***Jaws*: The Classic that Doomed Sharks**

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**Statement of Purpose**

Since the release of the critically acclaimed summer horror film *Jaws*, sharks have been at the forefront of general apprehensions of the ocean and its unknowns. Prior to the release of the movie, shark attacks, though they occurred, were reported on much more infrequently (Francis, 3). Since the movie’s screening, shark reports have significantly increased, especially in Australia, and the political and media rhetoric around sharks has similarly sharpened despite still low attacks (Francis, 49). Subsequently, with numerous shark species now threatened by extinction, how has public media’s portrayal of sharks affected White Shark populations and public perceptions of the animal? Media can take many forms beyond *Jaws* and news reports, including recent movies like *The Meg* and *Meg 2: The Trench*, showcasing resurrected, bloodthirsty Megalodons wreaking carnage on humans, or consistent television programs like Discovery Channel’s *Shark Week*, sensationalizing the “killer efficiency” of different shark species. Do these sources prominently displaying sharks as threats to human life continue to damage the reputation of sharks, particularly White Sharks, or have they brought more light onto the barriers they face? How does this influence also compare to the mirrored efforts to promote and protect their populations? Using what I learn throughout my project, I hope to write and present an encapsulating paper and/or website explaining and displaying any possible connection between notable media spotlights related to sharks and their presence.

**Background**

My interest in sharks and marine biology started when I was a child in Costco who got a new book named *Sharks*. I loved learning about their behaviors and unique characteristics, and I’ve carried this passion throughout my life, always visiting aquariums wherever I go to see and discover what other creatures exist in the world. My experience with the subject extends to my own personal investigations on marine ecosystems through documentaries, trips, etc. and my research at ASDRP in 2022 with Mr. Adams’ groups creating an algae-powered battery, and data and image analysis of tide pool populations as they’ve changed before and after COVID-19.

On the other hand, my fascination of computer science was fostered by both classes I’ve taken in school and personal projects I’ve made to test my abilities. From AP Computer Science A to various Hackathons, I’ve tested and broadened my programming abilities to cover a wide range of fields. I have over 4 years of experience in Python, mixed with HTML, CSS, PyMongo, JavaScript, Java, and stints in robotics powered by Raspberry Pi and machine learning after teaching myself. With such an expansive array of topics covered by computer science, I’ve loved picking up as much as I can learn to be the most versatile coder I can be. However, I am also aiming to identify which sector of computer science I want to pursue, and a Senior Project will hopefully be one way to better understand my options.

In terms of curricular subjects relevant to my question, however, I have taken AP Biology, AP Calculus BC, and AP Statistics, and I am currently taking the capstones Existentialism and the Absurd and Differential Equations. While AP Biology is primarily focused on microbial studies, its brief sections on ecology were the most fascinating to me and were often the easiest and most interesting to research and write. Though I haven’t taken AP Environmental Science, I consider myself well-versed in conservation efforts and the natural inorganic and organic processes dictating our environment, especially in the ocean. AP Statistics and AP Calculus BC also occasionally intersected with what I studied in AP Biology with Chi-Square tests and logistic growth models. These interdisciplinary studies proved extremely beneficial not only in my understanding of the mathematical meaning of “significance,” “correlation,” etc., but also in the projects I’ve previously taken part in like Mr. Adams’ tide pool group. These AP classes will serve as a useful background from which I can build my understanding of White Sharks, their populations, and the risks they face.

Through my current capstone courses, I’m learning to apply more advanced qualitative and quantitative analyses to various types of problems. In Existentialism and the Absurd, I’ve addressed issues related to questions of identity of the individual compared to the community and purpose in continuing to fight for a seemingly hopeless world. These philosophical questions will prove extremely useful for the observations I make regarding the “vulnerable” future of White Sharks and the mentalities of poachers and conservationists in light of conflicting public narratives. In addition, the intensive research required in Mr. Meyerowitz’s classes have prepared me well for the time I will need to spend to locate various sources on my topic. In Differential Equations, I may be able to mathematically argue of the danger current actions, or lack thereof, have on the White Shark populations using formulas like the Harvest Model to determine current approximate sustainability. Additionally, I am currently working on an in-class project describing a study on the sustainability of Blue Shark fishing. Using this much more well-documented species, I could look towards using similar population estimation methods to extrapolate and create conclusions on the status of White Sharks.

**Prior Research**

White Sharks have been in the media spotlight for decades ever since *Jaws*, taking the brunt of much of the public backlash against sharks despite not being the primary culprit of most shark attacks. In fact, scientists believe that many White Shark attacks are actually Bull Sharks. Regardless, the actual statistics of White Shark interactions with people is still extremely low 82 no injury incidents, 114 non-fatal injury incidents, and 16 fatal incidents in California since the 1950’s (California Department of Fish and Wildlife). Consequently, you are more likely to die from a lightning strike, a fall from bed, or an extra-hot shower than you are to die to a shark attack.

Additionally, there is an existing study into the changes in public perception and “revenge killing” of sharks ushered in before and after the release of *Jaws* (Francis, 44-64). However, what does not yet exist on the topic are direct connections made between what popular sentiment is, or at least what is commonly reported, and the direct effects on shark populations. Additionally, there are numerous reports on White Shark sightings around the world observing poachers’ effects on their populations. Similarly, there are also well-documented studies on the behaviors and trends of their populations over time, especially with the hyper-commercialization of the oceans through ocean trawling. Alternatively, looking into various conservation movements and their respective impacts on White Shark populations can inspire future, better methods for preserving these species. These efforts to track this type of shark will prove useful for analyzing any significant changes in estimated population numbers as they relate to well-publicized events.

On the other hand, conservationist efforts have also done much to change the narrative for sharks, and while recently, especially in the US, shark populations have rebounded rather well. From government agencies to nonprofit organizations, groups at all levels of influence have been attempting to reverse the aggressive overfishing against sharks, threatening their population and global ecosystems. The NOAA manages commercial and recreational shark fisheries, restricting shark harvests and rebuilding populations and places the US as the global leader for shark conservation. Similarly, organizations like Shark Trust, WWF, and the Shark Conservation Fund work towards managing global measures, advocating for change, reversing the narrative of sharks, etc. Using these sources and potential contacts, I plan to gain a greater understanding of the past and present situation facing White Sharks, potentially integrating environmentalists’ interviews to best understand and explain any trends noted.

**Significance**

With the critical role all shark species have on our marine ecosystems, humanity’s job in preserving these apex predators grows in importance. In light of negative and overblown stereotypes of White Sharks, the loss of these important animals with minimal concern by the global populace will prove disastrous for the sustainability of over 50% of all life on Earth. By diving deeper into the potential, direct consequences that media’s portrayals of any type of shark, especially White Sharks, have on their populations, hopefully progress can be made to revert this ecological catastrophe. On the flip side, shedding light onto successful conservationist movements for White Sharks and sharks in general may be the much-needed boost in the “PR” of the animals as a substantial number of species are listed on the IUCN Red List. Improving this truly global effort to preserve marine ecosystems by combatting misinformation and fearmongering will also simply have the effect of increasing worldwide appreciation of our blue and mysterious oceans. Presenting a Senior Project as well can shed light on the true danger, or lack thereof, of sharks for our local BISV community. Simply spreading the word on the relative harmlessness of these titans (to us) is a meaningful step towards the change necessary to keep our oceans healthy.

**Description**

My project will focus on the analysis of public data, news sources throughout time, and these public opinions’ effects on white shark populations. This analysis will be done by utilizing R-Studio’s data analysis features, statistical tests to determine the significance of population changes and people-shark incidents, and potentially interviews from professionals in the field. Concluding my project, I will, of course, run the presentation at the end of Trimester 3, and if time permits, I will attempt to run a survey of BISV Senior’s opinions on sharks and create a video showcasing all that I have learnt on sharks, conservation efforts for them, and positive and negative media about them.

**Research Methodology**

Central to my project is analyzing a sizable database of White Shark populations, ideally from the 1970’s to present day. Consequently, the first main priority will be identifying an adequate dataset that shows significant trends in White Shark populations, globally or in a specific region that has seen *Jaws* or experienced similar media portrayals. In deciding what data to use, it will need to contain categorizable attributes like ID’s, location, etc. so that I can further analyze any inconsistencies or interesting features observed as White Shark sightings change over time.

After isolating my data, I will need to narrow down my research on the specific region I’m investigating and the relationship that region has had with sharks. Understanding public opinion before, during, and after significant shark-related events, be it the release of *Jaws*, a similar movie, a shark attack, or conservation movement, will be integral to understanding any statistically significant variations from normal population and sighting fluctuations. Additionally, I will also ensure that I learn as much as possible on the behaviors of White Sharks so that I am knowledgeable on any potential confusions or inconsistencies I may initially observe in any data, report, or studies.

Using the research I find, my experience in statistics, and the advice of Mr. Adams, I am aiming to build a timeline and plausible connections between the presence of White Sharks and people’s responses to the animal. Also with Mr. Adams’ help, I hope to be able to graph and display the data I use on an interactive map and potentially a website I create. In addition, with the experience of both of my advisors, I will be able to gauge the possible directions my project can take, especially with regards to the lenses of conservation, government, and society as they pertain to White Sharks. I have also talked with Ms. Wendel and Dr. Gerges about my Senior Project, and they’ve expressed that they are willing to offer their expertise (psychology and differential equations, respectively) on my project as needed.

Finally, if I still have extra time after researching White Sharks, comparing data, analyzing significance, plotting sightings, and preparing my presentation, I will attempt to survey BISV Seniors on their own perceptions of sharks: “the good, the bad, and the ugly.” This extension will be a fun and relatable addition where I can clarify some misconceptions and start taking the action I’ve researched, to repair what damage has been caused by the narratives we’ve frequently heard. In addition, I will attempt to create a promotional video combatting misinformation about White Sharks which will be the culmination of the negative and positive media I will have studied. Combining what I’ve learnt does and doesn’t work in portrayals of sharks and what I’ve concluded on these sharks and their population trends from interviews and data analysis, I can show the results of over a trimester’s work studying media’s impact on White Sharks.

**Problems**

As with any surveying of populations, we can only estimate total values, so finding reliable datasets will be difficult. Consequently, although utilizing population statistics of White Sharks in a certain region would be ideal, I will most likely have to settle for sightings of these sharks.

Other problems I may run into with my project include incomplete or concerning data. These issues may arise from limited data, seemingly random fluctuations, or even extremely smooth graphs. As a result, I will need to pay close attention to the methods of data acquisition of whatever dataset I use and the baseline trends in random population fluctuations due to normal life cycles.

Fishing markets are interesting to consider for this project as they may or may not be confounding. On one side, some areas and cultures, especially in the East, highly value shark-based products like shark fin soup, complicating the number of White Sharks reported and the link between their populations and media portrayals. On the other side, the hunting of sharks as inspired by institutional authorities through fear or financial incentives are important to consider with their direct and motivated attacks, normalizing the killing and, possibly, selling of sharks. As a result, an in-depth understanding of past and present population trends (pre-1970’s to current day) will be necessary to assess the true impact of media on White Sharks.

Additionally, differentiating correlation from causation will a significant challenge facing this project, especially as I attempt to connect any population changes I’ve noted in a population dataset of White Sharks to local, national, and/or international media of the region I’m observing. As a result, the best way to assess the real impact of publicity on shark populations will be to (while considering shark fishing) compare film reviews and expert interviews to popular media. With professional opinions, I can also consult the statistical significance of White Shark population changes to understand whether my methods of determining connections are accurate.

**Bibliography**

Christiansen, H. M., Lin, V., Tanaka, S., Velikanov, A., Mollet, H. F., Wintner, S. P., Fordham, S., Fisk, A. & Hussey, N.E. (2014). The last frontier: Catch records of white sharks (carcharodon carcharias) in the northwest pacific ocean *PloS one*. vol. 9. E94407. [https://www.researchgate.csnet/publication/261750754\_The\_Last\_Frontier\_Catch\_Records\_of\_White\_Sharks\_Carcharodon\_carcharias\_in\_the\_Northwest\_Pacific\_Ocean](https://www.researchgate.net/publication/261750754_The_Last_Frontier_Catch_Records_of_White_Sharks_Carcharodon_carcharias_in_the_Northwest_Pacific_Ocean).

Curtis, T. H., McCandless, C. T., Carlson, J. K., Skomal, G. B., Kohler, N. E., Natanson, L. J., Burgess, G. H., Hoey, J. J. & Pratt, H. L., Jr. (2014). Seasonal distribution and historic trends in abundance of white sharks, Carcharodon carcharias, in the western North Atlantic Ocean. *PloS one*, *9*(6), e99240. <https://doi.org/10.1371/journal.pone.0099240>.

Casola, W. R., Beall, J. M., Peterson, M. N., Larson, L. R. & Price, C. S. (2022). Influence of social media on fear of sharks, perceptions of intentionality associated with shark bites, and shark management preferences. *Frontiers in Communication*, vol. 7. <https://doi.org/10.3389/fcomm.2022.1033347>. (<https://www.frontiersin.org/articles/10.3389/fcomm.2022.1033347/full>)

Castro, J. I., Woodley, C. M., & Brudek, R. L. (1999). *A Preliminary Evaluation of the Status of Shark Species*. Food and Agriculture Organization of the United Nations.

Davis, E. & Ries, B. (2019, July 28). *Stop sweating the great white shark. here’s the one you should really be worried about*. CNN. <http://www.cnn.com/2019/07/28/us/shark-week-bull-shark-trnd/index.html>.

Feldman, D. (2020, August 11). *Shark Week 2020: How the pandemic added to this year’s programming*. Forbes. <http://www.forbes.com/sites/danafeldman/2020/08/10/shark-week-2020-expert-shares-5-ways-the-pandemic-is-impacting-sharks/?sh=47ae92833513>.

Francis, B. (2012). BEFORE AND AFTER “JAWS”: CHANGING REPRESENTATIONS OF SHARK ATTACKS. *The Great Circle*, *34*(2), 44–64. <http://www.jstor.org/stable/23622226>.

H. Malcolm, B. D. Bruce & J. D. Stevens. (2001, September). A Review of the Biology and Status of White Sharks in Australian Waters. *CSIRO Marine Research, Hobart*. <https://publications.csiro.au/rpr/download?pid=procite:1d0d13e5-7a60-4e65-be78-636e6f2dd22e&dsid=DS1>.

*Juvenile white shark behavior and biology*. CSU Long Beach Shark Lab. (2022, June 17). <http://www.csulb.edu/shark-lab/juvenile-white-shark-behavior-and-biology>.

Kanive, P. E., Rotella, J. J., Chapple, T. K., Anderson, S. D., White, T. D., Block, B. A. & Jorgensen, S. J. (2021, May). Estimates of regional annual abundance and population growth rates of white sharks off central California. *Biological Conservation*, vol. 257, 2021, 109104. ISSN 0006-3207, <https://doi.org/10.1016/j.biocon.2021.109104>. (<https://www.sciencedirect.com/science/article/pii/S0006320721001567>)

Levine, M., Collier, R. S., Ritter, E., Fouda, M. & Canabal, V. (2014). Shark cognition and a human mediated driver of a spate of shark attacks. *Open Journal of Animal Sciences*, 4, 263-269. doi: [10.4236/ojas.2014.45033](http://dx.doi.org/10.4236/ojas.2014.45033).

Lowe, C.G., Blasius, M., Mason, E.J., Mason, T., Lowe, G.G. & O’Sullivan, J. (2012). Historic fishery interactions with white sharks in the southern California bight. *Global Perspectives on the Biology and Life History of the White Shark*, pp. 169-186. <https://www.researchgate.net/publication/285259322_Historic_Fishery_Interactions_with_White_Sharks_in_the_Southern_California_Bight>.

Madigan, D. J., Arnoldi, N. S., Hussey, N. E. & Carlisle, A. B. (2021). An illicit artisanal fishery for north Pacific white sharks indicates frequent occurrence and high mortality in the Gulf of California. *Conservation Letters*. 14:e12796. <https://conbio.onlinelibrary.wiley.com/doi/10.1111/conl.12796>.

Midway, S. R., Wagner, T., & Burgess, G. H. (2019). Trends in global shark attacks. *PloS one*, *14*(2), e0211049. <https://doi.org/10.1371/journal.pone.0211049>.

NBCUniversal News Group. (2014, July 14). *Reality bites: Why sharks aren’t always to blame for attacks*. NBCNews.com. <https://www.nbcnews.com/storyline/sharkwatch/reality-bites-why-sharks-arent-always-blame-attacks-n153826>.

Pallardy, R. (2021, April 14). *Poachers’ catch suggests the Gulf of California is an overlooked home for great white sharks*. Hakai Magazine. <https://hakaimagazine.com/news/poachers-catch-suggests-the-gulf-of-california-is-an-overlooked-home-for-great-white-sharks/>.

Pepin-Neff, C., Wynter, T. (2017, August 29). Shark Bites and Shark Conservation: An Analysis of Human Attitudes Following Shark Bite Incidents in Two Locations in Australia. *Conservation Letters*. <https://doi.org/10.1111/conl.12407>. (<https://conbio.onlinelibrary.wiley.com/doi/full/10.1111/conl.12407>)

Meagher, P. (2024). Australian Shark Incident Database [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.10476905>.

Sabatier, E., & Huveneers, C. (2018). Changes in Media Portrayal of Human-wildlife Conflict During Successive Fatal Shark Bites. *Conservation and Society*, *16*(3), 338–350. <http://www.jstor.org/stable/26500645>.

Ugoretz, J., Hellmers, E.A. & Coates, J.H. (2022). Shark incidents in California 1950-2021; frequency and trends. *Frontiers in Marine Science*, vol. 9. <https://www.frontiersin.org/articles/10.3389/fmars.2022.1020187/full>.

Vannuccini, S. (1999). *Shark Utilization, Marketing and Trade*. Food & Agriculture Organization.

*White shark data — unleashed*. Monterey Bay Aquarium. [www.montereybayaquarium.org/stories/white-shark-data-unleashed](http://www.montereybayaquarium.org/stories/white-shark-data-unleashed).

*White shark information*. California Department of Fish and Wildlife. 19 Oct. 2023, <https://wildlife.ca.gov/Conservation/Marine/White-Shark>.