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Assessing a social norms approach for improving recreational fisheries compliance

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Abstract

This study aimed to assess the suitability of the Berkowitz' (2005) social norms approach (SNA) for improving compliance behaviour amongst recreational fishers. A total of 138 recreational shore anglers were interviewed in Eastern Cape, South Africa and asked about their compliance, attitudes towards compliance, perceptions of compliance and the attitudes of other anglers. Results indicate that angler compliance for individual regulations was relatively high (75%–90%). Attitudes of anglers towards compliance was positive, with >80% feeling that "breaking any regulation is wrong." Yet, as predicted by the SNA, interviewees often overestimated the non-compliance and negative attitudes of other anglers, particularly as their social proximity decreased. Interviewees with the greatest misperceptions were also less compliant. The social norms present in the Eastern Cape rock and surf fishery fulfil the criteria required for the application of the SNA, suggesting that this approach may provide a suitable normative intervention for improving compliance to be used in conjunction with instrumental approaches in recreational fisheries.

KEYWORDS
compliance, Eastern Cape, fisheries management, recreational angling, South Africa

1 | INTRODUCTION

With a global participation rate estimated to be around 10% (Arlinghaus & Cooke, 2009; Granek et al., 2008), recreational fisheries are estimated to harvest of over 10 million tonnes of fish annually (Cooke & Cowx, 2004). This impact on the environment has been recognised in many countries around the world, and it is widely recognised that recreational fisheries can be as destructive as commercial fisheries (Coleman, Figueroa, Ueland & Crowder, 2004; Hyder, Armstrong, Ferter & Strehlow, 2014).

Non-compliance, which refers to any action that is in direct contravention of the laws set forth by fisheries managers, whether accidental or deliberate, has been a problem in recreational fisheries for decades (Gabelhouse, 1980; Hauck & Kroese, 2006; Pierce & Tomcko, 1998). It has been a concern of both recreational anglers and managers (Gigliotti & Taylor, 1990) as it exacerbates the already significant impact of the sector on fish populations. Examples of non-compliance in recreational fisheries include, but are not limited to: unlicenced fishing, fishing for prohibited species or in prohibited areas, catching undersized fish and exceeding bag limits.

The behavioural social sciences generally present two notions of compliance: the instrumental and the normative. The instrumental concept assumes that people are rational actors who pursue their own interests and determine their actions according to their own costs or benefits (Hauck, 2008). This view, while important in determining behavioural propensities in individuals and groups, is incomplete as it ignores collective action problems and contradictions that may arise in particular social and historical contexts. For example, Herbert Simon's (1957) theory of bounded rationality argues that the rationality of one's decisions are limited to the information they have, the cognitive limitations of their minds and the time available to make the decision. This theory postulated that most people are

only partly rational and are irrational in the remaining part of their actions.

Conventional natural resource managers have categorised recreational fishers as instrumental actors, and their compliance is thought to be primarily determined as a trade-off between the financial incentive to comply and the chance of detection if free-riding (Keane, Jones, Edward-Jones & Milner-Gulland, 2008). Becker's (1968) seminal paper on the economics of crime, deterrence and punishment suggests that the likelihood of a criminal committing an offence is determined by an assumed "cost" measured by the expected penalties: the probability of being punished, multiplied by the subjective disutility of the punishment. Increased expected punishments, such as higher monetary fines, longer imprisonment terms or greater probability of detection, will decrease the likelihood of an offence due to a higher perceived "cost" to the criminal. Basic economic principles would argue that when the "costs" increase, criminals will substitute out of crime and into other (legal) activities. This model became known as the "deterrence effect."

Unsurprisingly, fisheries managers have generally held the view that compliance can be improved by either increasing the level of enforcement (Hatcher, Jaffry, Th′ebaud & Bennett, 2000) or by increasing the penalties for breaking the regulations (Keane et al., 2008). Increasing penalties, while theoretically possible, may also result in an escalation of poor behaviour as the fishers begin to rebel against regulations particularly in a third-world context where many users are impoverished (Keane et al., 2008). Furthermore, Kuperan and Sutinen (1998) suggested that judges often feel that the penalties should be appropriate for the crime, which may result in poor institutional support for this approach as there is not a direct victim. Increased enforcement activity in recreational fisheries has in some cases improved compliance (Brouwer, Mann, Lamberth, Sauer & Erasmus, 2010; Gigliotti & Taylor, 1990). However, as recreational fishers are often widely dispersed amongst lakes, rivers, along extensive coastlines and multiple landing sites, enforcement activities can be complex and cost prohibitive (Sutenin, 1993). Therefore, it is unlikely that increasing the levels of enforcement is a sustainable, long-term option in many recreational fisheries and alternatives to the instrumental approach are necessary.

Despite this unpropitious picture, some fisheries with weak law enforcement and low penalties manage to retain high levels of compliance (Gezelius, 2003; Sutinen & Kuperan, 1999). In these cases, the favourable compliance behaviour is thought to be attributed to factors aligned with the normative concept. This concept suggests that an individual's decision is to comply with regulations that are based on morality, legitimacy, and social and cultural norms (Hauck, 2008). In the normative, sometimes the perceptions of "fairness" and "validity" are said to sway the decision-maker when the threat of a sanction is not enough (Keane et al., 2008). Perceptions can also be swayed by fear of retribution or informal or formal units of coercion (Bromley, 1992). However, due to the characteristically broad range of demographic characteristics, motives, attitudes and social values of recreational fishers (Sutton, 2006; Wilde, Riechers & Ditton, 1998), interventions to improve their compliance behaviour using a normative approach have been elusive.

One of the primary normative interventions that has attempted to improve compliance behaviour has been educational campaigns to enhance angler awareness of (Page & Radomski, 2006) and public attitudes towards (Matthews & Riley, 1995) conservation. These interventions assume that education will drive changes in attitude and ultimately human behaviour. However, there is limited empirical evidence suggesting that these cognitive fixes have been successful and as the initial study by LaPierre (1934) found that people's actions do not necessarily reflect their attitudes, several questions have been raised about the connection between attitudes and behaviour (Herberlein, 2012; Matthews & Riley, 1995).

Herberlein (2012) suggested that technological and structural fixes could be used as alternatives to a cognitive fix when attempting to influence environmental behaviour. A technological fix attempts to alter a process or object in the environment and thus completely bypassing the need to change attitudes. For example, preventing access (by closing a road) and limiting recreational fishing along a particular area characterised by poor compliance behaviour could be a technological fix. A structural fix refers to changing the context within which behaviour occurs, such as imposing levies or amending angling regulations. However, these fixes have not been overly successful. Many attempts have resulted in controversy and protest (McComas, 2004) or the circumvention of the fix. In the technological fix example, anglers would most likely respond by creating their own paths to the fishing area or displacing their fishing effort and non-compliant activities to another area. Herberlein (2012) suggested that both fixes carry the potential for unintended consequences, such as causing a change in the attitudes they were initially built upon.

A normative intervention, which has yet to be applied to recreational fisheries compliance behaviour, is the manipulation of social norms. Individual behaviour is often shaped by what people around them consider to be appropriate or desirable. A social norm has to do with beliefs about others, that is, social expectations within some reference group that are maintained by social approval, disapproval or influence. People, therefore, generally conform to social norms to avoid the disapproval of others (Elster, 1989). Herberlein (2012) felt that these norms are the key to influencing behaviour as they explicitly involve a social and not a personal component.

Although there are many types of social norms, the descriptive, injunctive and perceived norms are important when considering the manipulation of behaviour. Cialdini, Kallgren and Reno (1990) defined a descriptive (or actual) norm as people's perceptions of what is commonly performed in specific situations. The injunctive norm is people's approval about a particular behaviour, or their opinion of how an individual *should* behave. Subjective (or perceived) norms relate to the perceived social pressure to engage or not to engage in a behaviour (Ajzen, 1991).

The accurate interpretation of social norms is critical to any programme that aims to use them for the manipulation of human behaviour. Several authors have used a focus-theory approach conducted in an experimental setting to investigate the normative standards related to overcrowding in national parks and marine-protected areas (MPA) (Budruk & Manning, 2003; Manning, Morrissey & Lawson,

2005; Needham, Szuster & Bell, 2011; Shelby & Vaske, 2007). Cialdini et al. (1990) used a focus-theory approach to measure and influence the norms associated with littering behaviour. In that case study, unknowing participants made a decision about littering based on the amount of litter in their surrounding environment and after witnessing the behaviour of a confederate. Unfortunately, these focus-theory approaches require specialised expertise that is often lacking amongst fishery managers, thus limiting their broad use in a recreational fisheries context.

Kagervall, Heberlein, Hellström and Ericsson (2014) used a simpler, questionnaire method and asked anglers about their attitudes to catch and release angling based on the amount of fish caught by another angler. The responses were recorded on 5-point Likert-type scales ranging from "Extremely unacceptable" to "Extremely acceptable," and a social norms curve for catch and release attitudes was constructed with the scale responses on the *y*-axis and the amount of fish kept on the *x*-axis. This method graphically displays the injunctive norm (what society finds acceptable or unacceptable) or as the authors refer to it "the optimal behaviour." Unfortunately, the estimation of the norms of recreational fisheries compliance is not possible using a typical social norms curve as the angler responses to questions on their own compliance and the compliance of other anglers will be a binomial probability (yes or no). Berkowitz (2005) proposed a similar questionnaire method that asked individuals about their behaviour (descriptive norm), about their attitudes towards the behaviour of others (injunctive norm) and their perceptions of the behaviour of others (perceived norm). This methodology, provided that the potential for angler dishonesty is minimised, may provide a robust method for the collection of the social norms associated with angler compliance.

Once the social norms have been accurately interpreted, a range of interventions are used to manipulate behaviour. For example, Stern, Dietz and Black (1985) presented a theoretical norms model that relates concepts together as a social–psychological guide for supporting environmental protection. This involved the activation of moral norms against harming innocent people, referred to as norm-activation theory. An alternative and simpler method, which may have potential in an environmental context, was developed by Berkowitz (2005) and is known as social norms approach (SNA). The SNA uses research to determine the social descriptive, injunctive and subjective norms and intervenes by attempting to correct any negative misperceptions of societal norms using targeted advertising campaigns. The SNA is dependent on the existence of pluralistic ignorance (Berkowitz, 2003) or false consensus, a clear misperception between the descriptive and perceived norms by an individual. Critically, the misperception should be an overestimation of the undesirable behaviour (Berkowitz, 2005). Perkins and Berkowitz (1986a,b) recommended that for the SNA to be effective, at least half of the population should exhibit the acceptable behaviour (descriptive norm) and should maintain beliefs that align with the acceptable behaviour (injunctive norm). In a hypothetical recreational fisheries context, the descriptive norm may be that very few anglers keep fish smaller than the specified minimum size limit and the injunctive norm is that the majority of anglers believe that one should not keep these undersize fish. However, many anglers believe that most other anglers do indeed retain undersize fish (perceived norm). The SNA assumes that despite an angler's belief that he/she should not retain undersize fish, the impression that other anglers do retain these fish will increase the likelihood that he/she will be non-compliant. Therefore, compliance behaviour can theoretically be improved by advertising the descriptive norm (actual proportion of anglers that are compliant to minimum size limits) and thereby correcting the pluralistic ignorance.

The SNA has been successfully applied in the context of alcohol consumption (Borsari & Carey, 2003; Haines, Barker & Rice, 2003; Johannessen & Glider, 2003). In most studies, the correction of the pluralistic ignorance through educational awareness campaigns reduced the quantity of alcohol consumed by heavy drinkers and increased the number of individuals that abstained. Other successful applications of the SNA include smoking, seat belt use (Linkenbach & Perkins, 2003; Perkins & Linkenbach, 2004) and HIV risk behaviour (Chernoff & Davison, 2005). However, this particular approach has not been implemented extensively in an environmental context, with the exception of a study on debris from recreational boats (Haab & McConnel, 2002) and the evolution of social norms in the management and governance of natural resources and ways in which communities work to reduce free-riding (Ostrom, 1990, 2014).

The SNA could therefore provide a simple and more practical means of identifying and correcting social norms in the recreational fisheries context. It also requires less social science expertise and could facilitate the transition from traditional management to the inclusion of the human dimension, even when fisheries managers, most of whom are ecologists (Caddy & Cochrane, 2001), have limited social science training.

This study provides the first step towards exploring the SNA for improving compliance in recreational fisheries. The applicability of the SNA towards improving compliance in a recreational fishery was assessed using South Africa's Eastern Cape rock and surf fishery as a case study. The study: (1) interpreted the descriptive, injunctive and perceived norms for compliance of anglers; (2) examined correlations between these norms and angler demographics; and (3) determined the suitability of recreational fisheries for the implementation of the SNA.

2 | METHODS

South Africa's Eastern Cape (EC) rock and surf (R&S) fishery was selected as an appropriate case study to gather data on the social norms of compliance and to assess the suitability of the Berkowitz (2005) SNA as a potential tool for improving recreational fisheries compliance. Anglers in the province represent a diverse community with wide disparities in characteristics such as education, income and employment. The fishery, which comprises both a competitive and non-competitive subsector, is regulated with a range of restrictions, including species-specific size limits, bag limits, closed seasons and closed areas, but these are poorly enforced resulting from corruption and limited manpower (Brouwer et al., 1997). R&S anglers are characteristically widely dispersed along the extensive EC coastline

(800 km) suggesting that efforts to improve compliance based on the instrumental approach would require a significant increase in enforcement. The South African government has yet to recognise recreational fishing as a legitimate fishery sector as the fishes captured are managed as linefish, which comprise all fishes captured on hook and line regardless whether they are captured in a subsistence, recreational or commercial fishery. The failure of the government to address this large fishery as an individual sector provides some indication of the limited resources allocated to its governance. Further undermining the objectives of increased enforcement is the wide-ranging petty corruption prevalent throughout the South African law enforcement agencies (Faull, 2007; Hauck & Kroese, 2006; Pillay, 2004). As a result, in the context of South Africa's recreational fishery, increased and improved enforcement on its own may not solve the widespread non-compliance issues, and hence, finding alternative ways of increasing compliance are necessary.

Data were collected using interview surveys between Kasouga and the Great Fish River in Eastern Cape, South Africa (Fig. S1) between March and June, 2012. To maximise the number of anglers intercepted, roving surveys were conducted during two long weekends and surveys were conducted at access points during several fishing competitions. For the roving creel surveys, interviewers began at the access points and moved on foot to intercept all anglers along a 10-km stretch of coastline.

Before the interview, anglers were asked whether they were interested in participating in a confidential and anonymous academic survey on fisheries compliance. Once the angler agreed to participate, they were reassured that all responses would be kept confidential to encourage honesty. The survey (Data S1) comprised questions on demographic information, including education, employment status, household size, income and religion; information on their angling history, such as the age at which they began angling, information on their fishing mentor, their motivations for angling and whether they read the popular angling literature.

When presenting participants with a questionnaire in which sensitive data are being gathered about the individual, especially data that may reveal criminal behaviour, two major sources of bias can arise. People may refuse to participate or after agreeing to participate, they may provide false information to prevent incrimination or judgement (Hansen, Hurwitz & Madow, 1993). Therefore, it was crucial that the participants felt comfortable that their information was secure and that they would not be penalised for their answers. Besides providing this assurance, a random response technique was used. This technique allows survey participants to respond to sensitive questions while maintaining confidentiality and decreasing the possibility of response and non-response bias and has been used to determine the rates of non-compliance in recreational fisheries (Arias & Sutton, 2013; Schill & Kline, 1995). In this study, anglers were asked to first flip a coin (out of view of the interviewer) and to answer "yes" if the coin landed on "tails" or truthfully if the coin landed on "heads." The majority of anglers found this method too confusing and insisted that they would prefer to "answer honestly" rather than use the random response technique.

This was followed by questions on their perception of the compliance of anglers belonging to other reference groups, including their close fishing friends (close friends), competitive anglers and EC anglers in general. Interviewees were also questioned on their attitudes towards compliance and asked for their perception of the attitudes of other anglers towards compliance. The survey used Likert scales, which were employed to identify the attitudes towards various regulations. All anglers that were encountered were willing to participate in the survey, and a total of 138 were interviewed.

2.1 | Statistical analysis

Most of the anglers (90%) were not in favour of using the random response technique and opted instead to answer truthfully which required an alternative method to test the validity of the results. Therefore, a chi-square analysis was used to evaluate the truthfulness of the responses of all anglers by comparing their own answers to their perceptions of the compliance behaviour of their close friends. This was based on the assumption that the compliance behaviour of anglers was similar to that of their close friends. Previous research (Reed, Lange, Ketchie & Clapp, 2007; Yanovitzky, 2006) suggested that the perceived norm of the behaviour of close friends plays a major role in shaping true behaviour.

Anglers who admitted to breaking a specific regulation (size limits, bag limits, closed seasons, fishing in marine-protected areas, selling fish and possessing a valid permit) were aggregated and categorised as non-compliant for that given regulation. Data were organised by compliance category (compliant or non-compliant) and subsequently the demographic characteristics, such as age, gender and race; social characters, such as religion, motivation for angling (including competitive or recreational) and attitude towards compliance; and economic characteristics, such as employment status, income and expenditure on fishing activities. The perceived norm of compliant and non-compliant anglers was all compared using a chi-square analysis to determine whether they influenced compliance behaviour.

The perceived norm of compliance (expressed as a percentage) for competitive, non-competitive and all EC R&S anglers was compared using two-way ANOVA with alpha set at $p < 0.05$ for each comparison. Differences in the perceived norm between close angling friends, mentors, competitive anglers, non-competitive and all R&S anglers were compared using chi-square analysis.

3 | RESULTS

A total of 138 R&S anglers were interviewed. The average angler was a 42-year-old, white (89%), Christian (69%), employed male (97%) with a secondary education (89%). The average household size of the anglers was three, with two anglers per household. Anglers mostly began fishing between the ages of 10 and 13 and identified their father as their fishing mentor (68%). Religious affiliations were dispersed between Christian (69%) and Atheist beliefs (30%). The majority of anglers were employed or self-employed (87%). Anglers indicated that

their motivations for fishing were "social" (31%), to "enjoy the environment" (29%), "to compete" (15%), "for provincial/national recognition" (5%), "get out of the house" (13%) and to "catch fish" (6%).

The majority of anglers (56%) admitted to having violated at least one of the regulations at least one time in the previous 12 months. However, when examined by individual regulation, the reported compliance was generally high, with 75%, 85% and 90% of anglers adhering to the size limits, bag limits and marine-protected areas, respectively, over a 12-month period (Table 1). The proportion of compliant anglers was not significantly different from the proportion of close friends that was perceived to be compliant ($\chi^2 = 0.4$, $p < 0.05$, $df = 6$), and the actual compliance and perceived compliance of close fishing friends to each of the regulations were similar (Figure 1).

Age ($\chi^2 = 12.59$, $p < 0.05$, $df = 6$), religion ($\chi^2 = 3.61$, $p < 0.05$, $df = 2$), employment status ($\chi^2 = 0.64$, $p < 0.05$, $df = 1$) and income ($\chi^2 = 1.9$, $p < 0.05$, $df = 3$) were not related to angler compliance. However, compliant anglers were significantly more educated than non-compliant anglers ($\chi^2 = 23.73$, $p < 0.05$, $df = 3$). Mentorship significantly influenced compliance ($\chi^2 = 13.61$, $p < 0.05$, $df = 3$) as a higher proportion of compliant anglers identified their father as their mentor. However, the motivation for angling did not impact compliance ($\chi^2 = 1.981$, $p < 0.05$, $df = 1$).

Angler perceptions of the compliance of competitive, non-competitive and all EC R&S anglers were significantly different ($F_{2,12} = 285.38$, $p < 0.05$). When compared with the observed compliance data (actual norm) for each group, anglers generally overestimated the level of compliance of competitive anglers (with the exception of selling fish and fishing in an MPA), underestimated the compliance of non-competitive anglers and largely underestimated the compliance of EC R&S anglers (Table 1). Overall, for each individual regulation, anglers perceived other fishers to be less compliant than the actual compliance data suggested (Table 1). Although the perceptions of the compliance of all EC R&S anglers were better for compliant than non-compliant anglers, this difference was not significant for any regulation (Table 2).

Over 80% of the interviewees believed that "breaking any regulation is wrong" and beliefs were generally in favour of compliant behaviour (Figure 2). Anglers who believed that "breaking any regulation is wrong" were significantly more compliant than those with poorer attitudes towards compliance ($\chi^2 = 7.21$, $p < 0.05$, $df = 1$). Compliant anglers also maintained significantly ($\chi^2 = 30.37$, $p < 0.05$, $df = 3$) better attitudes towards compliance than non-compliant anglers (Table 2).

Angler perceptions of the attitudes of their close angling friends, mentor, competitive anglers, non-competitive anglers and EC R&S anglers towards compliance were significantly different ($\chi^2 = 231.21$, $p < 0.05$, $df = 3$). This was largely attributed to their perception of the poor attitude of EC R&S anglers towards compliance (Figure 1). Anglers with negative perceptions of the attitudes of "EC R&S anglers" were significantly ($\chi^2 = 11.14$, $p < 0.05$, $df = 3$) less compliant than those with positive perceptions.

4 | DISCUSSION

Perkins and Berkowitz (1986a,b) recommended that at least half of the population should exhibit the acceptable behaviour (descriptive norm) and should maintain beliefs that align with the acceptable behaviour (injunctive norm) if the SNA is to be effective. With only 44.5% of anglers compliant to all regulations (actual norm), the initial conclusion might be that this fishery may be unsuitable for the SNA. However, when examining individual regulations, angler compliance to individual regulations (actual norm) was well over the 50% (ranging from 75% for size limits to 90% for marine-protected areas) and therefore suited to an SNA intervention. It appears that angler compliance has remained at these levels in the Eastern Cape for some time. Brouwer et al. (1997) conducted angler interviews in this region and estimated the compliance to individual regulations at between 50% (size limits) and 91% (marine-protected areas). This suggests that the current instrumental model used to combat non-compliance has been largely unsuccessful and emphasises the introduction of new supplementary approaches.

The beliefs of anglers aligned well with acceptable compliance behaviour (Figure 2), with the majority (80%) feeling that "breaking any regulation is wrong." Besides adhering to the requirements of the SNA, Nielson and Mathieson (2003) found that the attitudes of fishermen were correlated to compliance. They felt that personal ethical views on "right" and "wrong" often determined compliance behaviour.

TABLE 1 Interviewee's own and perceived non-compliance (%) for their close friends, competitive, non-competitive and all anglers in the Eastern Cape rock and surf fishery, South Africa

	Interviewees	Close fishing friends	Competitive anglers		Non-competitive anglers		EC R&S anglers
	Actual	Actual	Actual	Perceived	Actual	Perceived	Perceived
Undersize fish	30.2	50.7	32.3	13.5	30.0	46.6	66.3
Over bag limit	24.0	36.2	25.0	23.0	22.9	45.3	70.2
Fish retained during closed season	12.9	21.2	13.8	12.3	12.0	39.7	67.7
Fish in MPA	0.6	6.4	1.1	10.3	0.0	36.4	64.5
Selling fish	7.7	19.0	9.4	21.3	6.0	37.3	66.9

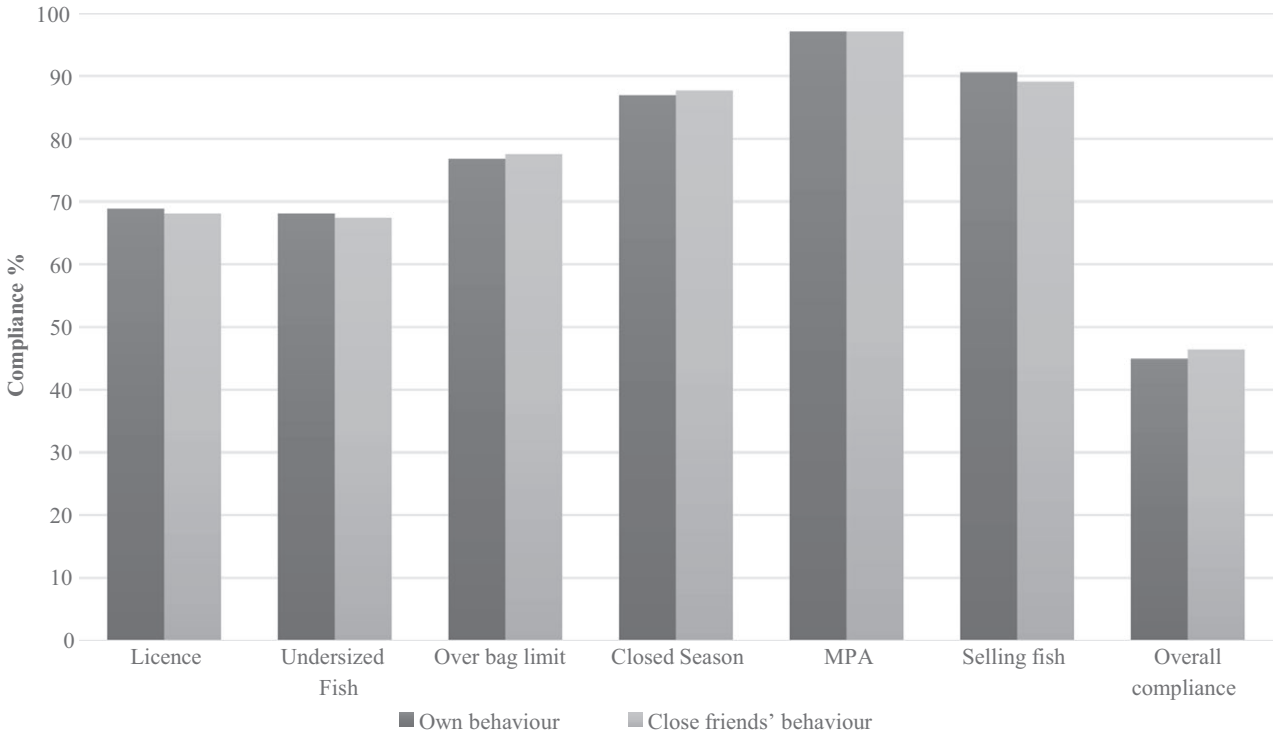

FIGURE 1 Comparison between the compliance of Eastern Cape rock and surf anglers and the perceived compliance of their close fishing friends

TABLE 2 Perceptions of the compliance behaviour (%) of all Eastern Cape rock and surf anglers by compliant and non-compliant interviewees

	Compliant interviewees	Non-compliant interviewees	*p* value (students *t* test)
Perceived compliance to size limits	29.7	37.9	0.23
Perceived compliance to bag limits	29.5	32.7	0.63
Perceived compliance to closed seasons	28.9	36.8	0.27
Perceived compliance to MPA restrictions	31.7	40.1	0.27
Perceived compliance to selling fish	31.5	38.8	0.33

This was also found in this study as individuals with positive attitudes (those who believe that breaking any regulation is wrong) were found to be significantly (Table 2) more compliant than those with poorer attitudes towards compliance.

Central to the requirements of the SNA is the existence of "pluralistic ignorance," where individuals perceive the behaviour of others as different from their own and then align their behaviour more closely to the presumed majority (Berkowitz, 2005). There was evidence of this within the EC R&S fishery (Table 1). Here, the difference between the actual compliance of the interviewees and the perceived compliance of all EC R&S anglers ranged between 39% (size limits) and 63% (marine-protected areas). The perceptions of the compliance of "all EC R&S" were also worse for the interviewees who were non-compliant to the regulations (Table 2). Pluralistic ignorance has been found in other fisheries compliance studies. For example, Hatcher et al. (2000) found that fishers who felt that their peers were non-compliant were 8% more likely to be non-compliant themselves.

Misperceptions of angler compliance and attitudes towards compliance are likely to negatively influence behaviour in a number of ways. The Thomas theorem (Thomas & Thomas, 1928) states that "If people perceive situations to be real, those situations are real in their consequences." Merton (1957) described a self-fulfilling prophecy as a new behaviour that is evoked by a false conception and ultimately makes it true. Thus, the poor compliance appears to be a self-fulfilling prophecy in this fishery, where the misperception of poor compliance and the attitudes of anglers towards compliance negatively effect compliance behaviour.

Misperceptions can also discourage the expression of opinions and actions (Merton, 1957). In a recreational fisheries context, anglers who observe others breaking the regulations are less likely to confront them as they (the compliant anglers) assume that they are in the minority and non-conforming. In this case, the perception that the majority of anglers are non-compliant and have poor attitudes towards compliance reduces the likelihood of individuals confronting non-compliant anglers. This will

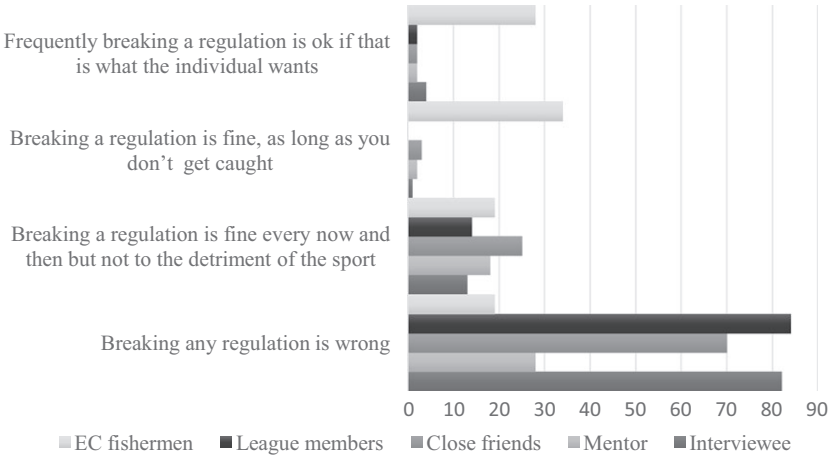

FIGURE 2 Perceived norms (%) for attitudes to compliance of Eastern Cape rock and surf anglers of varying social proximity

ultimately reduce the social pressure to comply and encourage conformity with the perceived norm of non-compliance (Berkowitz, 2005).

Based on this study, fisheries managers for the EC R&S fishery could consider implementing the SNA to improve fisheries compliance. This would require the implementation of a targeted advertising campaign that attempts to correct the misperceptions of non-compliance and poor angler attitudes towards compliance using the information collected during this study. Although the communication of this may be complex, an example slogan (which is paraphrased from a similar antismoking campaign) could be: "More than 75% of anglers stick to the size limit regulations." This type of campaign can be advertised using a range of methods, including print media, notice boards at access points, social media or presentations at angling competitions.

While the SNA may be suitable for implementation in the EC R&S fishery, the angling population in this study was fairly homogenous and education was the only demographic factor that appeared to influence compliance behaviour. However, recreational fisheries are typically characterised by heterogeneous angling populous (Arlinghaus, Bork & Fladung, 2008; Greiner, Franklin & Gregg, 2013; Johnston, Arlinghaus & Dieckmann, 2010; Kearney, 2001) and diversity in demographics, motivation, culture, religion and education. This research was undertaken in a roughly 60-km portion of South Africa's vast 2,800 km coastline, and, as a result, it is important to consider the historical context of land use in South Africa when viewing the angler demographics. Many policies dating back to the colonial era, such as the Land Act, the Group Areas Act and subsequent policies implemented during the Apartheid regime, denied the majority of non-White South Africans' ownership and use of certain stretches of the coastline and its resources (Hauck & Sowman, 2005). Despite numerous measures to reintegrate races and cultures since the end of Apartheid, many areas have maintained their historically homogenous characteristics. As social norms can vary between people belonging to different age classes, cultures, religion, economic backgrounds and other factors and each of these can influence compliance behaviour (Haab & McConnel, 2002), it is critical that fishery-specific research is conducted before considering the implementation of the SNA.

Central to the implementation of the SNA is the collection of accurate data on the actual norm. Data on compliance behaviour or criminal behaviour, as with other sensitive issues, are difficult to acquire, and the likelihood of obtaining a true reflection of the actual norm is difficult without a specialised approach. The random response technique has been used in various surveys on sensitive issues including recreational fisheries compliance (Schill & Kline, 1995). In this study, interviewees were not always willing to use this technique, instead opting to "answer truthfully." This was not anticipated in the survey design and required *ex poste* statistical analysis to assess the validity of the data. Perhaps the most convincing evidence of the validity of the actual norm data was its close alignment between the perceived behaviours of their close angling friends. People generally tend to associate themselves with those who display similar behaviour. For example, students have been found to associate on the grounds of similar drinking behaviour (Leibsohn, 1994). Therefore, it is assumed that anglers, like other social groups, will associate with individuals with similar compliance behaviour. Naturally, it is possible that individuals may perceive their close friends to be more compliant than they actually are, a phenomenon known as the halo effect (Nisbett & Wilson, 1977). Nevertheless, future social norms research on recreational fisheries compliance should incorporate additional efforts to obtain truthful information. Besides an anonymous interview process, the reiteration that the interviewer is not a law enforcement officer, a guarantee that all information would remain confidential and the use of some simplified version of random response technique should be a minimum requirement for the collection of baseline compliance data.

Besides the potential for the introduction of the SNA to improve recreational fisheries compliance, other findings of this study may be useful to fisheries managers. The compliance behaviour of the interviewee and the perceived behaviour of their mentors aligned closely in this study. This suggests that the role of mentors may be very important in shaping compliance behaviour. Therefore, fisheries managers could look to improve compliance behaviour by initiating mentorship programmes that aim to pass on good compliance practices and attitudes to young anglers. Previous studies suggested that mentorship results in positive but modest effects on social behaviour (Grossman & Tierney, 1998; Herrera, Kauh, Cooney, Grossman & McMaken, 2008). While a variety of mentoring programmes for recreational fishing have emerged around the world in recent years, South Africa has yet to

implement this strategy and knowledge of its effectiveness remains incomplete.

Another finding was the significantly improved compliance amongst anglers who were mentored by their fathers. Chawla and Cushing (2007) emphasised the importance of parents when educating children on good environmental behaviour. This appeared to hold true in the context of recreational fisheries compliance. Although understanding the mechanism driving this pattern was not an objective in this study, it is possible that fathers emphasise good compliance practices to preserve their children's future recreational fishing opportunities. Regardless of the mechanism driving this finding, it may provide fisheries managers with an opportunity to improve compliance behaviour by simply encouraging fathers to take their children fishing.

In conclusion, recreational fisheries managers would do well to shift some attention towards the normative concept when addressing the problem of poor fisheries compliance. This research suggests the SNA may be an appropriate method to increase the accuracy of the perceptions of the compliance and attitudes of recreational anglers and possibly improving compliance behaviour. This, along with the traditional instrumental compliance methods, may encourage recreational anglers to act in congruence with their attitudes and strengthen an already majority culture of complying with individual fishery regulations. The development of such a social movement of self reform, could be the key defining feature of a more effective fisheries management approach to address levels of compliance, which have been historically low in the Eastern Cape.

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