‘Doing the right thing’: how social science can help foster pro-environmental behaviour change in marine protected areas

Victoria Y. Martin  
Southern Cross University

Betty Weiler  
Southern Cross University

Arianne Reis  
Southern Cross University

Kay Dimmock  
Southern Cross University

Pascal Scherrer  
Southern Cross University

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Victoria Y. Martin, Betty Weiler, Arianne Reis, Kay Dimmock, Pascal Scherrer

School of Business and Tourism, Southern Cross University, PO Box 157, Lismore NSW 2480, Australia

School of Business and Tourism, Southern Cross University, Locked Mail Bag 4, Coolangatta QLD 4225, Gold Coast, Australia

School of Science and Health, University of Western Sydney, Locked Bag 1797, Penrith NSW 2751, Australia

School of Business and Tourism, Southern Cross University, Hogbin Drive, Coffs Harbour NSW 2450, Australia

*corresponding author: Betty Weiler, School of Business and Tourism, Southern Cross University, Locked Mail Bag 4, Coolangatta QLD 4225, Australia, Betty.Weiler@scu.edu.au

1Victoria Martin is now at the Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, NY 14850, USA
‘Doing the right thing’: How social science can help foster positive behaviour change in marine protected areas

Abstract

Managers of marine protected areas (MPAs) are constantly challenged to encourage positive user behaviour to minimise impacts on marine ecosystems while allowing recreational use. Yet, some marine users continue to act in ways that diminish conservation values of the area. Drawing on social psychological theories, this paper presents a case for informed behaviour change strategies to reduce problem behaviours in MPAs and contribute to conservation efforts. Social psychological drivers of behaviour are explained and applied to an MPA context to demonstrate how they can inform strategies for predicting and changing behaviour using persuasive communication. As behavioural and persuasive communication theories are seldom invoked and almost never rigorously applied to MPAs, the review offers new theoretical and practical insights into how they can assist MPA management to target and shift specific behaviours that ultimately support marine park values.

Keywords: behaviour change theory, social psychology, marine protected area, marine park user, recreational use

Highlights

- Presents decision flowchart to guide theory-driven MPA user behaviour change
- Identifies constructs and theories of relevance to changing marine user behaviour
- Reviews persuasive communication theory and research in environmental contexts
- Examples of applications of behaviour change research in marine environments
- A model of factors influencing MPA user behaviour and behaviour change
1. **Introduction**

Although oceans cover 70% of the Earth’s surface and drive fundamental functions such as climate, weather, temperature regulation, oxygen production and carbon dioxide absorption, the focus on the protection of marine areas is recent compared to terrestrial efforts [1]. Accelerated growth in the creation of marine protected areas (MPAs) globally over the past decade comes at a time of ever increasing population growth and resource use, and unprecedented urbanisation and development, particularly along coastal areas [1, 2]. MPAs are recognised globally as a management tool to support marine ecosystem protection and conservation [3, 4], and are socially constructed with rules that collectively govern human uses of the marine space within a specified area [4].

MPAs tend to have a dual mandate of conservation while facilitating a range of uses as reflected in legislation and in social and political expectations, with recreational use and enjoyment being the focus of the present paper. The conservation–recreational use nexus poses constant challenges to managers of MPAs, challenges that are not uniform and that can vary significantly between sites and even shift over time [5]. These challenges are exacerbated when users of MPAs ‘do the wrong thing’ or break the rules governing allowable use that are in place to achieve the conservation goals of the area. Currently, managing non-compliance incurs considerable costs [6], and in some MPAs non-compliant behaviour is occurring to such an extent that it is detrimental to the conservation values of MPAs [7]. For example, poaching by recreational fishers (a common problem in MPAs across the globe) was recently shown to be taking place in the Great Barrier Reef Marine Park at a higher rate than managers previously believed [8]. It is therefore important to understand the drivers of these problematic behaviours in the management of all recreational users to facilitate positive, safe and inspiring experiences in natural and cultural areas without diminishing the very characteristics that attracted users in the first place [9].

Understanding, measuring and mitigating human impacts on the marine environment has been the focus of considerable research across the globe [9, 10]. While this body of research has not necessarily concentrated solely on MPAs [11], many of the environmental impacts caused by problem marine user behaviours do arise in MPAs and include: (i) negative impacts on marine species’ populations and health caused by illegal fishing [12, 13], intertidal/nearshore species harvesting [14, 15], disturbance of marine life [16-19], and disturbance to shorebirds by dog
walking [20] and/or human foot traffic [21]; (ii) environmental pollution as a result of littering and marine debris [22, 23]; and (iii) habitat damage caused by divers and snorkelers [24-27], anchor damage in environmentally sensitive locations [28], and trampling impacts on marine life [29-32]. Eliminating these impacts is not only essential for the health of the marine environment; it is also critical to marine scientific research. MPAs allow marine scientists to compare protected zones with other areas experiencing much greater pressures from certain types of human behaviours. In doing so, this research advances scientific understanding of the cause and effects of anthropogenic environmental impacts [33, 34].

Recreational use in MPAs is managed by a number of mechanisms, such as regulation and enforcement, the use of physical structures, and economic incentives and disincentives [5]. Regulatory and enforcement approaches are particularly effective for managing deliberate breaches of rules of which users are aware [35]. However, problem marine user behaviour may also occur when users are naïve or unapprised about the regulations and the links between their behaviour and the health of the ecosystem [36]. In such instances, heavy reliance on enforcement tools can be seen as excessive and conflicting with the recreational values and experiences that these areas are also designed to facilitate [5]. Surveillance and regulatory enforcement are also costly, particularly in settings such as MPAs where use can be highly dispersed both spatially and temporally. Managers seeking to prevent these unintentional problem behaviours require new, more cost-effective approaches that are appropriate for the behaviour of concern.

Ensuring that MPA resources are both protected and enjoyed by users is a challenge MPA managers need to balance [37-41]. The paradoxical situation for many MPA managers is that their educational training may have been in the natural and conservation sciences, yet a considerable portion of their responsibilities lie in managing and changing human behaviours, an area of work normally ascribed to social scientists. While managers achieve impressive results through enforcement and using their intuition, local knowledge, stakeholder engagement, and learning from strategies that have worked in other MPAs, problem behaviours still occur. With time and resource constraints commonplace in MPA agencies, managers are unlikely to have the capacity or time to engage with the considerable academic literature on behaviour change research.
This paper reviews some of the more commonly applied social psychological theories used in behaviour change, along with research in persuasive communication. Together with illustrative examples of their application to MPAs, this review provides MPA managers with a sound understanding of behaviour management strategies that will aid dialogue between managers and researchers who are aiming to change behaviours in MPAs. In addition to walking the reader through the steps involved in behaviour change research, the paper presents a conceptual model of important social-psychological constructs that underpin successful behaviour change interventions in MPA settings. Although this discussion cannot replace the need for engaging social psychologists in behaviour change strategies, the aim is to enhance MPA managers and researchers’ understanding and capacity to make use of the considerable social science theory behind successful behaviour change.

2. Understanding behaviour change

Human behaviour is inherently complex. The abundant literature on the topic reflects the challenges in understanding why people do what they do [42], and the long history of social psychological research into human behaviour [43]. Human behaviour arises from external contextual influences and internal psychological attributes and thus can vary over time and between contexts, and it can be self-focused or altruistic [44-46]. While many behavioural studies have focussed on the intrinsic (internal) factors such as attitudes or beliefs that influence an individual’s behaviour, other factors external to the individual (such as signage, physical barriers, or monetary fines) also impact the decisions people make to behave a certain way. When applied appropriately, theories of human behaviour have helped to successfully change behaviours in areas such as public safety, health, and reduction of energy consumption and waste [42, 47, 48], yet they have not been widely adopted in MPA contexts.

When researchers undertake behaviour change campaigns, they need to proceed in four stages (left side of Figure 1): (1) definition of the behaviour, (2) identification of the drivers of and barriers to the behaviour, (3) implementation of theory-driven behaviour change interventions aimed at addressing the factors uncovered in the second stage, and (4) evaluation of the intervention’s success, and refinement of the strategies as necessary. These stages provide a structure for the subsections that follow, guiding the reader through relevant literature and its application to MPAs.
2.1. Defining the behaviour

The first step in behaviour change research is to define the behaviour under investigation. While this sounds simple enough, the reliability of some behavioural theories hinges on a highly precise definition of the desired behaviour, which clarifies what is to be done, by whom, where and when [44, 49-51]. Schultz and Kaiser [52] contest this limits our understanding of more generalised pro-environmental behaviours, which are the focus of other models that define environmental behaviours more broadly (for example, they might consider a range of environmentally-friendly household behaviours that reduce waste). However, a highly specific definition of the desired behaviour helps determine what needs to be put in place or communicated to achieve change, and enhances the capacity to evaluate whether an intervention has been successful.

Fishbein and Ajzen [44] define the behaviour by: (i) the target (the thing that will be affected by the actions), (ii) the action (what is it we want the target audience to do), (iii) the context (setting), and (iv) time elements (i.e. when do we want the target audience to undertake the behaviour). In contrast, Stern [53] focusses on a range of human behaviours that impact the environment in a specific context.

It is also worth pointing out here that the desired behaviour is not always a complete change of behaviour; the theory and methods apply equally well to influencing users to undertake a current desirable behaviour more often or more consistently. For example, a behaviour change program in an MPA context might seek to get recreational users who are currently catching and occasionally keeping fish to release every fish that is caught, to refrain from fishing in certain zones, or to limit their fishing to certain seasons or times, depending on the environmental target (benefit) of the changed behaviour.
2.2. Identification of behavioural drivers and barriers

The second stage of behaviour change research (Figure 1) employs theories of human behaviour to help identify the factors that influence the behaviour. By their nature, models of human behaviour are simplified representations of the underlying drivers and resulting actions of people in a particular context. Nevertheless, they have been shown to be useful for understanding, predicting and testing factors that influence human behaviours [42, 54]. While there are a great many theories pertaining to human behaviour, only a few have undergone considerable testing for robustness (and subsequent refinement) around the globe across many different behaviours in many different contexts. Subsections 2.2.2 and 2.2.3 outline two of the most commonly used and tested behavioural theories that have been applied in environmental management research (Theory of Planned Behaviour and Value-Belief-Norm theory), however this discussion does not preclude other theories from being relevant for particular behaviours in certain MPA situations. The point here is that when MPA managers coordinate or conduct theoretically driven research, the use of robust and appropriate methods will enhance the validity of the results. Before discussing the two most common theories, it is first necessary to define the social psychological constructs used in the theories, particularly since some of these terms may be interpreted differently outside of social psychology, which has led to problems with research in the past [44, 55]. Each of these constructs is illustrated with a hypothetical example in an MPA setting.

2.2.1. Common social psychological constructs used in theories of human behaviour

*Attitudes* are the most studied constructs of human social behaviour and have been shown to be important antecedents to behaviour [44, 49, 56, 57]. Attitudes can be considered a ‘latent disposition or tendency to respond with some degree of favourableness or unfavourableness to a psychological object’ [44, p. 76]. Latency implies that the construct (in this case attitude) cannot necessarily be measured directly, a point to which we return in section 2.2.2. Fishbein and Ajzen [44] describe two dimensions of attitude that influence behaviour: (i) *instrumental attitude*, which is the individual's cognitive evaluation of the behaviour (e.g. whether it is a ‘good’ or ‘bad’ thing to do), and (ii) *experiential attitude*, which is their affective evaluation of the behaviour (e.g. whether it will be ‘fun’, ‘painful’, ‘boring’ etc.)
Generally speaking, the more positive a person’s attitudes are towards a particular behaviour, the more likely the person is to engage in that behaviour. In an MPA context, a simple illustration of this is the more positive an individual’s attitudes about complying with the MPA regulations, the more likely they will do so. Generally, research will be enhanced by measuring a person’s attitudes toward a very specific behaviour (e.g. their attitude toward ensuring that their dog never enters a particular shorebird nesting area while walking on the beach), and not their broader attitudes towards, say, marine protection, or shorebirds, or dog-walking. However, as with other behavioural antecedents, attitudes on their own are not enough to explain human behaviour.

Two types of norms are commonly considered in behavioural theories: personal and social norms. Personal norms refer to an individual's beliefs about the behaviour they should or should not engage in [58]. Social norms refer to the influence of other people on an individual’s behaviour, or in other words, it is the social pressure one feels to behave a certain way [59]. People who are important to an individual may exert pressure to perform a behaviour either explicitly (through encouragement, suggestions or requests), or indirectly, as in the case of descriptive and injunctive normative pressure [60]. Descriptive norms refer to the behaviour of other people that is either observed or perceived by an individual (i.e. what they see, or think others are doing). Injunctive norms describe the pressure a person feels to behave a certain way, which is brought on by the expectations of important others in their lives [44]. A range of norms feature in behavioural theories and have been demonstrated to explain behaviour as well as play a part in behaviour change. Many social psychologists see norms, like attitudes, as latent constructs. In an MPA context, a social norm might be created through engaging an appropriate opinion leader in a fishing club to help reduce noncompliant fishing behaviour (through communication or demonstrating appropriate behaviour).

Self-efficacy and perceived behavioural control describe an individual’s perception of their ability or sense of control over performing a behaviour [61, 62]. This is yet another latent construct and is not concerned with actual but rather an individual’s perception of their ability to perform the behaviour. In an MPA context, a person who feels well-informed about the location of restricted fishing areas may feel more confident they can adhere to the rules than someone who does not know the areas. Perceived behavioural control is different to actual behavioural control, which refers to whether a person can actually perform the behaviour. A person’s capacity to conduct the behaviour will be determined by their skills and abilities, as
well as other external factors (Figure 1) that act as real barriers for a particular behaviour, despite one’s best intention to perform it [44]. For example, recreational fishers may have intentions of placing discarded fishing lines in bins, but when bins are non-existent the behaviour is prevented. Thus the desired behaviour (i.e. to put their rubbish in a bin) may not be an available option, so an alternative behaviour (e.g. taking it home, or littering) will result.

Returning to the concept of latency, a person’s attitudes, social and personal norms, and perceived behavioural control are considered to have underlying beliefs, and these are the constructs that can be measured in behavioural research [44]. Social psychologists conceptualise and define beliefs in different ways, as revealed in the presentation of two specific theories in subsections 2.2.2 and 2.2.3. Fishbein and Ajzen [44] use these beliefs to distinguish between individuals who are complying with a desired behaviour and those who are not (non-compliers). Any beliefs identified in this process are then used to formulate behaviour change campaigns to convert non-compliers to compliers.

*Personal values* are principles that guide an individual to make decisions about the right or wrong way to behave. They tend to relate to a suite of behaviours, develop over time (starting early in life) and be generally resistant to change [42]. Stern, Dietz, Abel, Guagnano and Kalof [58] propose that individual values serve to influence behaviour through their effect on beliefs and sense of moral obligation to behave a certain way. While there is disagreement about the position of values in behavioural models, they are generally viewed as weak predictors of behaviour on their own [42].

Research by Stern and colleagues on personal environmental values suggests there are three key dimensions to environmental values: *biospheric, altruistic* and *egoistic* values [58, 63]. These studies have shown strong environmental values across those three dimensions that extend beyond a person’s self-interest are associated with increased likelihood to act in pro-environmental ways [64]. It is reasonable to expect that MPA users who value conservation highly or hold values associated with benevolence and universalism [65] may more readily undertake pro-environmental behaviours in MPAs than those who do not.

The constructs discussed above are important elements of commonly used theories in behaviour change interventions and in the conceptual model outlined later in this paper (section 3). However, there are other social psychological factors such as habits [66, 67], knowledge
[64] and emotions [68, 69], amongst others, which can influence responses to behaviour change interventions, a useful summary of which is provided by Darnton [42].

Perhaps the most important element of this second stage of behaviour change research is the selection of an appropriate theory. This will be driven by the research aims and management context (including the behaviour being targeted), and will help determine the factors that are most influential on the behaviour in question. The two most dominant theories found in the behaviour change literature are the Theory of Planned Behaviour [44, 49] and the Value-Belief-Norm theory [58]. An introduction to these two theories is presented in subsections 2.2.2 and 2.2.3 and the theories also appear in the decision flowchart (Figure 1).

2.2.2. Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) is a widely-used theory first developed by Icek Ajzen [42, 49], who built upon Ajzen and Fishbein’s [61] Theory of Reasoned Action (TRA). The TPB states behavioural intention is the key predictor of behaviour, with attitudes, norms and perceived behavioural control as the most important antecedents of a person’s intention to perform the behaviour. TPB also acknowledges actual behavioural control as mediating the effect of intention on behaviour. Fishbein and Ajzen [44] further refined their model (Figure 2) to include subdimensions of the predictor variables, which strengthened the predictive ability of the model because, as noted earlier, beliefs are measurable constructs while the constructs listed above are latent.

According to Fishbein and Ajzen [44], attitude towards the behaviour, perceived norms and perceived behavioural control are determined by the relative importance of a person’s underlying belief about each construct (i.e. behavioural beliefs, normative beliefs, and control beliefs) and the strength of each of these beliefs. The beliefs of those complying with the desired behaviour and those who are not (non-compliers) are commonly examined in behaviour research for significant differences, which are used to formulate behaviour change campaigns.
TPB has been used across a variety of different behaviours, but especially in health and environmental research [42]. Assessments of the efficacy of the TPB model in explaining behaviour have more often than not tested the earlier version of the model, in which each predictor of intention (attitude, subjective norm, perceived behavioural control) had only one dimension. Overall, TPB was shown to predict behaviour (but more so intention) relatively well when the theory was applied appropriately and the predictors were developed and measured acceptably [50, 70-72]. In the application of TPB, as with other intention-behaviour models, it is common to find a gap between behavioural intention and actual behaviour [73, 74]. Research generally notes that the closer that behavioural intention and behaviour are to each other in time and space, the smaller the gap [44]. For example, if an on-site user accompanied by their dog is asked where they intend to walk their dog that day, the response is likely to be highly consistent with actual behaviour, but will be much less so if they are asked while at home where they will walk their dog next month. This means that while intention can be used as a proxy for actual behaviour (when performance of the behaviour cannot be measured), researchers need to be mindful of the possibility that a behaviour may not take place, despite a person’s best intention [44].

Theory-driven behavioural studies are gaining recognition for their potential contribution to conservation [75], and to marine user management in particular [76]. TPB has been used in its entirety to uncover barriers for public participation in marine research [77]. However, there has been very little use of TPB, in its full application, in MPA settings. Instead it has more often been used as theoretical background to research issues in the marine environment, such as SCUBA diver behaviour [78], coastal residents’ willingness to reduce lighting for the purpose of turtle conservation [79], and public understanding of marine wildlife entanglement in marine debris [80]. A number of other marine-based studies simply refer to TPB amongst other theories used in their research [for example, 80, 81, 82, 83].

2.2.3. Value-Belief-Norm Theory

Other social psychological theories have been applied in environmental management, most notably the Value-Belief-Norm (VBN) theory of environmentalism [53, 58]. The theory contends environmental behaviours are a result of a hierarchical order of processes starting with an individual’s values, which underpin their environmental beliefs (Figure 3). Beliefs are
formed by the person’s environmental worldview (i.e. their mental model of the way the world works), which brings about their awareness of consequences of particular behaviours. Following this, a person’s ascription of responsibility (i.e. their perceptions about their ability to take action to avoid negative consequences) impacts on their personal norms. Personal norms are then thought to influence their intention to behave in pro-environmental ways.

[Insert Figure 3 here]

The VBN has been used predominantly to predict pro-environmental behaviour in terrestrial environments [for example, 84, 85] although marine settings feature more recently in the literature [for example, 86, 87, 88]. van Riper and Kyle [86] used the theory in their assessment of the psychological factors influencing a range of pro-environmental behaviours in the Channel Islands National Park. Wynveen, Wynveen and Sutton [88] used the model to investigate marine-related pro-environmental behaviours of residents who lived near marine protected areas in Australia and the USA.

While the VBN has successfully predicted behaviour [89, 90], some scholars contest its efficacy in comparison with models such as the TPB. In their assessment of the VBN and TPB for conservation behaviour, Kaiser Kaiser, Hübner and Böninger [72] found the TPB better able to predict behaviour than VBN. Steg and Vlek [64] suggest the VBN is better at predicting low cost behaviours, while the TPB is better at predicting behaviours with higher behavioural costs.

There are many other theories of human behaviour that apply to problem behaviours in MPA, but none have been as widely used in environmental research as the ones mentioned above. The methods used to apply these theories to behaviour change research typically involve interviews and surveys of the target audience (in the context of this paper, the audience is marine park users who are ‘doing the wrong thing’). Once practitioners have conducted their research to understand the causes of problem behaviours, they can begin to develop their behaviour change strategies. Changes in people’s behaviour can occur in different ways, and while many of the social psychological models of behaviour consider change as occurring in one event [42], it is complex and may take a considerable length of time, or progress in stages [91, 92]. There is a large body of work regarding the stages of change that is beyond the scope of this review; interested readers are encouraged to consult [for example, 42, 92, 93, 94].
2.3. Implementation and evaluation of behaviour change interventions

Strategies for changing behaviour can be thought of in two main categories (stage 3 in Figure 1): (i) those that change the external factors (i.e. forces on an individual’s behaviour that are outside of their control), and (ii) those that change the internal factors driving behaviour (i.e. the social-psychological antecedents such as an individual’s beliefs, attitudes, norms etc.). Managers of MPAs will be familiar with many different methods for changing external influences on behaviour [5], including infrastructural changes (e.g. signage, mooring buoys in fragile environments, provision of rubbish bins) and economic factors (e.g. monetary incentives and fines). The use of these kinds of management tools have been shown to successfully influence marine user behaviour in many marine settings. For example, in a study which sought to reduce boat collisions with manatees, researchers investigated boaters’ intentions to drive within the speed regulations. The use of speed rules, which were actively enforced, was an important factor influencing boaters’ intention to drive at acceptable speeds [95]. Yet, it was not the speed limit itself that modified the boaters’ intention to comply with the rules; rather, it was the social pressure boaters felt (primarily from law enforcers, but also friends, family and others) to follow the legal speed limit. In this way, the use of speed regulations had a strong influence on boaters’ behavioural intention when it came to speeding. Enforcement of fishing regulations has also been found to have dramatic impacts on abundance of target marine species through the reduction of illegal fishing in MPAs [35].

As marine managers know, external forces can be powerful drivers of positive behaviours in protected areas, yet there are situations where less forceful management options are preferable. For example, when marine users break the rules unintentionally, management approaches that involve communication and relationship-building with stakeholders may be more appropriate. They may also do more to encourage pro-environmental behaviours in the longer-term, as the drivers of user behaviour (beliefs) are shifted. For example, if a user changes his/her belief about the consequences of their correct vs incorrect disposal of fishing line, their attitude toward this behaviour and, most likely, their behaviour will be shifted both on the current visit and on subsequent visits as well as potentially to other MPAs, regardless of whether enforcement occurs. However, this approach involves targeting the social-psychological drivers of behaviour (i.e. beliefs), and may be challenging for many MPA managers who may not have training in the social sciences. For this reason, the review now turns its focus specifically to the use of persuasive communication for pro-environmental behaviour change.
2.3.1. *Persuasive communication to change behaviour*

Theories of human behaviour help to explain why simply trying to increase people’s awareness of problems does not change behaviour on its own [52, 96-98]. In behaviour change programs underpinned by the TPB, for example, communication needs to convey messages aimed squarely at changing the beliefs that underpin the problem user behaviour. If a marine park user already knows that leaving behind their old fishing line has negative consequences for the environment, then a message about the negative environmental impacts of doing this will not on its own shift this user’s behaviour. Understanding the beliefs that need to be targeted is certainly critical to effective persuasive communication.

Persuading people to change their behaviour is, however, not as simple as conveying key messages; in fact, there are many examples of communication failures, often due to a lack of understanding of the social psychological factors that influence communication effectiveness [99]. For persuasive communication to be effective, communicators also need to understand their target audience well, or risk the audience ignoring the information [100]. This requires audience research, which forms part of the research process in behaviour change campaigns discussed earlier, to identify their communication needs, concerns and interests along with the factors (constructs) relevant to the behaviour and its context as outlined in section 2.2 [101-103]. Audience (in this case marine park user) research is essential to avoid incorrect assumptions being made about the most important information to convey and channels to communicate [104]. In fact, communication campaigns developed without appropriate audience research can backfire in attempts to change behaviour and worsen the problem [47, 52].

Capturing the audience’s attention in the first place can be especially difficult in a highly-connected, information-overloaded and over-stimulated society [103]. Gaining and retaining attention can depend on how the message is delivered, and who is communicating it. For example, messages about impacts on shorebirds have been shown to stand out when they surprise people [82]; creating an element of the unexpected is likely to make people pay attention [105]. Stories are good mechanisms for retaining attention [105, 106]. This is due to humans’ ability to process information in experiential or analytical ways. Marx, Weber, Orlove, Leiserowitz, Krantz, Roncoli and Phillips [107] found that experiential processing to
convey complex issues through storytelling motivated action more effectively than analytical processing. Marine managers might consider how to use storytelling in their communication strategies to convey important environmental information and behaviours.

Maintaining an audience’s interest can also be influenced by confirmation bias [108], which is the tendency for people to seek out information and pay attention to information that confirms their worldview (and avoid information that contradicts it). Other potential tripwires in gaining audience attention include individual differences in how people interpret a message [109-113], and how they respond to it [69, 108, 114-116].

2.3.2. The art of persuasive communication: Aristotle’s three modes

Once the audience’s attention has been gained, key messages can then be developed which, in the case of the TPB for example, would aim to shift the beliefs that underpin non-compliant behaviour. While message content must be driven by behaviour change theory, their design and delivery must also be informed by the science of persuasive communication, which dates back two millennia to the work of Aristotle [117]. Aristotle proposed three modes of persuasion: ethos (credibility), pathos (emotion), and logos (logic or reason). They remain relevant today and, with additional insights from behavioural research, provide a basis for the design of effective behaviour change strategies.

Aristotle’s first mode of persuasion, ethos, or credibility, implies that who is communicating matters to the audience. The audience needs to like the messenger [118] and perceive them to have credibility [112, 119]. This has also been shown to be the case in the marine environment for pro-environmental behaviour change to occur; for example, Wynveen and Sutton [120] found that trust in the management of the Great Barrier Reef is important for the adoption of pro-environmental behaviours by the public. Persuasive communication strategies may enlist the help of people whom the audience admires. This approach taps into social norms (discussed earlier) through the use of opinion leaders and celebrities who may be effective role models for encouraging pro-environmental behaviour.

While the influences of others can be a powerful force for change, Brace-Govan [121] warns that the messenger must be positive, inspiring, and relevant, and must model behaviour that is
achievable by the audience. Poor use of social norms can have the reverse effect and reinforce or amplify problem behaviours [47, 122]. This is especially when descriptive norms are used in behaviour change communication [123]. For example, when the descriptive norm is implied rather than explicit, such as a message stating “there is an enormous marine debris problem at this site” (which implies a lot of people leave their litter on the beach), it can lead to individuals conforming to the social norm in the message, through their interpretation of it as “everybody else litters here – so I will, too”. Schultz, Nolan, Cialdini, Goldstein and Griskevicius [47] illustrate the potential for these types of ‘boomerang’ effects from the use of descriptive social norms in persuasive communication to reduce electricity consumption. Their study showed consumers who used less electricity than their neighbours increased their energy consumption when they saw how they compared to the neighbourhood, yet when an injunctive norm was used along with the descriptive norm, the boomerang effect was negated.

Inducing pathos in the audience, i.e. an emotional response, can be very effective [46, 124] as people are likely to act following an emotional response to topics they find relevant and meaningful [69]. However, the approach needs to be carefully managed. For example, reef health may be more important to those who rely on and use coral reefs (in which case the message ‘the reef is dying’ may trigger an emotional response that has a positive persuasive effect) than to those who rarely use reefs (and may ignore the message). Communicators also need to bear in mind that people have a ‘finite pool of worry’, or in other words, a limited capacity to worry about things [125], which helps to explain the lack of audience response some passionate environmental communicators experience.

Using reason and logic (logos) in persuasive communication has been shown to have limited effect on its own [112]. However, the careful framing of messages so they are relevant to the needs and interests of the audience (such as marine park users) can appeal to logic, reason and emotions if the argument is set in the right context [126-128]. This has been shown to be effective for issues in the marine environment [129, 130]. A study examining information seeking and pro-environmental behavioural intentions in the context of sea star wasting disease found evidence to suggest that emotional appeals are more effective when accompanied by a logic framing [130]. It therefore supports the Aristotelean modes of persuasion, although emphasises the three components need to be interwoven to improve their effectiveness in changing behaviour.
2.3.3. Other considerations in persuasive communication

Persuasive communication that encourages people to engage with and deliberate over the information may also be effective for changing behaviour. In their Elaboration Likelihood Model (ELM), Petty and Cacioppo [131] maintain two routes to persuasion: one central and one peripheral. The central route is one through which an individual carefully and thoughtfully considers the message presented to them. The peripheral route is one whereby the message does not stimulate careful consideration by the recipient, for a variety of reasons (e.g. they are distracted by something else), so the individual makes instead a decision based on other cues. An example is audience receptiveness to an environmental behavioural message delivered by Sir David Attenborough, due to the messenger’s credibility. Petty and Cacioppo [131] argue that the two routes can be used together to enhance persuasiveness. Research has found ELM to be effective in provoking thoughtful consideration of environmental messages [132], especially when the message is presented as images and visual information [133]. An experiment by Lazard and Atkinson [133] using recycling as the topic of interest showed that “environmental messages incorporating visual components … are more engaging than messages that rely just on text or just on illustration. The persuasive nature of these infographics holds true across different audiences, regardless of learning preferences or visual literacy” (p. 21). While ELM is instructive, Kitchen, Kerr, Schultz, McColl and Pals [134] have raised doubts about the relevance and validity of the model given the monumental changes in the way people communicate since the original conception of the theory.

Behavioural research using persuasive communication has found that asking the audience to commit to change may assist behaviour change [135], but results are mixed [136]. Giving people feedback on their behaviour can encourage pro-environmental behaviour, especially when combined with commitment [59, 136, 137]. The use of incentives (economic or otherwise) has also produced varied and sometimes surprising results for behavioural change [98, 114, 138, 139], and although widely-used, incentives have been shown to undermine people’s intrinsic motivation to do the right thing [140]. While the social scientific literature highlights the need for caution in using incentives, Lubchenco, Cerny-Chipman, Reimer and Levin [141] point out that appropriate economic or social incentives can have positive behavioural impacts in the marine environment.
The topics discussed above outline some of the important considerations in persuasive communication strategies. When these strategies are successful, changes in behaviour can also result in positive spillover effects and lead to other types of pro-environmental behaviour [142], thus the impacts of these campaigns can have far-reaching consequences.

The only way to determine behaviour change success is, of course, to evaluate the campaign (stage 4 in Figure 1). There is a great deal of literature to assist evaluation practice in environmental social research and behaviour change [143], including change in underlying constructs as well as change in observed behaviour. Unfortunately, a full review is beyond the scope of this paper, however evaluation forms a crucial part of successful behaviour change especially when it is used to assess and adjust the campaign activities if they are not working.

With so many constructs and relationships developed, tested and refined over decades, identifying and selecting what is relevant and useful in an MPA context is often well beyond the time and resource constraints and expertise of MPA managers and policy-makers. In section 3, a model is presented as a conceptual tool for managers to use in conjunction with the decision flowchart (Figure 1).

3. Discussion and a model for achieving positive behavioural change in marine protected areas

The various constructs and relationships expounded in the foregoing sections are illustrated in the form of a conceptual model (Figure 4). Conceptually mapping these constructs and relationships in the context of marine park settings has not been undertaken in the literature to date. The model can be used as a starting point for investigating why a particular problem behaviour is currently occurring, when and where it is occurring, and precisely which users are responsible. It can also help point to exactly what it is that managers want these users to be doing in place of the problem behaviour.

Once there is some clarity in terms of which precise problem behaviour(s) managers need to tackle, the decision flowchart (Figure 1) can be used to address each specific target behaviour. The flowchart aids the decision about when and how to engage research expertise to identify
the problem and develop a strategy to change the behaviour. In some cases, managers may decide that continued use of regulations, enforcement, physical structures or monetary incentives are the best way forward for controlling MPA users’ behaviour and its associated impacts. There are many instances, however, where fostering appropriate marine user behaviour through persuasive communication can complement and even replace these more expensive and invasive approaches. Either way, the decision flowchart (Figure 1) and our conceptual model (Figure 4) together provide conceptual clarity and decision-making tools that can underpin the use of theory-driven research on MPA user behaviours. Such an approach is crucial to the understanding of a particular behaviour and its antecedents, to point to possible communication or contextual (structural) interventions, and to drive the development and evaluation of behaviour change interventions in MPA settings.

[Insert Figure 4 here]

4. Limitations and Conclusions

While the models provide clarity, this paper is not a how-to manual for undertaking behavioural change research. Just as managing and sustaining the health of marine environments is underpinned by a large body of science, so too is human behaviour management. Marine managers cannot be expected to know and keep up-to-date on the theory and empirical evidence that underpins marine user management and behaviour change. While this paper serves as a primer and introduction to the application of social psychological theory to behaviour change in MPA settings, the devil is in the detail, and the planning, implementation and evaluation of behaviour change interventions can be labour-intensive and costly. MPA managers without a solid background in the social sciences would do well to collaborate with appropriate partners who have the depth of social psychological knowledge and research experience to assist in the development of their strategies.

There are still large knowledge gaps regarding how to encourage pro-environmental behaviours generally, but especially in MPAs. Much of this paper is based on behavioural and communication theory and applications in fields outside of MPAs. More empirical research is
needed to test the application of models to determine not only the antecedents of problem behaviours in MPAs, but also the effectiveness of interventions to address behaviours.

As marine managers well know, encouraging pro-environmental behaviours is a key function of their organisations, and doing this well is essential for both marine ecosystem health and sustainable use of MPAs into the future [76]. Theory-driven research is essential for effective management of marine park users, including behaviour change. As with addressing stressors that threaten the health of marine ecosystems, there is no quick fix to getting marine park users to ‘do the right thing’. With adequate resources, managers can to some extent control user behaviours through regulation and enforcement, and can sometimes achieve behaviour change by replicating interventions that have worked in other MPAs. In most cases, however, widespread and sustained behaviour change by target audiences requires theory-driven research. The future of MPAs demand that managers take advantage of the science and theory that has underpinned pro-environmental behaviour change; this paper provides a starting point on that journey.

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References


[112] B.J. Reynolds, When the facts are just not enough: Credibly communicating about risk is riskier when emotions run high and time is short, Toxicology and Applied Pharmacology 254(2) (2011) 206-214.
[116] E. Weber, Experience-Based and Description-Based Perceptions of Long-Term Risk: Why Global Warming does not Scare us (Yet), Climatic Change 77(1-2) (2006) 103-120.
Figure 1. Decision flowchart for a theory- and research-driven approach to influencing MPA user behaviour
Figure 2. Theory of Planned Behaviour [44] ; [49].
Figure 3. Value-Belief-Norm theory [58].
Figure 4. Conceptual model of how to change problematic MPA user behaviours

**Internal factors**
- **Behavioral influences**
  - Attitudes
  - Personal & social norms
  - Self-efficacy/perceived behavioural control
  - Beliefs
  - Values
  - and others (e.g. habits, knowledge, emotions etc.)

**External factors**
- **Behavior**
  - MPA users
    - e.g. recreational fishers, divers, snorklers etc.

**Problem behaviour**
- e.g. littering, wildlife disturbance etc.
  - Small % of users with significant impacts

**Positive change in MPA user behaviour**

**Change internal factors**
- **Persuasive communication strategies should:**
  - Conduct theoretically-driven audience research
  - Focus on relevant behavioural drivers and barriers
  - Use appropriate communication channels for audience
  - Combine ethos (credibility), pathos (emotion), and logos (logic or reason)
  - Use audience-relevant message framing
  - Model realistic & achievable behaviour
  - Consider how message could be ignored or backfire

**Change external factors**
- Additional infrastructure (e.g. signage, physical barriers such as fencing, rubbish bins)
- Facilitating social/cultural networks (e.g. beach care groups)
- Increasing economic pressure (e.g. monetary fines)