

You Don't Need Lungs to Suffer: Fish Suffering in the Age of Climate Change with a Call for Regulatory Reform

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Fish are sentient — they feel pain and suffer. Yet, while we see increasing interest in protecting birds and mammals in industries such as farming and research (albeit few laws), no such attention has been paid to the suffering of fish in the fishing industry. Consideration of fish welfare including reducing needless suffering should be a component of fisheries management. This article focuses on fisheries management practices, the effects of anthropogenic climate change on fisheries management practices, and the moral implications of fish sentience on the development and amendment of global fishing practices. Part I examines domestic and international fisheries, including slaughter practices for wild-caught and farmed fish. Part II discusses the impact of climate change on global fisheries management. Part III outlines recent scientific discoveries that reveal that fish have sentient capabilities. Part IV analyzes psychological and economic roadblocks to acknowledging fish harm. Part V discusses strategies to incorporate concerns over fish harm into current practices. Part VI discusses the United States' Public Trust Doctrine, arguing that: (1) it exists at both the state and federal levels; and (2) it requires stricter fisheries management practices that impose humane requirements on commercial fisheries. Part VII concludes that (1) anthropogenic climate change is inflicting an enormous amount of suffering on fish populations, and (2) fisheries management practices must mitigate these harms by incorporating moral considerations.

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I. Introduction

Fish are a vital commodity in global markets and a food source for billions of people. But they also have intrinsic value unrelated to the human food supply that is not contemplated in fisheries management systems. Furthermore, fish are sentient — they feel pain and suffer like birds and mammals. Yet, while there are some laws and increasing interest in protecting birds and mammals in industries such as farming and research,¹ no such attention has been paid to the suffering experienced by fish in the fishing industry.

If we accept the principle that inflicting needless suffering is wrongful (as we do with humans and other mammals), there arises a moral obligation not to do so. Absent a morally relevant difference between aquatic and land animals, that same moral obligation afforded to land animals should apply equally to fish and other aquatic animals. It hardly bears stating that human activity, particularly fishing, has a substantial impact on the lives of aquatic animals. Consequently, consideration of fish welfare — including reducing needless suffering — should be a standard component of fisheries management.

This article focuses on current domestic and international fisheries management practices, the effects of anthropogenic climate change

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1. See *e.g.* *Animal Welfare Act*, 7 USC § 2131 (1966) [*AWA*], (regulating the treatment of animals in research and exhibition); *Humane Slaughter Act*, 7 USC § 1901 (1958) [*HSA*], (regulating the treatment of livestock during slaughter). This legislation, however, has been pitifully inadequate to protect animals from harm and suffering. See Courtney G Lee, “The Animal Welfare Act at Fifty: Problems and Possibilities in Animal Testing Regulation” (2016) 95:1 *Nebraska Law Review* 194 (discussing the inadequacies of the *AWA* in protecting laboratory animals); see also Lauren S Rikleen, “The Animal Welfare Act: Still a Cruelty to Animals” (1978) 7:1 *Boston College Environmental Affairs Law Review* 129 (discussing the United States Department of Agriculture failure to effectively implement and enforce the *AWA*).

on fisheries management practices, and the moral implications of fish sentience on the development and amendment of global fishing practices. Part II of this article examines the role of domestic and international fisheries, including current slaughter practices for wild-caught and farmed fish and the laws governing them. Part III outlines recent scientific discoveries that reveal that fish have sentient capabilities — *i.e.* they are able to feel, perceive, and experience subjectively. Part IV discusses current fishing practices, both domestically and internationally. Part V analyzes the impact of climate change on global fisheries management practices. Part VI analyzes the current psychological and economic roadblocks to acknowledging fish harm in domestic and international fisheries management practices. Part VII discusses strategies to incorporate fish harm mitigation into current practices, including reframing principles of fisheries management systems, encouraging more humane practices, and incorporating moral considerations into international maritime treaties. Part VIII discusses the United States' Public Trust Doctrine, arguing that: (1) it exists at both the state *and* federal levels; and (2) it requires stricter fisheries management practices that contemplate fish harm and impose humane requirements on commercial fisheries. Part IX of the article concludes that (1) anthropogenic climate change is currently inflicting an enormous amount of suffering on fish populations, and (2) fisheries management practices must mitigate these harms by incorporating moral considerations.

II. ROLE OF DOMESTIC & INTERNATIONAL FISHERIES

A fishery is the “occupation, industry, or season for catching fish”.² More broadly, fisheries refer to an area of the ocean where fish are caught.³ Under either definition, fisheries management is an enormous subject. Humans kill a lot of fish. Every year between 0.97 and 2.7 trillion fish are

2. “Understanding Fisheries Management in the United States” (2017), online: *National Ocean and Atmospheric Administration, Fisheries* <www.fisheries.noaa.gov/insight/fisheries-management-united-states> [NOAA].

3. *Ibid.*

caught from the wild and killed globally.⁴ This number does not include farmed fish or those caught for recreational purposes.⁵ The market for human consumption of fish is expanding, and fish products account for approximately 39% of animal products consumed globally.⁶ Moreover, farmed fish account for 70% of all farmed animals worldwide⁷ and the fish farming industry has been expanding at a rate of 8% per year since the 1980s.⁸

A. International Fisheries

Fish migrate through international waters as well as the territorial waters of scores of nations, making it impossible to regulate fisheries without cooperation among nations. Few treaties address fisheries management practices. Among those that do, none integrate management principles that contemplate sentience, suffering, and welfare.

Fisheries management in the European Union is guided by the *Common Fisheries Policy* (“CFP”).⁹ The principal goals of the CFP include: maximizing sustainable yield for all fish stocks, reducing unwanted

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4. *Ibid*, see also Michael P Rowland, “Two-Thirds Of The World’s Seafood Is Over-Fished — Here’s How You Can Help” (24 July 2017), online: *Forbes* <www.forbes.com/sites/michaelpellmanrowland/2017/07/24/seafood-sustainability-facts/#6c8dba604bbf> (“[w]e now have a fifth more of global fish stocks at worrying levels than we did in 2000. The global environmental impact of overfishing is incalculable and the knock-on impact on coastal economies is simply too great for this to be swept under the rug anymore” at 3). This number varies so greatly due to the vast amount of catch dumped back into the ocean, as well as the unreported and illegal fishing that occurs globally.
 5. *Ibid*.
 6. *Ibid* (comparing the statistics as opposed to pigs (26%), chickens (20%), and cows (14%)).
 7. *Ibid*.
 8. Stephanie Yue, “An HSUS Report: The Welfare of Farmed Fish at Slaughter” (2008), online (pdf): *The Humane Society of the United States* <www.humanesociety.org/assets/pdfs/farm/hsus-the-welfare-of-farmed-fish-at-slaughter.pdf>.
 9. European Commission, “Managing Fisheries” (2018), online: *Common Fisheries Policy* <ec.europa.eu/fisheries/cfp/fishing_rules>.

bycatch, reducing wasteful commercial fishing practices, and striving for environmental and economically sustainable practices.¹⁰ In 1993 the United Nations Conference on Straddling Fish Stocks and Migratory Species convened to draft an agreement (“*Agreement*”) “to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks”.¹¹ The *Agreement* aims to protect the biodiversity of migrating fish species and minimize pollution in international waters.¹² Moreover, the *Agreement* integrates the precautionary approach,¹³ incorporating language to protect fish species and habitats against adverse environmental impacts, both known and unknown.¹⁴

Similarly, the International Commission for the Conservation of Atlantic Tunas (“ICCAT”) is an oversight organization of 48 participating countries, including the United States. ICCAT oversees the conservation

10. *Ibid.*

11. United Nations, “Documents of the Conference” (1995), *United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks* online: <www.un.org/depts/los/fish_stocks_conference/fish_stocks_conference.htm>.

12. *Agreement For The Implementation Of The Provisions Of The United Nations Convention On The Law Of The Sea Of 10 December 1982 Relating To The Conservation And Management Of Straddling Fish Stocks And Highly Migratory Fish Stocks*, 4 August 1995, 2167 UNTS 37924 (entered into force 11 December 2001), online: <www.un.org/depts/los/convention_agreements/texts/fish_stocks_agreement/CONF164_37.htm> [*UN Agreement*].

13. David Kriebel, et al, “The Precautionary Principle in Environmental Science” (2001) 109:9 *Environmental Health Perspectives Commentaries* 871 (the precautionary principle “encourages policies that protect human health and the environment in the face of certain risks” at 871). It has four central components, which include: “taking preventive action in the fact of uncertainty; shifting the burden of proof to the proponents of an activity; exploring a wide range of alternatives to possibly harmful actions; and increasing public participation in decision making” at 871.

14. *UN Agreement*, *supra* note 12.

and management of a variety of marine species¹⁵ found in the Atlantic Ocean.¹⁶ In addition to focusing on overfishing, sustainability, and conservation, ICCAT adopts measures to minimize bycatch of marine mammals in commercial fishing practices.¹⁷ Unfortunately, these international efforts to preserve sustainable populations of marine species have failed. Shark populations are declining rapidly, with approximately 100 million disappearing each year.¹⁸ Furthermore, in the past 40 years, global tuna and mackerel populations have declined by 75%.¹⁹ These rapid decreases result primarily from overfishing, bycatch, and the effects of climate change, including ocean acidification.²⁰ Since current fishing practices do not prioritize humane practices, the above-mentioned mortality increase correlates to an increase in fish suffering as well.

In addition to attempts at conservation and management, international fisheries laws and agreements also focus on preventing illegal, unreported, and unregulated fishing (“IUU fishing”).²¹ Often referred to as ‘pirate fishing’, IUU fishing undermines international and domestic efforts to manage fish stocks, implement conservation practices, and achieve long-term sustainability goals.²² The United States has entered

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15. “International Commission for the Conservation of Atlantic Tunas” (2018), online: *National Oceanic and Atmospheric Administration* <www.fisheries.noaa.gov/national/international-affairs/international-commission-conservation-atlantic-tunas>. The ICCAT oversees the following species: tunas, swordfish, marlin, and sharks.
 16. *Ibid.*
 17. *Ibid.*
 18. JoAnn Adkins, “Fishing Leads to Significant Shark Population Declines, Researchers Say” (1 March 2013), online: *Florida International University News* <news.fiu.edu/2013/03/100millionsharks/52935>.
 19. Fiona Harvey, “Tuna and Mackerel Populations Suffer Catastrophic 74% Decline, Research Shows” (16 September 2015), online: *The Guardian* <www.theguardian.com/environment/2015/sep/15/tuna-and-mackerel-populations-suffer-catastrophic-74-decline-research-shows>.
 20. *Ibid*; see Part III, *infra*.
 21. UNFAO, “Illegal, Unreported and Unregulated (IUU) Fishing” (2018), online: *Food and Agriculture Organization of the United Nations* <www.fao.org/iuu-fishing/en/>.
 22. *Ibid.*

into international agreements with Russia²³ and the European Union,²⁴ among others, to attempt to combat IUU fishing. Although it is difficult to measure the total yield of IUU fishing, it is estimated that these illegal practices account for 20–30% of global catch.²⁵ IUU fishing practices clearly contribute to the global depletion of fish stocks and provide a steep obstacle to preventing widespread, global fish suffering.²⁶

Overall, treaties, laws and agreements fail to acknowledge and manage fish suffering. In addition, drastic levels of bycatch, overfishing, and IUU fishing contribute to increased rates of mortality, thereby increasing the harm to marine species.

B. Domestic Fisheries

The United States marine fisheries are the largest in the world, covering 4.4 million square miles of ocean.²⁷ These include commercial,²⁸ recreational,²⁹ and subsistence³⁰ fishing. Commercial fishing is responsible for the majority of fish deaths,³¹ followed by recreational fishing. While

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23. *Agreement between the Government of the United States of America and the Government of the Russian Federation on Cooperation for the Purposes of Preventing, Deterring and Eliminating Illegal, Unreported, and Unregulated Fishing*, (11 September 2015), TIAS 15-1204 (entered into force 4 December 2015), online (pdf): <2009-2017.state.gov/documents/organization/250927.pdf>.
 24. *Joint Statement Between the European Commission and the United States Government on Efforts to Combat Illegal, Unreported, and Unregulated (IUU) Fishing*, (7 September 2011), online (pdf): <ec.europa.eu/archives/commission_2010-2014/damanaki/headlines/press-releases/2011/09/20110907_jointstatement_eu-us_iuu_en.pdf>.
 25. See Rowland, *supra* note 4.
 26. “Illegal Fishing” (2013), online: *World Ocean Review* <worldoceanreview.com/en/wor-2/fisheries/illegal-fishing/>.
 27. See NOAA, *supra* note 2.
 28. *Ibid*, commercial fishing is defined as “catching and marking fish and shellfish for profit”.
 29. *Ibid*, recreational fishing is defined as “fishing for sport or pleasure”.
 30. *Ibid*, subsistence fishing is defined as “fishing for personal, family, and community consumption or sharing”.
 31. See Part II.A, *infra*.

this article focuses primarily on commercial fisheries management and practices, recreational and subsistence fishing significantly increase the stress on global fish populations and contribute to fish suffering.

1. Domestic Fisheries Management

The National Oceanic and Atmospheric Administration (“NOAA”) is the United States government agency responsible for regulating, implementing, and enforcing domestic fisheries management at the federal level.³² NOAA has jurisdiction over fishing occurring between two to three-hundred nautical miles off of the coast, an area known as the US Exclusive Economic Zone (“EEZ”).³³ Individual coastal states manage fisheries from the coastline out to three miles.³⁴ NOAA’s stated objective is:

- (1) sustain, protect, and increase domestic food supply; (2) maintain and enhance recreational and subsistence fishing opportunities; (3) protect ecosystem health and sustainability; and (4) create jobs, support related economic and social benefits, and sustain community resilience”.³⁵

However, failing to account for fish welfare means that the goals of ecosystem health and protection have not been met.

i. Current Statutory Framework

The principal enabling statute guiding NOAA is the *Magnuson-Stevens Fishery Conservation and Management Act* (“MSA”) of 1976.³⁶ The MSA sets national standards for domestic fisheries to prevent overfishing, reduce bycatch, and ensure a sustainable seafood supply.³⁷ It authorizes NOAA to establish and maintain catch limits to reduce overfishing and

32. See NOAA, *supra* note 2.

33. *Ibid.*

34. *Ibid.*

35. *Ibid.*

36. *Magnuson-Stevens Fishery Conservation and Management Act*, 16 USC § 1801 (1976).

37. *Ibid.*, § 1851 (establishing guidelines that aim to prevent overfishing, bycatch, and incorporate social and economic concerns associated with fisheries management).

restore depleted populations.³⁸ Towards that end, NOAA works closely with eight regional fishery management councils to regulate commercial and recreational practices in each geographical area of the United States.³⁹

The *Marine Mammal Protection Act* (“*MMPA*”)⁴⁰ and the *Endangered Species Act* (“*ESA*”)⁴¹ play fragmented roles in fisheries management practices. The *MMPA* was enacted to protect dolphins, whales, porpoises, seals, and sea lions.⁴² It regulates interactions between commercial fishing exploration and protected marine mammal species.⁴³ Furthermore, the *MMPA* requires that seafood exported to the US come from fisheries with measures in place to reduce the bycatch of marine mammals.⁴⁴ The *ESA* protects endangered and threatened species and their habitats from harm, harassment, and interference.⁴⁵ Although the *MMPA* and *ESA* do not directly regulate fisheries management and sustainable commercial fishing practices, the requirements of the two laws impact the regulatory

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38. *Ibid*, § 1853(a)(15) (requiring all fishery management plans to establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability).
 39. See NOAA, *supra* note 2 (the regional councils include: North Pacific, Pacific, Western Pacific, Gulf of Mexico, Caribbean, South Atlantic, Mid-Atlantic, and New-England).
 40. *Marine Mammal Protection Act*, 16 USC § 1361 (1972) [*MMPA*].
 41. *Endangered Species Act*, 16 USC § 1531 (1973) [*ESA*].
 42. *MMPA*, *supra* note 40 (“marine mammals have proven themselves to be resources of great international significance, esthetic and recreational as well as economic, and it is the sense of the Congress that they should be protected and encouraged to develop to the greatest extent feasible commensurate with sound policies of resource management and that the primary objective of their management should be to maintain the health and stability of the marine ecosystem. Whenever consistent with this primary objective, it should be the goal to obtain an optimum sustainable population keeping in mind the carrying capacity of the habitat” § 1361(a)(6)).
 43. See *MMPA*, *supra* note 40, § 1372 (prohibitions regarding interactions with protected marine species).
 44. *Ibid*, § 1372(c)(3).
 45. *ESA*, *supra* note 41, § 1538.

process.

ii. Failure of Current Methods

NOAA and its eight regional councils seek to foster, promote, and enforce sustainable fishing practices. However, these efforts have been unsuccessful. Over 31.4% of fish stocks are either fished to capacity or overfished, a percentage that continues to increase.⁴⁶ Aquatic biodiversity studies reveal that if current trends continue, the seafood supply could be eradicated by 2048.⁴⁷

Not only have current management practices failed to preserve fish stocks, they have also done little to protect fish welfare. Instead, they exacerbate suffering, a reality that has been wholly overlooked not just in the United States, but throughout the world. So, while the United States has attempted — largely unsuccessfully — to incorporate conservation and economic considerations into fisheries management practices, it has done nothing to protect wild-caught fish from inhumane treatment.

III. Why Fish Suffering Matters: Scientific Evidence of Fish Sentience

For hundreds of years, it was assumed that fish could not feel pain or suffer.⁴⁸ Laws, regulations, and morality followed this logic and excluded fish from animal welfare standards.⁴⁹ However, those assumptions were flawed. Fish feel pain and perceive their environment. Thus, any moral or

46. “Oceans Threats” (2018), online: *National Geographic* <www.nationalgeographic.com/environment/habitats/ocean-threats/>.

47. Chris Crowley, “A New Warning Says We Could Run Out of Fish by 2048” (14 December 2016), online: *Huffington Post* <www.huffingtonpost.com/grub-street/a-new-warning-says-we-cou_b_13615338.html>.

48. Brian Key, “Fish Do Not Feel Pain and its Implications For Understanding Phenomenal Consciousness” (2015) 30:2 *Biology & Philosophy* 149.

49. As discussed above, fish have not been included in animal welfare legislation as other land animals have, due to the belief that they cannot feel pain or suffer.

normative standard aimed at protecting animals from needless suffering should similarly protect fish.

A. Fish Feel Pain

Historically, the notion that fish do not suffer was simply based on a lack of scientific research. Indeed, it seems a counterintuitive proposition since fish have central nervous systems, are biologically sophisticated, and in general, pain and suffering serve an important evolutionary function.⁵⁰ All of these factors point to an ability to experience pain and recent studies bear this out. Furthermore, the pain fish experience is more than simple nociception (the unconscious, reflex-driven response when pain receptors send information about an injury).⁵¹ It is rather a subjective, conscious experience. The upshot: fish experience physical pain and suffering. That fact alone seems worthy of moral consideration. However, there is also strong evidence suggesting that fish experience emotional anguish as well.

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50. See Ferris Jabr, "It's Official: Fish Feel Pain" (8 January 2018), online: *Smithsonian* <www.smithsonianmag.com/science-nature/fish-feel-pain-180967764/> (fish have central nervous systems); see also Orsola R Salva, et al, "What Can Fish Brains Tell Us About Visual Perception?" (2014) 8:1 *Frontiers in Neural Circuits* 119 (discussing the complexity of fish anatomy and perception); Ann Gibbons, "Human Evolution: Gain Came With Pain" (16 February 2013), online: *Science* <www.sciencemag.org/news/2013/02/human-evolution-gain-came-pain>.
51. Jabr, *ibid* ("[fish] brain activity during injury is analogous to that in terrestrial vertebrates: sticking a pin into goldfish or rainbow trout, just behind their gills, stimulates nociceptors and a cascade of electrical activity that surges toward brain regions essential for conscious sensory perceptions (such as the cerebellum, tectum, and telencephalon), not just the hindbrain and brainstem, which are responsible for reflexes and impulses").

B. Fish Have Emotions

Fish have emotions. Indeed, certain species of fish serve as animal models for anti-depressant medications.⁵² For example, researchers have conducted studies on zebrafish through the “novel tank test”.⁵³ The test involves dropping the zebrafish into a tank for approximately five minutes.⁵⁴ If the fish sinks to the bottom after five minutes, it is deemed depressed.⁵⁵ If it swims along the top of the tank, it is not.⁵⁶ The longer the fish stays at the bottom, the more depressed it is, and vice versa.⁵⁷ “Depressed people are withdrawn, the same is true for fish”.⁵⁸

The success of the novel tank test revolves around the hypothesis that fish are in a positive state of mind when they are swimming along the top of the tank because they are exploring new environments.⁵⁹ Similar studies have found that depressed fish lose interest in food and toys.⁶⁰ Studies such as these raise their own ethical issues regarding the intentional infliction of suffering. We cite them not to indicate approval of the methodologies but rather to note that even under the current ethically questionable methods for demonstrating animal sentience, fish merit protection.

Since the nervous systems, physicality, and mental capacities of fish render them susceptible to pain and suffering, it triggers a moral obligation to avoid inflicting unnecessary suffering. Consequently, domestic and international fisheries management practices should identify the barriers

52. Heather Murphy, “Fish Depression Is Not A Joke” (16 October 2017), online: *The New York Times* <www.nytimes.com/2017/10/16/science/depressed-fish.html>.

53. *Ibid.*

54. *Ibid.*

55. *Ibid.*

56. *Ibid.*

57. *Ibid.*

58. “Do Fish Suffer From Depression Too? Experts Say Yes” (18 October 2017), online: *CBS New York* <newyork.cbslocal.com/2017/10/18/fish-depression/>.

59. Murphy, *supra* note 52.

60. *Ibid.*

to incorporating the lessening of fish harm into current best practices and develop strategies to overcome them.

C. Moral Considerations

Once we accept that fish are capable of feeling, we must then determine which moral obligations are implicated by that reality. What follows is by no means an exhaustive discussion of the case for moral consideration of animal suffering. Those arguments have been ably made elsewhere and at length.⁶¹ We merely observe that if suffering is morally relevant (and we have yet to see any convincing argument that it is not), then that relevance crosses the species barrier. And, if suffering crosses the species barrier and there is no morally relevant distinction between land and water animals, then the moral relevance of suffering crosses the land barrier as well.

The argument may be summarized as follows: moral consideration is typically afforded to species possessing some level of intelligence, interpersonal communication abilities, and overall consciousness.⁶² Because fish were traditionally assumed to lack these characteristics, they were excluded from the moral considerations afforded to other

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61. See Marian Stamp Dawkins, *Animal Suffering: The Science of Animal Welfare* (London: Chapman & Hall, 1980); Andrew Linzey, *Why Animal Suffering Matters: Philosophy, Theology, and Practical Ethics* (New York: Oxford University Press, 2009); Jonathan Safran Foer, *Eating Animals* (New York: Little, Brown & Co, 2009); Hal Herzog, *Some We Love, Some We Hate, Some We Eat: Why It's So Hard to Think Straight About Animals* (New York: Harper Perennial, 2011); Lee, *supra* note 1; Rikleen, *supra* note 1.
62. See *e.g.* AWA, *supra* note 1 and HSA, *supra* note 1 (the legislation designed, however poorly, to protect warm-blooded mammals) see *e.g.* MMPA, *supra* note 40, or those seen as intelligent. The debate over whether these are or should be the sole criteria is important but not our focus here.

animal species.⁶³ Yet, the recent recognition that fish feel and perceive pain mandates that this exclusion be reevaluated. That reevaluation has significant practical implications.

On a macro level, the global community faces the same questions that arise with all animal exploitation: whether to continue to permit nonhuman suffering in furtherance of commercial, economic, and personal gain. That debate, however, is not imminent. More immediately, the global community and individual nations must decide whether and how to acknowledge the suffering that current practices cause, that climate change exacerbates that suffering, and that mitigation measures exist that can at least lessen the scale and severity of the torment that the fish experience.

IV. Current Fishing Practices

Fishing practices — both domestic and international — fail to incorporate any consideration for pain or suffering. Instead, they prioritize profit and efficiency.

63. As Cassuto and others have argued elsewhere, the rights and protections — both legal and moral — that nonhuman animals have been afforded are inadequate and often serve to camouflage systemic, deliberate torture. See David N Cassuto, “Meat Animals, Humane Standards, and Other Legal Fictions” (2014) 10:2 *Law Culture and the Humanities* 225; David N Cassuto & Cayleigh Eckhardt, “Don’t Be Cruel (Anymore): A Look at the Animal Cruelty Regimes of the United States and Brazil with a Call for a New Animal Welfare Agency” (2016) 43:1 *Boston College Environmental Affairs Law Review* 1. Nevertheless, the very fact that we have laws protecting (some) land animals and we have continuing efforts to strengthen and better enforce those laws indicate that the discussion about our moral duties is vigorous and continuing. The fledgling efforts to extend that discussion into the aquatic are in need of significant expansion, particularly in the legal and regulatory realm. These efforts have been spearheaded by organizations like the Lewis & Clark Law School Animal Law Clinic in Portland, Oregon and the Animal Legal Defense Fund.

A. Domestic Fishing Practices

Domestic fishing practices vary depending on (1) the venue — *i.e.* aquaculture or at sea; and (2) the purpose of the catch — *i.e.* recreational, commercial, etc. Although this article focuses on wild-caught fish in commercial fisheries, the treatment of farmed fish is equally relevant. Aquaculture — *i.e.* the farming of fish and other aquatic animals for food — will likely supplant wild-caught fish as the principal source of food fish by 2021.⁶⁴ Fish suffering will run parallel with this shift, arguably making aquaculture the greatest source of fish suffering by 2021. Therefore, the section that follows provides an overview of the methods and impacts of fish-farming.

1. Farmed Fish

Common practices for killing fish depend on the type of fishery.⁶⁵ *Slaughter* is the primary term used by agricultural and commercial fisherman to describe the killing of fish for human consumption.⁶⁶ With farmed fish, slaughter generally involves a two-step process.⁶⁷ First, the animal is stunned to render it unconscious prior to killing it. This is known as the 'stun-to-kill' time and ideally should be as brief as possible.⁶⁸ Second, various techniques, including: asphyxiation, live chilling, carbon dioxide ("CO₂") stunning, gill cutting, and percussive and electrical stunning are used to cause death.

64. See Rowland, *supra* note 4.

65. Roy PE Yanong, et al, "Fish Slaughter, Killing, and Euthanasia: A Review of Major Published US Guidance Documents and General Considerations of Methods" (2007), online (pdf): *Institute of Food and Agricultural Sciences* <www.esf.edu/animalcare/documents/yanong-fisheuth_fa15000_b.pdf>.

66. *Ibid*, the term *killing* is most commonly used to refer to recreational fisheries, fishing for population control, and educational and research uses.

67. David D Kuhn, et al, "Fish Slaughter" (2017), online (pdf): *Virginia State University* <techworks.lib.vt.edu/bitstream/handle/10919/80713/FST-276.pdf>.

68. *Ibid*.

Asphyxiation — *i.e.* the deprivation of oxygen — can occur in air or over ice.⁶⁹ When asphyxiated in air, the gills of fish slowly collapse, causing a physical stress response and violent response behaviors.⁷⁰ A study conducted on immature gilthead seabream⁷¹ revealed an average of four minutes in air before the fish exhibited spastic, uncontrollable behaviors.⁷²

Asphyxiation on ice — ‘live chilling’ — is also common and involves immersing the fish in a mixture of ice and water.⁷³ Although live-chilling immobilizes and often sedates the fish, it does little to desensitize them.⁷⁴ In fact, the ‘cold-shock’ effect caused by live-chilling can prolong the time of consciousness and increase the duration of suffering.⁷⁵ Extreme changes in body temperature cause intense stress responses and reactive behaviors.⁷⁶ The same study on gilthead seabream revealed a loss of self-initiated behavior only after five minutes of submersion in ice.⁷⁷

CO₂ stunning involves saturating the water with CO₂, thereby creating a highly-acidic environment leading to narcosis.⁷⁸ Similarly to asphyxiation, this technique involves a period of adverse stress reactions, including vigorous shaking and mucus production.⁷⁹ With CO₂ stunning, different species of fish have demonstrated upwards of two to three minutes of stress signals and signs of suffering.⁸⁰ CO₂ stunning can

69. Hans Van De Vis, et al, “Is Humane Slaughter of Fish Possible for Industry?” (2003) 34:3 Aquaculture Research 211.

70. Yue, *supra* note 8.

71. European Commission, “Gilthead Seabream” (2018), online: Fisheries <ec.europa.eu/fisheries/marine_species/farmed_fish_and_shellfish/seabream_en> (gilthead seabream were extensively cultured in coastal lagoons and brackish ponds and are now one of European aquaculture’s main fish species. They are identified by the golden band on their heads).

72. Van De Vis, *supra* note 69 at 214.

73. Yue, *supra* note 8 at 4.

74. *Ibid* at 4.

75. *Ibid.*

76. Van De Vis, *supra* note 69 at 214.

77. *Ibid* at 214.

78. Yue, *supra* note 8 at 5.

79. *Ibid.*

80. *Ibid.*

also be done after live-chilling.⁸¹ However, since live-chilling prolongs consciousness, this process may actually increase the duration of the fish's suffering in the acidic environment.⁸²

Other fish slaughter techniques including bleeding (gill-cutting) without prior stunning,⁸³ and percussive and electrical stunning.⁸⁴ The latter two methods both require physical force to the body of the fish.⁸⁵ The time between impact and death depends on the accuracy of the stun blow.⁸⁶ Percussive stunning (which involves a rapid blow to the head) can render the fish immediately unconscious.⁸⁷ However, efficient quick death requires a degree of accuracy that is difficult to achieve.

Similarly, electrical stunning can also kill the fish immediately but accuracy remains an issue.⁸⁸ Incorrect voltages, frequencies, and durations of electric current can result in the fish regaining consciousness.⁸⁹ Percussive and electrical stunning are the more efficient slaughter methods in terms of reducing the duration of suffering. However, they are not commonly used in commercial aquaculture because they require great precision to work effectively. These are not considered feasible in the context of killing hundreds of thousands, if not millions, of fish.⁹⁰ Commercial practices, while different in style and scope, similarly do not contemplate the pain inflicted on their catch.

2. Wild-Caught Fish

Currently, no humane slaughter requirement exists for fish caught at sea (wild-caught fish). Generally, wild-caught fish are caught in nets by

81. *Ibid* at 5–6.

82. *Ibid* at 6.

83. *Ibid.*

84. *Ibid* at 5–6.

85. Van De Vis, *supra* note 69.

86. *Ibid.*

87. *Ibid.*

88. Yue, *supra* note 8.

89. *Ibid.*

90. *Ibid.*

trawlers and then dumped on board to suffocate.⁹¹ Impaling live bait (smaller fish used to attract larger fish) on hooks is also common. Long-line fishing is another common practice and uses hundreds or thousands of hooks on a single line that may stretch 50–100 kilometres and are used for catching bluefin tuna, swordfish, and marlins.⁹² Fish often remain caught and dragged for hours before the line is hauled in.⁹³

The use of gillnets in commercial fishing poses major moral concerns.⁹⁴ A gillnet is a flat net suspended vertically.⁹⁵ They create an invisible netting wall, either stationary or drifting. The fish swim directly into the nets and become ensnared.⁹⁶ Mesh size varies with species size; gillnets are crafted to ensure that the head of the fish can pass through, but its body cannot.⁹⁷ The fish may remain trapped for many hours before the nets are pulled in, resulting in gill constriction and slow suffocation.⁹⁸ Fisherman often tie individual nets together to create walls of netting that are between 10 and 50 feet high and can stretch as far as several miles.⁹⁹ Because gillnets are not species specific, they often snare fish and

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91. Mark Schrope, “Fishing Trawlers Have Double the Reach” (7 March 2008), online: *Nature* <www.nature.com/news/2008/080307/full/news.2008.658.html>.
 92. UNFAO, “Industrial Tuna Longlining” (2018), online: *Food and Agriculture Organization of the United Nations* <www.fao.org/fishery/fishtech/1010/en>.
 93. *Ibid.*
 94. National Oceanic and Atmospheric Administration, “Bycatch - Fishing Gear: Gillnets” (2018), online: *NOAA Fisheries* <www.fisheries.noaa.gov/national/bycatch/fishing-gear-gillnets>.
 95. *Ibid.*
 96. UNFAO, “Gillnets and Entangling Nets” (13 September 2001), online: *Food and Agriculture Organization of the United Nations* <www.fao.org/fishery/geartype/107/en>.
 97. Elizabeth Brown, “Fishing Gear 101: Gillnets” (6 June 2016), online (blog): *Safina Center* <safinacenter.org/2015/03/fishing-gear-101-gillnets-entanglers/>.
 98. *Ibid.*
 99. *Ibid.*

marine mammals that the fishermen do not seek (bycatch).¹⁰⁰ Bycatch represents over 40% of marine catches worldwide.¹⁰¹ Commercial net fishing is a substantial cause of death among small marine mammals.¹⁰²

In sum, the processes by which wild fish are caught for human consumption pose serious ethical concerns. These concerns are multiplied when coupled with the detrimental effects of climate change.

V. Effects of Climate Change & Ocean Acidification

Climate change significantly affects marine ecosystems and amplifies fish suffering.¹⁰³ Among other impacts, it causes coral bleaching, fish migration, rising sea levels, changes in weather patterns, and ocean acidification.¹⁰⁴ Of particular concern to fish populations are ocean acidification and drastic changes in weather and migration patterns.

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100. Andrew J Read et al, "Fine-scale Behavior of Bottlenose Dolphins Around Gillnets" (2003) 270:1 Proceedings of the Royal Society B: Biological Sciences 90 (discussing the factors leading to the entanglement of dolphins and other species in gillnets).
 101. RWD Davies, et al, "Defining and Estimating Global Marine Fisheries Bycatch" (2009) 33:4 Marine Policy 661.
 102. *Ibid* (discussing the issues in defining 'target' and 'non-target' by-catch).
 103. "Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change" (7 June 2013), online (pdf): *Intergovernmental Panel on Climate Change* <www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_SPM_FINAL.pdf>.
 104. *Ibid* (discussing changing atmosphere, rising sea levels, and increasing levels of CO₂ in the atmosphere); see also Ove Hoegh-Guldberg, et al, "Coral Reefs Under Rapid Climate Change and Ocean Acidification" (2007) 318:5857 Science 1737.

A. Ocean Acidification

Simply put, ocean acidification means the ocean becomes more acidic.¹⁰⁵ This process is caused by increasing levels of CO₂ in the atmosphere.¹⁰⁶ CO₂ combines with saltwater to produce carbonic acid, which increases the acidity of the water.¹⁰⁷ This results in the binding of carbonate ions, reducing their availability in the natural environment. As a result, many marine organisms including shellfish, crabs, lobsters and corals cannot build calcium carbonate shells.¹⁰⁸ Their populations are diminished and — in the case of corals — their habitats and physical frameworks are destroyed.¹⁰⁹

Since the Industrial Revolution, the concentration of CO₂ in the environment has risen exponentially and that surplus has been absorbed by the ocean.¹¹⁰ Over the past 250 years, since the Industrial Revolution, CO₂ levels in the natural environment have increased by over 40%.¹¹¹ That increase has caused a 30% increase in the ocean's acidity — a

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105. Hoegh-Guldberg, *supra* note 104 (discussing the detrimental effects of climate change on the world's coral reefs); see also Nicola Jones, "How Growing Sea Plants Can Help Slow Ocean Acidification" (12 July 2016), online (blog): *Yale Environment 360* <e360.yale.edu/features/kelp_seagrass_slow_ocean_acidification_netarts>.
106. Hoegh-Guldberg, *supra* note 104 ("[d]uring the 20th century, increasing CO₂ has driven an increase in global oceans' average temperature...and has depleted acidity by 0.1 pH unit" at 1737).
107. "Ocean Acidification" (27 April 2017), online: *National Geographic* <www.nationalgeographic.com/environment/oceans/critical-issues-ocean-acidification/>.
108. *Ibid.*
109. Hoegh-Guldberg, *supra* note 104 at 1737–38.
110. Joana Haigh, "A Brief History of the Earth's CO₂" (19 October 2017), online: *BBC News* <www.bbc.com/news/science-environment-41671770>.
111. David Adam, "World Carbon Dioxide Levels Highest for 650,000 years, U.S. Report Says" (13 May 2008), online: *The Guardian* <www.theguardian.com/environment/2008/may/13/carbonemissions.climatechange> (citing study conducted at the Mauna Loa observatory in Hawaii which found that CO₂ levels in the atmosphere have reached 387 parts per million); see also Hoegh-Gulberg, *supra* note 104 at 1737.

decrease of approximately 0.1 pH units.¹¹² If current emissions trends continue, the pH of the ocean could decrease by an additional 0.3–0.5 units.¹¹³

B. Change in Weather Patterns

Some species only thrive in certain habitats.¹¹⁴ As the oceans warm, the places where the various species can find their ideal water temperature shifts. As a result, the habitats of many aquatic species are compromised.¹¹⁵ Unpredictable extreme weather with storms, and heavy-rainfall cause damage to coastal ecosystems, communities, as well as coral reefs.¹¹⁶ Rising sea levels will cover wetlands and other low-lying habitats — where fish reproduce — and destroy mangroves, the nurseries for many commercially important fish species.¹¹⁷ Moreover, coral reefs and sea grass — habitats for many species — can only photosynthesize in shallow

112. Jones, *supra* note 105.

113. Rebecca Albright, “Reviewing the Effects of Ocean Acidification on Sexual Reproduction and Early Life History Stages of Reef-Building Corals” [2011] *Journal of Marine Biology* 36.

114. New South Wales Government, “Aquatic Habitats” (2018), online: *Department of Primary Industries* <www.dpi.nsw.gov.au/fishing/habitat/aquatic-habitats/about-aquatic-habitats> (discussing the differences in water flow, water quality, and water temperature for fish species).

115. Lise Comte & Julian D Olden, “Climatic Vulnerability of the World’s Freshwater and Marine Fishes” (2017) 7:10 *Nature Climate Change* 718.

116. Hoegh-Guldberg, *ibid* at 1742 (discussing loss of coastal barriers and concluding the ‘devastating ramifications’ that climate change will/has caused for coral reefs).

117. *Ibid* (“we can anticipate that decreasing rates of reef accretion, increasing rates of bioerosion, rising sea levels, and intensifying storms may combine to jeopardize a wide range of coastal barriers. People, infrastructure, and lagoon and estuarine ecosystems, including mangroves, seagrass meadows, and salt marshes, will become increasingly vulnerable to growing wave and storm impacts” at 1742).

water and drown in the rising tides.¹¹⁸

Dramatic weather patterns and ocean acidification caused by climate change have degraded the lives and habitats of all marine species, including fish. Yet, amidst all the discussions of the declining health of the world's oceans, there has yet to be any meaningful discussion of mitigation measures to ease the impacts on the well-being of fish.

VI. Current Barriers to Fish Harm Contemplation and Incorporation

A number of barriers exist to incorporating fish pain and suffering into domestic and international fisheries management practices. These include: anthropocentric motivation, overconcern with charismatic megafauna, and attention paid to stock and fish population numbers.

A. Anthropocentric Motivation

Humans often disregard the needs of other species. This anthropocentric orientation underlies a wide range of environmental degradation and harms, including global warming, ozone depletion, and water scarcity.¹¹⁹ Much of this disregard arises from a “[t]ragedy of the [c]ommons”¹²⁰ mentality.

118. See generally A Arias-Ortiz, et al, “A Marine Heatwave Drives Massive Losses From The World’s Largest Seagrass Carbon Stocks” (2017) 8:4 Nature Climate Change 33 (discussing the degradation of seagrass in the face of climate change).

119. ‘Anthropogenic’ is defined as “resulting from the influence of human beings on nature”, *Merriam-Webster Dictionary* (Springfield: Merriam-Webster, 2018) sub verbo “anthropogenic”. It is often used to refer the human degradation to the planet resulting from climate change, pollution, etc.

120. See Garret Hardin, “The Tragedy of the Commons” (1968) 162:3859 Science 1243.

B. Charismatic Megafauna

Charismatic megafauna, also known as flagship species, are large animal species with widespread popular appeal.¹²¹ While conservationists and environmentalists often use these species to appeal to human sympathies, there is much doubt as to this strategy's effectiveness.¹²² Some argue that using charismatic megafauna for research has an 'umbrella effect' and results in the preservation of less-glamorous species.¹²³ However, some studies have concluded that the 'umbrella effect' theory is essentially useless in protecting biodiversity.¹²⁴ Furthermore, since so few aquatic animals fall into the megafauna category, whatever gains such species might reap offer little protection to aquatic ecosystems.

C. Attention to Stock Numbers

Fish stock numbers pose obstacles on both an ecological and moral level. Ecologically, fish stocks are rapidly decreasing due to climate change and

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121. Jeffrey C Skibins, et al, "Charisma and Conservation: Charismatic Megafauna's Influence on Safari and Zoo Tourists' Pro-conservation Behaviors" (2013) 22:4 *Biodiversity and Conservation* 959 (discussing the connection between tourism and flagship species).
 122. See Franck Courchamp, et al, "The Paradoxical Extinction of the Most Charismatic Animals" (2018) 16:4 *Public Library of Science Biology* 1 (discussing threats to the ten most charismatic species: tiger, lion, elephant, giraffe, leopard, panda, cheetah, polar bear, gray wolf, and gorilla).
 123. See James M Dietz, LA Dietz, & Elizabeth Y Nagagata "The Effective Use of Flagship Species for Conservation of Biodiversity: The Example of Lion Tamarins in Brazil" in Peter JS Olney, Georgina M Mace, & Anna TC Feistner, eds, *Creative Conservation: Interactive Management of Wild and Captive Animals* (London: Chapman & Hall, 1994); see also Farid Belbachir, et al, "Monitoring Rarity: The Critically Endangered Saharan Cheetah as a Flagship Species for a Threatened Ecosystem" (2015) 10:1 *Public Library of Science One* 1.
 124. See Robin Meadows, "No Link Between Flagship Species and Other Biodiversity in Belize" (29 July 2008), online: *Conservation Magazine* <www.conservationmagazine.org/2008/07/no-link-between-flagship-species-and-other-biodiversity-in-belize/>.

overfishing, resulting in massive population and habitat destruction.¹²⁵ Commercial fisheries remain heavily focused on the quantity of fish caught, rather than the morality of the methods of capture. As noted earlier, commercial fisheries catch fish by the hundreds and thousands using gillnets and trawlers. These practices do not account for the sentience and mortality of each individual fish. Instead, they group fish in large numbers, focusing on quantity over the quality of the catch. Combatting the systemic indifference to the suffering caused by fishing and climate change will require a global cultural shift.

VII. Strategies to Overcome Moral Inadequacies

The multivalent barriers to acknowledging and managing for fish suffering mean that any solutions must be wide-ranging and multi-layered. First and foremost, those tasked with developing management practices must recognize that moral inadequacies exist. Second, the regulations directing these practices must be reformed to acknowledge and mitigate fish suffering.

A. Recognizing Moral Inadequacies

Wild-caught fisheries do nothing to incorporate fish harm into practices and regulatory schemes. For that to change, the harm and suffering inflicted on fish must move to the fore of the fisheries management discussion. That will involve critically reevaluating current best practices with an eye toward lessening the suffering caused by fishing as well as —

125. See Allister Doyle, “Ocean Fish Number Cut in Half Since 1970” (16 September 2015), online: *Scientific American* <www.scientificamerican.com/article/ocean-fish-numbers-cut-in-half-since-1970/>; Claire Leschin-Hoar, “Fish Stocks Are Struggling to Rebound. Why Climate Change is on the Hook” (14 December 2015), online: *National Public Radio* <www.npr.org/sections/thesalt/2015/12/14/459404745/fish-stocks-are-declining-worldwide-and-climate-change-is-on-the-hook>.

when possible — mitigating the impacts of climate change.¹²⁶

B. Recommended Regulatory Reforms

Essential regulatory reforms include: limiting stun-to-kill time, redesigning gillnets to eliminate suffocation and bycatch, and increasing monitoring and reporting requirements for commercial fisheries.

1. Limit Stun-to-Kill Time

To reduce suffering during the slaughter process, stun-to-kill time must be minimized. Scientific research as well as casual observation reveal that fish exhibit extensive stress signals within seconds of being stunned.¹²⁷ If not stunned properly, fish can suffer for upwards of 14 minutes *after* being removed from water.¹²⁸ We therefore propose that stunning occur immediately, with the goal that fish become insensible to pain less than one second after the application of the stun.¹²⁹ Commercial fisheries should stun the fish upon catch, rather than throwing them on deck to suffocate. Regulations must reflect this change in priorities and must be accompanied by increased enforcement.

Stunning practices must also account for physical differences and reactions among species. For example, electric stunning is the most humane slaughter method for trout and eels¹³⁰ while percussive stunning

126. Although farming practices often fail to adequately protect the welfare of farmed animals, many of the regulations contemplate some element of suffering. See *AWA*, *supra* note 1 (regulating the transportation and treatment of animals in research and exhibition, including size of enclosure, food and water, care during transit, etc.); *HSA*, *supra* note 1 (setting forth acceptable methods for killing and rendering livestock insensible to pain, as well as techniques for slaughter and stunning).

127. See above, Part III.B.

128. Jeff A Lines, et al, “Electric Stunning: A Humane Slaughter Method For Trout” (2003) 28:3-4 *Aquacultural Engineering* 141.

129. See above Part III.B.

130. Lines, *supra* note 128 at 141.

is more effective for other species.¹³¹ Consequently, regulatory reforms must be detailed enough to account for these differences. Such reforms should also incorporate considerations of the effects of climate change on the most heavily fished species. The latter may involve heightened protections for species whose lives and numbers are threatened by shrinking habitat and an increasingly stressful marine environment.

2. Gillnets

As discussed in Part IV.A, gillnets pose the most pressing concern with regard to mitigating fish suffering. Although banning gillnets may not succeed in the short term, their use and design can be reformed to reduce the harmful effects of bycatch and entrapment.¹³² Specifically, the nets should be modified to allow fish to swim into them without getting trapped. On a global scale, gillnets should be redesigned to allow the targeted catch to swim into the nets, while releasing those that would otherwise become bycatch. This change can be accomplished through international agreements that incorporate and standardize net mesh sizes. Commercial fisherman should also be required to check for bycatch on a regular basis, and to release any inadvertently trapped marine species.

3. Increased Enforcement

As with any successful regulation, proper enforcement is key to its success. In the case of commercial fisheries, increased patrol of high traffic areas, as well as increased monitoring at busy ports can ensure that commercial fisherman comply with humane slaughter and fishing practices. This enforcement should include mandatory inspections and reporting requirements for commercial fishing vessels to ensure strict

131. Bjorn Roth, et al, “Percussive Stunning of Atlantic Salmon (*Salmo Salar*) and the Relation Between Force and Stunning” (2007) 36:2 *Aquacultural Engineering* 192.

132. Gillnets could indeed be eliminated if there were international will. But to date, there have been no indications that it is on any international or domestic agenda.

compliance.¹³³ These regulatory requirements should also incorporate heavy fines for noncompliance.

4. Recommended Reform

While current treaty obligations are inadequate to address the safety of the world's fish, the framework for such protections does exist. It is simply a matter of making the requisite modifications. The 1995 *United Nations Agreement* seeks "long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks".¹³⁴ With respect to limiting stun-to-kill time, redesigning gillnets, and enforcing new and existing regulations, the General Principles in Article V of the *UN Agreement* should be modified to include the following language:

In order to conserve and manage straddling fish stocks and highly migratory fish stocks, coastal States and States fishing on the high seas shall, in giving effect to their duty to cooperate in accordance with the Convention:¹³⁵

- (m) take appropriate measures in accordance with this Agreement and best scientific evidence to incorporate fish suffering into fisheries management practices;
- (n) adopt slaughter practices, including stun-to-kill limits, in accordance with humane practices;
- (o) reduce the use of and work towards redesigning gillnets with the purpose of reducing bycatch, fish entrapment, suffocation, and unnecessary death; and
- (p) implement and enforce humane slaughter and fishing practices through effective monitoring, control, and surveillance.

133. Compliance is always an issue with respect to fishing practices. See Jonas Hentati-Sundberg, et al, "Does Fisheries Management Incentivize Non-compliance? Estimated Misreporting in the Swedish Baltic Sea Pelagic Fishery Based on Commercial Fishing Effort" (2014) 71:7 *International Council for the Exploration of the Sea Journal of Marine Science* 1846. However, oversight has improved in recent years and further improvement remains possible.

134. *UN Agreement*, *supra* note 12.

135. This language already exists in the *UN Agreement* but is included for clarity purposes.

Within each Article relating to the above principles, the *UN Agreement* should set forth the specific requirements necessary to achieve the above objectives. As discussed above, stun-to-kill time should be limited to one-second and should be accomplished through accurate percussive or electrical stunning.¹³⁶ Member states should be required to redesign gillnets in a manner that will reduce bycatch and suffocation. Finally, states should develop individual enforcement procedures that ensure strict compliance with all of the suggested reforms. Through this proposed amendment, the UN and its 193 member states have the ability to protect the welfare of fish on a global scale. More specific international agreements, such as ICCAT,¹³⁷ should be similarly amended to contemplate humane practices relating to the specific species they aim to protect.

The US should also reform the *MSA* to incorporate humane practices for wild-caught fish. This reform should also include rigid enforcement by each of NOAA's eight regional councils to ensure that all commercial fisheries within the EEZ comply with humane fishing practices. Specifically, the *MSA* should mirror the US *Humane Slaughter Act*¹³⁸ with respect to setting forth stun-to-kill and slaughter requirements for wild-caught fish species.¹³⁹ As with the *UN Agreement*, the *MSA* should require percussive or electrical stunning with a one-second stun time.

These legislative changes will represent the first steps to providing fish with the same legal protections that exist for land mammals and livestock. Underlying the need for these regulatory and legal reforms is more than just a moral obligation. The responsibility to safeguard the commons also derives from the Public Trust Doctrine ("PTD"),¹⁴⁰ a principle derived from Roman law and enshrined in the jurisprudence and statutes of many countries, including the United States.

136. See Part IV.A.

137. *Ibid.*

138. *HSA*, *supra* note 1.

139. *Ibid.* (setting forth acceptable methods for killing and rendering livestock insensible to pain, as well as techniques for slaughter and stunning).

140. See Peter Birks & Grant McLeod, *Justinian's Institutes* (Ithaca: Cornell University Press, 1987).

VIII. Implications of the Public Trust Doctrine

The PTD has its roots in the Justinian Code, which first articulated the principle that: “[b]y the law of nature, these things are common to mankind: the air, running water, the sea, and consequently, the shores of the sea”.¹⁴¹ Migrating from civil to common law, the PTD became part of the laws of medieval England and spread across the Atlantic to the United States and many other countries.¹⁴² While most environmental statutes rely on the police power, the PTD is founded in property law.¹⁴³ The state is the designated trustee of natural resources held in trust for the public. As with any other trust, the trustee must manage the corpus of the trust for the benefit of the beneficiaries. The beneficiaries of the PTD are present and future generations of citizens.¹⁴⁴ Traditionally, the PTD

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141. Thomas Cooper, *The Institutes of Justinian*, 2d (New York: Halsted & Voorhies, 1841); See also David C Slade, *Putting the Public Trust Doctrine to Work: The Application of the Public Trust Doctrine to the Management of Lands, Waters, and Living Resources of the Coastal States* (Washington, DC: Coastal States Organization, 1990).
 142. Michael C Blumm, “The Public Trust Doctrine and Private Property: The Accommodation Principle” (2010) 27:3 Pace Environmental Law Review 649.
 143. Joseph L Sax, “Liberating the Public Trust Doctrine from Its Historical Shackles” (1980) 14:2 University of California Davis Law Review 185 [Sax, “Liberating PTD”].
 144. See Mary C Wood, “Advancing the Sovereign Trust of Government to Safeguard the Environment for Present and Future Generations (Part I): Ecological Realism and the Need for a Paradigm Shift” (2009) 39:1 Environmental Law 43 (“[a]t the core of the doctrine is the antecedent principle that every sovereign government holds vital natural resources in ‘trust’ for the public — present and future generations of citizen beneficiaries” at 45); Melissa K Scanlan, “Implementing the Public Trust Doctrine: A Lakeside View into the Trustee’s World” (2012) 39:123 Ecology Law Quarterly 1174.

applied to tidal uplands and other coastal areas¹⁴⁵ but in recent centuries it has expanded to include other public goods, including fisheries.¹⁴⁶

In the sections that follow, we examine the United States PTD, arguing first that it applies to fisheries. We then turn to whether the PTD applies solely to the states or whether it also binds the federal government. Though traditionally a state doctrine, there is ample support for the PTD's application at the federal level. If the federal government is obliged to safeguard natural resources for present and future generations, fish (in addition to other wildlife) form one of those resources and merit protection. That does not mean that the United States (or individual states) or other countries must ban fishing in order to comply with the PTD. It does mean, however, that fish are a protected resource whose value is not solely economic and that the state and federal governments are obliged to act in a manner that acknowledges and protects that value.

Last, we briefly survey the PTD in other countries to show that there is a growing awareness that public goods must be protected. Fish are a public good and, in order to protect them, we must safeguard not just

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145. *Illinois Central Railroad v State of Illinois*, 146 US 387 (1892) [*Illinois Central*] (“[i]t is a title held in trust for the people of the state, that they may enjoy the navigation of the waters, carry on commerce over them, and have liberty of fishing therein, freed from the obstruction or interference of private parties” at 452); see also Sax, “Liberating PTD”, *supra* note 143 (“[i]t [the PTD] deals with lands beneath navigable waters, with constraints on alienation by the sovereign and with an affirmative protective duty of government—a fiduciary obligation—in dealing with certain properties held publicly” at 185); Joseph L Sax, “The Public Trust Doctrine in Natural Resources Law: Effective Judicial Intervention” (1969) 68:1 *Michigan Law Review* 471 [Sax, “The Public Trust Doctrine”]; see also Blumm, *supra* note 142 at 657; Richard M Frank, “The Public Trust Doctrine: Assessing Its Recent Past & Charting Its Future” (2012) 45:3 *University of California Davis Law Review* 665.
146. See Joshua B Fortenbery, “The Public Trust Doctrine Adrift in Federal Waters, Fishery Management in the Exclusive Economic Zone off Alaska” (2015) 5:1 *Seattle Journal of Environmental Law* 227; Kevin J Lynch, “Application of the Public Trust Doctrine to Modern Fishery Management Regimes” (2007) 15:2 *New York University Environmental Law Journal* 285.

their habitat (through mitigating the impacts of climate change) but also their well-being by protecting them from unnecessary suffering.

A. The PTD Applies to Fisheries

The original United States PTD cases involved aquatic wildlife. *Arnold v Mundy*¹⁴⁷ and *Martin v Waddell*¹⁴⁸ were both about oysters. However, both cases turned on ownership of submerged lands and thus did not stand for the principle that fish and other aquatic life formed part of the corpus of the trust.¹⁴⁹ In addition, the common law of property in the US with respect to wildlife and other natural resources was founded on the right of capture.

Mortally wounding or killing a wild animal established occupancy and ownership of the animal.¹⁵⁰ This proved problematic as the unfettered right to take wild animals led to widespread species extinctions. This in turn led to the creation of the progressive movement in the US, which sought to protect wildlife from further decimation by looking to English common law. Plaintiffs suing to protect wild animals argued that, as successors to the British sovereign, states owned the wildlife and were

147. *Arnold v Mundy*, 6 NJL 1 (NJ Sup Ct 1821) [*Arnold*].

148. *Martin v Waddell's Lessee*, 41 US 367 (1842).

149. *Ibid*; *Arnold*, *supra* note 147.

150. See *Pierson v Post*, 3 Caines 175 (1805) (“[w]e are the more readily inclined to confine possession or occupancy of beasts *feræ nature*, within the limits prescribed by the learned authors above cited, for the sake of certainty, and preserving peace and order in society. If the first seeing, starting, or pursuing such animals, without having so wounded, circumvented or ensnared them, so as to deprive them of their natural liberty, and subject them to the control of their pursuer, should afford the basis of actions against others for intercepting and killing them, it would prove a fertile source of quarrels and litigation” at 179); see also *Keeble v Hickeringill*, [1707] 103 ER 1127 (QB); *Mullett v Bradley*, 53 NYS 781 (NY Sup Ct 1898).

obligated to protect it.¹⁵¹

In later years, states ‘republicanized’ the idea of sovereign ownership,¹⁵² recognizing it as a legal fiction that enabled the state to act as guardian of public resources.¹⁵³ This recognition brought wildlife management squarely within the realm of the PTD. Individuals could no more take wildlife to the detriment of the public good than they could expropriate public water, coastal lands, or any other part of the trust corpus. In addition, the state’s inalienable responsibility to manage the trust for the public good supersedes private property rights. Private property emerged out of state ownership; since the state never possessed an unfettered right to destroy the public trust, neither does anyone else whose property right descends from state ownership.

As the Supreme Court observed in *Illinois Central Railroad v State of Illinois*, “[t]he State can no more abdicate its trust over property in which the whole people are interested...than it can abdicate its police powers...”.¹⁵⁴ The responsibilities of the state as trustee extend beyond maintaining the economic viability of the trust property (or ‘res’). With respect to wildlife, those responsibilities extend to safeguarding the well-

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151. Michael C Blumm & Mary C Wood, *The Public Trust Doctrine in Environmental and Natural Resources Law*, 2d (Durham: Carolina Academic Press, 2015) [Blumm & Wood, *The Public Trust Doctrine*]. This formulation and much of the ensuing discussion of the PTD and wildlife draws heavily on the outstanding work of Professors Blumm and Wood especially at 217–56.
152. See Dale D Goble, “Three Cases/Four Tales: Commons, Capture, the Public Trust, and Property in Land” (2005) 35:4 *Environmental Law* 807 at 831. See also *Magner v People*, 97 Ill 320 333 (1881); *State v Rodman*, 59 NW 1098 (Minn 1894).
153. See *Toomer v Witsell*, 334 US 385 (1948) (“[t]he ownership language... must be understood as but a fiction expressive in legal shorthand of the importance to its people that a State have power to preserve and regulate an important resource” at 402).
154. *Illinois Central*, *supra* note 145.

being of the animals themselves.¹⁵⁵

We have already established that fish have the same right to moral consideration as any other animal.¹⁵⁶ In addition, the public waters (in which the fish dwell) are one of the oldest and best recognized components of the public trust.¹⁵⁷ It therefore stands to reason that fish, as wildlife and as a resident of the nation's waters, form part of the public trust as well. This concept is also well established in American case law.

In *State Department of Fisheries v Gillette*, for example, the Court of Appeals of the State of Washington declared that:

[T]he state's proprietary interest in animals *ferae naturae* dates at least from the common law of England. Our courts have incorporated this concept in cases upholding the state's authority to regulate fish and game...In addition to recognizing the state's proprietary interest in its fish, our courts have also held

155. See *e.g. Barrett v State*, 116 NE 99, 101 (NY 1917) (in which the New York Court of Appeals observed that “[beaver] are one of the most valuable of the fur-bearing animals of the state...But apart from these considerations, their habits and customs, their curious instincts and intelligence, place them in a class by themselves” at 101).

156. See above, Part II.

157. See Sax, “Liberating PTD”, *supra* note 143 (“[t]he source of modern public trust law is found in a concept that received much attention in Roman and English law — the nature of property rights in rivers, the sea, and the seashore” at 475).

that the state holds it title as trustee for the common good¹⁵⁸.

Under the PTD, the state therefore has an obligation to act to protect them. It remains but to show that the federal government is similarly bound.

B. There is a Federal Public Trust and it Applies to Fish

The existence of a federal public trust obligation has both historical and practical roots. It is also recognized obliquely in federal jurisprudence.

1. Powers Were Ceded to the Federal Government by the States

When the American colonies gained independence from the British Crown, there did not yet exist a unified United States of America. The Articles of Confederation represented a first effort to unify the fledgling states into a nation. However, entrenched resistance to a strong federal authority meant that the document offered little meaningful power to the federal government.¹⁵⁹ The chaos that resulted, both domestically and in

158. *State Department of Fisheries v Gillette*, 621 P2d 764, 767 (Wash App Ct 1980) (internal citations omitted). See also *People v Truckee Lumber*, 48 P 374 (Cal 1897) (“[t]he dominion of the state for the purposes of protecting its sovereign rights in the fish within its waters, and their preservation for the common enjoyment of its citizens, is...not restricted to their protection only when found within what may in strictness be held to be navigable or otherwise public waters” at 375; *California Fish and Game Code*, § 711.7(a) (“[t]he fish and wildlife resources are held in trust for the people of the state by and through the department [of Fish & Game]”); see also *State Fisheries of Bacich v Huse*, 59 P2d 1101 (Wash 1936) (“[b]ut it is equally true, and is uniformly held, that, while the state owns the fish in its waters in its proprietary capacity, it nevertheless holds title thereto as trustee for all the people of the state and for the common good, and therefore regulations made for the use of this common property must bear equally on all persons similarly situated with reference to the subject-matter and purpose to be served by the regulation” at 1104).

159. See Articles of Confederation.

international relations, led to the Constitutional Convention of 1787.¹⁶⁰

In the ensuing debates about the need for and scope of federal authority, the central question was always how much power the States would delegate to the federal government.¹⁶¹ The document that emerged from those negotiations represented a compromise that satisfied neither those who favored a strong federal government nor those wishing to preserve state autonomy.¹⁶² However, all agreed that the States would permit the federal government only those powers specifically enumerated in the *Constitution*.¹⁶³

The 10th Amendment memorialized that understanding, stating that those “powers not delegated to the United States by the *Constitution*, nor prohibited by it to the States, are reserved to the States respectively, or to the people”.¹⁶⁴ It is thus clear that the limited powers of the federal government derive from the States. It remains to be determined whether the powers ceded to the federal government by the States were encumbered by a public trust obligation.

160. See US State Department, “Constitutional Convention and Ratification, 1787–1789” (2018), online: *United States Office of the Historian* <history.state.gov/milestones/1784-1800/convention-and-ratification> (discussing radical movements, demand for a central government, and economic troubles that triggered the Convention).

161. James Madison, “Federalist No. 45. The Alleged Danger From the Powers of the Union to the State Governments” (1788), online: *Project Gutenberg* <www.gutenberg.org/files/1404/1404-h/1404-h.htm#link2H_4_0045> (“[having] shown that no one of the powers transferred to the federal government is unnecessary or improper, the next question to be considered is, whether the whole mass of them will be dangerous to the portion of authority left in the several States. The adversaries to the plan of the convention, instead of considering in the first place what degree of power was absolutely necessary for the purposes of the federal government, have exhausted themselves in a secondary inquiry into the possible consequences of the proposed degree of power to the governments of the particular States”).

162. US Const.

163. US Const art I, § 8.

164. US Const amend X. We return to the concept of powers reserved to the people in our discussion of the Reserved Powers Clause and the Federal Public Trust Doctrine in Part VIII.B.2.

The States won their powers from the British Crown, entitling them to exercise over themselves the sovereignty that the Crown once exercised. However, the British Crown was itself bound by the PTD. It held the natural resources of the colonies in trust for the people — present and future. Therefore, when the colonies won independence, they won what the Crown possessed — a sovereignty constrained by the PTD.

It is a foundational principle of law and of civil society that one can only give (or sell) what one actually possesses.¹⁶⁵ The States' sovereignty was constrained by a public trust obligation. It is only logical that any powers ceded to the federal government by the States would be similarly constrained.

2. The Federal Trust Obligation Is Recognized in Jurisprudence

To date, there has been no explicit recognition of a federal public trust obligation by either the legislature or the courts, and there is a robust debate about whether one exists.¹⁶⁶ Nevertheless, there is much in federal jurisprudence and statutes that seems to implicitly recognize the PTD's existence and necessity. *Illinois Central*,¹⁶⁷ the seminal PTD case, addressed the validity of an 1869 grant by the Illinois Legislature of an extensive amount of valuable and important submerged lands along Lake Michigan to the Illinois Central Railroad. Several years later, the legislature recognized the magnitude of its error and sued to invalidate

165. Brian A Garner & Henry Campbell Black, eds, *Black's Law Dictionary* (St. Paul: Thomson Reuters, 2014) sub verbo “nemo dat quod non habet”.

166. See Sax, “Liberating PTD”, *supra* note 143; Michael C Blumm & Lynn S Schaffer, “The Federal Public Trust Doctrine: Misinterpreting Justice Kennedy and Illinois Central Railroad” (2015) 45:2 *Environmental Law* 399 (arguing that the public trust doctrine is an “inherent limit on all sovereign authority, not just states” at 399); Cathy J Lewis, “The Timid Approach of the Federal Courts to the Public Trust Doctrine” (1998) 19:1 *Public Land & Resources Law Review* 51; Hope M Babcock, “Using the Federal Public Trust Doctrine to Fill Gaps in the Legal Systems Protecting Migrating Wildlife from the Effects of Climate Change” (2017) 95:3 *Nebraska Law Review* 649.

167. *Illinois Central*, *supra* note 145.

the original grant. The US Supreme Court agreed that the grant was invalid because the conveyance of public trust lands in such a manner represented an abdication of the state's police power and its authority over navigation.¹⁶⁸

There are many important threads in the Court's opinion, and the literature about it is vast and important.¹⁶⁹ For present purposes, we merely note that *Illinois Central* invalidated an action of the state legislature on the grounds that the state did not have the authority to divest itself of state-owned submerged lands even though there was no state statute with which the legislature had failed to comply. Indeed, the Court made no attempt to ground its decision in state law. Rather, it invalidated the grant because it determined that the legislature had failed to act in accordance with the Court's own vision of the state's PTD responsibilities. Thus, the Court recognized a federal right to exercise supervisory authority over state compliance with the PTD.

Some scholars argue that the Court was relying on the Reserved Powers Doctrine, which is derived from the 10th Amendment's acknowledgement of inherent limits on state powers.¹⁷⁰ The Amendment declares that powers not granted to the federal government are reserved to the States *and the people*.¹⁷¹ Since certain powers reside with the people, some actions and decisions lie outside the state's authority. For example, a legislature cannot abdicate its responsibilities to its citizens nor can

168. *Ibid* ("such abdication is not consistent with the exercise of that trust which requires the government of the state to preserve such waters for the use of the public" at 453).

169. See Sax, "Liberating PTD", *supra* note 143; see also Sax, "The Public Trust Doctrine", *supra* note 145; Joseph D Kearney & Thomas W Merrill, "The Origins of the American Public Trust Doctrine: What Really Happened in *Illinois Central*" (2004) 71:3 *Chicago Law Review* 799; Blumm & Schaffer, *supra* note 166.

170. See Blumm & Schaffer, *supra* note 166 at 412.

171. US Const, *supra* note 162 ("[t]he powers not delegated to the United States by the *Constitution*, nor prohibited by it to the States, are reserved to the States respectively, or to the people" at amend X).

it bind future legislatures to any such abdication.¹⁷² Federal courts may determine if and when those limits are breached.¹⁷³

The federal government is similarly bound by its responsibility to manage public resources for the people. As Blumm and Schaffer argue, US Courts have acknowledged that the federal government acts as “trustee for the people of the United States”¹⁷⁴ and that “the United States do[es] not and cannot hold property as a monarch may, for private and personal purposes”.¹⁷⁵ As recently argued by the plaintiffs in a potentially groundbreaking case in federal court in Oregon, the federal government’s obligations arise from the Due Process and Equal Protection Clauses of the *Fifth Amendment* of the *Constitution*.¹⁷⁶

3. The *Juliana* Case

In *Juliana v United States*,¹⁷⁷ a group of young people sued the United States, arguing that the government had breached its obligations to safeguard the atmosphere so as to provide a habitable environment for present and future generations. Their claims are founded in the constitutional rights to life, liberty, and property, as well as the government’s public trust obligations located in the due process and equal protection clauses

172. Blumm & Schaffer, *supra* note 166; see also *Illinois Central*, *supra* note 145.

173. See e.g. Karl S Coplan, “Public Trust Limits on Greenhouse Gas Trading Schemes: A Sustainable Middle Ground?” (2010) 35:2 Columbia Journal of Environmental Law 287, (“[s]ince [the] public trust doctrine is a pre-existing limit on the scope of state sovereignty ... the pre-existing rights of the people in trust assets — at a minimum, rights to navigation and fishing — are reserved by the Tenth Amendment” at 311–12).

174. See Blumm & Schaffer, *supra* note 166 at 422 (citing *Canfield v United States*, 167 US 518 at 524 (1897)).

175. *Ibid* (citing *Light v United States*, 220 US 523 at 527 (1911)).

176. *Juliana v United States*, 217 F Supp 3d 1224 (D Or 2016) [*Juliana*]; see also US Const amend V (“[n]o person shall...be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation”).

177. *Ibid*.

of the *Constitution*.¹⁷⁸ In denying the government's motion to dismiss, Judge Aiken agreed with the plaintiffs that there was a fundamental right to a climate and atmosphere capable of sustaining human life and that the government did indeed have a public trust obligation founded in the *Fifth Amendment*.¹⁷⁹ The forthcoming trial will determine if those rights have been violated.

Juliana is still in its preliminary stages, but the case has already demonstrated that arguments for a constitutional basis for a federal public trust doctrine have traction in federal court. The burgeoning scholarship on the issue¹⁸⁰ will only strengthen this position over time. When this is combined with the already strong implicit support for the federal PTD in federal case law, as well as the growing recognition of this sovereign obligation in countries around the world, it appears increasingly likely that the expansion of the scope and authority of the PTD will eventually contain a clearly articulated federal component.¹⁸¹

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178. See *Juliana v United States* (12 August 2015), Oregon, Wash CA 6:15-cv-01517-TC (complaint for declaratory and injunctive relief), online (pdf): <blogs2.law.columbia.edu/climate-change-litigation/wp-content/uploads/sites/16/case-documents/2018/20180509_docket-615-cv-1517_motion-3.pdf>
179. *Ibid* (“[e]xercising my ‘reasoned judgment,’ I have no doubt that the right to a climate system capable of sustaining human life is fundamental to a free and ordered society” at 1250).
180. See Michael C Blumm & Mary C Wood, “‘No Ordinary Lawsuit’: Climate Change, Due Process, and the Public Trust Doctrine” (2017) 67:1 *American University Law Review* 1; see also Don C Smith, “‘No Ordinary Lawsuit’: Will *Juliana v United States* Put the Judiciary at the Centre of US Climate Change Policy?” (2018) 36:3 *Journal of Energy & Natural Resources Law* 259; Melissa Powers, “*Juliana v United States*: The Next Frontier in U.S. Climate Mitigation?” (2018) 27:2 *Review of European Comparative & International Environmental Law* 199.
181. Numerous scholars have noted that the federal obligation to maintain public resources for the people is already clearly spelled out in statutory law, even without explicit mention of the PTD. See *National Park Service Organic Act*, 16 USC §§ 1–4; *Wilderness Act*, 16 USC §§ 1131–1136; *Redwood National Park Act*, 16 USC §§ 79a–79q; Blumm & Wood, *The Public Trust Doctrine*, *supra* note 151; Blumm & Schaffer, *supra* note 166.

4. The Federal PTD Applies to Fish

If a federal PTD exists, then the scope of the obligations it confers must be federal as well. The beneficiaries of the trust include all United States citizens and the federal government has an obligation to safeguard the public trust for the benefit of present and future generations of citizens. As Judge Aiken opined in *Juliana*, the PTD places constitutional limits on sovereignty by mandating that future legislatures not be foreclosed from providing for their citizens or exercising their police powers.¹⁸²

As discussed above, wildlife form an important part of the national trust. Fish are wildlife and thus equally subject to the trust's protections. The federal government controls far more fish habitat than any individual state, giving federal laws and treaties much more influence on fish habitat and well-being. Furthermore, although state actions are important and necessary, it ultimately falls to the federal government to coordinate a national response to climate change. It therefore seems clear that fish well-being falls within the purview of federal trust obligations. In the following section, we note that the PTD is found by other nations either by locating the obligation in natural law, or finding it in their constitutions and jurisprudence. We look at its presence in several countries around the world and in Canada. Unsurprisingly, there is ample overlap. Treaties and other international agreements could easily reflect the shared value of protecting the world's resources.

182. *Juliana*, *supra* note 176 (“[t]he [public trust] doctrine conceives of certain powers and obligations — for example, the police power — as inherent aspects of sovereignty. Permitting the government to permanently give one of these powers to another entity runs afoul of the public trust doctrine because it diminishes the power of future legislatures to promote the general welfare” at 1253).

C. The PTD Internationally

When we consider that the PTD derives from ancient Roman law, it is not surprising that it has made its way into many legal regimes.¹⁸³ It shapes environmental decision-making, protects vulnerable resources and populations, and requires that future generations be considered in the formation of policy. No other environmental doctrine has such overarching and general applicability.

In India, for example, the 1997 Supreme Court decision in *MC Mehta v Kamal Nath*¹⁸⁴ established the PTD as a foundational principle of Indian law. The Court invalidated a lease that would have enabled the defendant to dredge and reshape a riverbed in order to protect its resort. The Court opined that the “laws of nature...must inform all of our social institutions”¹⁸⁵ and that the PTD’s scope was expansive, including navigation, commerce, fishing and environmental protection.¹⁸⁶ In later cases, the Court found further basis for the PTD in the Indian Constitution.¹⁸⁷

The Filipino PTD is similarly broad although its enforcement has

183. This discussion of the PTD internationally once again owes an enormous debt to Professor Blumm, whose scholarship on the PTD is extraordinary in its scope and depth. See Michael C Blumm & Rachel Guthrie, “Internationalizing the Public Trust: Natural Law and Constitutional and Statutory Approaches to Fulfilling the Saxian Vision” (2012) 45:3 University of California Davis Law Review 741.

184. *MC Mehta v Kamal Nath* (1997), [1997] 1 SCC 388 (India) in 1 United Nations Environment Project Compendium of Judicial Decisions in Matters Related to the Environment, National Decisions 259 (1998).

185. *Ibid* at 269.

186. *Ibid*.

187. Blumm & Guthrie, *supra* note 183 at 762 (citing *MI Builders Private Ltd v Radhey Shayam Sahu* [1999] 6 SCC 464 at 466 (India)); see also *Formento Resorts & Hotels v Minguel Martins*, [2009] INSC 100 (India).

not matched the force of its rhetoric.¹⁸⁸ The 1977 Environmental Policy declares that the nation will “fulfill the responsibilities of each generation as trustee and guardian of the environment for succeeding generations”.¹⁸⁹ The *Constitution* also expresses that the state had a duty to “protect and advance the right of the people to a balanced and healthful ecology...”.¹⁹⁰ In *Oposa v Factoran*,¹⁹¹ the Court held that the PTD includes fisheries.¹⁹²

Several African countries (e.g., South Africa, Kenya, & Uganda)¹⁹³ have similarly expansive doctrines and a number of South American countries, including Brazil, Bolivia, and Ecuador recognize a constitutional right to a healthy environment. That latter right includes a state obligation to safeguard the health and well-being of the marine ecosystems.¹⁹⁴

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188. See *The Water Code of the Philippines, A Decree Instituting a Water Code, Thereby Revising and Consolidating Laws Governing the Ownership, Appropriation, Utilization, Exploitation, Development, Conservation and Protection of Water Resources*, Pres Dec No 1067 art 3 (Dec. 31, 1976); see also *Philippine Environmental Policy*, Pres Dec No 1151 § 2 (June 6, 1977); Philippine Const. (1987), art II, § 16, (“[t]he State shall protect and advance the right of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature”).
189. *Philippine Environmental Policy*, Pres Dec No 1151 § 2 (June 6, 1977); Blumm & Guthrie, *supra* note 183 at 771.
190. Philippine Const (1987), art II, § 16
191. *Oposa v Factoran*, [1993] 224 SCRA 792 (Philippines).
192. *Ibid* (“[s]uch a right, as hereinafter expounded, considers the “rhythm and harmony of nature”. Nature means the created world in its entirety. Such rhythm and harmony indispensably include, *inter alia*, the judicious disposition, utilization, management, renewal and conservation of the country’s forest, mineral, land, waters, fisheries, wildlife...” at 792).
193. Blumm & Guthrie, *supra* note 183 at 777–86. See also *The National Environmental Act of 1995* (Uganda) (requiring “prior environmental assessments of proposed projects which may significantly affect the environment or use of natural resources” at § II(i)); *Advocates Coalition for Development & Environment v Attorney General*, Misc Cause No 0100 of 2004 (11 July 2005) (Uganda); Ugandan Const art 27 (directing the state to “promote sustainable development and public awareness of the need to manage land, air, and water resources in a balanced and sustainable manner of the present and future generations”); *Waweru v Republic*, (2006) 1 KLR 677, 677 (HC) (Kenya); Kenyan Const (2010), art 62.
194. See Ecuador Const, art 395.

In Canada, a number of cases recognize the state's stewardship over navigable waters and public access. For example, in *Prince Edward Island v Canada (Minister of Fisheries and Oceans)*,¹⁹⁵ the trial court refused to dismiss a suit against the government for failure to maintain the Atlantic fishery. The court noted that if the government could sue in its capacity as guardian of the public interest, it was only logical that "a beneficiary of the public interest ought to be able to claim against the government for failure to protect [that] interest..."¹⁹⁶ The court's reasoning seems to draw both from the government's public trust obligations as well as its duty to exercise its police power.

The foregoing cursory overview shows that the PTD is well-ensconced in the laws and jurisprudence of countries around the world. And recent decades have witnessed a marked momentum toward broadening and strengthening the breadth and power of the doctrine.¹⁹⁷ Among countries that embrace the PTD, protecting marine resources from harm is nearly universally acknowledged to form part of the state's stewardship obligations. Suffering is undeniably a harm. While it has yet to be raised in legal proceedings as a public trust obligation, it seems clear that protecting marine resources from suffering should be recognized and integrated into any approaches that aim to protect fish and marine ecosystems.

IX. Conclusion

Emerging science demonstrates that fish are sentient — they feel pain and suffer like birds and mammals. Although fish suffering is systemic, fisheries management practices have yet to incorporate or contemplate the idea of mitigating it. The great majority of pain inflicted upon

195. *Prince Edward Island v Canada (Minister of Fisheries and Oceans)*, [2005] 256 Nfld & PEIR 343 (NLCA).

196. *Ibid* at para 37; See also Blumm & Guthrie, *supra* note 183 at 805.

197. See Rebecca LaGrandeur Harms, "Preserving the Common Law Public Trust Doctrine: Maintaining Flexibility in an Era of Increasing Statutes" (2015) 39:1 University of California Davis Law Review 97 at 98 (discussing the increased flexibility of the public trust doctrine in protecting natural resources); see also *Juliana*, *supra* note 176.

fish results from human activity, particularly commercial fishing and anthropogenic climate change. Current fishing practices fail to incorporate humane slaughter practices and lack any regulations to protect fish from unnecessary harm. Moreover, climate change and ocean acidification have warmed the world's oceans, destroyed critical habitat, and decimated species. To be sustainable, fisheries management systems must account for the effects of climate change, ocean acidification, and depletion of fish stocks while also taking steps to reduce suffering.

The PTD further imposes an obligation on the federal government to protect fish. Federal and state governments, as trustees, must act to ensure the well-being of fish; not because they are food but rather because they form part of the natural world whose safety is entrusted to the state. The reforms suggested are both practical and necessary. The alternative to reform is immoral and unsustainable.

