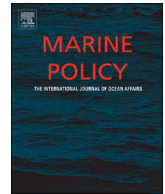




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When push comes to shove in recreational fishing compliance, think ‘nudge’

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ABSTRACT

Enforcing compliance with rules and regulations in recreational fisheries has proved difficult due to factors such as the high number of participants and costs of enforcement, the absence of regular monitoring of recreational fishing activity, and the inherent difficulties in accurately determining catch levels. The effectiveness of traditional punitive deterrence is limited, yet current management is heavily reliant on this compliance approach. In this paper, the potential of behavioural based management is considered through a narrative review of the relevant literature; specifically, exploring the use of nudges, which aim through subtle changes and indirect suggestion to make certain decisions more salient, thereby improving voluntary compliance. This concept is explored with specific reference to the compliance of fishers within Australian recreational fisheries. There are only a few examples of behavioural based approaches found. However, based on their theoretical foundations, nudges may represent an inexpensive, and potentially highly effective tool for recreational fisheries management. Nudges do not offer a ‘quick fix’ to cases where traditional policy instruments have failed. Rather, there is the potential for behavioural nudges (based on framing, changing the physical environment, presenting default options, and social norms) to augment and complement existing deterrence regimes. A number of potential nudges for compliance management in recreational fisheries are suggested, but caution is advised. As with any novel management approach, nudges must be rigorously tested to demonstrate their cost-effectiveness and to avoid unintended consequences.

1. Introduction

Fishing is a popular recreational activity in many places around the world [128]. The global estimation of recreational fishing¹ participation is around 11% of people [13] with an estimated number of fishers ranging between 220 million [47] and 700 million [36]. Recreational fishing provides participants with a number of social, economic and health benefits [37,72] as well as a potential source of protein [35,38]. In some cases it also generates significant social and economic benefits to communities, for example through the flow-on economic and employment benefits arising from fisher expenditure and tourism [32]. Many recreational fisheries are managed under regulated open access regimes [69], which fail to fully curtail the destructive race behaviours characteristic of users of a common pool resource, which can result in excessive fishing capacity and user congestion, and overuse of fish stocks. Recreational fisheries are, therefore, prone to over-exploitation and with the most valued commercial species often targeted [33], re-

creational fisheries have been credited with contributing to global fisheries declines [151,36].

Global recreational fisheries are generally understudied, poorly understood [153], and their scale and impact are largely underestimated [118,35,86]. For example, in Australia, recreational harvest is substantial and exceeds the commercial catch for a number of species, including Yellowtail Kingfish [88], Blue Swimmer Crab and Snapper [98]. More widely, monitoring, surveillance and enforcement efforts by management are well below those for commercial fisheries [60]. This is often due to capacity shortfalls in staff and financial resources [55] and consequently, very few comprehensive records of catch and effort exist [28]. The impacts of recreational fishing can affect size structure, stock abundance and evolutionary trajectories [86], and will be further heightened by technological improvements [98]. However, poor knowledge and understanding of these impacts challenges the effectiveness of sustainable management [9,7]. To date, initiatives to limit and control recreational fishing activity have focused on addressing

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¹ Recreational fishing is often defined as any recreational activity that removes aquatic organisms, including but not limited to line fishing, spearfishing, netting and collecting [128].

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symptoms and not on the underlying causes of problems because of this lack of understanding [36].

The overall approach to recreational fisheries management has tended to mirror that of the commercial fisheries with a heavy emphasis on the use of regulatory tools, such as effort regulation and catch limits [35]. Ensuring compliance with such regulations is therefore a key element in effective fisheries management. Non-compliance with regulations in the global conservation context remains one of the largest illegal activities in the world, resulting in degradation to societies, economies and the environment [61,7]. The threats that non-compliance poses on marine conservation and marine socio-ecological systems are also consequential; non-compliance has the potential to undermine management [129] and sustainability [78], and to create conflict between user groups [35,79]. Conversely, ensuring recreational fishers' compliance with rules and regulations is particularly difficult due to factors such as the high number of participants and costs of enforcement, the absence of regular monitoring of recreational fishing activity, and the inherent difficulties in accurately determining catches. While management of both sectors tends to emphasise instrumental factors like economic incentives and deterrence for ensuring compliance [108,81], the absence of formal management infrastructure in recreational fisheries (i.e. landing obligations, log books, electronic monitoring or on-board observers) renders this approach less effective and suggests the need for an alternative approach.

Although recreational and commercial fisheries share a number of characteristics, and enforcement and management tend to be similar, the two are fundamentally different [42]. In particular, while commercial and recreational fishers both positively respond to catch rates, recreational fishers are generally more motivated by non-catch incentives [10]. Non-catch motivations can be broadly categorised into three groups; mastery motivations such as mental stimulation [73], achievement [70,82] and trophy winning [135]; social factors [45,95]; and escapism (White [148]; [68]). Since the main drivers for recreational fishing behaviour extend beyond the key economic drivers of commercial fishing, the instruments needed for effective management of recreational fishing are likely to differ from those used in commercial fisheries. Despite this, such instruments have typically dominated recreational fisheries [39]. Moreover, the need to incorporate human dimensions for compliance management in recreational fisheries is increasingly being recognised and advocated for [11,19,71] and the use of voluntary and informal institutions for recreational fisheries management have been suggested [39]. However, the application of behaviourally-based approaches for compliance management has yet to be explored.

The overall aim of this manuscript is to highlight how behavioural nudges may fill a critical gap in current fisheries management and improve recreational fishing compliance outcomes. The potential for lesser used, non-traditional approaches is highlighted through a narrative review of the peer reviewed literature on behavioural theory, specifically nudge theory. Nudge theory argues that through positive reinforcement or indirect suggestion, non-forced compliance can be achieved. The manuscript aim is achieved with specific reference to the case of Australian recreational fisheries, which have particularly high participation and a fisheries regulatory regime typical of developed countries. Additionally, there is a considerable wealth of literature on recreational fisheries in Australia, specifically with a focus on compliance. A brief background of relevant compliance theory is provided along with the definition of nudge theory (Section 2), followed by a review of the compliance issues and current management within Australian case literature (Section 3). This provides the context for discussing which behavioural nudges may be effective in influencing compliance behaviour, with examples provided (Section 4). The paper concludes by identifying a series of challenges and design considerations which will influence the effectiveness of nudges within recreational fisheries in Australia and elsewhere (Section 5).

2. Compliance theory in recreational fisheries

2.1. Traditional compliance theory

Compliance is defined for the purpose of this paper as adhering to the rules and regulations by recreational fishers. Compliance can be interpreted as either binary, i.e. no compliance vs. compliance, or as a spectrum, i.e. 'high', 'medium', 'low' [7]. The latter interpretation is more pertinent when considering compliance management as it is consistent with the notion that compliance is malleable and that gradual behavioural change can transition compliance along a gradient, rather than requiring behaviour to move from one opposite disposition to another. Non-compliance can be accidental or deliberate and can occur on a range of scales and frequencies, for example catching an undersized fish after a recent amendment to size restrictions, or a conscious, organised effort to catch a high value species with the intention to profit from sales. Compliance can be viewed as a function of deterrence and voluntary compliance. Deterrence is the outcome of deliberately implemented prevention tactics including the likelihood of getting caught and the severity of the repercussions. Voluntary compliance, on the other hand, occurs when people willingly choose to adhere to the rules and regulations regardless of the expected repercussions of non-compliance [121].

Identifying the determinants of compliance and knowing what drives compliance behaviour is complex, and this is reflected in the evolution of compliance theories and models. Becker [15] was the first to model the broad components of compliance and to discuss how to choose enforcement levels. Based on the assumption of rational economic behaviour, this model assumes that the decision to infringe is based on the expected return to breaking the rules, taking into account the direct returns and costs of different compliance behaviours, and the risk of detection and punishment. Some fisheries compliance models have built on Becker's model to include some of the complexity, incorporating additional parameters including individual effort [6] and personality types [30]. However, they are still better equipped for explaining compliance behaviour where economic drivers dominate (i.e. commercial fisheries) and inadequately capture the full complexity of the problem [111].

The recognition that compliance behaviour is not solely based on economic gains is expanding and is reflected in compliance models relaxing the assumption of pure instrumental rationality of agents and acknowledging the importance of normative behavioural drivers. Expansion of fisheries compliance models used concepts from psychology and sociology to extend the rational choice model to also include intrinsic values such as personal morality, social reputation and legitimacy [134,83]. Intrinsic values and informal management have been integrated within theoretical models of commercial fisheries ([108,65,93]; Nøstbakken [111]; Xepapadeas [152]). However, only recently have compliance models been tested on recreational fishing compliance behaviour [144]. The integration of normative drivers results in better prediction of compliance behaviour, with psycho-social factors such as social norms, being the most significant driver compared to instrumental drivers [141]. Therefore, the predictors of compliance are broader than the earlier deterrence models assumed, and the instrumental factors, upon which recreational compliance management is largely based, might not be adequate. Understanding of normative drivers is yet to be adequately applied in management, as harnessing social norms, legitimacy and personal morality into action is challenging. However, this is a gap that nudges, as successfully trialled and tested tools in influencing behaviour in other domains, may fill.

2.2. Nudge theory

If deterrence relies on 'shoving' people to make certain decisions (such as complying with rules), a 'nudge' can be thought of as a more subtle way to encourage a decision that is in people's best interest. For

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