar Policy 2001;25:173–85.
[69] Moolla S. Illegal fishing of marine resources in South African waters: in search of solutions. Draft article.Institute for Security Studies; 2010.
[70] Pramod G, Pitcher TJ, Rojo-Diaz P. An estimation of compliance of the fisheries of South Africa with Article 7 (Fisheries Management) of the FAO (UN) Code of Conduct for Responsible Fishing. In: Pitcher TJ, Kalikoski D, Pramod G, editors. Evaluations of compliance with the FAO (UN) Code of Conduct for Responsible Fisheries, Fisheries Centre research reports 14, no 2. Canada: Fisheries Centre, University of British Columbia; 2006.
[71] South African Development Community, SADC. SADC monitoring, control and surveillance of fisheries activities programme. Working article no 9, the SADC-EU MCS programme. Namibia: South African Development Community; 2002.
[72] Steinberg J. The illicit abalone trade in South Africa. ISS occasional article no 105, 2005.
[73] Department of Environment Affairs and Tourism, DEAT. Court bid to halt emergency abalone fishing failed. Department of Environment Affairs and Tourism,

South Africa, 〈http://www.info.gov.za/speeches/2007/07121214151001.htm〉, 2007 [accessed May 2011].
[74] Stop illegal fishing. Abalone is delisted from CITES by South Africa. 〈http://www.stopillegalfishing.com/sifnews_article.php?ID=51〉, 2010 [accessed May 2011].
[75] Auditor-General of South Africa. Report of the Auditor-General to Parliament on performance audit of the handling of confiscated abalone at the Department of Environmental Affairs and Tourism. 〈http://www.environmental-auditing.org/Portals/0/AuditFiles/SouthAfrica_f_eng_Handling%20of%20Confiscated%20Abalone.pdf〉, 2009 [accessed May 2011].
[76] Raemaekers S, Hauck M, Bürgener M, Mackenzie A, Maharaj G, Plaganyi EE, et al. Review of the causes of the rise of the illegal South African abalone fishery and consequent closure of the rights-based fishery. Ocean Coast Manage 2011;54(6):433–45.
[77] Cape Argus. ANC man arrested in abalone bust. Published 7 April 2009.
[78] Hauck M, Hector R. An analysis of Operation Neptune: government's response to marine poaching.occasional paper series. South Africa: University of Cape Town; 2000.
[79] Morton R, Williams KC. Experimental political science and the study of causality: from nature to the lab. Cambridge: Cambridge University Press; 2010.
[80] Ostrom E. A behavioral approach to the study of rational choice theory of collective action. Am Polit Sci Rev 1998;92(1):1–22.
[81] Campbell DT, Stanley JC. Experimental and quasi-experimental designs for research. Chicago: Rand McNally; 1963.
[82] Standing A. Corruption and commercial fishing in Africa. U4 Brief 23, U4 Anti Corruption Resource Centre,2008.