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Review

Academic Medical Advancements into Shark Finning Conservation Acts in the United States

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Between 2000 and 2023, three federal bills were passed to eliminate shark finning in the United States and close the legal loophole that allowed the sale of fins, making the U.S. a global leader in shark conservation by eliminating its domestic participation in the shark fin trade. The three bills included 1) The Shark Finning Prohibition Act of 2000, 2) Shark Conservation Act of 2010, and 3) The Shark Fin Sales Elimination Act of 2023. Academic Medicine has played a crucial role in neurotoxin research, investigating agents like BMAA, which has been linked to Alzheimer's disease and other neurodegenerative conditions. Research has shown that high levels of methylmercury are absorbed in the fins and muscles of sharks. Finally, there has also been extensive research into eliminating any medical recommendations that shark cartilage can treat cancer patients.

INTRODUCTION

The Shark Finning Prohibition Act of 2000 was signed into law by President Bill Clinton on December 21, 2000. The rule was implemented because shark finning is a serious threat to the shark population. Sharks die in cruel ways, such as suffocation or being eaten alive due to the loss of movement. People sell the shark fins and use them for shark fin soup. The final rule was meant to limit the decline of the shark population by making it illegal for anyone under U.S. jurisdiction to engage in shark finning, possess shark fins from a U.S. fishing vessel without the rest of the shark's body, or bring ashore shark fins without the corresponding carcasses.[1] The implementation process (regulation and enforcement) was a rational top-down prescription from the federal to the five domestic regional fisheries management councils across the United States, including consistency of written regulations and its enforcement.[2]

The summary of regulations "prohibits: 1) any person from engaging in shark finning aboard a U.S. fishing vessel; 2) any person from possessing shark fins on board a U.S. fishing vessel without the corresponding shark carcasses; 3) any person from landing from a U.S. fishing vessel shark fins without the corresponding carcasses".[2] This regulation prohibits people from engaging in shark finning, possessing any shark fins, and throwing away a shark fin without the rest of its carcass on a U.S. fishing vessel. According to the regulations, no one on a fishing vessel is allowed to sell or purchase shark fins.

However, on August 13, 2002, just three months after the *Shark Finning Prohibition Act* was implemented, the Coast Guard searched the King Diamond 2, which was a U.S. flagged, Hong Kong-based vessel off of Guatemala. The Coast Guard found 32.3 tons of shark fins without their carcasses. The National Oceanic and Atmospheric Administration – Office of Law Enforcement (NOAA – OLE) fined the vessel $600,000, which was the largest amount ever. In 2005, Judge Barry Ted Moskowitz agreed with the NOAA OLE ruling. The decision was then upheld in The United States v. Approximately 64,695 Pounds of Shark Fins (2008) by Judge Stephen Reinhardt in the Ninth Circuit Court because the King Diamond 2 was not defined as a fishing vessel, and the purchasing of the shark fins from other vessels was not under the *Shark Finning Prohibition Act*.[3] The regulation implemented by NMFS ended up being the decider in court because the court looked at two specific provisions within the regulation: the possession prohibition and the landing prohibition.[4]

Not even a month after this ruling was decided, Representative Madeleine Bordallo of Guam's at-large district introduced the *Shark Conservation Act* to Congress in order to close this loophole and add more rules to the current law at the time. President Obama who signed the *Shark Conservation Act of 2010* in order to avoid loopholes in the future. To avoid or minimize problems in the future, the *Shark Conservation Act of 2010* specifically "prohibit any person from removing any of the fins of a shark at sea" (Federal Register, 2013, p. 25685).

12 years later, the *Shark Fin Sales Elimination Act* became effective in December 2022. The Shark Fin Sales Elimination Act makes it illegal in the U.S. to possess, transport, or sell shark fins. Specifically, the law prohibits any person from possessing, acquiring, receiving, transporting, offering for sale, selling, or purchasing a shark fin or any product that contains one. The 2023 act built on that foundation by closing the legal loophole that allowed for the sale of fins, making the U.S. a global leader in shark conservation by eliminating its domestic participation in the shark fin trade. The 2022/2023 act was the final step of the long-term goals of ending the U.S. role in the global shark fin trade.[5]

ACADEMIC MEDICAL ADVANCEMENTS INTO SHARK FINNING

The *Shark Fin Sales Elimination Act* lobbying efforts cited the Department of Neurology at the Miller School of Medicine at the University of Miami on the consumption of shark meat posing risk to human health using peer-reviewed research from (Hammerschlag et. al., 2016). Delegate Gregorio Kilili Camacho Sablan from the Northern Mariana Islands, District At Large 111th-118th (2009-2025) reported the following to the New York City Bar Association's Animal Law Committee when lobbying for The Shark Fin Sales Elimination Act in 2019:

> "Shark fin consumption is a threat to human health. Toxins and mercury bioaccumulate in shark fins as a result of the animals' long lives as top predators in the oceanic food web and may pose health risks to consumers of shark products. A neurotoxin linked to Alzheimer's disease and other neurodegenerative diseases and high levels of methylmercury are absorbed in shark fins and muscles. The FDA recommends that children, women of childbearing age who are or may become pregnant, and nursing mothers limit consumption of shark meat because of its high levels of mercury. The consumption of shark cartilage can cause nausea, indigestion, hypotension, hypoglycemia, general weakness and hypercalcemia. A 2017 FDA Import Alert also notes that "[i]nsect, rodent, or other animal filth has long been a problem with dried shark fins of all types and dried fish maws." In addition, the illegal marketing of shark cartilage as medicine may lead consumers to replace FDA-approved medicine with shark cartilage."[6]

The neurotoxin BMAA has been detected in shark fins and cartilage supplements. BMAA is linked to Amyotrophic Lateral Sclerosis/parkinsonism dementia complex (ALS/PDC) and has been found in the brains of ALS patients. The toxin is produced by cyanobacterial blooms, and even living near contaminated water (which affects water, fish, and air) may increase the risk of developing ALS. Consuming shark fins and cartilage supplements presents a potential health risk due to exposure to the neurotoxins BMAA and mercury (Hg).[7,8]

There is also a historical connection between BMAA to the high incidence of ALS/PDC among the Chamorro people of Guam. This historic link is tied to the consumption of cycad seeds, which harbor BMAA-producing cyanobacteria (a type of microorganism).[9] Chronic exposure to BMAA through diet is also linked to neurodegenerative disorders in humans. For example, "Guamanians with diets high in BMAA developed a complex neurodegenerative disease call Lytico-bodig or amyotrophic lateral sclerosis/parkinsonism-dementia complex (ALS/PDC), which consists of motor neuron degeneration and dementia".[7,10-12]

Next, in 2023, Wayne State University Medical School compiled a list of peer-reviews to debunk the medical myths that shark cartilage treats cancer.[13] For example, at the Mayo Clinic Department of Oncology in 2005, A randomized, placebo-controlled, double-blinded clinical trial was conducted in 2005 involved 83 patients with advanced cancers. Participants received either chemotherapy plus a placebo or chemotherapy plus a shark cartilage product. The study found no evidence that the shark cartilage product improved overall survival or the course of the illness. Furthermore, it demonstrated no indication of improved quality of life among patients who received the product.[14] Another study led by the Department of Thoracic/Head & Neck Medical Oncology at The University of Texas M. D. Anderson Cancer Center among other academic medical centers found that clinical trials showed no improvement in survival rates for lung cancer treatment in which "The addition of AE-941 (standardized aqueous shark cartilage extract with antiangiogenic properties that has previously been evaluated in phase I and II clinical trials) to chemoradiotherapy did not improve overall survival in patients with unresectable stage III NSCLC".[15] The National Cancer Institute also provides a patient version for shark cartilage and stated that the FDA has not approved cartilage as a treatment for cancer.[16] Wayne State University Medical School also stated many side effects to ingesting shark cartilage include GI issues, low blood pressure, fatigue, asthma symptoms, and Alzheimer's disease due to neurotoxins as mentioned from prior research.[13]

CONCLUSION

Overall, researchers from Academic Medical Centers such as the University of Miami, Wayne State University, Mayo Clinic, and Texas M.D. Anderson Cancer Center have made strides in the past quarter of a century into shark finning research. As legislatures have closed the gaps into shark finning in the United States, Academic Medicine has maintained crucial research focusing on advancing ALS/PDC research and presenting potential health risk due to exposure to the neurotoxins BMAA and mercury, as well as eliminating medical recommendations suggesting shark cartilage can treat cancer.

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