

Reducing risk in human-shark interactions in NSW

Trialling a participatory approach to
understanding beachgoer behaviour

SUMMARY OF FINDINGS AND RECOMMENDATIONS

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Following shark sightings and incidents that occurred on the NSW North Coast in 2015/16, both the NSW Government and beachgoers themselves have been responding in a number of ways in order to reduce the risk of shark interactions. This report documents results of 4 participatory workshops in Ballina, Byron Bay and Lismore, which explored current beachgoer behaviour in relation to sharks and risk. Workshops included 60 participants, comprising perspectives from primarily local residents, with a range of beachgoing interests, such as casual and ocean swimmers, surfers, fishers, kayakers and other paddlecraft, and SCUBA divers. Workshops documented the ways beachgoers have been changing their own behaviour, beliefs about how others have been changing their behaviour, possible reasons for particular types of behaviour change, and also why some behaviours have not changed.

This research revealed important aspects of beachgoer behaviour, perceptions, and decision-making processes. It also revealed the importance of participatory processes in developing a full understanding of community and stakeholder views, and their relevance to strategy and policy considerations.

Key Finding #1: Many people in coastal communities have changed their behaviour in response to the shark incidents of 2015/2016 and to an ongoing perception of increased risk of shark encounters in specific coastal communities.

Behaviours recorded in workshops can be categorised into 4 categories of relevance to sharks and risk:

- **Changes in behaviour where a direct risk is observed, or a high/increasing risk is perceived to be present.**

For example, people leave the water in response to a shark being observed, or people don't go in the water due to multiple factors considered likely to increase risk, such as the co-occurrence of baitfish, murky water and overcast weather, have been observed.

- **No change in behaviour where a direct risk is observed.**

For example, a group of surfers stay in the water despite the observed presence of sharks, or a diver actively pursues interactions with sharks due to an interest in the natural world.

- **Changes in behaviour where no direct risk is observed, but some risk is considered likely to be present.**

For example, an individual may choose to swim at a patrolled beach as a precautionary measure, or may seek detailed information from apps, social media or local networks to inform their own assessment of risk.

- **No change in behaviour where no risk is perceived to be present.**

In general, this would be considered to be behaviours at the beach under "normal" conditions – i.e. where there is perceived to be no appreciable risk of a shark encounter.

Behaviour changes were a result of the following described drivers. A driver is at its simplest level an explanation for a behaviour, that can help connect behaviours to a range of possible factors influencing that behaviour. For example, for the statement that "surfers always stick together now", the driver is the general perception among the beach-going population that there is "safety in numbers". This indicates that there is a

potential causal relationship between social factors, such as the presence/absence of others at the beach, and beliefs about safety, which influence individual's decision-making and behaviour. Identification of drivers or explanations for behaviour can therefore also potentially enable the development of strategies to change behaviour.

1. **Act to reduce present or increasing risk** – a behaviour that attempts to reduce a perceived present or increasing risk (e.g. leave water/do not enter water due a shark having been sighted, or leave water due to due to multiple factors considered likely to increase risk, such as the co-occurrence of baitfish, murky water and overcast weather).
2. **Accept or disregard risk** – a behaviour that is based on a judgement that a perceived present risk is acceptable (e.g. a shark may be present but is exhibiting behaviour that indicates it will likely not target humans) or that seeking information about risks impedes the enjoyment of the beachgoers experience.
3. **Act to increase safety.** A behaviour that attempts to increase safety in light of potential, though not immediately present risks (e.g. change location of beach activity due to history of encounters at key locations).
4. **Safety measure** – a behaviour that is a response to a belief in the effectiveness of a safety measure, and the presence of a safety measure at the beach (e.g. swim at patrolled beaches, surf in places where smart drumlines are in place). This can be understood as a sub-set of point 3 “Act to increase safety.”
5. **Safety in numbers** – a behaviour that is a response to a belief that there is safety in numbers, and a response to the presence of others at the beach (e.g. surf or swim because others are out in the water). This can be understood as a sub-set of point 3 “Act to increase safety.”
6. **Information need or gap** – a behaviour that is a response to a need for information, or a lack of available information/knowledge about a topic (e.g. seek information from apps to assess risk, seek information from local networks about recent shark sightings).
7. **Information failure or mistrust** – a behaviour that is the response to relevant information either being inaccessible or misunderstood (e.g. delete Shark Smart app because information cannot be tailored to the specific needs of the user) or considered untrustworthy (disregard risk advice as it is considered generic and not tailored to local circumstances).

Key Finding #2: Beachgoers make decisions about when and where to engage in water-based activities in relation to sharks, by interpreting and weighing multiple factors.

The risk of a shark encounter is only one of many drivers of beachgoer behaviour, and beachgoers are influenced by multiple factors, or suites of factors in relation to the risk of an encounter with a shark and how to manage it. These include:

- Presence and behaviour of sharks (i.e. history of presence, recent incidents and sightings, species, size and behaviour of sharks)
- Environmental conditions (i.e. cloudiness, murky waters, presence of baitfish, open river mouths).
- Activity and frequency/intensity (i.e. surfing or swimming, every morning or occasionally)

- Water experience and knowledge (i.e. extent of experience, knowledge level).
- Social factors (i.e. number of people in the water, types of people in water, time of the day).
- Mitigation and deterrent measures (i.e. presence of drumlines, use of drones).
- Information Sources (i.e. use of Apps, social media, local networks).

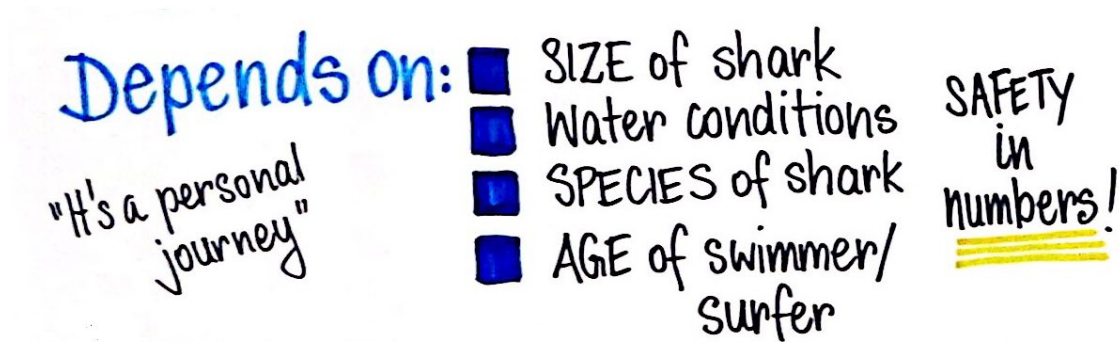


Figure 1: An example of the types of factors contributing to beachgoers decisions regarding risk of encountering sharks, as described by community participants from Byron (Image: www.dr.suepillans.com)

Key Finding #3: Individuals interpret these factors by means of three key decision-making processes: perception of risk, risk tolerance, and trust in available information and advice.

Variations occur in how common suites of factors influence behaviour. Interpretation by individuals therefore plays a role in mediating between a factor or suite of factors, and a predictable behavioural outcome. 3 key processes, through which individuals interpret multiple factors and choose how to respond to a situation, are focused on perception of risk, risk tolerance, and trust in available information and advice. In any given situation, a beachgoer must either explicitly or implicitly address the following 3 questions, based on the situation to hand:

- **Perception of risk:** How much risk do I think is present?
- **Risk tolerance:** How much risk am I willing to accept?
- **Trust in information/advice:** How much do I trust the information and advice available to me to mitigate these risks?

How beachgoers perceive and address these three issues can explain variations in behaviours (and behaviour change) between different beachgoers. For example, two individuals may assess the same high-risk situation, yet one may stay in the water, while the other may leave the water. These three decision-making processes, risk assessment, risk tolerance, and trust in information and advice, represent critical aspects of beachgoer decision-making that can explain variations in behaviours, and can be influenced to potentially change behaviour where this is seen as appropriate.

Tools for addressing beachgoer behaviour and risk management

Tracking behaviour in relation to risk reduction strategies

The following matrix demonstrates the main categories of behaviour, considered in terms of the outcomes of risk reduction strategies. This is envisaged as a tool to be used to track beachgoer behaviour over time, and assess the effectiveness of risk reduction strategies. In the case of the two green segments, these can be considered positive outcomes either because no risk is present (bottom right), or behaviours are an appropriate response to a risk, or risk reduction strategies (top left). The grey segment (top right) can be considered mixed, because some anticipatory responses will be positive, such as efforts to by beachgoers to inform themselves of conditions and potential risks, others may be considered negative, such as an unwillingness to swim at the beach even when a risk is not present. The orange segment is considered negative as it would represent an ineffective risk reduction strategy (bottom left).



Figure 2. Behaviour change matrix for tracking effectiveness of risk reduction strategies

A conceptual model of beachgoer behaviour and decision-making

The following conceptual model integrates the three key processes identified in this research, relating to behaviours, contextual factors, and mediating/decision-making processes. This could be further refined to potentially identify and predict the impacts of risk reduction strategies.

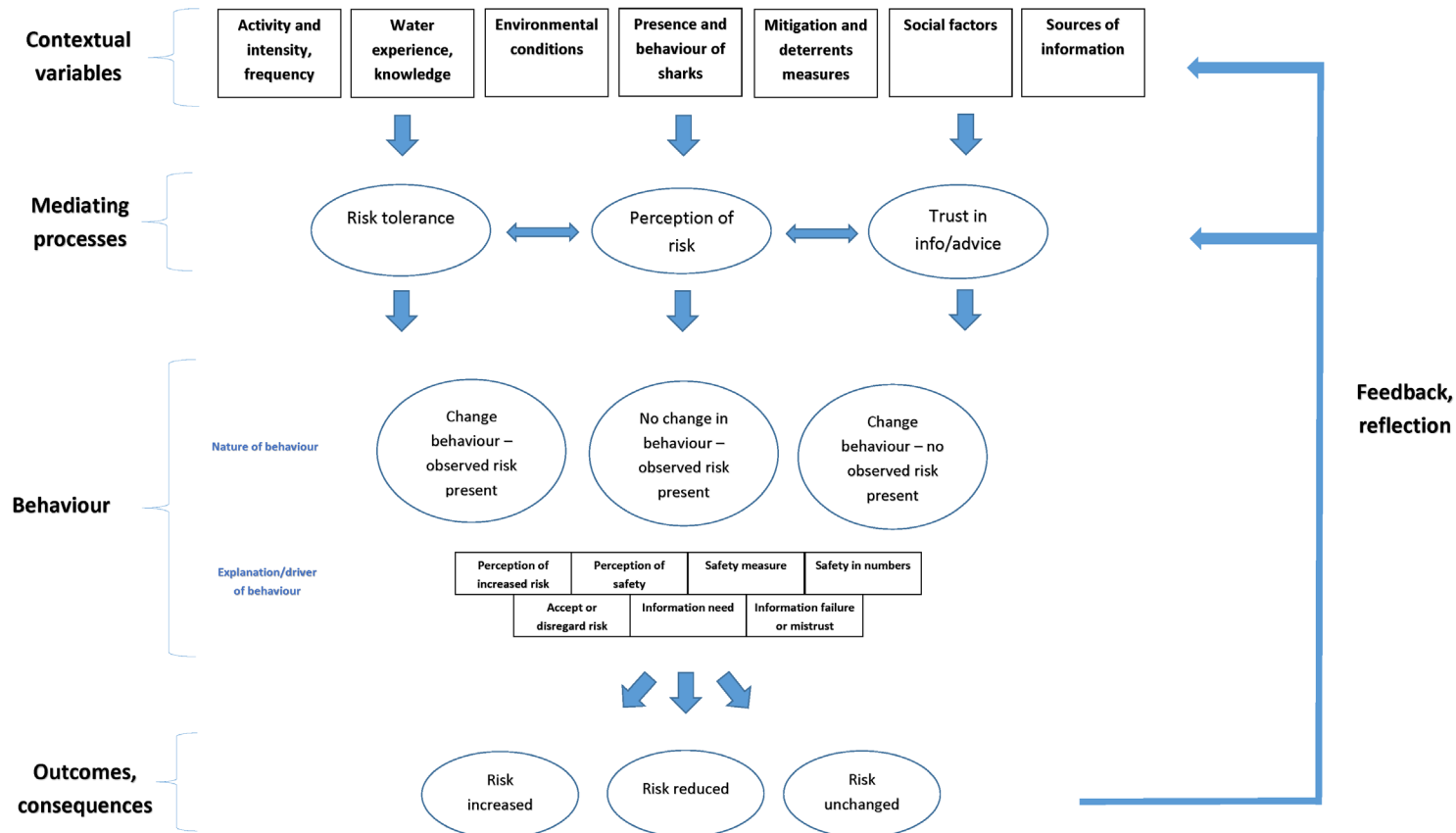


Figure 3. A conceptual model of beachgoer behaviour in relation to sharks and risk

Recommendations

Policy recommendation #1

The NSW Government assist community members (of a wide range of ages and demographics) to responsibly **self-assess risk** in relation to encountering sharks, and **improve trust in information and advice** available to beachgoers.

- **Action:** Support scientific assessment of the validity of widely publicised risk factors, and the potential efficacy of management measures in reducing those risks.
- **Action:** Provide transparent, publicly available information on the scientific basis of widely disseminated risk factors.
- **Action:** Work with local communities to provide information and risk advice that reflects local conditions and local knowledge of previous shark encounters. A web-based platform that houses localised, robust information for particular coastal areas, that can be accessible to visitors and locals alike, would be of potentially high value.
- **Action:** Adjust the Shark Smart App so that information on shark sightings can be customised by users to their needs. This includes whether information is provided at a state-wide or at a local level, whether it provides specific or general information on the species, size and number of sharks associated with a data point, and the frequency of alerts (“pings”) related to new shark sightings.
- **Action:** Provide targeted education and communication materials on sharks as well as basic beach safety to teenagers, and particularly teenagers who are not exposed to formalised beach safety training through Nippers clubs, or teenagers who live in inland communities (up to 1hr away) yet who are regular beach-users.
- **Action:** Consider working with media organisations to develop guidelines on sensitive, factual, and responsible reporting and publicity following incidents.

Policy recommendation #2

The NSW government **include consideration of beachgoer behaviour**, including behaviour changes and local responses to shark encounters and a variety of management measures, within the ongoing implementation of the Shark Management Strategy.

- **Action:** Expand participatory workshops exploring beachgoer behaviour and decision-making to other areas where there is a high level of focus from the SMS, and where beachgoer behaviour may be changing in response to heightened shark encounters in recent years.
- **Action:** Further develop tools that allow stakeholders and policy makers to **increase** their understanding of how beachgoers respond to risk, identify feasible risk reduction strategies, and track their effectiveness over time.
- **Action:** Conduct a user-experience based review of the Shark Smart App to assess usage to date and inform further adjustments of the app, supporting previous recommendations on this app.

- **Action:** While addressing beachgoer behaviour, the NSW Government should maintain SMART drumline management measures and drone surveillance operations in areas where communities have experienced high levels shark interactions, until the community support their discontinuation.

Policy recommendation #3

Work with groups that are considered to have a **high risk tolerance** to support responsible actions in relation to the risk of shark encounters.

- **Action:** Build understanding and collaboration between authorities and relatively risk tolerant groups (e.g. surfers, experienced swimmers, spearfishers, divers, young men). This could extend to consideration of when they are likely to respond to safety measures, further exploration of what are considered to be high and low risk factors by those groups, and which types of information they would like, and in what formats, in order to keep themselves safe.

Artworks communicating key findings

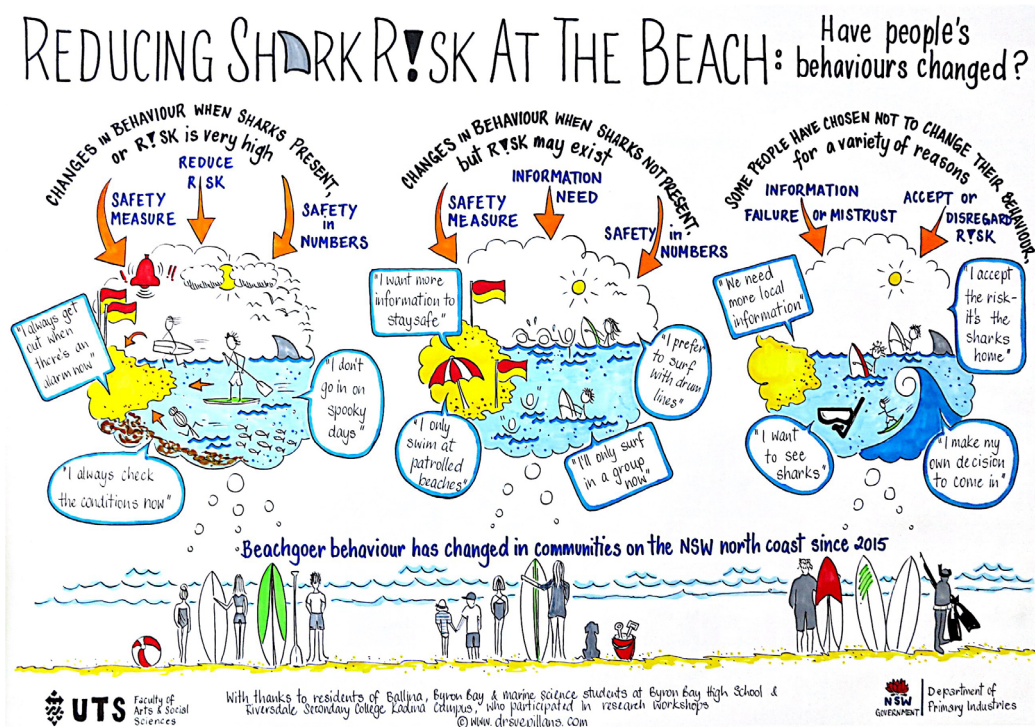


Figure 4. Findings related to behaviour changes. (Image: www.drstepillans.com)

BEACHGOER DECISION MAKING: Why do people change, or not change, their behaviour?

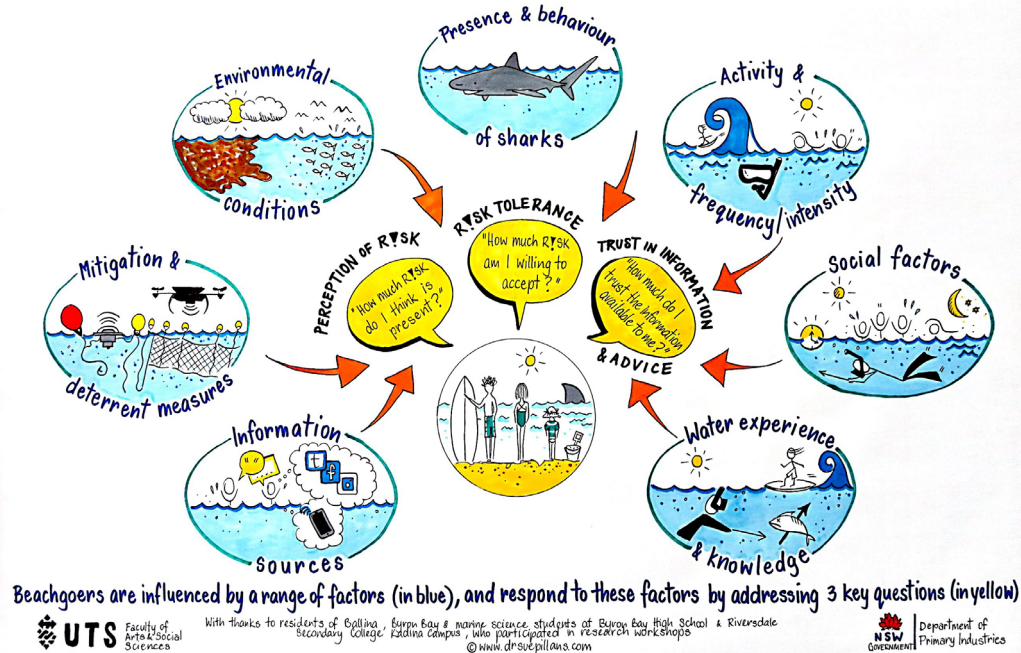


Figure 5. Findings related to beachgoer decision-making, and factors influencing decisions/behaviour. (Image: www.dr.suepillans.com)

PERSONAL RISK ASSESSMENT: What does a day at the beach look like for some people?

Different people have their own ways of responding to risk. Here are some common examples reported in our workshops

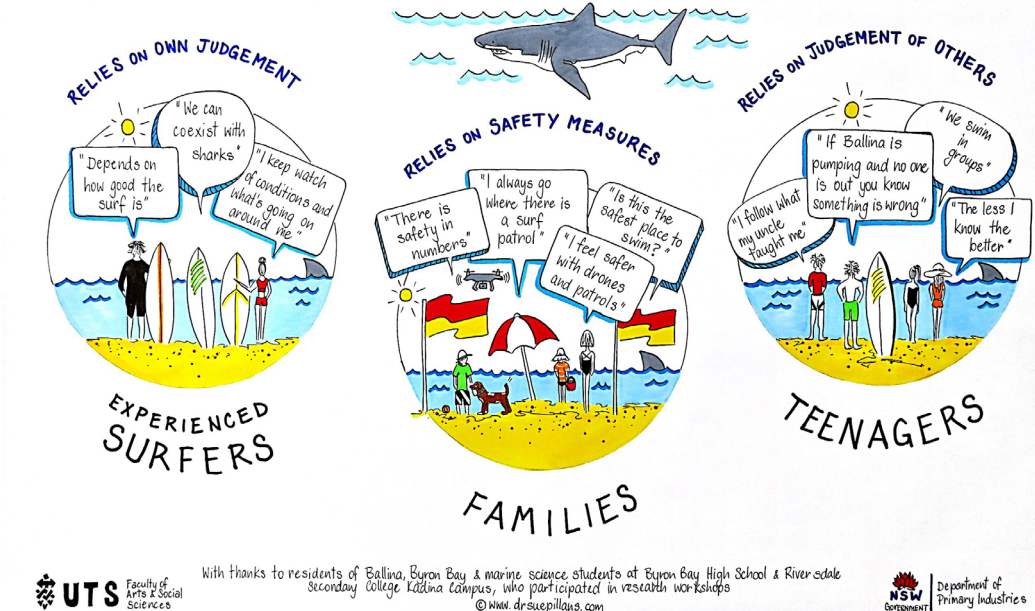


Figure 6. Findings related to how different groups approach beach safety in relation to sharks. (Image: www.dr.suepillans.com)