

## 20 Snorkeller attitudes and behaviours at two popular sites in Ningaloo Reef Marine Park, northern Western Australia.

Danielle Godwin, Michael Hughes, Halina Kobryn, Murdoch University, Australia

### Background

Globally, coral reefs play various important roles. Despite only occupying ~0.2% of the surface of the ocean, coral reefs are home to diverse species, provide ecosystem services and generate income for millions of people (Cesar et al., 2003). Approximately 18% of all coral reef habitats are in marine protected areas. While marine protected area management commonly seeks to balance conservation and human use, there are ongoing concerns about human activity impacts, including recreational uses like snorkelling. The World Heritage-listed Ningaloo Reef Marine Park, in northern Western Australia, receives approximately 179,000 visitors annually, with snorkelling rated as the most important and popular recreational activity in the Marine Park (Jones et al., 2011).

Although snorkelling is generally considered a low-impact activity, growing evidence suggests that certain behaviours, including fin kicks, brushes, grabs, and sitting, standing or kneeling on corals, may damage coral colonies, which are slow to recover (Webler & Jakubowski, 2016). While previous studies looked at 'how' snorkellers impact Ningaloo Reef, few have looked at behavioural drivers to understand 'why'.

### Project aim

This study sought to identify the common drivers behind problem behaviours through a survey of abilities, value-based characteristics, beliefs, knowledge, and behaviours of snorkeller visitors at two popular yet contrasting sites.

This study drew on the foundational theories: the Theory of Planned Behaviour (TPB) (Ajzen, 1991), Value-Belief-Norm theory (VBN) (Stern et al., 1999) and Responsible Environmental Behaviour (REB) (Hines et al., 1987) and addresses the question of 'how do ability, value-based characteristics (beliefs, values, perceptions, opinions), and knowledge relate to the perceptions of damaging behaviours and self-

reported in-water behaviours of snorkellers at Turquoise Bay and Oyster Stacks'.

### Study sites

The two study sites, Turquoise Bay (TB) and Oyster Stacks (OS), are located within the World Heritage-listed Ningaloo Reef Marine Park, which is accessible from land via the adjacent Cape Range National Park. Ningaloo Reef is a fringing reef that stretches for over 300 km along the West Australian coastline approximately 1200 km north of the WA state capital city, Perth. As a fringing reef, visitors can easily access many parts directly from the shore (Jones et al., 2011). Located in an arid region of coastal Western Australia, the shore based accessibility is a major drawcard for snorkellers at both sites. While these sites are popular with snorkellers, they differ in visitation rates per year (TB: ~175,000, OS: ~48,000) likely owing to different coastal morphology: TB has a sandy beach and lagoon while OS has a rocky shoreline and is shallow.

### Methods

Data was collected using a 45-question online social survey of visitors who snorkelled at the two study sites. The Department of Biodiversity, Conservation and Attractions contacted, via email, those from their visitor database who booked campsites in the adjacent Cape Range National Park during select months from September 2019 to March 2020. A total of 3,571 visitors were contacted: 571 accessed the questionnaire, of whom 424 completed it. All completed responses were used in analyses.

The survey consisted of multiple-choice and rating-scale type questions about self-reported attributes associated with the reef and snorkelling, including swimming ability, attitudes, perceptions, knowledge, and snorkelling behaviour. Chi-square tests, and Spearman's rank-order correlation or Cramer's V were used to identify relationships between variables. By identifying snorkellers' ability, value-based characteristics, and knowledge, whether and how these variables related and the

strength of any relationship with snorkellers' perceptions of damaging behaviours and their self-reported in-water behaviours could be identified.

### Key findings

Overall, those snorkellers who reported greater ability, greater knowledge, and pro-environmental values, were more likely to also report greater perceptions of damaging behaviour and fewer self-reported coral contacting behaviours.

#### Attributes on Perceptions:

This study found the association between self reported ability and perceptions of damaging behaviours was not useful because they hold a limited logical connection. Thus, the association produced is likely indicative of an underlying factor common to both, i.e. each act as antecedents of TPB's behavioural intention (see Ajzen (1991)). Furthermore, examining the association between environmental values and perceptions of damaging behaviours as separate variables demonstrated that this approach is not particularly useful because both variables essentially measure elements of the same construct. Knowledge was weakly associated with perceptions.

#### Attributes on Behaviours:

Previous studies suggested there may be an association between snorkellers ability and in-water behaviours; the current study has provided evidence that those self reporting greater ability were more likely to report fewer coral-contacting behaviours.

There were a large proportion of significant associations between values and behaviours (Figure 1), with respondents reporting greater pro-environmental values and few coral-contacts overall. This result supports the findings of previous studies, to wit that strength of attitude can inform the predictability of behaviour, extending this knowledge to snorkellers in MPAs.

The associations between knowledge and behaviours indicated that those reporting less knowledge were more likely to report more frequent coral-contacts (and vice-versa) and that knowledge (of coral biology) source was associated with differing coral-contact rates: those with more formal knowledge sources reported the least contacts.

Overall, the associations between perceptions and behaviours supported the hypothesis while also

providing insight into the differences between the visitor types across the two study sites: Turquoise Bay tended to attract general recreationalists whereas Oyster Stacks tended to attract visitors with more specific marine activity-based intentions and backgrounds.

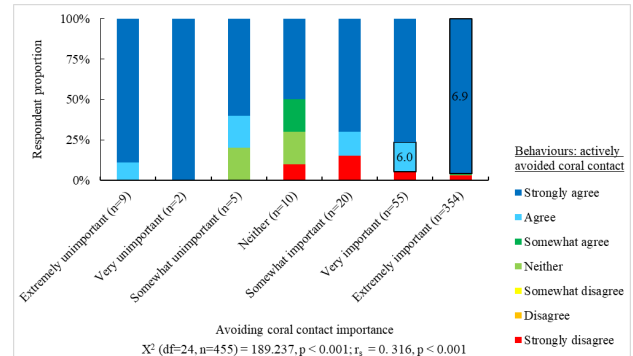


Figure 1. The largest proportion of significant associations was between values and behaviours. A pattern of association is highlighted by the adjusted residuals (inserted into relevant proportions) demonstrates that those who report greater importance of avoiding contact with corals (Q30) were more likely to also report agreement with having tried to avoid contact with the corals (Q28).

### Conclusion:

The results highlight the role that values play in snorkeller behaviours while also indicating a pattern amongst respondents which would benefit from further validation by in-water observation of snorkellers. Such knowledge would help inform management approaches, like tailored messaging, in order to target the normative belief that most people want to be seen doing the 'right' thing, which in the context of this study was not impacting the coral reef.