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News Media Portrayal of Attributed Stakeholder Attitudes to Shark Management in Australia

Nigel Hardiman^a, Shelley Burgin^{b*}, and Jia Shao^c

^a School of Strategy and Leadership, Faculty of Business and Law, Coventry University, CV1 5FB, Coventry, United Kingdom. Email: ac6539@coventry.ac.uk

^b Faculty of Science and Health, Western Sydney University, Locked Bag 1797, Penrith, New South Wales, Australia, 2751. Email: s.burgin@westernsydney.edu.au

^c SIGMA and Centre for Financial and Corporate Integrity, Coventry University, CV1 5FB, United Kingdom. Email: ac3679@coventry.ac.uk

* Corresponding author

Shelley Burgin, Faculty of Science and Health, Western Sydney University, Locked Bag 1797, Penrith, New South Wales, Australia, 2751. Email: s.burgin@westernsydney.edu.au

Abstract

Shark attacks have increased globally and are one of the most widely reported human-wildlife conflicts. Reflecting global trends, the number of recorded attacks has increased in Australian waters. Whether positively or negatively affected, stakeholders potentially often pressure authorities to mitigate economic and human risks when developing shark management policies. This article used discourse analysis to review how attitudes toward management approaches were attributed in Australian newspapers to a range of stakeholders. The most frequently attributed stakeholders were journalists and public office holders; victims, commercial operators, and scientists were least attributed. Although most measures were portrayed as supported by a majority of stakeholders, there was apparent misalignment between reported public and policymaker attitudes, especially regarding lethal control. Despite the ramifications (e.g., social, biological) of shark management and policymaking, reporting of science-informed facts and use of scientists to inform debate were low. Opportunities exist for increased engagement among scientists, journalists, and policymakers.

Keywords: stakeholder attitudes, public opinion, human-wildlife conflict, community attitudes, shark management

Introduction

An unplanned shark-human interaction (i.e., shark incident), where the human outcome is a near-miss, injury, or fatality, is one of the most geographically-dispersed and widely-reported types of human-wildlife conflict. Such incidents, while infrequent, have increased globally in recent years (Chapman & McPhee, 2016; McPhee, 2014; West, 2011). Although exact causes remain unclear, direct human influences may include growing human populations in coastal areas, increased participation in ocean-based recreation, shark finning, or any other such factor that results in more people in the water, in more places, more often, and for longer (Burgin & Hardiman, 2011; Clarke, Harley, Hoyle, & Rice, 2013; West, 2011). Environmental factors, such as climate change-induced warmer sea-surface temperatures and/or increasing populations of shark prey species, may also contribute (Bruce, Albright, Sheehan, & Blewitt 2014; Campbell, Holley, Collins, & Armstrong, 2014; Chapman & McPhee, 2016). However, increased shark abundance is unlikely to be responsible because approximately 25% of the world's more than 500 shark species are classified as being in decline (IUCN, 2016).

In 2015, a record number of shark incidents was reported globally (98; ISAF, 2018). Thirty-three of these were recorded in Australia, with the State of New South Wales (NSW) recording the most (21) incidents (ASAF, undated). Only the United States of America (USA) records a higher frequency of 'shark attacks' (Chapman & McPhee, 2016; ISAF, 2018). Reflecting global trends, the number of incidents in Australia has increased from an annual average of 6.5 during 1990-1999 to 12.1 during 2000-2009. The risk of fatality remains low, averaging approximately one annually, which is 10% of the total recorded incidents (West, 2011) and comparable to the average annual global fatality rate (McPhee, 2014).

Shark incidents involve a variety of stakeholders (i.e., individuals or organizations affected by their occurrence or decisions affecting risk of occurrence; Johnson, Whittington,

Scholes, Angwin, & Regnér, 2017). Stakeholders may be affected positively, such as suppliers of products aimed to mitigate shark incident risk. Conversely, tourism destination business owners may be negatively affected due to reduced public confidence in ocean-based recreation. However, whether positively or negatively affected, stakeholders potentially pressure politicians to mitigate the economic and human risks in shark management policymaking. Politicians are sensitive to such demands, fearing voter backlash (Sunstein & Zeckhauser, 2011). The scope to respond effectively to such pressure is, however, constrained by three factors: (a) knowledge of shark biology and factors influencing sharks' propensity to 'attack' humans is incomplete, (b) absolute and relative effectiveness of various risk mitigation measures is unknown, and (c) many shark species are of conservation concern and protected by international, national, and/or state laws. In this regard, stakeholders are those who are informing policymaking.

A small but growing body of research (e.g., Apps, Dimmock, & Huvneers, 2018; Friedrich, Jefferson, & Glegg 2014; O'Bryhim & Parsons, 2015), has revealed that public knowledge, perceptions, attitudes, and behaviors toward sharks may be influenced by two opposing frames (anthropocentric and conservation) by their portrayal in media. More informed individuals (e.g., victims and scientists) tend to be more supportive of shark conservation than those with less knowledge (O'Bryhim & Parsons, 2015). However, attitudes may also potentially be negatively affected by inaccurate or melodramatic media depiction (e.g., McCagh, Sneddon, & Blache, 2015; Neff, 2015; Neff & Hueter, 2013). This has implications for shark management if, as has been previously reported (e.g., McCagh et al., 2015; Muter, Gore, Gledhill, Lamont, & Huvneers, 2013), many media articles are highly anthropocentrically and narrowly focused on risks to humans, with content emphasis and framing on human safety greatly outweighing concern for shark conservation.

Shark management may include ‘do nothing,’ catch and relocate (Cliff & Dudley, 2011; Hazin & Afonso, 2014), or lethal control, which can be either passive (e.g., baited hooks, fixed mesh gill nets) or active (hunt and kill ‘dangerous’ species) (Gibbs, & Warren, 2015; Neff, 2012; Reid, Robbins, & Peddemors, 2011). Lethal control measures are particularly controversial. These measures pose environmental risks and ethical dilemmas due to, for example, incidental entanglement in nets and/or fatality of non-target marine animals on baited drums, including non-target species (Cliff & Dudley, 2011; Reid et al., 2011). Such measures may, therefore, contribute to further depletion of shark populations already impacted by overfishing and/or habitat destruction (Worm et al., 2013).

Few studies have been undertaken on the understanding of ocean users and their attitudes toward shark management measures. Such studies (e.g., Crossley, Collins, Sutton, & Huveneers, 2014; Gibbs & Warren, 2015; Gray & Gray, 2017) have indicated that the public is typically aware of current options, although with limited understanding of how they work, and their benefits tend to be overestimated. For example, most people are not aware that sharks may swim around or under nets into protected waters. Individuals also overestimate the risk of shark attacks although their knowledge of measures employed to deter sharks does not influence their choice of beach destination.

‘Shark attack,’ although an emotive and misleading expression, is typically the term most-widely employed by journalists (i.e., authors) and other stakeholders when reporting shark incidents (McCagh et al., 2015; Neff & Hueter, 2013). Additionally, compared with their infrequent occurrence, shark incidents have typically been over-reported in news media and thus may be perceived by the community to occur much more frequently than in reality (Crossley et al., 2014; McCagh et al., 2015; Muter et al., 2013). Such tendency for news media to over-report and sensationalize low probability, high fear events is driven by interest in such stories (Davis & McLeod, 2003). Such sensationalism in news reporting has also been

shown to elicit emotional arousal in the reader (or viewer). This, in turn, mediates liking of the source and hence people's propensity to purchase and attend to such news (Vettehen, Nuijten, & Peeters, 2008), which is an important consideration in a highly competitive industry such as newspaper publishing (Hollifield, 2009).

There is a body of evidence indicating that public opinion is influenced by news media (e.g., McCombs, 2014; Shanahan, McBeth, & Hathway, 2011). For example, Shanahan et al. (2011) found that in reporting on a controversial issue in Yellowstone National Park (USA), the media influenced public opinion in two ways. When the reader's opinion was aligned with that espoused by the article, there was a significant strengthening of the reader's congruent opinions. Alternatively, when read by those with a divergent view from that of the article, there was a significant strengthening of opinion in the opposite direction from the previously held view. The frequency and manner of reporting of shark incidents are therefore likely to have implications for people's awareness, understanding, and attitudes toward shark management.

Despite the high profile of 'shark attack,' there appears to be a dearth of publications on how shark management and attributed attitudes toward sharks among major stakeholders are portrayed in news media. This article investigated attitudes attributed to major stakeholders in the most widely-read Australian newspapers toward measures intended to reduce human risk of 'shark attack' in the country's waters. The hypothesis investigated was that attitudes toward different management approaches attributed to the different stakeholder groups varied more within stakeholder group than among them.

Methods

Measurement of Attitudes

Critical media discourse analysis (Weiss & Wodak, 2017) was used for investigating attributed stakeholder attitudes. Media discourse refers to information transmitted to a non-present reader, listener, or viewer via a broadcast platform (e.g., newspaper, internet, radio,

television). Such discourse is typically mediated by a journalist (author). This technique is designed to identify a primary theme(s) with the power to influence opinions of stakeholders. This analytical approach is a qualitative research technique, widely used in social science studies, to analyze media and other forms of discourse. The method provides the researcher with a tool to generate insights into awareness, perceptions, and attitudes toward complex issues which, in the current study, emanates from the discourse mediator (hereafter referred to as the ‘author’).

This method of analysis (media discourse) was used for identifying how the topic of ‘shark attack’ was portrayed in the newspapers reviewed, how often, and how the media authors’ views and views attributed to other stakeholders were presented. The technique has been previously used for investigating human-wildlife conflicts (e.g., Alexander & Quinn, 2012; Houston, Bruskotter, & Fan, 2010). Previously, this technique has been used for studying shark reporting within a single newspaper (McCagh et al., 2015) or species (Boissonneault, Gladstone, Scott, & Cushing, 2005), and among multiple titles between two countries (Muter et al., 2013). There has, however, been a dearth of analysis investigating shark management measures and portrayal of attributed attitudes of different stakeholders toward sharks using media discourse analysis.

Data Collection

Newspaper articles published in four widely-read Australian newspapers were searched to identify the frequency of the mention of shark risk mitigation measures. Also identified were attitudes toward sharks by stakeholders with varying degrees of power to affect implementation of mitigation measures. This approach necessarily meant that the stakeholders’ views were gained indirectly, since their putative attitudes were filtered and expressed by each article’s journalist(s). However, together with all media outlets in Australia, the newspaper industry is governed by the Federal government’s Australian

Communications and Media Authority (Australian Government, undated). Within the industry, the Australian Press Council (undated), maintains robust Standards of Practice to govern journalistic behavior at organizational and individual journalist levels. This body represents approximately 95% of the more than 900 mastheads (including those surveyed during this study) of Australian print circulation. Such oversight by government and self-regulation by the media encourages truthful reporting of events.

This study was undertaken in 2015, during a period of record ‘shark attacks’ in Australia. Articles were identified by searching the term ‘shark’ anywhere (i.e., headline, graphics caption, body copy) within the online archives of the daily and weekend editions (analyzed together) of four widely-circulated Australian newspapers during a six-month period between April 1 and September 30, 2015, which is the period when effectively all ‘shark attacks’ in that year occurred. Content, layout, sections, and supplements in each online edition are identical to the hardcopy version.

Articles analyzed were restricted to those that mentioned the ‘animal’ shark. Non-animal references (e.g., Cronulla Sharks Rugby Team, *Shark Tank* reality television program, and *Sharknado* film) were excluded. Given the focus on a period of record shark attacks, it was necessary to use the form of media readily available, which was on-line newspaper archives.

Contents of two ‘broadsheet’ and two ‘tabloid’ newspapers were analyzed. Traditionally in newspaper publishing, broadsheets attract predominantly ‘middle-class’ audiences, and are regarded as more serious in tone and less sensationalist than tabloids. Tabloids are typically popular with ‘working-class’ audiences and are less serious and more sensationalist in tone (Oxford University Press, 2017). Inclusion of both genres aimed to ensure a sample that represented a diverse readership in terms of age, social class, and political alignment.

The titles surveyed were:

- (a) *The Australian* and its weekend counterpart *The Weekend Australian* ('Australian') is a broadsheet-quality newspaper (although now published in tabloid format), owned by News Corp., Australia. It is the country's biggest-selling nationally-circulated newspaper, and the seventh most read in Australia overall. No other major newspaper is circulated throughout Australia.
- (b) *The Sydney Morning Herald* and its Sunday counterpart *The Sun-Herald* ('Herald') is a broadsheet-quality newspaper, owned by Fairfax Media. Circulated in NSW, the Australian Capital Territory (ACT), and southeastern Queensland, it is the second most read newspaper in NSW, and third in Australia overall.
- (c) *The Daily Telegraph* and its Sunday counterpart *The Sunday Telegraph* ('Telegraph') is a tabloid newspaper, owned by News Corp., Australia. Circulated throughout NSW, the ACT, and southeastern Queensland, it is the country's most read tabloid and the second most read newspaper overall.
- (d) *The Courier Mail* and its Sunday counterpart *The Sunday Mail* ('Mail') is also a tabloid, owned by News Corp Australia. Circulated throughout Queensland, Northern NSW, and the Northern Territory, it is the most read newspaper in Queensland and sixth overall (Roy Morgan Research, undated).

All articles that mentioned at least one management measure for the animal 'shark,' and one stakeholder expressing a reported attitude were analyzed to determine how frequently measures and attitudes were mentioned, and by which stakeholder(s). Articles could mention multiple stakeholders, attitudes, and measures. To avoid 'double counting' and ensure statistical validity, each reported 'stakeholder + measure + attitude' combination was counted once per article. 'Mention frequency,' therefore, is defined as 'at least one mention per article' (i.e., not 'total mentions').

The measures were:

- (a) ‘Lethal control’ including active (e.g., shooting, baited drumlines) and passive (e.g., mesh nets) shark management.
- (b) ‘Increased surveillance’ including surveillance by formal organizations (e.g., police, local council, surf lifesaving clubs, commercial drone operators) and ocean users.
- (c) ‘Education and/or risk acceptance’ by ocean users.
- (d) ‘Shark research’ including shark biology and ecology, satellite tagging, and tracking.
- (e) ‘Non-lethal control/deterrent’ (e.g., electronic devices, non-lethal barriers).

The stakeholders were:

- (a) ‘Commercial,’ which was classified as an individual whose livelihood was either directly or indirectly influenced by shark-human interactions (e.g., surfing instructor/event organizer, beachwear retailer, restaurateur/hotelier, commercial fisher, shark deterrent/surveillance equipment manufacturer, commercial surfing).
- (b) ‘Public’ encompassed individuals within the general public, volunteer post-holder (e.g., lifeguard, surf lifesaving club official), or article guest writer (e.g., scientist).
- (c) ‘Author’ was classified as a professional newspaper or broadcast journalist, including documentary maker/presenter (unidentified stakeholders were designated as ‘Author’).
- (d) ‘Public Office Holder’ was a paid official (elected or appointed) of a public organization at Local, State, or Federal levels (e.g., Mayor, Police Officer, relevant government Minister or other official spokesperson).
- (e) ‘Scientist’ was a professional researcher; an individual scientist or representative of a scientific research organization (e.g., University, government department).

- (f) 'Victim' was classified as an individual who had directly experienced a 'shark attack' (i.e., 'near miss' with or without injury, attempted bite, surf board bumped) or 'injury.'

Data were quantitatively analyzed and statistically tested among measures, attitudes, and stakeholders using descriptive statistics and appropriate statistical tests. Association between frequency of mention of measures by stakeholder (attitudes aggregated) was examined using Pearson's chi-square test (with a simulated *p*-value based on 50,000 replications). Chi-square tests for goodness-of-fit (or multinomial exact tests for goodness-of-fit to handle low count data) with post-hoc analysis were used for checking whether stakeholders mentioned each measure equally often. Data were rated (-1 = oppose, 0 = neutral/unspecified, +1 = support) and one-sample Wilcoxon signed-rank tests were used for checking stakeholders' attitudes to each measure.

Results

Overall, 309 articles that mentioned the 'animal' shark were identified. Of these, 89% mentioned a potential or actual risk from sharks to humans and of these, a modest majority (58%, *n* = 160) mentioned at least one shark management measure by at least one stakeholder. Effectively all (98%) articles were authored by a named journalist(s) employed by the newspaper. Of the other three articles, two were authored by a scientist and one by a member of the public.

Mention of Measures and Attitudes; Stakeholders Aggregated

Among these 160 qualifying articles, support was the dominant attitude mentioned (range: 58-74%) for all five measures (lethal control, increased surveillance, education/risk acceptance, non-lethal control). Lethal control was the only one of these measures with a high percentage of opposition (38%), with the other four measures having negligible opposition (\leq 3%) (Table 1).

Insert table 1 about here

Mention of Measures, by Stakeholders; Attitudes Aggregated

There were marked differences in the frequency of mention of measures among stakeholders. Authors and public office holders were overwhelmingly the most-frequently mentioned stakeholders. The number of mentions attributed to these two stakeholders was broadly similar overall, and across four of the five measures. Other stakeholders, including public, scientist, and commercial groups, were less frequently mentioned. Victims were the least-frequently mentioned stakeholders (Table 2).

Insert Table 2 about here

Among all stakeholders except scientists, there was evidence (with a large effect size) that the five shark management measures were not mentioned equally. Stakeholders mentioned at least one measure significantly more or less frequently than average (Table 3). Lethal control was mentioned more than average. Only public stakeholders also mentioned increased surveillance and non-lethal control less than average (with a medium effect size). Two stakeholders (public and victim) mentioned education/risk acceptance more than average (with small and large effect sizes, respectively). Shark research was mentioned less than average by commercial, public, and author stakeholders (with medium, medium, and small effect sizes, respectively).

Insert Table 3 about here

Mention of Measures, by Attitude and Stakeholder

Lethal control. Three stakeholders (commercial, public, author) supported lethal shark control, whereas one stakeholder (scientist) opposed this measure. Two stakeholders (public office holder, victim) were neutral toward this measure (Table 4).

Insert Table 4 about here

Support comments typically took the form of human rights versus animal rights/environmental concerns. For example, one author in the Mail opined “... *sentimental environmental arguments should not obscure the fact that human existence has always involved the trading-off of animal rights for our rights.*” Another opinion was that shark numbers were increasing. This was, for example, reflected in the quote in the Australian attributed to a commercial fisher: “... *shark numbers ... had been steadily increasing for the past decade.*” It was his view that “... *the increased presence of whales and the banning of fishing for great whites... If you don't take them they are going to increase.*” Another public stakeholder who supported lethal control (a Vice President of a Boardriders Club) was quoted by the Telegraph as saying that “... *the numbers are there to prove nets work. It seems the obvious way to go until they come up with another way to protect human life.*”

Neutral comments included trying to rationally evaluate potential costs and benefits of lethal management. For example, a town mayor was reported in the Mail as saying “... *shark nets and drumlines were impractical for his region due to its vast stretches of beach.*” A state government minister was quoted by a Telegraph journalist that although he personally “... *was against both culling and using nets ... he admitted the ... attacks were hurting the ... tourism industry and he was ... open to taking any action.*” Scientists were more likely to advocate research on the effectiveness of lethal measures. For example, a government scientist was quoted in the Telegraph as saying “... *experts have been tagging sharks ... and ... studying the success of drum lines ... deployed off Reunion Island.*”

Stakeholder comments in opposition included the views that sharks had an inherent right of existence in the ocean, the unproven effectiveness of both active and passive lethal measures, and/or unintended by-catch effects on non-target species. One scientist, quoted in the Mail, argued that “... *killing sharks ... it's like saying ... we want to go for long walks on the African savannah ... so let's kill all the big cats and ... other animals ... so we can walk*

safely.” Other opposing attitudes included a belief that ocean users needed to be educated regarding risks and ways to reduce risks. For example, an author in the Telegraph opined “... *research and education are the key. If we can get a better understanding of what the triggers are then we have a better chance of saving lives. Surely this is a much better approach than the knee-jerk reaction of culling, which ends up killing all sharks.*”

Increased surveillance. Two stakeholders (commercial, public office holder) supported increased surveillance. Four stakeholders (public, author, victim, scientist) were neutral. None of the stakeholders opposed this measure (Table 4).

Stakeholder comments in support related to a range of surveillance initiatives. For example, a government minister was reported in the Telegraph to have said “... *government will fund extra shark surveillance New South Wales Government is committed to making our beaches safer so ... there will be an increased aerial surveillance ... on the North Coast.*” Surf clubs and individual ocean users were also encouraged to increase their vigilance. For example, a South African Public group was reported by the Mail to be planning “... *to run a test program in Queensland ... New South Wales and Western Australia to ... help reduce shark attacks Down Under.*”

Neutral comments referred to some measures already implemented. For example, a Mail author commented that “*Police and council vehicles on the New South Wales north coast have been fitted with air horns to get surfers out of the water and away from sharks.*” Other stakeholders suggested that an apparent recent increase in shark sightings might not reflect a real increase, but instead be a result of higher surveillance efforts. For example, one scientist was reported in the Mail to have said that “... *an increase in sightings in northern New South Wales could be due to the introduction of a reporting system based on 000 calls.*”

Education/risk acceptance. Five stakeholders (public, author, victim, public office holder, scientist) supported more public education and/or risk acceptance. The commercial stakeholder group was neutral and no stakeholders opposed this measure (Table 4).

Comments in support typically observed that sharks live in the ocean and are biologically-important predators, whereas humans who entered the ocean did so by choice for recreation and should accept the risk. For example, one scientist was reported in the Australian saying “... *it doesn't come up on the beach ... and grab you. You make the decision to go into the water, and you have to live with it.*” Other comments referred to opportunities for people to learn more about sharks, either by public education/entertainment (e.g., visiting aquaria) and by science-informed facts, and by modifying ocean use behavior. For example, a surfer quoted in the Mail said that “... *board riders needed to take responsibility and get out of the water when there are bait fish in the water.*”

Neutral comments included actions that might be taken by formal organizations to reduce, but could not negate, risk for ocean users. For example, it was reported in the Australian by an official of the World Surf League that the League would commence looking at “... *different risk management measures to make sure it [shark attack] can't happen again, but it is the ocean.*” Other comments suggested that ocean users necessarily faced inherent risks by personal choice. For example, after a shark-surfer interaction, one author from the Herald wrote that the “... *ordeal highlighted the day-to-day risks not merely endured by surfers but entertained as an integral part of their sport.*”

Shark research. Two stakeholders (public office holder, scientist) supported shark research. Three stakeholders (commercial, public, author) were neutral. Victims did not mention research and no stakeholder groups opposed this measure (Table 4).

Comments in support included the tagging and tracking of sharks to provide data on their behavior and movement. For example, one public angler interviewed by the Telegraph

was reported to have explained how and why he tagged and released every shark he caught: *“All my tags and information is for the New South Wales Department of Fisheries; in particular the game fishing/shark tagging programs.”* Other mentions of support for shark-related research were related to the (non)efficacy of shark repellent devices. For example, a commercial manufacturer of an electronic personal shark repellent device was quoted in the Telegraph saying *“The market wants to know it works. They want ... independent scientific evidence ... it has taken many years ... but we now have it unequivocally so we are at a tipping point.”*

Neutral comments included mention of the International Shark Summit convened in Sydney in September 2015. For example, a Herald author commented that *“The shark summit, which is the first of its kind, also examined the results of the government’s \$250,000 shark tagging program on the state’s far North Coast.”* Other forms of shark research (e.g., color sense, visual ability to distinguish between shapes of seals and board riders) were also mentioned by scientists such as in the Telegraph *“... the University of Western Australia found the ocean predators were probably color-blind and were instead drawn to high-contrast targets.”*

Only one attitude in opposition was mentioned and this was by a Telegraph author. Within a sarcastic context he wrote: *“... shark tagging off the state’s north coast will not provide ‘real time’ tracking of sharks or keep surfers and swimmers safe in the short-term.”*

Non-lethal control. Three stakeholders (commercial, public office holder, scientist) supported non-lethal control. Three stakeholders (public, author, victim) were neutral and no stakeholder groups opposed this measure (Table 4).

Comments in support included mention of innovative personal electronic shark repellent devices. For example, a manufacturer of such a device was quoted in the Australian saying *“... I am sure surfers themselves will be going: ‘That’s a damn good idea.’”* Other

comments related to shark detection and deterrence more generally. For example, a government minister was quoted in the Herald saying that the State Government “... *was looking at ways to improve shark protection ..., including spending \$100,000 to investigate new detection and deterrence technologies.*”

Neutral comments referred to various surveillance, detection, and repellent measures. For example, a near-miss victim was quoted in the Australian as saying that he continues to surf “... *but now has a shark repellent device in his board.*” Stakeholders noted, however, that such devices could mitigate, but not negate all risks. For example, one scientist was reported in the Australian saying that “... *despite the positive results no deterrent on the market was 100 per cent effective.*”

Only one attitude in opposition was mentioned. An author from the Telegraph wrote with a sarcastic note that a government department was “... *considering bubble curtains and land-based people spotters to stop massive white pointers lurking off local beaches ... despite the fact bubble curtains have failed to deter sharks during a ... study in Western Australia.*”

Discussion

Despite the low risk of mortality from a ‘shark attack’ in Australian waters, lethal control was the most-frequently mentioned shark management measure. Indeed, this measure was mentioned in more than half (53%) of all articles examined. As a control tool, it was the most strongly supported option mentioned. Of the five management techniques investigated, positive mentions occurred more than twice as often for lethal control as the others (Table 1). Despite the strength of support for lethal control, this was the only management measure that attracted controversy (i.e., attitudes in opposition). Approximately half of the articles that approved of shark control more generally opposed lethal control. However, there was effectively no opposition (< 3%) to all other measures reviewed.

The observation that lethal control of sharks generated the greatest controversy may reflect the split in the broader public between prioritizing for human safety and the conservation of threatened species. It may also represent the ultimate ‘action response’ (Sunstein & Zeckhauser, 2011) and is arguably the only risk mitigation measure for which tangible results (e.g., number of sharks killed, photographic evidence) can be demonstrated and understood by the general public.

Such tangible evidence also affords newspapers an opportunity to generate controversy and sensationalize low risk/high fear events that might be predicted to increase reader engagement, and thus sales revenue (Hollifield, 2009; Vettehen et al., 2008). However, despite the extent of media reporting associated with lethal shark control and, presumably, the influence on the readership of newspapers, surveys of Australian ocean users appear to provide a slightly different focus. For example, Gray and Gray (2017) found that, although recreationists surveyed on Sydney beaches gave relatively strong (> 60%) support for the use of mesh nets, more than 80% opposed general culling of sharks. Most (> 70%) even opposed such action following a shark incident. An Australia-wide survey (cited in Dorling, 2014) also showed substantial support for the use of nets or meshing to protect beaches from sharks. Some 25% of respondents supported protection of all beaches while 60% supported protecting ‘some beaches.’ Conversely, in Western Australia, a minority (22%) of ocean users supported wider use of shark nets, whereas a majority (56%) opposed such a policy (Gibbs & Warren, 2015).

However, awareness of measures does not necessarily mean accurate understanding of these measures. For example, Crossley et al. (2014) showed that ocean users in NSW and South Australia had high levels of awareness of shark mesh netting (and surveillance). Despite such awareness, members of the general public frequently over-perceived their efficacy. For example, it is often not considered that sharks could swim around or under such

nets. Although attitudes toward such measures were not reported in that study, the presence/absence of nets did not influence choice of beach destination.

The Australian public's attitude to lethal shark control may also be influenced by whether it is passive (e.g., mesh nets) or active (e.g., culling or directed hunting and killing). Active lethal control measures, including shooting and the use of drum lines, have been shown to elicit a low level of support (19%) or high opposition (> 60%) among ocean users (Gibbs & Warren, 2015; Marketforce, 2013). Opposition to such methods 'forced' the Western Australian Government to discontinue their use (Gibbs & Warren, 2015; McCagh et al., 2015).

A nationwide survey of the public more generally revealed that 82% of respondents opposed lethal shark control and considered that people entered the water at their own risk (Dorling, 2014, cited in Gibbs & Warren, 2015). These results are congruent with a survey of the public in Western Australia where only 19% of respondents supported culling. However, Gray and Gray (2017) did find that older respondents (51+ years) were more likely to support lethal strategies compared to young respondents, and that a 'shark attack' may engender support to kill the 'culprit' shark. Such attitudes may be influenced by people's ethical views that differentiate between general culling of sharks and the killing of individual problem individuals. Alternatively, it may result from sensationalized media portrayals of sharks and their behavior (McCagh et al., 2015; Muter et al., 2013; Neff, 2015).

As with lethal control, both authors and public stakeholders supported education/risk acceptance and were effectively neutral toward other measures. Public office holders, typically State or Federal ministers, supported all measures except lethal control, toward which they were neutral. If such elected officials are viewed as being responsible for 'carrying out the will of the people' with regard to lethal control (as interpreted and reported by authors

with regard to that section of the public represented by their readers), then this does not seem to be occurring.

Such differences, however, most likely reflect public office holders' multiple and potentially-conflicting needs to: (a) safeguard human lives by many means possible, (b) simultaneously fulfil legal responsibilities to protect shark species of conservation concern under Australia's *Federal Environmental Protection and Biodiversity Conservation Act 1999*, and (c) maximize voter satisfaction. It may be speculated that public office holders need to be seen as addressing such conflict. This 'imperative' was presumably a driver in the decision by the NSW Government (2015) to convene an International Shark Summit in Sydney during the study period to review all potential mitigation measures, and to gain public support for/justify its subsequent policymaking.

Given the wide range of measures available for implementation, and especially the controversy regarding lethal control, the relatively low mention of scientists overall was surprising, with this stakeholder group authoring < 1% of all articles examined. Even for the 'shark research' measure, scientists were not significantly associated with its discussion. In the current study, comments attributed to scientists appeared in only 24% of articles (vs. authors as the highest group mentioned [72%], Table 1). Conversely, in a previous study (Muter et al., 2013), scientists represented the equal highest number of mentions in Australian newspaper articles, and even higher attributions in articles in the USA. In contrast, Muter et al. (2013) reported that a group of stakeholders comparable to 'public office holders' had an equivalent number of mentions in the two countries.

The contribution attributed to scientists also came only from the biological and not, for example, the social or technological sciences. The infrequent scientific research-informed input was, therefore, restricted to a relatively limited field of expertise within the sciences. Such paucity of comment may be due to, for example, declining government and public trust

in and/or support for science generally (Gauchat, 2012; Hartz & Chappell, 1997; Lewandowsky, Oberauer, & Gignac 2013), scientists' hesitancy to comment on risk management processes due to fear of inadvertently causing panic or confusion among the public (Frewer, Hunt, Brennan, Kuznesof, Ness, & Ritson, 2003), a disjoint between the goals of authors and scientists (e.g., controversy/entertainment vs. scholarly communication/paternalistic public education; Peters, 1995), or that tight publishing deadlines made timely location and interview of relevant scientists impractical (Reed, 2001).

Scientists were the only stakeholder to oppose any measure, namely lethal control. This presumably, at least in part, reflected the biological interests of those concerned such as the balance between human safety and shark conservation. As with scientists who would have been sought for comment within their area of research expertise, comments attributed to commercial stakeholders would have been sought based on their expertise associated with shark management. Overall, therefore, these stakeholders would be expected to have views that aligned with their business interests, whether their interest was focused on lethal control (e.g., recreation or commercial fishing, mesh netting, direct cull of sharks), surveillance (e.g., sales and/or drone operation, air pilot), or non-lethal control (e.g., sale of personal shark deterrent devices, exclusion barriers). It is therefore logical that such stakeholders as scientists and commercial operators may have a bias (professional and/or commercial) and be encouraged to voice it to the interviewer. The very reason that such stakeholders are sought is to obtain comments that will enhance authors' articles.

In contrast, compared with all other stakeholders groups, the number of victims potentially available to provide comment is necessarily limited due to the paucity of attack survivors. Under Australian law, the definition of 'shark attack' varies from near-miss to extensive mauling or fatality (see ASAF, undated). It may also differ with the reason for exposure to attack (e.g., surfer, diver, fisher, conservationist – professional or recreational).

Unlike the other stakeholders, it is therefore not surprising that the reported attitudes of the small number (6) of surviving victims regarding mitigation measures varied. Although some individuals supported lethal control, victims were more likely to support education/risk acceptance and were neutral toward, or did not mention, other measures. This suggests that even people experiencing a near-miss event or actual injury did not necessarily blame the sharks.

Conclusion

The most frequently mentioned and supported shark management measure was lethal control, although it was also the only measure that generated controversy. This is despite approximately 25% of the 500 or so known species of sharks being in decline (IUCN, 2016). Such decline is of conservation concern (Clark, Harley, Hoyle, & Rice, 2013; Dulvy et al., 2014; Worm et al., 2013). Conversely, worldwide, shark attacks (encompassing near miss, injury, or fatality) have been rising in recent years (Chapman & McPhee, 2016; McPhee, 2014; West, 2011). Despite worldwide shark attacks trending up, the risk of fatality in Australian waters averages approximately one annually (McPhee, 2014). This contrasts with an average of 21 coastal drownings annually (Brighton, Sherker, Brander, Thompson, & Bradstreet, 2013). Attributions that supported lethal control were by authors (typically employed by newspapers), commercial operators, and the public, whereas other stakeholders were neutral or opposed. It has been suggested that media (e.g., Hammerton & Ford, 2018) have "... fuelled public imagination, perpetuating fear and negative stereotypes of sharks and hysteria around human-shark interactions" (p. 1). The result is that public office holders are expected to act (Hammerton & Ford, 2018), although the current study indicated that the opinion they are acting on is not necessarily that of the broader community. This is indicated by the observation that among stakeholders, authors and public office holders had comments similarly attributed far more often than others, whereas other stakeholders were substantially less-frequently mentioned attributed stakeholders.

Given that ‘newsworthiness is subjective’ (Lunney & Moon, 2008), it may be surmised that the overrepresentation of the views of just two of the six stakeholders would result in biased reporting. If so, it would be expected that the views of the two stakeholders who provided most comments would be similar. This was not the situation. The only attitudes toward shark management that these two stakeholder groups had in common was the positive attitude toward education/risk management. For example, the author stakeholders were strongly supportive of lethal shark control, whereas public office holders were neutral, and likewise there were differing views presented on non-lethal shark control.

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Table 1. Mention frequency of a shark management measure, by attitude, stakeholders aggregated, in 160 articles published in four widely circulated Australian newspapers surveyed between 1st April and 30th September 2015.

Measure	Support <i>n</i> (%)	Neutral/Unspecified <i>n</i> (%)	Oppose <i>n</i> (%)	Total articles <i>N</i> (%)
Lethal control	61 (73)	25 (30)	32 (38)	84 (53)
Increased surveillance	30 (58)	25 (48)	0	52 (33)
Education/Risk acceptance	32 (74)	11 (26)	0	43 (27)
Shark research	29 (73)	15 (38)	1 (3)	40 (25)
Non-lethal control	23 (68)	16 (47)	1 (3)	34 (21)
				160 ¹ (100)

¹ Total articles sum to more than 160 as some articles mentioned multiple measures and/or attitudes.

Table 2. Mention frequency of a shark management measure; attitudes aggregated, by stakeholder¹, in 160 articles published in four widely circulated Australian newspapers surveyed between 1st April and 30th September 2015.

Stakeholder & Measure ¹	Lethal control <i>n</i> (%)	Increased surveillance <i>n</i> (%)	Education/ risk acceptance <i>n</i> (%)	Shark research <i>n</i> (%)	Non-lethal control <i>n</i> (%)	Total articles <i>N</i> (%) ²
Author	50(44)	23(20)	12(10)	14(12)	16(14)	115(72)
Commercial Public	11(44.0)	4(16)	2(8)	1(4)	7(28)	25(16)
Officer	48(44)	23(21)	5(5)	18(17)	14(13)	108(68)
Public	24(57)	2(5)	14(33)	1(2)	1(2)	42(26)
Scientist	5(13.2)	4(11)	7(18)	13(34)	9(24)	38(24)
Victim	7(44)	1(6)	7(44)	0	1(6)	16 ⁴ (10)
Total³	84³	52³	43³	40³	34³	253³

¹ See text for stakeholder and measure definitions.

² % of total 160 articles mentioning at least one measure.

³ Total sums to more than column total as some articles mentioned multiple stakeholders and/or measures.

⁴ Comprises near-miss (*n* = 7) and injury (*n* = 9) articles.

Table 3. Analysis of (non)significant differences among stakeholders in average mention frequency of shark management measures; attitudes aggregated, in 160 articles published in four widely circulated Australian newspapers surveyed between 1st April and 30th September 2015.

Stakeholder & Measure ¹	Commercial	Public	Author	Victim	Public Office Holder	Scientist
χ^2_4	13.20	47.81	42.61	E	48.39	6.74
<i>p</i> value (Cramér's <i>V</i>)	.010* (.363)	<.001*** (.527)	<.001*** (.304)	.002** (.488)	<.001*** (.335)	.15
Lethal control	(+) ² .003** (.600)	(+) <.001*** (.921)	(+) <.001*** (.587)	(+) .027* (.594)	(+) <.001*** (.611)	1.0
Increased surveillance	.617 (.100)	(-) .012* (.386)	1.00 (.000)	.222 (.344)	1.000 (.384)	1.0
Education/Risk acceptance	.134 (.300)	(+) .040 (.296)	(-) .010* (.239)	(+) .027 (.594)	(-) <.001*** (.083)	1.0
Shark research	(-) .046 (.400)	(-) .004** (.443)	(-) .036 (.196)	.055 (.500)	1.00 (.083)	.20
Non-Lethal control	.317 (.200)	(-) .012* (.386)	.103 (.344)	.222 (.344)	.068 (.176)	1.0

¹ See text for stakeholder and measure definitions. Statistic is Chi-square goodness-of-fit based on 50,000 replicates.

² (+) if the measure was mentioned more than the overall average among stakeholders, (-) if the measure was mentioned less than the overall average among stakeholders, no sign indicates the measure was mentioned neither more nor less than the overall average among stakeholders.

Significance: **p* <.05, ** *p* <.01, ****p* <.001

Table 4. Analysis of (non)significant differences among stakeholders¹ regarding support, oppose, or neutral attitude to shark management measures in 160 articles published in four widely circulated Australian newspapers surveyed between 1st April and 30th September 2015.

One-sample Wilcoxon test <i>p</i> value (Effect size <i>r</i>) ³	Commercial	Public	Author	Victim	Public Officer	Scientist
Lethal Shark control	(+) ² <.001*** (1.000)	(+) .014* (.440)	(+) <.001*** (.728)	.484 (.309)	.141	(-) .036*
Increased surveillance	(+) <.036* (1.000)	.346 (1.000)	.346 (.295)	1.000 (1.000)	(+) <.001***	.346
Education/ Risk acceptance	1.000 (1.000)	(+) <.001*** (.886)	(+) .005** (.764)	(+) .010* (.926)	(+) .018*	(+) .010**
Shark research	1.000 (1.000)	1.000 (1.000)	.424 (.267)	nm	(+) <.001***	(+) .002**
Non-Lethal shark control	(+) .005** (1.000)	.346 (1.000)	.424 (.250)	1.000 (1.000)	(+) .002**	(+) .018*

¹ See text for stakeholder and measure definitions

² (+) indicates support for the measure; (-) indicates opposition to the measure; no sign indicates neither support or opposition; nm = not mentioned.

³ Effect size *r*: small (.1 - .4), medium (.4 - .6), large (> .6).
Significance: **p* <.05, ** *p* <.01, ****p* <.001.