

Article

How Sharks and Shark–Human Interactions are Reported in Major Australian Newspapers

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Received: 3 March 2020; Accepted: 26 March 2020; Published: 29 March 2020



Abstract: Few phrases evoke more negative emotion, or generate more media coverage, than ‘shark attack’ despite the few deaths that have been attributed to shark bite. Typically, tabloids are considered to provide more sensational coverage than broadsheets. We investigated how sharks and shark–human interactions were portrayed in four major Australian newspapers during a period of a record number of shark attacks in Australian waters. There was strong focus on human risk from sharks, and over-reportage of negative aspects. Thirty incidents were recorded: two fatal, 20 injury, and eight ‘near-miss’. Of 309 ‘shark’ articles surveyed, 24% mentioned fatalities (65% occurred prior to the study, some decades earlier). Injury was reported in 40% of articles, and “near-miss” in 33% (89% related to an incident in South Africa involving an Australian surfing celebrity). The tabloid, *Telegraph*, published substantially more shark-related articles and photographs than other newspapers. There was otherwise no consistent pattern of difference between genre or newspapers.

Keywords: biased reporting; anthropogenic focus; shark incidents; shark attacks; news media bias; genre bias reporting; shark conservation; marine ecosystems; ‘fake news’

We are not afraid of predators, we’re transfixed by them, prone to weave stories and fables and chatter endlessly about them ...

(E.O. Wilson, cited [1])

1. Introduction

As predators, sharks play a crucial role in maintaining healthy marine ecosystems [2,3]. However, they face substantial threats from human activities including commercial fishing [4], pollution [5], climate change [6], habitat loss, and degradation [7]. Their consequent decline has resulted in approximately 25% of shark species being classified as at risk (i.e., vulnerable, endangered or critically endangered) [8]. Recognition of the impacts caused by such activities has resulted in efforts to educate communities about sharks, restrict or ban shark finning, establish shark sanctuaries and promote shark conservation laws. Consequently, some species of shark (e.g., white (*Carcharodon Carcharias*), whale (*Rhincodon typus*), grey nurse (*Carcharias Taurus*) are now protected under legislation in many sovereign waters [8]. In Australia, nine shark species are protected under the Federal Government’s *Environmental Protection and Biodiversity Conservation Act 1999*.

Human–wildlife interactions offer potential for both positive or negative outcomes for individuals, both human and shark. Positives include human-derived pleasure and understanding of the species which, in turn, may engender support for their conservation. Conversely, if an animal physically

attacks a human, the result may be human injury or even fatality. When this occurs, typically there is public pressure to mitigate the human risk [9–11]. This may be problematic if the species is in decline, and particularly if the taxon (population or species) is already of conservation concern [12,13].

Among the marine species that may attack humans, sharks are arguably the most feared. Indeed, there are few phrases that evoke as much powerful, negative emotion as ‘shark attack’, or generate such a high degree of media coverage [14–16]. However, such reporting may not accurately reflect the actual risk that sharks pose. For example, among the more than 500 known shark species [17], only three, the white, tiger (*Galeocerdo cuvier*) and bull (*Carcharhinus leucas*) sharks, are responsible for most of the confirmed unprovoked bites and fatalities.

Reflecting long-term trends, in 2017, the United States of America (USA) recorded the highest number of shark incidents (53) worldwide, followed by Australia (14), while other countries each reported substantially fewer incidents (0–3 [18]). One reason for the relatively high number of reported incidents in Australia is due to the definition of ‘shark attack’ which, under the current recording criteria used in the Australian Shark Attack File (ASAF), may include incidents lacking physical contact (e.g., shark bumping watercraft or equipment worn by a human) between shark and human [19]. Indeed, 27% of recorded shark incidents in Australian waters between the years 1990–2017 did not result in human injury (i.e., the human suffered a ‘near-miss’). Fatal incidents in Australia are rare: they average 1.5 annually, forming 10.5% of total incidents between the period 1990–2017 [19]. This is far fewer than coastal drownings, which averaged 99 annually between 2004–2017 [20].

Despite the actual paucity of injury and death due to shark bite, media reports often portray sharks as ‘man-eaters’, and use of the term ‘shark attack’ is widespread [15]. Sharks may also be portrayed as a ‘rogue’ that have become resident of a location and develops a putative taste for human flesh—a serial killer with criminal, malign intent [21]. This perception that such ‘guilty’ animals may be identified, and must be killed, has become known as the ‘Jaws Effect’ [22]. Efforts to change such perceptions based on scientific knowledge (e.g., shark biology, behaviour, incident frequency and outcomes) could be enhanced with greater understanding of the beliefs in the broader community, and knowledge of how such attitudes are developed and maintained [23]. Since it is known that such attitudes are influenced by what and how information is communicated, especially by the media [24–26], understanding of how such interactions are portrayed could help to change attitudes.

We used Media Discourse Analysis to explore how sharks and shark–human interactions were portrayed in the textual and graphical content of articles published in the four most widely read Australian newspapers. The study was undertaken during a six-month period in 2015, a period of record shark attacks within Australian waters [19]. Specifically, we investigated how reportage presented (i) ocean users’ perceptions and behaviour; (ii) shark management policymaking; and (iii) support for shark conservation.

2. Methods

2.1. Media Discourse Analysis

Mass media studies offer a research tool that may generate insight into the effects of the media’s role in influencing society and vice versa [27–29]. Some previous studies have demonstrated that sections of the media may portray sharks favourably (e.g., documentaries [30], diving magazines [31], shark-diving websites [32]). Newspaper reportage of a species may also evolve over time (e.g., grey nurse shark [33]); however, compared with terrestrial carnivores, there have been relatively few studies (e.g., [10,25]) that have addressed how news media portray sharks and shark–human interactions.

Media discourse analysis examines interactions that occur through a broadcast platform—typically newspaper, television, radio or internet—with the discourse focused on a central theme(s) or frame [10].

This tool may thus be employed to provide insights into the awareness, perceptions, and attitudes of complex management issues, including human–wildlife conflict. It is aimed at a non-present reader, listener or viewer.

2.2. Data Collection

The number, and human outcome, of shark incidents in Australia were analysed using ASAF [19] data between January 1 and March 31 (the period immediately preceding the study), and April 1 and September 30, 2015 (the survey period). This spanned a period of record ‘shark attacks’ in Australian waters [16]. Articles were collected from four of the most widely read Australian newspapers; two broadsheet and two tabloid. For convenience, the on-line version of each newspaper was analysed, since the content, layout, sections, and supplements in each online edition were presented identically to the hardcopy version.

Within each newspaper, the term ‘shark’ was searched anywhere—headline, graphics caption, and body copy. The number, word count, format of articles, shark species, and geographical location of the incident were also recorded. From these data, primary and secondary themes were identified and their framing (i.e., what information was reported, how, and how often). In addition, if/how such reportage differed between newspaper genres (i.e., broadsheet and tabloid) and among individual newspaper titles was investigated.

2.3. Newspapers Surveyed

Traditionally, ‘broadsheet’ newspapers are predominantly read by ‘middle-class’ audiences. They are regarded as more serious in tone, and less sensationalist, than ‘tabloids’. Tabloids are most popular among ‘working-class’ audiences. Articles in these newspapers tend to be less serious and/or more sensationalist in tone than broadsheets [34]. The inclusion of both genres aimed to ensure representation of a diverse readership in terms of age, social class, and political alignment, and to identify if/how reportage of sharks differed among genres and titles.

The four newspapers of this study are each published daily during the week, and have a weekend counterpart. The data from the weekday and weekend versions were combined for analyses.

The Australian and its weekend counterpart the *Weekend Australian* (‘Australian’) is a daily broadsheet newspaper, owned by News Corp Australia. Hardcopy versions are circulated nationwide, and it is the country’s most widely circulated newspaper, although it does not have the largest readership. In the twelve months preceding June 2015, *The Australian* was read 333,000 times Monday to Friday. The *Weekend Australian* was read 664,000 times [35].

The Sydney Morning Herald and its Sunday counterpart the *Sun Herald* (‘Herald’) is a daily broadsheet newspaper, owned by Fairfax Media. Hardcopy versions are circulated predominantly in New South Wales, the Australian Capital Territory, and Southeast Queensland. In the twelve months to June 2015, *The Sydney Morning Herald* was read 515,000 times Monday to Friday and 727,000 times on Saturday. The *Sun Herald* was read 685,000 times [35].

The *Courier Mail* and its Sunday counterpart the *Sunday Mail* (‘Mail’) is a daily tabloid newspaper, owned by News Corp Australia. Hardcopy versions are circulated throughout Queensland, most regions of New South Wales and parts of the Northern Territory. In the twelve months preceding June 2015, the *Courier Mail* was read, on average, 420,000 times Monday to Friday and, on average, 533,000 times on Saturday. The *Sunday Mail* was read, on average, 847,000 times [35].

The *Daily Telegraph* and its Sunday counterpart The *Sunday Telegraph* (‘Telegraph’) is a daily tabloid newspaper, owned by News Corp Australia. Hardcopy versions are circulated throughout New South Wales, the Australian Capital Territory and Southeast Queensland. It has the largest readership of any Australian newspaper. In the twelve months preceding June 2015, *The Daily Telegraph* was read, on average, 625,000 times Monday to Friday and 605,000 times on Saturday. The *Sunday Telegraph* was read, on average, 1,010,000 times on Sunday [35].

2.4. Definitions

The term “shark” was restricted to its use with respect to the animal shark; non-animal references were excluded (e.g., Cronulla Sharks Rugby Team; *Shark Tank* reality television programme; *Sharknado* film).

Headlines, sub-headlines, and body text were combined and analysed together for reference to sharks. Readers’ tweets/emails that were reproduced verbatim and located adjoining and directly relating to qualifying articles were also analysed. Photographs and graphics (e.g., diagrams of shark nets, maps of incident locations) were analysed separately. A small percentage of photographs and graphics shared among multiple articles on the same page were analysed against the article with which they seemed primarily associated.

Articles were classified into four formats: (i) “Run Of Paper” are articles that, at the Editor’s discretion, are placed anywhere within the newspaper; (ii) “Front Page Article” included headlines with accompanying text on the front page of the main paper or a component section; (iii) “Front Page Banner Headline” is a headline and/or sub-heading, typically ≤ 7 words, that appears on the front page of the main paper or a component section, sometimes with a photograph or graphic; and (iv) “Special Feature Article” is a multi-page article on aspects of potential or actual shark–human interactions.

2.5. Data Analysis

Article content data were first manually coded and qualitatively analysed, using pilot-tested systematic inductive coding, facilitated by QSR NVivo11 software [36]. The aim of this was to analyse underlying latent meanings within the content of the article, in an inherently subjective process. An iterative process was followed to identify and code salient themes and sub-themes. These were defined as those that were relevant, repeated and meaningful (e.g., ‘what was said’). Any theme considered irrelevant or insensible was deleted, and analogous themes were merged. It was assumed that shark taxa named in photograph captions were correctly identified.

Quantitative analysis was made of manifest, that is ‘surface level’, content of articles, for example article format, frequency, word count and mention of subjects (e.g., themes/sub-themes, shark taxa, geographical location) within articles. A subject could be mentioned singly or multiple times in an article, and subjects were analysed based on ‘at least one mention’ in an article.

Analysis of significant differences or associations among titles and between genres was made by descriptive statistics and appropriate statistical tests. Pearson’s chi-square test (or Fisher’s exact test [FE]) with Yates’ continuity correction, if appropriate) was used to analyse number of articles, article format, mention of identified shark taxa, and article themes/sub-themes. Levene’s test of equal variance was used to check the assumption of ANOVA; Welch’s test and Brown–Forsyth test were used to check for unequal variance, and Tukey HSD post-hoc pairwise test and independent samples *t*-test to analyse mean word count in Run Of Paper articles. Chi-square goodness-of-fit (or exact test of goodness-of-fit [E] based on 2000 replicates, as appropriate) was used to analyse proportional mention in each title and genre of geographic location by country and Australian state/territory and use of photographs/graphics. Further exact binomial with Bonferroni’s correction (E) testing was made to determine whether the proportions in each title differed significantly from expected 14.5%, 18.4%, 23.6%, 43.4%. (i.e., the overall proportion of articles among the four titles).

3. Results

3.1. Frequency of Incidents

In 2015, there were a record number shark incidents (98), both globally [18] and in Australia (33) [19]. Nine incidents were reported in Australia in the three months immediately preceding the survey, and 21 during the survey period. Of these 30 incidents, two caused fatality, 20 caused injury, and eight ‘victims’ were not physically injured (i.e., ‘near-miss’). Twenty of these incidents, including

one fatality, occurred in New South Wales (NSW). Elsewhere in the country, the number of attacks was much lower (≤ 4), and the only other fatality was in Tasmanian waters (Table 1).

Table 1. Number and timing of recorded shark incidents in Australia, January–September, 2015 ¹.

January 1–March 31	April	May	June	July	August	September	Outcome
3	0	0	1	3	1	0	Uninjured
5	3	1	3	4	1	3	Injured
1	0	0	0	1	0	0	Fatal
9	3	1	4	8	2	3	Total

¹ Source: [19].

3.2. Frequency of Articles

Overall, 309 articles published during the survey mentioned sharks, but the number and frequency of articles varied with month ($n = 5$ –106/month; see Table 2). Commencing at a relatively low number during April–June (Austral autumn), there was a substantial increase in shark articles during July through August (Austral winter). A subsequent decline occurred in September (Austral spring) (Table 2, Figure 1).

Table 2. Number of shark articles published monthly April–September, 2015, in each newspaper/genre (Broadsheet: Australian, Herald; Tabloid: Mail, Telegraph (week/weekend edition titles combined)).

Title/Genre	Number of Articles/Month						Total Articles
	April	May	June	July	August	September	
Australian	0	1	2	19	17	6	45
Herald	3	1	0	22	25	6	57
Mean broadsheet	1.5	1	1	20.5	21	6	51
Mail	7	2	4	31	17	12	73
Telegraph	4	1	3	35	47	44	134
Mean Tabloid	5.5	1.5	3.5	33	32	27	103.5
Total titles	14	5	9	106	106	69	309

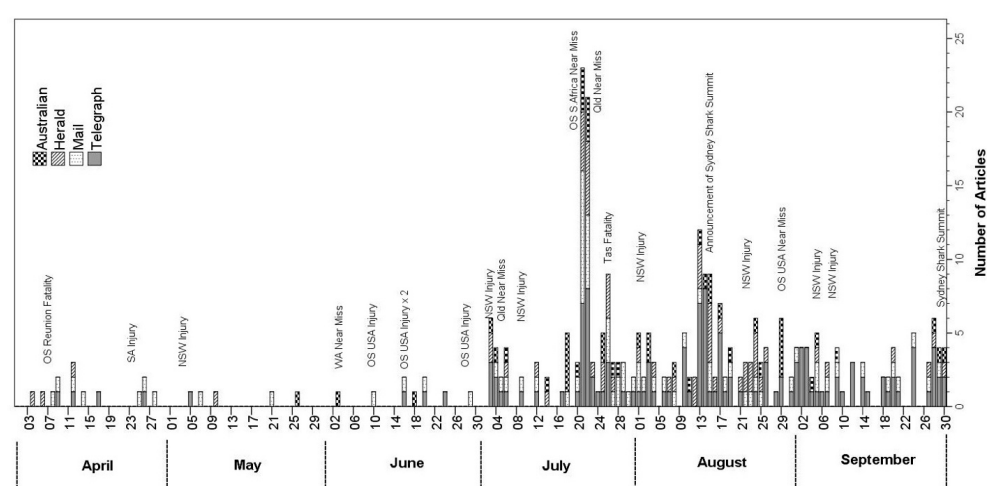


Figure 1. Number and timing of articles mentioning sharks between 1st April–30th September 2015 in four major Australian newspaper titles; two broadsheets (Australian: Herald and to tabloids (Mail; Telegraph), with reported Australian and overseas shark incidents highlighted (Note: OS = Overseas; SA = South Australia; NSW = New South Wales; WA = Western Australia; Qld = Queensland; Tas = Tasmania).

There was a highly significant difference ($\chi^2_1 = 35.68, p < 0.001$) in the number of articles published in tabloids compared with broadsheets. Throughout the survey period, tabloids (Mail, Telegraph) consistently published more articles mentioning sharks (mean: 1.5–33) than the broadsheet titles (Australian, Herald; mean: 1–21). The difference in total number of articles among individual titles was also highly significant ($\chi^2_3 = 60.7, p < 0.001$). The Telegraph published almost half (43.0%) of all articles, approximately three times as many as the title, Australian, publishing the fewest articles (14.5%; Table 2).

3.3. Article Format and Mean Word Length

Overall, and in each title, most articles (89.3%) were published in Run of Paper format (Table 3). There was not a significant difference in the proportional use of this format between broadsheets and tabloid genres overall ($\chi^2_1 = 1.996, p = 0.158$). There was, however, a significant difference (FE, $p = 0.0416$) in the proportional use of this format among titles, although there was not a discernible, consistent pattern among titles. Overall, the other three article formats (Front Page Banner Headline, Front Page Article, Special Feature Article), were infrequently used (10.7% combined). There was no significant difference in their proportional use, either between genres or among titles.

Table 3. Number and percentage of shark articles published by genre, title and format April 1–September 30, 2015. (Broadsheet: Australian, Herald; Tabloid: Mail, Telegraph).

Title/Genre	Run of Paper	Front Page Banner Headline	Front Page Article	Special Feature Article	Totally All Formats
	% (n)	% (n)	% (n)	% (n)	% (n)
Australian	84.4 (38)	11.1 (5)	2.2 (1)	2.2 (1)	14.5 (45)
Herald	86.0 (49)	8.8 (5)	5.3 (3)	0.0 (0)	18.4 (57)
Total broadsheet	85.3 (87)	9.8 (10)	3.9 (4)	1.0 (1)	33.0 (102)
Mail	97.3 (71)	0 (0)	1.4 (1)	1.4 (1)	23.6 (73)
Telegraph	88.1 (118)	3.7 (5)	8.2 (11)	0 (0)	43.4 (134)
Total tabloid	91.3 (189)	2.4 (5)	5.8 (12)	0.5 (1)	67.0 (207)
Total Titles	89.3 (276)	4.9 (15)	5.2 (16)	0.6 (2)	100.0 (309)

Analysis of mean word count in Run Of Paper articles (excluding two extreme outlier articles; Australian, 2918, Mail, 2693), revealed a wide variation among titles (range: 38 (Telegraph)–1554 (Herald)). The mean word count overall in the two broadsheets was highly significantly different compared with the combined word counts/article in the tabloids ($t_{127.37} = 4.17, p < 0.001$). There was also a highly significant difference in mean word count among titles overall (Welch: $F_{3,103.38} = 7.718, p < 0.001$; Brown–Forsythe: $F_{3,143.85} = 7.470, p < 0.001$). In addition, there was a highly significant difference in the mean word count among newspapers (Australian > Mail ($p < 0.001$); Australian > Telegraph ($p = 0.015$); Herald > Mail ($p < 0.001$); Herald > Telegraph ($p = 0.042$)), but not between titles of the same genre (Table 3).

3.4. Use of Photographs and Graphics

A substantial majority of articles featured at least one photograph, both overall (69.9%), and among titles (range: Mail 63.0%–Telegraph 75.4%; Table 4).

Table 4. Number and percentage of themes and the two most-mentioned sub-themes in articles published between April 1 and September 30, 2015 in four major Australian newspaper titles; two broadsheets (Australian, Herald) and two tabloids (Mail, Telegraph).

Percentage of Articles Mentioning Sharks by Theme (n = Total Articles)	Total Broadsheet (%) n = 102	Total Tabloid (%) n = 207	Total Articles (%) n = 309
Risk to humans	91.2	88.4	89.3
Scientific research	20.6	14.5	16.5
Risk to sharks ¹	4.9	6.8	6.1
Shark tourism ²	2.0	6.3	4.9
Miscellaneous mention of sharks	9.8	2.4	4.9
Total number of mentions of themes ⁵	131		376
Ratio of total mentions/total articles	1.28	1.18	1.22
Number of Articles Mentioning Sharks, by Sub-Theme, within ‘Risk to humans’	Total Broadsheet (%) n = 93	Total Tabloid (%) n = 18	Total Articles (%) n = 276
Risk to humans generally	61.3	66.7	4.9
Injury	45.2	43.7	44.2
Near-miss	44.1	33.3	37.0
Fatality	21.5	29.5	26.8
Total number of mentions of sub-themes ⁵	160	317	403
Ratio of total mentions/total articles	1.72	1.73	1.46
Number of Articles Mentioning Sharks, by Sub-Theme, within ‘Scientific research’	Total Broadsheet (%) n = 21	Total Tabloid (%) n = 30	Total Articles (%) n = 51
Human safety ³	90.5	86.7	88.2
Shark biology ⁴	23.8	13.3	17.6
Total no. of mentions of sub-themes ⁵	24	30	54
Ratio of total mentions/total articles	1.14	1.00	1.06

¹ includes commercial and recreational fishing; ² includes free ranging and captive sharks in aquaria; ³ includes shark vision and other senses; non-lethal and lethal repellent devices; shark tagging and tracking; International Shark Summit; ⁴ includes shark ecology and behavior; ⁵ totals may sum to more than total number of articles as some articles mentioned multiple themes.

Three photograph categories (human, shark, object/scenery) were identified. These occurred in the same descending rank order frequency overall, and among all four titles: human > shark > object/scenery.

Within the ‘human’ category, seven subjects were portrayed: near-miss > injury > public > friend/relative (of near-miss/injury/fatality) > public office holder (including politicians and other elected officials) > scientist > fatality (Table 4). The ‘human’ photograph category was most frequently presented (overall 69.9% n = 151; range, Australian 69.0%, n = 20; Telegraph 70.3%, n = 71). ‘Near-miss’ was the most-featured subject within the ‘human’ category (36.4%, n = 55), and among all photographs overall (25.5%). Within the ‘near-miss’ subject, an Australian professional surfer, Mick Fanning, who experienced an incident with a (unconfirmed) white shark, recorded live while competing in a round of the World Surfing Championship in South Africa, was substantially the most-frequent specific subject, overall, and in all titles. Photographs featuring this person comprised 90.9%, n = 50 of ‘near-miss’ photographs; 33.1% of ‘person’ category; 23.1% of all photographs overall.

Among the ‘shark’ photograph category, five subjects were featured. In descending rank order frequency, these were: white shark > unidentified taxon > tiger shark > other identified taxon > whale shark (Table 4). Overall, this ‘shark photograph’ category was the second most frequently used in articles (41.2%, n = 89). While the Herald used this category most infrequently (30.0%, n = 12), in the Telegraph (48.5%, n = 49) this category was used most frequently. Among the photographs of sharks used, the white shark was the most-frequently pictured taxon (53.9%, n = 48). After photographs of the near-miss human subject ‘Fanning’, the white shark was the second most-featured subject among all photographs. Tiger sharks were the second most frequently featured shark taxon, followed by the whale shark. Photographs of nine other identified taxa were featured substantially less frequently (≤2.2% each).

The third photograph category, ‘object/scenery’ was substantially less frequently used in association with shark articles (overall: 17.1%; $n = 37$; Table 4).

There was no significant difference between broadsheet and tabloid genres or among titles in proportional use of person or object/scenery photographs, either by individual subject, within each category, or between categories. Proportional use of total shark photographs was significantly higher in tabloids than broadsheets ($\chi^2_1 = 4.430$, $p = 0.035$) but there was no significant difference among titles. Proportional use of white shark photographs did not differ significantly between genres but was significantly different among titles overall ($\chi^2_3 = 9.918$, $p = 0.019$). Such a difference in use of white shark photographs was, however, only significantly higher than average (E , $p = 0.014$) in the Telegraph. There was no significant difference in use of this subject from the average among the other titles. There was also no significant difference in the proportional use of any of the other shark photograph subjects between genres or among titles.

A small minority of articles, both overall (9.4%, $n = 29$) and among titles (range: (Mail), 5.5%, $n = 4$ –(Telegraph) 11.9%, $n = 16$), featured at least one graphic (Table 4). Two graphic categories were identified. The most commonly used of these was a location map of the shark–human interaction, and devices to reduce such interactions (e.g., diagrams of shark nets; repellent devices). There was no significant difference in the proportional use of graphics overall, either between broadsheet and tabloid genres or among titles.

3.5. Mention of Sharks by Geographic Location

Australia was markedly the most frequently mentioned country in articles (71.5%), followed by South Africa (20.8%). Ten other countries/territories (USA, United Kingdom, New Zealand, Dubai, Egypt, Italy, Mexico, Bahamas, Réunion, New Caledonia) were mentioned substantially less frequently ($\leq 3.9\%$ each).

Among the articles that mentioned Australia, a small minority (5.3%) mentioned the country generally but most (94.7%) mentioned a specific state or territory where the ‘shark attack’ occurred. New South Wales was substantially the most frequently mentioned state overall (60.8%), followed by Queensland (12.0%) and Western Australia (11.7%). All other locations were substantially less frequently mentioned ($\leq 4.2\%$).

There was no significant difference in the proportional mention of Australia generally, or any of its component states or territories, between broadsheet and tabloid genres. There was, however, a highly significant difference among titles overall in proportional mention of three states: New South Wales ($\chi^2_3 = 17.886$; $p < 0.001$), Queensland ($\chi^2_3 = 22.018$; $p < 0.001$) and Western Australia ($\chi^2_3 = 21.890$; $p < 0.001$), but not the other states/territories or Australia. Western Australia was mentioned significantly more often in the Australian compared with the other three titles (vs. Herald: $p = 0.002$; vs. Mail: $p = 0.004$; vs. Telegraph: $p = 0.007$);

Queensland was mentioned significantly more often in the Mail compared to the other three titles (vs. Australian: $p = 0.036$; vs. Herald: $p = 0.043$; vs. Telegraph: $p < 0.001$), and New South Wales was mentioned significantly more often in the Telegraph compared with the other three titles (vs. Australian: $p = 0.011$; vs. Herald: $p = 0.049$; vs. Mail: $p = 0.002$).

3.6. Mention of Identified Shark Taxa

Overall, 22 different shark taxa were identified to at least genus. At least one of these was mentioned in most articles, both overall (65.0%, $n = 201$), and in all titles (range: Australian 57.8%, $n = 26$ –Telegraph 71.6%, $n = 96$). The remaining 35.0% of articles used only the generic term ‘shark’, either because taxon identification was irrelevant to the article or was unknown (Table 5).

Table 5. Number and percentage of articles mentioning an identified shark taxon between April 1–September 30, 2015 in four major Australian newspaper titles (Broadsheet: Australian, Herald; Tabloid: Mail, Telegraph).

Common Name	Scientific Name	Total Broadsheet n = 102 (%)	Total Tabloid n = 207 (%)	Total Articles n = 309 (%)
White shark	<i>Carcharodon carcharias</i> ¹	52 (51.0)	121 (58.5)	173 (56.0)
Unidentified spp.		43 (42.2)	65 (31.4)	108 (35.0)
Tiger shark	<i>Galeocerdo cuvier</i>	13 (12.7)	33 (15.9)	46 (14.9)
Bull shark	<i>Carcharhinus leucas</i>	9 (8.8)	17 (8.2)	26 (8.4)
Hammerhead spp.	<i>Sphyrna</i> spp. ²	0 (0.0)	9 (4.3)	9 (2.9)
Whaler spp.	<i>Carcharhinus</i> spp.	1 (1.0)	5 (2.4)	6 (1.9)
Black tip reef shark	<i>Carcharhinus melanopterus</i>	1 (1.0)	4 (1.9)	5 (1.6)
Mako shark	<i>Isurus</i> spp.	0 (0.0)	5 (2.4)	5 (1.6)
Whale shark	<i>Rhincodon typus</i> ^{1,2}	1 (1.0)	2 (1.0)	3 (1.0)
Broadnose sevengill shark	<i>Notorynchus cepedianus</i>	0 (0.0)	3 (1.4)	3 (1.0)
Grey nurse shark	<i>Carcharias taurus</i> ¹	0 (0.0)	3 (1.4)	3 (1.0)
Oceanic whitetip	<i>Carcharhinus longimanus</i>	1 (1.0)	0 (0.0)	1 (0.3)
Grey reef shark	<i>Carcharhinus amblyrhynchos</i>	0 (0.0)	1 (0.5)	1 (0.3)
Pocket shark	<i>Mollisquama parini</i>	0 (0.0)	1 (0.5)	1 (0.3)
Leopard shark	<i>Triakis semifasciata</i>	0 (0.0)	1 (0.5)	1 (0.3)
Wobbegong/Carpet shark spp.	<i>Orectolobus</i> spp.	0 (0.0)	1 (0.5)	1 (0.3)
Sand shark	<i>Carcharias taurus</i> ³	0 (0.0)	1 (0.5)	1 (0.3)
Reef shark spp.	<i>Carcharhinus</i> spp.	0 (0.0)	1 (0.5)	1 (0.3)
Horn shark spp.	<i>Heterodontus galeatus</i>	0 (0.0)	1 (0.5)	1 (0.3)
Port Jackson shark	<i>Heterodontus portusjacksoni</i>	0 (0.0)	1 (0.5)	1 (0.3)
Lemon shark	<i>Negaprion</i> spp.	0 (0.0)	1 (0.5)	1 (0.3)
Basking shark	<i>Cetorhinus maximus</i>	0 (0.0)	1 (0.5)	1 (0.3)
Elephant shark ⁴	<i>Callorhynchus milii</i>	1 (1.0)	0 (0.0)	1 (0.3)
Total articles with ≥1 ID'd shark taxon		59 (57.8)	142 (68.6)	201 (65.0)

¹ Protected species in Australia; ² IUCN (International Union for Conservation of Nature) Red List globally endangered; ³ most likely scientific name; ⁴ not a shark (ray family, close relative).

White, tiger and bull sharks, in that order, were the three most-mentioned identified taxa in all four titles, both between genres and overall. The white shark was the most-mentioned species, both overall (56.0%, n = 173), and in all titles (range: Herald 49.1%, n = 28–Telegraph 63.4%, n = 85). All other identified taxa were mentioned substantially less frequently, both overall (≤2.9%, n = 9), and among titles, with no mention in the Australian, Herald, and Mail, and only 4.5%, n = 6 in the Telegraph.

There was no significant difference in proportional mention of the top three identified shark taxa, between genres or among titles. Analysis of the other 19 identified taxa combined showed a highly significant different mention in tabloids (higher) compared to broadsheets ($\chi^2_1 = 8.706$, $p = 0.003$). There was also a highly significant difference among titles overall ($\chi^2_3 = 11.806$, $p = 0.008$). There was, however, no consistent, discernible pattern of difference in combined mention among the titles of the 19 other identified taxa.

3.7. Thematic Analysis

Among the newspaper titles reviewed, five themes emerged (i) risk to humans; (ii) risk to sharks from humans; (iii) scientific research; (iv) shark tourism; and (v) miscellaneous mention of sharks (not

technically a specific theme). Most articles focused on a single theme (themes/article mean range: Mail 1.1–Australian 1.3 (Table 6).

Table 6. Number and percentage of themes and two most-mentioned sub-themes in articles published between April 1–September 30, 2015 in four major Australian newspaper titles (Broadsheet: Australian, Herald; Tabloid Mail, Telegraph).

Percentage of Articles Mentioning Sharks by Theme (n = Total Articles)	Total Broadsheet (%) n = 102	Total Tabloid (%) n = 207	Total Articles (%) n = 309
Risk to humans	91.2	88.4	89.3
Scientific research	20.6	14.5	16.5
Risk to sharks ¹	4.9	6.8	6.1
Shark tourism ²	2.0	6.3	4.9
Miscellaneous mention of sharks	9.8	2.4	4.9
Total number of mentions of themes ⁵	131	245	376
Ratio of total mentions/total articles	1.28	1.18	1.22
Number of Articles Mentioning Sharks, by Sub-theme, within ‘Risk to humans’	Total Broadsheet (%) n = 93	Total Tabloid (%) n = 183	Total Articles (%) n = 276
Risk to humans generally	61.3	66.7	64.9
Injury	45.2	43.7	44.2
Near-miss	44.1	33.3	37.0
Fatality	21.5	29.5	26.8
Total number of mentions of sub-themes ⁵	160	317	403
Ratio of total mentions/total articles	1.72	1.73	1.46
Number of Articles Mentioning Sharks, by Sub-theme, within ‘Scientific research’	Total Broadsheet (%) n = 21	Total Tabloid (%) n = 30	Total Articles (%) n = 51
Human safety ³	90.5	86.7	88.2
Shark biology ⁴	23.8	13.3	17.6
Total no. of mentions of sub-themes ⁵	24	30	54
Ratio of total mentions/total articles	1.14	1.00	1.06

¹ includes commercial and recreational fishing; ² includes free ranging and captive sharks in aquaria; ³ includes shark vision and other senses; non-lethal and lethal repellent devices; shark tagging and tracking; International Shark Summit; ⁴ includes shark ecology and behaviour; ⁵ totals may sum to more than total number of articles, as some articles mentioned multiple themes.

Overall, the theme ‘risk to humans’ was by far the most common theme identified (89.3%) in all four titles (range: [Mail] 79.5%–[Telegraph] 93.3%) (Table 6). There was no significant proportional difference in mention between broadsheet and tabloid genres ($X^2_1 = 0.298$, $p = 0.585$). Despite a significant difference (FE, $p = 0.029$) in the mention of this theme among titles overall, there was no consistent, discernible pattern of significant difference among individual titles. Within this theme, four sub-themes were identified: (i) risk to humans generally; (ii) near-miss; (iii) injury; and (iv) fatality (Table 6). Articles typically mentioned multiple sub-themes (mean range: [Herald] 1.58–[Australian] 1.90). Overall, ‘risk to humans generally’ was substantially the most frequently mentioned sub-theme (64.9%, $n = 179$), with other sub-themes mentioned much less often (injury 44.2%; near-miss 37.0%; fatality 26.8%). There was no significant proportional difference in mention between broadsheet and tabloid genres for the ‘risk to humans’ sub-theme. However, there was a significant difference among titles overall between two sub-themes, ‘risk to humans generally’ ($\chi^2_3 = 12.300$; $p = 0.006$) and near-miss ($\chi^2_3 = 11.200$, $p = 0.011$) (Table 6) although there was no consistent, discernible pattern of difference among individual titles.

‘Scientific research’ was the second most mentioned theme overall, and among individual titles. There was no significant difference in mention of this theme between broadsheet and tabloid genres or among titles. Within the theme, two sub-themes were identified, ‘human safety’ and ‘shark biology’ (Table 6). Articles typically mentioned a single sub-theme. Overall, ‘human safety’ was the most-mentioned sub-theme (88.2%), and it was mentioned in the same rank order, and a substantially similar relative proportion, in all titles. ‘Human safety’ was mentioned in many contexts, including shark vision and other senses, effectiveness of various non-lethal repellents (e.g., ‘Shark Shield’ personal

electronic repellent; plastic or bubble fences); lethal shark control methods (e.g., drum lines, mesh nets); shark tagging and tracking programmes, and the 'International Shark Summit' in Sydney that occurred in response to community pressure due to the record number of shark attacks over the study period. There was no significant difference in mention of 'human safety' between broadsheet and tabloid genres, or among titles. The second sub-theme, 'shark biology', included shark biology, ecology, and behaviour. It was mentioned infrequently within the theme (17.6%), and among shark articles overall (2.9%, $n = 9$). There was a significantly higher proportional mention of this sub-theme in broadsheet newspapers compared to tabloids (FE, $p = 0.046$), and among titles (FE, $p = 0.042$). There was, however, no consistent, discernible pattern among titles.

All three other themes were mentioned infrequently. 'Risk to sharks' was the third most mentioned theme overall (6.1%; Table 6). Commercial and recreational shark fishing were mentioned in a substantially equal proportion overall, and there was no significant difference either between genres or among titles. 'Shark tourism' (including swimming/diving with free-ranging sharks and viewing captive sharks in aquaria) and 'miscellaneous mention of sharks' were the least mentioned themes overall (4.9% each). There was no significant difference in mention of 'shark tourism' between genres or among titles. 'Miscellaneous mention of sharks' showed a significant difference between genres, and among titles overall. There was, however, no discernible, consistent pattern of significant difference among individual titles.

4. Discussion

The 30 shark attacks that occurred immediately, preceding and during the survey represented most of the 33 reported in Australia during 2015 [19], a year of record numbers of shark attacks. This record was frequently commented upon in news articles. Overall, most articles strongly focused on specific shark–human interactions that involved injury and risk to humans. As has been reported previously (e.g., [28,37]), shark articles appeared episodically and were incident-specific, rather than regular and/or thematic matters (e.g., general issues, abstract context). This was reflected in the low frequency of articles published in the first half of the study. However, even when incidents did occur, they did not necessarily attract substantial coverage. For example, four incidents between April 25–July 19, all resulting in human injury, generated minimal reportage (approximately four articles/incident within the immediate news cycle). Subsequently, the number and frequency of articles increased substantially following three incidents in close succession in late July, despite two being near misses (i.e., the victim was not physically harmed); the other was a fatality. However, despite the fatal attack in Tasmania being potentially 'sensational' reading, since it involved a young woman witnessing her father being attacked at the end of a dive, it generated only modest coverage compared with the first in this cycle of attacks. This is despite the first incident occurring overseas (i.e., in South African waters) and being a near-miss (i.e., there was no physical damage to the surfer or his board). Indeed, this near-miss generated by far the greatest number of media articles of any 'shark attack' that occurred during the study, and was the only such incident that occurred outside of Australian waters that drew substantial media attention.

There were several factors that undoubtedly contributed to the difference in reportage between the two events. Importantly, unlike the Tasmania fatality, the near-miss victim (Mick Fanning) had celebrity status. He had been three-time World Surfing Champion and, as previously mentioned, was participating in the World Surfing Championships when the incident occurred [38]. Some support for this suggestion may be gleaned from the deluge of worldwide media coverage following the death of another Australian 'celebrity', Steve Irwin, in 2006, due to a stingray strike [39]. However, the comparative lack of media coverage of even a shark attack fatality within Australian waters is also likely to be a strong influence on the availability of live coverage of the incident. Unlike any of the other victims covered in this study, only Mick Fanning's altercation with the shark was recorded live (as was the death of Steve Irwin), and there was a substantial audience watching the event from the beach. There was therefore media footage available for journalists to access to support their reporting.

Peace [39] provided an example of an attraction for the media to be present. In discussing a shark attack in South Australia, he commented that ‘all this took place just 400 metres from the shore, and only a few kilometres from Adelaide’s CBD from which the media descended in droves to provide on-the-spot coverage’. Underwater incidents, in relatively more remote areas, do not make for the quick ‘media grab’ that may occur in urban waters or, in the case of Mick Fanning, representatives of multi-media outlets.

The coverage of shark attacks within Australia did appear to reflect the newspaper titles’ circulation footprint, and the number of shark incidents experienced within respective state and territory coastal waters immediately prior to and during the survey. For example, New South Wales’ reportage of shark attacks was probably influenced by the fact that the circulations of two of the four titles (Herald and Telegraph) are primarily within this state. However, as noted, this state also experienced by far the highest absolute and relative frequency of incidents; five times higher than Queensland and ten times higher than Western Australia. The latter state’s substantially lower, equal second, proportional mention was probably influenced by the lack of a Western Australia-focused title in the study, along with the very low number of incidents (two—no fatality) experienced in that state prior to, and during, the survey.

The number of shark-related articles was markedly higher in tabloids than in broadsheets. This could be predicted because, by their very nature, ‘shark attacks’ are sensational news [12,40] and, stylistically, tabloids portray news melodramatically [41]. Indeed, tabloid journalists have pressures from within their organisation that encourage sensationalism in news coverage [42–44], and this is what their audience expects [41,45,46]. For example, Dowler [47] suggested that the number of articles printed that report violent crime are proportionally higher, and reported more sensationally, in tabloid newspapers compared to broadsheets. Along with violent crime, after the film ‘*Jaws*’ was released in 1975, which was about a shark that terrorised a small community, there arose an ‘unprecedented paranoia’ of sharks that the ‘media hyperbole exploited’ [48,49]. The observation of a substantially higher number of shark articles published in the Telegraph, Australia’s most-read tabloid (and newspaper), lends support to the concept that shark attacks sell newspapers [50].

Although there were more articles on shark attacks in tabloids than broadsheets, the articles had a lower mean word count in the former genre. This reflects the newspaper editors ‘playing to their audience’. For example, compared with those that read broadsheets (i.e., ‘business-class people’), readers of tabloids were less likely to have a university education and more likely to have minimal secondary education, and to be unemployed or blue-collar workers [51]. Tabloids have also been described as a ‘pick up, flick through’ reading, but an ‘integral part of the working day’ [41]. With such an approach to consuming tabloids, focus on catching the reader’s attention with a ‘flick through’ may be expected, however, there was no other observed difference in shark reportage between newspaper genres or titles. In all titles, most articles on sharks were placed in the body of the paper (i.e., Run-of-Paper), and typically supplemented with at least one photograph. These photographs were not necessarily unique to a genre, for example, the News Corp-owned newspapers occasionally used the same photograph in their tabloid and broadsheet.

Shark reportage was also highly anthropocentric. Typically, the emphasis was on risk to humans from sharks. Few articles addressed shark conservation. This human focus extended to mention of shark taxa, graphics, and themes. The most commonly reported (but not necessarily identified) sharks were white > tiger > bull sharks. For example, the most reported incident, a near-miss off South Africa involving Australian world champion surfer Mick Fanning, typically reported that a white shark was the culprit but, although this was very likely, the species was not formally identified. Within Australia, this species, together with tiger and bull sharks, are the most-frequently reported—but not necessarily confirmed—taxa in shark attacks, although this was often due to identification issues [40,52]. Apart from the white shark, however, taxa of conservation concern received negligible mention. For example, of 76 species of Chondrichthyes (sharks, rays, skates and chimaeras) listed as endangered or critically endangered by the International Union for Conservation of Nature [8] at the time of the study,

together with the endangered NSW population of grey nurse sharks, only three of these shark taxa (grey nurse, whale, hammerhead) were mentioned in any of the articles surveyed. By comparison, the white shark was mentioned in more than half of the articles. Such differences reveal a strong anthropocentric focus on prioritising human safety over animal conservation. The anthropogenic focus of the articles reviewed was reinforced by the subject of photographs accompanying articles. Most photographs pictured human ‘victims’ or ‘dangerous taxa’. Such polarisation was exacerbated by the frequent use of photographs of Mick Fanning’s near miss and/or a white shark, the species suspected of the putative attack. Indeed, among the 70% of all articles featuring at least one photograph, 41% included at least one shark photograph, of which photographs of white (53.9%), followed by tiger (16.1%) sharks dominated. The dominance of photographs of white sharks was also strongly associated with articles that predominately mentioned research. Nearly 90% of such articles identified human safety as a research need.

In contrast to the ‘negative press’ associated with sharks, there was negligible ‘positive press’ on shark–human interactions. For example, ‘shark tourism’ was mentioned in fewer than 5% of articles, despite the strong growth in non-consumptive shark tourism in Australia [53–55]. Such low reportage of shark tourism may be an artefact of the timing of the study (Austral autumn to spring) although swim- and dive- with shark tourism typically operates into this period in several locations throughout Australia [56]. The lack of reportage on shark conservation, and negligible mention of ‘risk to sharks from humans’ (commercial and recreational fishing, approximately 6%), contrasted strongly with a previous media study [57].

5. Conclusions

It may be assumed by readers that news reportage, at least broadly, reflects the frequency and outcome of current and recent real-world events and sensationalism, if included, tends to be largely restricted to the tabloids. This was not observed—reportage of sharks tended to be sensationalised and, particularly in the case of one near-miss incident, sustained and maybe even distorted against reality. For example, although only one fatality occurred immediately prior to the study, and another during it (<7% total incidents [19]), 24% of the articles surveyed mentioned fatalities. Of such fatalities, 65% occurred prior to the current study (i.e., 2015) with some incidents dating back to the 1920s. Similarly, 20 injuries and eight near-misses which occurred during the same period elicited mentions of injury in 40% of articles, while near-miss mentions occurred in 33% of articles surveyed. For example, the near-miss suffered by Mick Fanning while competing in the World Surfing Championships in South Africa, represented 89% of reportage on near-miss incidents. It also dominated the reportage of shark attacks in other countries, several of which involved injuries and fatalities. There was also some distortion in the number of articles reported in all three incident types compared with real-world events. These findings reflect those of other studies that have shown over-reporting of shark incidents against their occurrence (e.g., [57]). This may explain the perceptions in the community, which substantially overestimate the frequency and gravity of ‘shark attacks’. For example, Crossley et al. [12] reported that many people believe that there are double the number of non-fatal, and four times as many fatal, incidents as in reality.

It is generally accepted (e.g., [34]) that there is a greater tendency for tabloid compared to broadsheet newspapers to provide sensational reporting. There was some evidence of this in the current study. For example, the Telegraph published 43.4% of all shark-related articles and used a significantly higher proportion of white shark photographs (a species known/assumed to be the culprit of many ‘attacks’) than other titles. Such findings, in the country’s largest-circulation newspaper, hints at an association between such sensationalism and revenue. However, in other attributes of coverage there was limited difference among newspaper titles, either tabloid or broadsheet. Whether the skewed or over-reporting identified constitutes ‘fake news’ is debatable, and problematic to determine since there is currently no universally accepted definition of the term [58,59].

Author Contributions: Conceptualisation: S.B., N.H.; formal analysis: J.S., N.H.; Methodology: N.H., J.S., S.B.; Writing: S.B., N.H. All authors have read and agreed to the published version of the manuscript.

Funding: The research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

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