

The Role of Agency, Sentience, and Cognition in the Protection of Aquatic Animals

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Executive Summary

In this project we sought to better understand relationships between scientific and popular views regarding the agency, sentience, and cognition (ASC) of aquatic animals, and policies that protect these animals in the United States. For case studies we chose cetaceans, tunas, and octopuses. For cetaceans, we have well-developed ASC and extinction science, sentinels for both kinds of science, and advocates for the protection of these animals. For tunas we have extinction science and sentinels, but little if any ASC science or sentinels, and advocates to prevent their overexploitation but not for their welfare. With octopuses we have ASC science and sentinels that are beginning to come into view, but little extinction science, and some early advocates for their protection. Cetaceans have cultural significance, and their interests to a great extent now align with broader economic interests. Tunas have localized cultural significance but not as individuals, and remain high value commodities. Octopuses have growing cultural significance, and are also highly valued as commodities.

Comparing these three case studies shows that there is no strong, general relationship between the state of the scientific literature and positive directionality regarding their protection. However, we identified seven key insights about how positive change can occur that suggests that ASC science may generally be necessary but almost never sufficient in leading to greater protection:

1. When science is silent, it speaks volumes;
2. Science matters but so do scientists;
3. No protection without advocacy;
4. Familiarity can breed protection;
5. Protection has multiple, interacting sources;
6. Protection takes many different forms;
7. Legal and regulatory documents often cover their tracks.

1. Introduction

In this project we sought to better understand relationships between scientific and popular views regarding the agency, sentience, and cognition (ASC) of aquatic animals, and policies that protect these animals in the United States. In particular we focused on the influence of scientific literatures in motivating, justifying, and rationalizing changes in protection. For case studies, we chose Cetaceans (i.e. whales, dolphins, and porpoises), Thunnini (i.e., tunas); and Octopoda, (i.e., octopuses). We selected these cases in part because we provisionally assumed that, since roughly the middle of the twentieth century, the trajectory of protection was different with respect to each animal: that protection has increased for whales, not appreciably changed for tunas, and appears to be in the early stages of improvement for octopuses. These three cases would thus provide different perspectives on the relations between protection and scientific literatures.

1.1. The Approach

Our approach involved four elements. First we defined *positive directionality* as greater protection for the animals in question. Indicators of positive directionality include more protective laws and regulations, international treaties, voluntary commitments, protective policies initiated by the private sector, survey data increasingly attributing ASC to these animals, and increasing membership in, and budgets of, groups dedicated to the protection of these animals. In his background paper (Appendix 1), Christopher Ewell, vindicated our initial assumption and provided details regarding legal directionality of protections. The second element of our study was to develop a cultural narrative for each of these three kinds of animals. These narratives about whales, tunas, and octopuses (Appendices 2–4) characterize popular perceptions of these animals on the basis of research funding (both government and philanthropic spending), popular scientific writing, gray literature reports, media landmarks, and activist campaigns. The third stage of our study analyzed the development of the scientific literature regarding ASC as well as population assessments (i.e., *extinction science*) of these animals. Information about the availability of ASC science can be found in the figures that Becca Franks developed for the project (Appendix 5). In

addition to this top down analysis, we also traced the influence of particular papers that, on the basis of expert judgment, we identified as being especially significant. Finally, we overlaid these three kinds of data and drew some conclusions.

The hypothesis with which we began is that there is no strong, general relationship between the state of the scientific literature and positive directionality. In the next section we provide a brief overview of ASC science, and then discuss the difficulties involved in identifying relevant scientific literature regarding these concepts. In Section 2 we summarize the case studies, and in Section 3 we identify seven key takeaways. Finally, we draw some conclusions in Section 4.

1.2. Overview of ASC

There are a variety of reasons for thinking that ASC science is closely associated with legal protection. Begin with this fact: we ascribe ASC qualities to humans and we provide humans with legal protection. While some have argued that we grant humans legal protection solely in virtue of our own individual self-interest or our common biological humanity, most philosophers have argued that we grant this protection in virtue of humans instantiating morally relevant properties, and that these morally relevant properties are encompassed by ASC.

There are many complications here that we will ignore for purposes of this study. First, the arguments of philosophers have generally related to moral standing rather than legal protection. Although closely related, these concepts are not co-extensive. Second, there are different views regarding the relations between the different elements of ASC and moral standing and legal protection. The most common view asserts sentience as both necessary and sufficient, and agency and cognition as less central. Yet there are important reasons for including all three concepts in our study.

Although it has a more ancient lineage, the modern origin of the sentience criterion for moral standing is in the writings of the eighteenth century British philosopher, Jeremy Bentham:

It may one day come to be recognized that the number of the legs, the villosity of the skin, or the termination of the *os sacrum* are reasons equally insufficient for abandoning a sensitive being to the same fate...the question is not, Can they reason? nor, Can they talk? but, Can they suffer?

The sentience criterion was vigorously defended in Peter Singer's 1975 book, *Animal Liberation*, and has subsequently been central to most animal protection thought. The 2008 *Treaty of Lisbon*, which revises the *Maastricht Treaty* and the *Treaty of Rome* (the documents that established the constitutional basis of the European Union), declared that:

...the Union and Member States shall, since animals are sentient beings, pay full regard to the welfare requirements of animals...¹

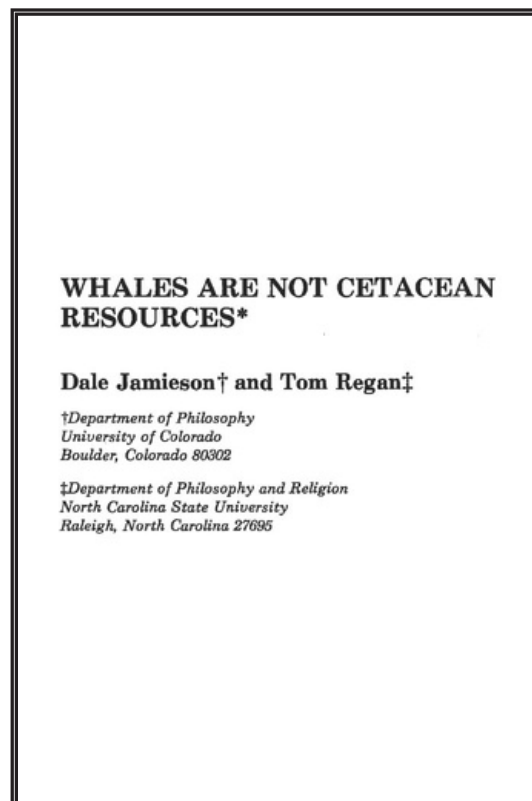
Since then, an increasing number of jurisdictions have adopted legislation that mentions sentience as a ground for protection.

Cognition is important to moral standing and legal protection for the following reasons. First, while they are conceptually distinct, sentience and cognition are typically entwined and it is far from clear that there can actually be sentient creatures who are entirely incapable of cognition. It is difficult to imagine an evolutionary function for sentience without cognition, and therefore difficult to see how sentience without cognition could be sustained by natural selection if it were to occur. Even if we could identify creatures who are sentient but non-cognitive, it is not clear that we should think that their experiences matter morally or require legal protection. It can be asked why someone should be protected from painful experiences that they will never know that they have been subjected to, much less why an organism should be protected from painful experiences if it is incapable of ever knowing that it is in pain or even that it is the kind of creature who is capable of experiencing pain (Carruthers, 1989). A second reason for taking cognition seriously is because many people believe that cognitive ability in itself is morally important. Even many of those who think that animals matter morally believe that humans matter more because of their cognitive superiority (e.g., Singer, 1979). Indeed, as a brute fact, it is obvious that judgments about comparative cognition are important to how people think about the relative moral importance of animals. Whatever the causal direction (if one exists

1. This now appears in Article 13 of the *Consolidated Version of the Treaty on the Functioning of the European Union*, available at <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:12012E/TXT:en:PDF>

at all), it is clear that there is a psychological association between the non-human animals that people think are deserving of moral and legal protection and those animals that they regard as smart (Higgs et al., 2020; Leach et al., 2020).

Agency matters for several reasons as well. First, agency is entwined with cognition and sentience. For many organisms, agency is a means for gathering information and enables them to seek pleasure and avoid pain. Agency can be seen as one solution, produced by natural selection, to the challenges faced by sentient, cognitive creatures. Moreover, for many animals any conception of positive welfare requires some notion of agency. So, too, for many animals, a life without pain is not sufficient for being a good life. This, in fact, is a presupposition of a great deal of research in animal welfare science (e.g., Dawkins, 1977; Fife-Cook & Franks, 2019). Indeed, some have gone further and suggested that at least some animals can live meaningful lives, and for this agency is required (Delon, 2018).



Jamieson & Regan paper presented at "A Global Conference on the Nonconsumptive Utilization of Cetacean Resources," Boston, MA, 6 June 1983.

Finally, whatever one's normative commitments, it is a fact that however closely associated ASC is with legal protection, it is not strictly necessary nor sufficient. In some jurisdictions corals have legal protections, but not on the basis of exhibiting ASC (Davidson, 2002). In many societies, even humans who were recognized as instantiating ASC were denied legal protections. The recognition of universal human rights is neither obvious nor itself universal; it is a great cultural achievement, one still honored more in words than in action. Despite these caveats, it is clear that ASC is central, even if not essential, to moral standing and legal protection.

1.3. ASC in the Scientific Literature

We began our study of ASC in the scientific literature by searching the Web of Science from 1925 to present on the terms, 'agency', 'sentience' and 'cognition', then modifying these terms by 'animal', then modifying them by 'whale', 'tuna', and 'octopus' (see Appendix 5 for details). With the exception of 'cognition', the use of all of these terms is relatively rare against the background of the broader scientific literature. Moreover, when these terms occur, it is often in regions of the literature in which they are used with different meanings than is normally the case in the animal advocacy literature. The most frequent use of the expression 'animal cognition' is in the neuroscience and pharmacology literatures, in research funded by the United States Department of Health and Human Services and the National Institutes of Health. In most of these studies, animals are used in a laboratory setting as models for human cognition rather than themselves being the primary objects of study. The discipline which produces the most papers in which 'animal sentience' occurs is philosophy. While many of these papers are extremely valuable, they are generally theoretical and conceptual rather than empirical. The most frequent funders of this research are the European Commission and the international non-profit organization, World Animal Protection, both of which have deep interests in animal welfare but are hardly major scientific research funding bodies. Most of the uses of 'agency' in the literature refer to regulatory agencies and only rarely have anything to do with animals. Most of the occurrences of 'animal agency' appear in papers produced by scholars in the arts and humanities, environmental science and geography. The only funding body that registered in our search on this term is the Social Sciences and Humanities Research Council of Canada.

When we disaggregate agency, sentience, and cognition the picture comes into sharper focus. In the area of animal cognition, memory and learning are important areas of study and mice and rats appear to be the main animals that are studied. This would not be surprising to scholars working in the behaviorist tradition at any point in the last century. When it comes to animal sentience, pain, welfare, consciousness and morality are central areas of study. This is consistent with the fact that philosophers and others concerned with moral questions are the primary authors of these papers, and suggests that this work is not primarily directed towards providing an empirical foundation for animal protection. And, as

noted above, very little that is relevant to animals at all appears with respect to agency. From a broad, analytic perspective, all of this taken together does not suggest a picture of a growing, widely-shared, scientific foundation for attributing ASC to animals.

However, discerning trends is complicated. First, the number of papers employing ASC terms is increasing exponentially, but that is true of the scientific literature in general, and it is not clear whether there is a signal here. Second, there are interesting temporal patterns in the use of these terms. Both 'sentience' and 'animal cognition' first spike in the late 1970s after the publication of Donald Griffin's 1976 book, *The Question of Animal Awareness*, and Peter Singer's 1975, *Animal Liberation*. 'Animal agency' spikes much later in the 2000s. This may be a response to some broad trends in the social sciences emanating in part from the development of "actor-network" theory, which holds that any source of an action is an agent whether it is human or non-human. The locus classicus of actor-network theory is a 1984 paper by French sociologist, Michel Callon, which only began to be cited in the Anglophone literature in the early 2000s, and has been increasingly cited in each subsequent year. These ideas were more fully developed by Bruno Latour, especially in his 2005 book, *Reassembling the social: an introduction to actor-network-theory*. Related ideas became influential in anthropology through the work of Eduardo Kohn (2013) and others. In recent years, the agency turn has become increasingly influential in animal studies through such fields as multispecies ethnography which is "attentive to the agency of other-than-human species, whether they are plants, animals, fungi, bacteria, or even viruses" (Locke & Muenster, 2018) and is increasingly prominent in fields such as conservation biology, neuroscience, and philosophy (Edelblutte et al., 2022; Jamieson, 2018).

Beyond this, there are some profound difficulties in identifying the scientific literature that is relevant to ASC. First, ASC terms are often used in different ways across research traditions and communities. Second, these terms are often not defined operationally. Sentience, for example, is typically characterized as the capacity for pain and pleasure. 'Pain' is defined, by the International Association for the Study of Pain, as "[a]n unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage."² It is obvious that 'unpleasant' and 'emotional' have

2. <https://www.iasp-pain.org/resources/Cterminology/>

subjective dimensions and cannot be exhaustively characterized in behavioral terms. Third, the terms 'agency', 'sentience', and 'cognition' are quite general and many papers bear on the application of these terms without explicitly using them. Memory and learning, which are relevant to cognition, and pain which is relevant to sentience, are obvious examples that have already been mentioned. Agency can be even more difficult to identify because it is infra-structure relative and involves organisms preferentially responding to, or modifying, their environments. There are papers that do not use the word 'agency' that study preferences and decision-making in neurons, plants, scraperfish, lobsters, and other animals (e.g., Callon, 1984; Kohn, 2013). Fourth, a scientist may use different terms to apply to the same phenomenon over time or in different papers. For example, Iain Couzin, a leading researcher in collective behavior, including fish schooling, uses such terms as 'collective cognition' and 'collective decision-making' in his papers, without clearly distinguishing between them (e.g., Couzin, 2009). Finally, when terms that indicate ASC are used in scientific papers, they may carry different meanings than they do in ordinary language or to advocates and others.³ For example, major figure in the study of mate choice characterizes choice in the following way:

Choice can range from the simplicity of a single-celled protozoan exchanging genes only with another individual emitting a particular signaling molecule, through the protracted mutual courtship of humans and other vertebrates. (Rosenthal, 2017, p. 6)

The migration of an ordinary language term to the scientific literature, and back again, occurs frequently in popular science books, written either by scientists or journalists (e.g., Pollan, 2001). The drift of language through time and contexts may indicate greater comfort with applying ASC terms to animals, but it also may be inadvertent and ambiguous.

2. Case Studies

2.1. Cetaceans

3. For some examples in the human case visit <https://www.quantamagazine.org/mental-phenomena-dont-map-into-the-brain-as-expected-20210824/>

There are more than 90 species of cetaceans and they are the paradigm case of positive directionality in terms of protection. The *Marine Mammal Protection Act of 1972* (and subsequent amendments) as well as further legislation, and the international moratorium on commercial whaling in 1982 by member states of the International Whaling Commission (IWC) (see Ewell, Appendix 1) provide protection for whales and other marine mammals that does not exist for octopuses and tunas. Part of the explanation for this is apparent in the name of the 1972 Act: whales, like humans, are mammals; octopuses and tunas are not. But recognizing whales as mammals is not a matter of seeing an obvious fact. It is an achievement of science, law, and culture.

For most of western history whales have been classified as fish. Aristotle saw that cetaceans are different from fish in that they have hair, lungs (HA 489a34), lack gills, suckle their young, are viviparous (HA 489b4), and their bones are analogous to mammals not fish.⁴ Yet Aristotle still calls whales “fishes” (HA 566b2–5). It was not until 1758 with Linnaeus’s system of classification that whales were classified as mammals. But even then scientific classification was not dispositive for all purposes (for an overview, see Romero, 2012).

On March 31, 1818, the New York State Legislature enacted legislation to protect the public from contaminated oil by requiring that all fish oil sold in New York be gauged, inspected and branded, allowing inspectors to impose a penalty of \$25 per barrel on those who failed to comply. James Maurice, a fish oil inspector, brought suit against Samuel Judd who had purchased three barrels of whale oil that had not been inspected. Judd pleaded that the barrels contained whale oil, not fish oil, and so were not subject to the fish oil legislation. Plaintiff’s attorneys presented evidence that the term “fish oil” was commonly understood to include whale oil, and cited the Bible in support of this usage. Samuel L. Mitchill, Professor of Natural History and Chemistry at Columbia College (later University), testifying for the defendant, stated that “as a man of science, I can say positively, that a whale is no more a fish than a man; nobody pretends to the contrary nowadays except politicians and lawyers.” The jury found on behalf of the plaintiff after 15 minutes of deliberation: “A whale is a fish,” wrote both the *New-York Gazette* and the *Evening Post* (for an account of the case, see Burnett, 2010). The idea that whales are fish persisted into the nineteenth century, even among those who knew the most about whales.⁵

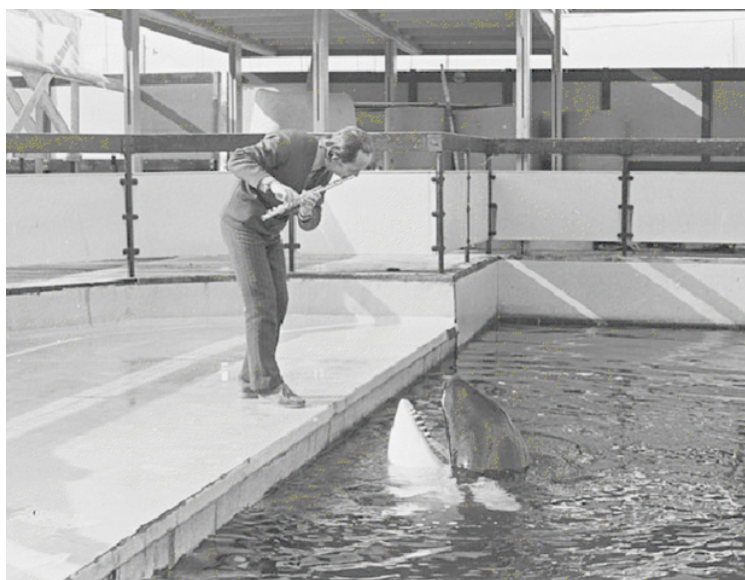
4. The Aristotle citations are to the *History of Animals* and employ standard Bekker numbering.

5. For example Ishmael, the protagonist of Melville’s *Moby Dick*, along with his fellow whalers, believed that whales are fish (see

There was little interest in studying whales for their own sake until the last few decades of the twentieth century. Whaling was a “boom and bust” extractive industry, and once a population or region was overexploited whalers moved on to the next. By the 1920s scientists, who worked closely with the industry, began to be concerned about the conservation of whale stocks. This eventually led to the creation of the International Whaling Commission in 1946, whose purpose was to “to provide for the proper conservation of whale stocks and thus make possible the orderly development of the whaling industry” (International Convention for the Regulation of Whaling, 1946, Introduction). Still, the period of greatest exploitation was the 20 years from 1945 to 1965 (Rocha et al., 2014). But in the 1960s, there was a “shift of view” on the part of “a significant number of politically engaged people in Europe and North America” (Burnett, 2012, p. 530). They began to “view these creatures as possessed of “intelligence.”” Scientist John Lilly was the most important person in this transition, according to historian D. Graham Burnett, for Lilly was “the first significant voice to invoke, and then to endeavor to substantiate empirically the claim that dolphins—and by extension and analogy the large whales—are moral agents” (Burnett, 2012, p. 532).

Here we seem to have a story of science providing a foundation for, and leading directly to, animal protection. In the 1960s a scientist claims and seeks to empirically demonstrate that whales have ASC. In the 1970s the *Marine Mammal Protection Act* inaugurates a period of ever increasing protection. However, things are not so simple.

As Lori Marino notes in her background paper (Appendix 2), Lilly extremely influential both in the development of cetacean science and in the



Paul Spong plays music to an orca at the Vancouver Aquarium, 1974 (photo credit: Rex Weyler).

Melville, 1851, Chapter 32: Cetology). Interestingly John Stuart Mill was a pluralist about classification, writing that “[w]hales are or are not fish, according to the purpose for which we are considering them.” (Mill, 1843, p. 716).

development of popular consciousness about cetaceans. But, as she also notes, Lilly was an extremely controversial character. He was a well-connected, Cal Tech trained physician, who in the 1950s worked at the neurophysiology lab at the National Institutes of Health, stimulating the brains of macaques in order to produce cortical maps correlated with specific behaviors and reactions. During this period the U.S. Navy was supporting cetacean research as part of its submarine warfare research program (Burnett, 2012, p. 537; Oreskes, 2021). Lilly began a series of experiments on dolphins in 1957, and became convinced that they were intelligent, capable of intra-specific communication, and that they even attempted interspecies communication (these were first reported in Lilly, 1958). In 1961, Lilly published a popular book, *Man and Dolphin*, which opens:

Within the next decade or two, the human species will establish communication with another species: nonhuman, alien, possibly extraterrestrial, more probably marine, but definitely highly intelligent, perhaps even intellectual. (Lilly, 1961, p. 7).

Lilly fell deeply into the 60s (e.g., sex, drugs, flotation tanks, esoteric philosophy, and increasingly extravagant claims). Major funding agencies withdrew their support and many researchers regarded him as an obstacle to serious research. Yet his work remained remarkably influential.



The discovery of the songs of the Humpback whales may be the single most important scientific contribution to cetacean science and protection. The finding is most closely associated with Roger Payne,⁶ first author of the first scientific publication on the topic (Payne & McVay, 1971), but was actually quite collaborative. In the 1950s, U.S. Navy engineer Frank Watlington was working in Bermuda at a top secret listening station built to detect Russian submarines. Watlington began hearing unusual, eerie sounds

6. Payne was a protégé of the founder of cognitive ethology, Donald Griffin. In addition to his own books, Griffin's influence was felt in many ways in the emerging study of animal minds. Conversations with Griffin led Thomas Nagel to write his 1974 paper, "What Is It Like to Be a Bat," and Griffin also contributed the foreword to the first comprehensive anthology in cognitive ethology, Marc Bekoff's and Dale Jamieson's two volume set, *Interpretation and Explanation in the Study of Animal Behavior*. For an overview, see Bekoff & Jamieson (1990).

coming from the ocean, and he started recording them. He came to believe that these sounds were being made by the humpback whales that winter off the coast of Bermuda. Fearing that whalers would use the sounds to hunt them, Watlington kept his recordings private. On a brief trip to Bermuda, Roger Payne and his wife and collaborator, Katy, were introduced to Watlington by Henry Clay Frick II.⁷ Watlington shared nearly a decade's worth of tapes with the Paynes. The Paynes realized that sounds were being repeated but they needed help in analyzing the tapes. Roger reached out to Scott McVay. Payne had already become interested in whale conservation, and he probably knew of McVay from a widely read article on whale conservation that McVay had published in *Scientific American* several years before (McVay, 1966). The expertise that McVay brought to the project was in analyzing sound spectrograms—a skill that he had developed working on dolphins under the supervision of John Lilly.⁸ The result was a jointly authored paper that has been cited more than 1,000 times, a best-selling record produced by Payne, and an album by Judy Collins on which she sang with the whales (Payne & McVay, 1971). There are reports that Bob Dylan would sometimes play recordings of the whales' songs at his concerts (Lewis, 2020). While Payne and McVay disagree about their relative contributions to the paper, Payne's media presence and highly visible role as a conservation activist has had the effect of overshadowing the importance of his collaborators and obscuring the influence of John Lilly.⁹

Lilly's influence on McVay was not the only way in which he affected the development of cetacean science and the "save the whales" movement. Paul Spong, who was instrumental in convincing Greenpeace to take up the anti-whaling cause, was a Ph.D. psychologist who was supervised at UCLA by a close friend of Lilly's. According to Burnett, Spong's "early career was wholly shaped by Lilly's work" (Burnett, 2012, p. 639).¹⁰ Lilly's influence is pervasive in *Mind in the Waters: A Book to Celebrate the Consciousness of Whales and Dolphins*, assembled by Joan McIntyre, with contributions from poets Pablo Neruda and W.S. Merwin, as well as scientists Gregory Bateson, Carl Sagan, Paul Spong, and of course John Lilly.¹¹ Lilly's collaborator, the distinguished brain scientist, Peter Morgane, also

7. Frick, the grandson of the steel magnate who founded the Frick Museum, was a trustee of both the Wildlife Conservation Society (WCS) and the Natural History Museum. Payne visited Bermuda in 1967, the same year that he began working for WCS.

8. In fact Lilly and McVey were so close that in 1965 Lilly apparently wrote to McVey, "from falling hand I pass the torch" (Burnett, 2012, p. 636).

9. As we shall see in the next two paragraphs, even some who were most directly influenced by Lilly downplayed his influence.

10. In a 2006 interview with Burnett, Spong explicitly denied that he had been influenced by Lilly, claiming implausibly that "he had never heard of Lilly before the early 1970s" (Burnett, 2012, p. 639).

11. In 2010 McIntyre wrote, "I really don't see that Lilly was that important...the dolphins hated Lilly and drove him out of the pool when

contributed, as did Lee Talbot who was Senior Scientist at the Council of Environmental Quality under Presidents Nixon, Ford and Carter, and Victor Scheffer who chaired the United States Marine Mammal Commission. The transformational effect of this book is indicated by the conclusion of *The New York Times* review:

I urge you to buy this book, both because it is fascinating and transforming to read and because the royalties from its sale will go to Project Jonah, which is battling to save the dolphins and the whales. (Gottlieb, 1974)

Perhaps surprisingly given the growth of knowledge about cetaceans and developments in neuroanatomy and other fields in the 1960s, science played an ambiguous role in the passage of the 1972 *Marine Mammal Protection Act*. The legislative history of the Act notes

the wide support ... of broader and more adequate protection for marine mammals, expressed by representatives of conservation and environmental organizations, humane groups, independent scientists, state agencies and agencies of the Federal Government and others. (House Report No. 92-707, Marine Mammal Protection Act of 1972, 1971, Legislative History, p. 4146)

Yet at the same time, science is invoked as a justification for not authorizing a complete ban on taking marine mammals:

Experienced, independent scientists, not representing hunters, entrepreneurs or other interest groups, argued persuasively that animal populations may indeed require management in order to prevent them from exceeding the carrying capacity of their environment and thus destroying it and themselves in the process. (House Report No. 92-707, Marine Mammal Protection Act of 1972, 1971, p. 4153)

Further, according to the legislative history, since

It is undeniable that the levels of knowledge of scientists on marine mammals are very low... It is not contemplated that the research authority provided to the Secretaries or to the Marine Mammal Commission will replace or supplant existing research authority in other organizations, such as the National Science Foundation, the... U.S. Navy, or others. (House Report No. 92-707, Marine Mammal Protection Act of 1972, 1971, pp. 4153-54)

he appeared – wet suited – with his grant giving buddies from NSF, and he stole Margaret Howe’s notes and published them as [sic] his own research. He is irrelevant to the conversation” (McIntyre, 2010). Despite this later recollection, Lilly’s influence on McIntyre is clear in her 1974 interview with Studs Terkel (Terkel, 1974).

There is a rich scientific background to cetacean protection to which Lori Marino, the author of our cetacean case study (Appendix 2) has made important contributions (e.g., Marino et al., 2004; Marino et al., 2007; Reiss & Marino, 2001; Marino, 2002). Yet the direct impact of the growth of scientific knowledge on the positive directionality of cetacean protection is difficult to assess, since scientific knowledge is often entwined with broader cultural considerations and movements. Marino (Appendix 2) emphasizes the mythical power of whales, and there is little doubt that this has been important in generating a movement for their protection. This is a story that runs from the ancient world to television shows such as *Flipper* and, indeed, is another way in which Lilly's influence has been felt. In addition to its contribution to protection, there is a dark side to the mythification of whales. People's love for dolphins and attribution to them of all sorts of mythical and even supernatural qualities to them is part of they want to swim them, and be up close and personal with them in marine theme parks.

While not all cetaceans have benefited equally from the positive directionality that we have described, the fact that the central issue in cetacean protection in the U.S. concerns captivity rather than killing is evidence of how much progress has been made. There is more work to be done, but there are a variety of tools that are available, from the establishment of informal norms to the forging of international agreements.

2.2. Thunnini

Thunnini stand in stark contrast to cetaceans, when it comes to protection. As far as we have been able to determine, there is no protection focused on individual tunas anywhere in the world. What protection exists is centered on populations with a concern for their commercial viability and their use in human consumption (see Telesca, Appendix 3).

While there are ancient cultural associations with cetaceans (and octopuses), it is difficult to find these with respect to tunas. What we do know is that humans were fishing for tunas 42,000 years ago, long before the rise of agriculture, cities, and the creation of the extant cultural record (O'Connor et al., 2011). Today the seven tuna species are arguably the most commodified and globalized aquatic animals in the world, with sashimi and canned tuna

accounting for 4.6 million metric tonnes in volume, and an end market value conservatively estimated at \$40.8 billion in 2018 (Galland et al., 2016). For comparison, the global shrimp market was estimated at \$18.3 billion in 2020 (Business Wire, 2021).

Canned tuna was introduced in the U.S. in the early twentieth century, becoming the most popular seafood in the American diet by 1950 and remaining so until 2000, when it was superseded by shrimp (Ferdman, 2014). Cans and pouches of tuna, which come from skipjack, yellowfin, or albacore species groups, continue to be the second most popular seafood product in the U.S., constituting one-third of the total seafood consumed (National Fisheries Institute, n.d.).

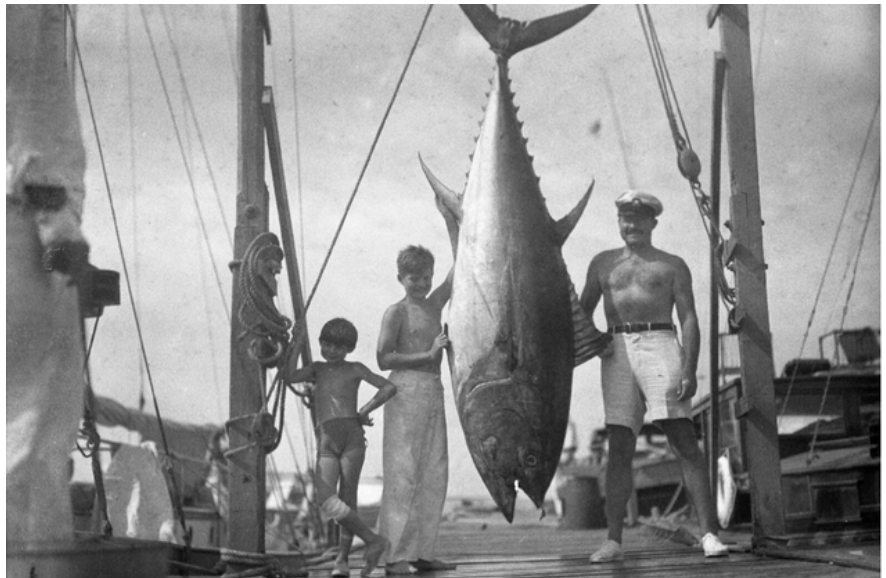
As with whales, the population dynamics and stock assessments of tunas have received a great deal of scientific attention. Because tuna species, like whales, are highly migratory and span international boundaries (and because of their high economic value), the global status (in terms of biomass and fishing mortality rate) of major tuna populations has been frequently assessed. Myers and Worm (2003) used “catch-per-unit-effort” data from industrial fisheries to estimate that the abundance of tunas had declined by 90% from pre-industrial levels. Another study, more precisely focused on age-structured stock assessments, based on more than 15 years of data for 17 tuna populations across all 7 species, reported that populations have declined, on average, by 60% over the past half century. This is inevitably an underestimate, since fishing began long before then (Juan-Jordá et al., 2011).

The life history characteristics of the three bluefin tuna species combined with high market price, make them particularly vulnerable to overexploitation: They are long-lived, large-bodied animals who have specific spawning sites and relatively short spawning periods of one to two months (Collette et al., 2011). Several populations of bluefin have collapsed, including the Southern bluefin and the western Atlantic bluefin (Collette et al., 2011). Telesca (Appendix 3) notes that bluefin tuna are the fish most associated with overfishing, particularly on the high seas, while yellowfin tuna are linked to the issue of bycatch, especially of dolphins, and albacore tuna can elicit consumer fears regarding toxicity. The industry works to assure consumers that the tuna in their can is not from these endangered bluefin varieties, but mainly from skipjack and albacore, which “are considered by scientists and industry experts to be strong and sustainability fished

worldwide” (National Fisheries Institute, n.d.). However, it is difficult to find independent population assessments that would confirm such claims.

Unlike whales, which experienced a de-commodification and most of whom benefited from an international moratorium, the approach to tunas has been to claim that their populations are being managed with extreme precision (Telesca, 2020). However, there is not a centralized international management structure for tunas, as there is with the IWC and whales. Tuna management is broken up into both national and international management bodies, with five dominant tuna Regional Fisheries Management Organizations (tRFMOs), the first of which was the International Commission for the Conservation of Atlantic Tunas (ICCAT) which was created in 1966.

An important difference between tunas and whales is that tunas are eaten, rather than caught for oil, which was the primary (though not exclusive) consumptive use of whales. This may affect how these different kinds of animals are perceived. The most familiar representations of tunas are those in which they are seen as analogues to



farmed terrestrial animals (e.g., *Chicken of the Sea*). In other representations, as Telesca points out (Appendix 3), tunas are dead at the point of capture, near the end of life, hung by the tail on a noose at marinas, or chopped up and seared in marketplaces, restaurants, and home kitchens.

The television reality show, *Wicked Tuna*, depicts tunas as a commodity, devoid of sentience, cognition, and agency. Some documentary films (e.g., *The End of the Line*, *Jiro Dreams of Sushi*, and *Racing Extinction*) use the bluefin as an icon of overfishing on the high seas, and speak about tunas in population terms rather than as individuals. As with octopuses, where the most popular online video relates to consumption, the most popular

YouTube video about tunas (posted in 2017) is titled *Fish Cutting in Sicily: Tuna and Swordfish*.¹² Even when images of tunas break with the usual iconography of seeing them dead (as in the photos accompanying Paul Greenberg's 2010 cover story for the New York Times Sunday Magazine, "Tuna's End: The Fate of the Bluefin, the Oceans, and Us"), they are still represented as a luxury good (Telesca, Appendix 3). What is even more striking is that it is the tuna industry that is at the center of the UN's World Tuna Day, not the animals themselves (United Nations, 2021).

Perhaps the most striking difference between Cetaceans, Octopoda, and Thunnini is that Thunnini are rarely depicted as displaying ASC, and they have been the objects of virtually no ASC science (Appendix 5). A recent bibliometric analysis identified more than 7,000 research papers on tunas, published between 1995 and 2019 (Xie et al., 2023). The papers clustered around 19 topics of which the largest were "overfishing", "bycatch", "climate change", "marine pollution", and "fish management." ASC terms did not figure in any of the 19 clusters. The authors summarized their findings by saying that "these clusters focused on sustainable fisheries."

Given the direction in which research has subsequently moved, it is surprising that a paper published four decades ago (Partridge et al., 1983) claimed to provide "the first evidence suggesting that tuna hunt cooperatively." The authors speak of the fish making "choices," and distinguish cooperative hunting, in which an animal's behavior is contingent on the behavior of others, from collective hunting in which animals hunt in a group. Cooperative hunting is rare in nature, occurring among mammals such as humans, chimpanzees, lions, wild dogs, spotted hyenas, and cetaceans, as well as some bird species such as the Harris's hawk. It is difficult to imagine that the cooperative hunting that the authors attribute to Bluefin tuna could occur without cognition. Indeed, this paper has been cited more than 100 times. It is cited for many different reasons, often in relation to fish schooling or other collective behavior, but it is rarely cited with respect to cooperative hunting or even in relation to specific claims about tunas. The ASC attributes of individual animals that are naturally thought to enable this behavior are rarely discussed, if at all, in this literature.

Tunas, like all commercial fish and aquatic invertebrates, are measured by the tonne, rather than counted as individuals. Even popular books about tunas (unlike those on whales and to

12. <https://www.youtube.com/watch?v=7Ko7jAsrkD8>

some extent octopuses) focus almost exclusively on them as a food source and on the viability of their populations. *Tuna: A Love Story* (Ellis, 2008), which expresses admiration for tunas' generic physical traits ("the pinnacle of piscine evolution," p. 44) has virtually nothing to say about their ASC properties. The primary concern, in this literature, centers on preventing extinction so that humans can continue to consume them. Eating tunas is generally regarded as permissible because they matter only as a population. Eating whales, on the other hand, is seen as impermissible in the United States and many other countries because they matter as individuals.¹³

2.3. Octopoda

In historical accounts octopuses have figured as both food sources and as monsters. A stone carving from Bronze Age Crete depicts a fisherman carrying an octopus. The Gorgon of Greek mythology is sometimes thought to have been inspired by the octopus or squid, with the octopus representing the severed head of Medusa. Victor Hugo's 1866 novel, *Les Travailleurs de la Mer (Toilers of the Sea)*, which features a fight to the death with an octopus, was "the *Jaws* of its time" (Appendix 4).

There are an estimated 300 species of octopus and at least 20 species are captured in the wild using bottom trawls, nets, pots, lines, and traps, mostly from shallow water coastal environments that span about 90 countries (Sauer et al., 2019). Global reported catches of octopus have nearly doubled between 1980 (179,042 t) and today. Since 2008, the reported annual global catch of octopus has hovered around 350,000 tonnes (Food and Agriculture Organization of the United Nations [FAO], 2016), which is likely a conservative estimate as catches are often underreported, particularly in near shore, artisanal fisheries (Jereb et al., 2016). The largest fisheries for octopuses are in North/West Africa (FAO Area 34), which account for nearly one-third of the global octopus catch (>100,000 t annually).

For many octopus fisheries there are no biological data or assessments at all, which is a common problem when it comes to marine invertebrates (Sauer et al., 2019). In addition to important differences in spatial distribution, most octopuses are not long-lived, unlike whales

13. But see Shoemaker (2005).

and bluefin tunas. The life span of shallow-water octopuses from tropical and subtropical areas is frequently estimated as between one and two years. Despite knowing little about octopus population dynamics and stock assessments, there is some evidence that octopus fisheries are in decline relative to peak catches, and many octopus fisheries are considered overfished (Jereb et al., 2016). However, a combination of localized overfishing, combined with growing demand (GLOBEFISH, 2017), as well as the depletion of groundfish populations (the ecological competitors to octopuses; Caddy & Rodhouse, 1998), has meant new octopus fisheries continue to open.

Since octopus fisheries exist entirely within the Exclusive Economic Zones of individual nations (Sauer et al., 2019), there is no international management of octopus fisheries (unlike the case of whales and tunas). In the United States, octopuses are mainly caught in the coastal waters of Alaska, Hawaii, California, and Florida. Each of these states have limited legal regulations covering octopus captures, but these regulations show no signs of positive directionality, and only Alaska formally monitors octopus populations (see Appendix 1).

In addition to the immediate threats posed by capture fisheries, octopuses are used for display in aquarium settings, and increasingly for experiments as laboratory animals (Guarino, 2019). In addition, plans for mass production in aquaculture are underway. In 2019, a group of scholars made the case against the mass production of cultivated octopuses



(Jacquet et al., 2019a), which then received attention from broader media outlets. A follow-up letter to the journal *Animal Sentience* opposing the farming of octopuses attracted more than 100 scholarly co-signatories (Jacquet et al., 2019b). Compassion in World Farming – an animal welfare organization based in the UK – cited their efforts in a new report in October 2021 titled “Octopus Factory Farming: A Recipe for Disaster” with eight reasons against farming octopuses (Lara, 2021).

As Christopher Ewell documented (Appendix 1), not only are there are no international legal

protections for octopuses, but there are no U.S. national protections for their use in captivity, research, and aquaculture. In contrast, over the last decade, the EU, Canada, and the UK have begun to provide some protections for individual octopuses used in scientific testing and entertainment display (e.g., Nosengo, 2011). In November 2021, a government-commissioned review by scholars from the London School of Economics and Political Science concluded there was strong scientific evidence for octopus sentience, as well as all cephalopods and decapods (i.e., crabs, lobsters, shrimps) (Birch et al., 2021). Soon after, there was an amendment to the Animal Welfare (Sentience) Bill (United Kingdom Department for Environment, Food & Rural Affairs et al., 2021), which had excluded invertebrates when it was first introduced in May 2021 (United Kingdom Department for Environment, Food & Rural Affairs and The Right Honorable Lord Goldsmith, 2021). The final bill, which included decapod crustaceans and cephalopod molluscs (e.g., shrimp, crabs, lobsters, and octopuses) was given Royal Assent on April 28, 2022.¹⁴

Most octopus species are very different from whales and tunas. They are not social animals, are not known for culture or family units, and have very short lifespans. Perhaps in part because of the role they play in the popular imagination, they have attracted a great deal of scientific attention, especially in those areas that bear on ASC. In 1891 Jakob Johan von Uexküll, whose concept of an animal's Umwelt was an important influence on cognitive ethology and animal studies generally, inaugurated systematic research on octopuses that has continued to the present. Important discoveries were made, especially in the post-World War II period, and by 1971 the nervous system of *Octopus vulgaris* had been fully mapped (Young, 1971). Subsequently there have been important discoveries regarding observational learning (Fiorito & Scotto, 1992), individual personalities (Mather & Anderson, 1993), play (Mather & Anderson, 1999), and even more complex behaviors (Godfrey-Smith, 2016) including problem-solving (Richter et al., 2016), deception (Anderson et al., 2010), and interspecies hunting (Vail et al., 2013). In 1998 a textbook was published on cephalopod behavior, (with a second edition in 2018), and a systematic edited collection on cephalopod cognition was published in 2014 (Hanlon & Messenger, 2018; Darmaillacq et al., 2014). These are important signs of the consolidation of a scientific field.

As these discoveries came to public attention, in part due to the rise of short videos available online, it was easy to see octopuses as “Houdinis”, capable of amazing acts of

14. <https://bills.parliament.uk/bills/2867>

escape and physical contortion. But the idea that they have ASC was difficult to fully accept. Whatever ASC they may have seemed alien and other-worldly—utterly unlike ours, or anything we could imagine. But the gap has continued to close.

For centuries, Cartesian models have dominated our picture of ourselves: we see the mind (in a metaphor that we owe to the seventeenth century philosopher, Rene Descartes) as the captain, and our bodies as the ship. Even with the rise of computers and what has come to be called “high church” cognitive science, the model has persisted. Our brains are seen as CPUs (still the captain), manipulating the rest of our body (still the ship). This is a special case of how we think of a stand-alone computer: We provide some inputs, it grinds away, and then some output appears (e.g., I strike a key, something happens inside the computer, and a letter appears on the screen).

Whatever an octopus is like, it is not like that. More than two-thirds of its neurons are in its arms, which function semi-autonomously in relation to its brain. Greenberg (Appendix 4) associates the rise of the internet with the increasing acceptance of octopus ASC:

Much like the way each octopus tentacle contributes to a collective sense of perception so too does the internet reflect a matrix of points of view.

Greenberg points out that “the first steps in popularization of the internet track closely in time with the octopus’ migration from strictly academic publications to more speculative ideas around what the octopus mind might be capable of doing.” Indeed, increasingly the distributed cognition model of the internet looks like a more plausible model of our minds than the one postulated by high church cognitive science.¹⁵

Greenberg also points out that technology (the internet, YouTube, GoPro cameras) has also greatly affected the way that we think about the octopus in popular culture. Evidence of octopus ASC is now easier to collect, and hits the internet almost simultaneously with scientific discovery. The 2020 hit documentary (and winner of an Academy Award for best documentary feature), *My Octopus Teacher*, was hugely influential in bringing a human-

15. Andy Clark has been advocating for this since his first book, *Microcognition: Philosophy, Cognitive Science and Parallel Distributed Processing* (1989), and he explains it in this video:

https://www.ted.com/talks/professor_andy_clark_extended_you_jan_2019. Such views have also spilled over into a popular book by Annie Murphy Paul, *The Extended Mind: The Power of Thinking Outside the Brain*.

octopus relationship to a large audience. In July 2021, John Oliver's *Last Week Tonight* spent nine minutes on a segment emphasizing the uniqueness of octopuses, including their use of tools.

However, this is a moment of flux, with respect to octopuses. The octopus YouTube video with the greatest number of hits (232 million views to date) is "Mukbang Twin Roozi Family" in which a pair of tween Korean girls play with and then devour an octopus. The protections that octopuses are beginning to achieve are largely aimed at scientific testing, entertainment display, and legislation related to farming. For instance, in early 2023, the state of Washington introduced precautionary legislation (HB 1153) to prohibit octopus farming. The existing and proposed protections do nothing to address the exploitation of octopuses in the wild by capture fisheries, an activity that continues to increase and is by far the largest current threat to octopuses globally. Despite this, it seems apparent that the directionality with respect to protection is changing.

3. Seven Key Takeaways

3.1. When science is silent, it speaks volumes

In the case of cetaceans we have both well-developed ASC science and extinction science, with tunas we have little ASC science but we have extinction science, and with octopuses we have ASC science but little extinction science. This suggests that for positive directionality it may be important to have both ASC science and extinction science, and that ASC science is more important when it comes to protective policies for individuals than extinction science. However, even if science generally contributes to positive directionality there is little reason to believe that its contribution is causal, and other factors may even be more important in particular cases. Indeed positive directionality in terms of protection can itself drive science, rather than the other way round.

14. <https://bills.parliament.uk/bills/2867>

There are several distinct ways that science may contribute to positive directionality: it may motivate greater protections, justify them, or rationalize them after they have been adopted. In some cases, science seems to provide a vocabulary and framing for the legal/policy discussion. *Obergefell v. Hodges*, which recognized a constitutional right for same sex couples to marry, framed homosexuality as an orientation rather than a preference, citing an amicus brief by the American Psychological Association (which only 22 years earlier renounced their previous view that homosexuality was a mental disorder). The importance of the orientation framing was not that it provided a unique justification for same sex marriage, but rather that the orientation framing, backed by science, cohered with the broader cultural narrative of gay rights advocacy that was gaining increasing traction (Ziegler, 2018). What may be true in the U.S., here and now, is that scientific language and evidence may be a necessary condition for positive directionality with respect to the animals whom we are considering. In our case studies the absence of ASC science was associated with the absence of a movement towards greater protection.

3.2. Science matters but so do scientists

Whales benefitted from both charismatic scientists who seemed to enjoy public interactions, and scientific research that received a lot of national attention. John Lilly wrote directly for popular audiences about his work with cetaceans, including *Man and Dolphin: Adventures of a New Scientific Frontier* (1961), *The Mind of the Dolphin* (1967), and *Lilly on Dolphins: Humans of the Sea* (1975). In 1979, National Geographic magazine included a flexi disk with



John Lilly (far right) and other participants at the 1980 IWC conference on "The Intelligence of Cetaceans and the Ethics of Killing Whales."

Humpback whale songs in one of its issues sent to its more than ten million subscribers. Although Paul Spong did not write popular books or receive a lot of media attention, he was involved in activism and beloved by many activists. Zelko (2013, p. 162) writes that Spong was “the man who inspired Greenpeace’s entry into the antiwhaling movement.”

Scientists may play the role of both sentinels and advocates (Oppenheimer et al., 2019). As sentinels, scientists may provide early warnings to the public and decision-makers about looming problems or the relevance of scientific data to existing practices that need reform. The IWC was an important venue for scientists acting as sentinels, with its scientific committee hosting and participating in discussions regarding cetacean behavior, intelligence and the ethics of killing cetaceans, as well as on the “non-consumptive” uses of cetaceans. For decades Sidney Holt played an important role in this regard as a scientific advisor to the International Whaling Commission. He went beyond being a sentinel to becoming an advocate when he is reported to have said at an IWC sponsored meeting,

If whales possess the intelligence and mental properties that we assume then whales have a culture. By continuing the current whaling practices, we are denying the future possibilities to discover and understand the culture of the whales. I consider it a great evil to destroy something we don’t understand. (Zelko, 2013, p. 297)

While scientists can be enormously effective advocates (e.g., Roger Payne), they may risk diminishing the authority of their science if they come to be seen as just another interest group promoting their own views about issues over which they have no special expertise (e.g., values and policy) (Oppenheimer et al., 2019).

When it comes to tunas, there are scientists who are sentinels with respect to the possibility of extinction (e.g., Barbara Block) but, unlike in the case of whales, they have done little to study, popularize, or promote ASC research. With octopuses, there are prominent researchers who focus on ASC research (e.g., Jennifer Mather), but are not sentinels or advocates. Nor do they pursue mass coverage by national outlets that focus on the ASC of the animals themselves. Peter Godfrey-Smith, an Australian philosopher of science, is doing more to fill this role than anyone else.

3.3. No protection without advocacy

Cetacean advocacy began early and has benefited from the activities of a wide range of organizations and high profile individuals, including Bob Hunter and Paul Watson – both involved in the founding of Greenpeace. This advocacy has led to boycotts of nations, industries, and individual states in response to their roles in causing the deaths of cetaceans. What advocacy there is regarding tunas, concerns protecting tuna stocks for future exploitation. For example, WWF’s “policy and advocacy” page (World Wildlife Fund [WWF], 2022) notes that “We are working with ICCAT [the International Commission for the Conservation of Atlantic Tunas], governments and relevant stakeholders to ensure that [Atlantic] bluefin tuna fisheries are sustainably managed to the benefit of marine ecosystems, fisheries communities and consumers.” There have been tuna boycotts, but they are directed towards protecting dolphins, who are caught as bycatch in [yellowfin] tuna purse seines. There are early glimmerings of octopus advocacy that primarily concern their potential role in research and aquaculture (e.g., Nosengo, 2011; Lyte, 2021).

There are many important questions about what forms of advocacy are most effective. In the U.S. litigation is (among other things) a form of advocacy, and can be effective, but it is



Greenpeace activist Paul Watson on harpooned whale, 1975 (photo credit : Rex Weyler).

expensive, and can have limited or even perverse effects. When litigation fails it can have the effect of justifying, excusing, or normalizing the offending behavior in the eyes of many people. When litigation succeeds it is on behalf of a client, and can create or reinforce prejudicial distinctions between one kind of animal and another.¹⁷ Yet there is little doubt that in some cases litigation on behalf of an individual or a species can contribute to the protection of many individuals and species.¹⁸

3.4. Familiarity can breed protection

Perception of others as alien can create interest and fascination (e.g., space aliens, octopus, whales in *Moby Dick*), but a supposed familiarity is required for empathy (a similar dynamic has been suggested for humans, especially across cultures). Familiarity can help individuate animals and this is often signaled by naming. In the 1983 film, *Local Hero*, the protagonists injure and then rescue a rabbit, who is later served to them for dinner at a local pub. When they discover that they are eating “their” rabbit, one exclaims in outrage, “you don’t eat things with names!”.¹⁹ Whales are highly individuated, tunas not at all, and octopuses perhaps becoming so. This matches the degree of protection given to these animals. Whale individuation occurs in research and natural history accounts, movies (e.g., *Free Willy*), and even in marine park shows. Octopuses are not social animals so they are studied as individuals, and it is easier to think of them as individuals with specific personalities than is the case with some social animals. *My Octopus Teacher* was an enormous step towards individualizing octopus and making them familiar. Yet it should be remembered that individualization and familiarization can be a rhetorical trope employed when animals are used in entertainment. Just as there have been multiple “Shamus” in Seaworld’s Shamu

17. This is a frequent criticism of the Non-human Rights Project and the Great Apes Project which have been seen by some as proposing chimpanzees and other great apes as honorary persons rather than challenging the speciesism that is at the core of human relationships with the rest of the natural world.

18. An example of this is a 1999 case in which the Humane Society of the United States challenged the U.S. Department of Agriculture’s decision to kill several thousand Canada Geese that were creating conflict on golf courses and office parks in Virginia. The ruling in that case not only prevented the killing of those animals, but also brought 800 species of birds under the protection of federal law with respect to federal agency actions for the first time (*Humane Society of the United States v. Glickman* 217 F.3d 882 (D.C. Cir. 2000). Thanks to Jon Lovvorn for this example (and his work on this case).

19. <https://www.youtube.com/watch?v=iBwFcYwsXv4>. There are of course many other examples of the importance of naming to individuation ranging from Jane Goodall’s innovation of naming non-human research subjects to popular books and movies.

show, so too there were several octopuses playing the role of the octopus in *My Octopus Teacher*. Moreover, at a population level, familiarity can breed contempt. The near extinction of Canada Geese was one of the factors that gave rise to the 1916 migratory bird treaty between the U.S. and Canada. Now some people regard them as pests.

3.5. Protection has multiple, interacting sources

People come to protecting particular animals through different routes. Some want to protect cetaceans because they are like us; others because they see them as better than us. Some want to protect them for their human qualities; others for their more than human qualities (e.g., telepathy). A sure grasp of the science is not the only route to protection, nor even perhaps the steadiest one.

The case for protection is built from materials that are valued at the time the arguments are being made. The discovery of culture in whales can seem important to people who value cultural diversity among humans. Seeing octopus ASC as related to the most advanced forms of artificial intelligence can make them seem worthy of admiration. The ASC behavior in tunas has been little studied and seldom commented on, and even their most striking behaviors (schooling and cooperative hunting) can make them seem uniform and robotic, not traits we ordinarily admire.

Sometimes particular species are gateways for protecting other species. Orcas and Humpbacks have been gateway species for protecting other cetaceans who do not exhibit the same ASC characteristics. Manatees, for example, have relatively strong protections due to the *Marine Mammal Protection Act* (MMPA), despite having exhibiting very different behavior than these “star” whale species and having a relatively small brains relative to their body size. While valuing one species can lead to seeing other animals in a way that leads to their protection, it can also lead to valuing the “special” animal at the expense of others (Beck, 1982). In the case of octopuses it is not yet clear whether gaining substantial protection for them would be a gateway for protecting other cephalopods (e.g., cuttlefish).

3.6. Protection takes many different forms

As Ewell shows (Appendix 1), many different forms of protection can be brought to bear including international agreements, statutes, and administrative regulations promulgated by various agencies, to voluntary restraints on behavior. It may be useful to think of the protection of particular kinds of animals as a regime, or even regime complex, rather than as a matter of single laws or policies. This is clearest in the case of whales.

Internationally, whales are protected by the IWC and CITES. Domestically they are protected under the *Endangered Species Act*, the *Marine Mammal Protection Act*, and other statutes. Several different agencies regulate in ways that can protect them. SeaWorld's violations of OSHA regulations was a big part of the Blackfish story, which has greatly weakened the captive marine mammal industry in the U.S. (Appendix 2).

Rather than pushing for a particular law or policy to protect tunas or octopuses, it may be useful to take a "building blocks" approach, and think about how particular laws or policies fit into existing systems of protection. Some forms of protection may apply to relatively few individuals (e.g., lab octopuses may have some protection while wild octopuses have none), but have the potential be extended to new contexts. For example, it might be possible to extend the precautionary prohibition on whales in captivity in South Carolina, or proposed prohibitions on octopus farming in Washington to provide greater protections to more individuals.

There may be other sources of protection that have not been exploited. Texas Senate Bill 8 (an extreme anti-abortion bill) has opened up new ways of thinking about how to use private action to enforce policies that a state may enact but cannot or will not enforce. Unlike traditional private enforcement, SB 8 does not require a private party to have been injured by the allegedly wrongful conduct in order to bring a case. SB 8 allows any Texan to sue for any violation of the law regardless of whether they had any connection with anyone involved in the allegedly wrongful act. Such approaches may make bad law but they may be effective in changing behavior in a way that can be used to protect animals.

3.7. Legal and regulatory documents often cover their tracks

Legal texts often do not refer to ASC research, even though we know from other sources that such influences were important in motivating protection. We have already seen this in the cetacean case study (2.1) with respect to the *Marine Mammal Protection Act*. Another example is that the verbatim and official record of the 34th IWC meeting in 1982, where the whaling moratorium was decided, does not make any reference to whale intelligence or sentience. The record does state that the IWC Technical Committee discussed the “humaneness of whaling” but the only specific language on humaneness adopted in a formal resolution at the 34th Annual Meeting is in the



ban on cold grenade harpoons because they are “cruel and attract adverse criticism of the whaling industry” (International Whaling Commission [IWC], 1983). Zelko (2013) has noted the importance of a special meeting of the IWC Scientific Committee at the Smithsonian Institution in 1980 on Cetacean Behavior and Intelligence, and the Ethics of Killing Whales that preceded the official moratorium. Dale Jamieson and Tom Regan both participated in that meeting, arguing (along with others including Paul Spong) that it was wrong to kill whales. The change in stance of the IWC from being pro-whaling to anti-whaling is an important and interesting moment in the history of animal protection. The science of agency, sentience, and cognition, as well as ethical reflection, seemed to have played an important role in the decision to impose a moratorium on whaling, though this would not be obvious from simply reading the documentary record.

4. Conclusion

The hypothesis with which we began is that there is no strong, general relationship between the state of the scientific literature and positive directionality. This was confirmed by our study. In addition to this negative result, our investigation produced some insights about how positive change can occur, and may suggest that ASC science is generally necessary but insufficient in influencing protections.

As summarized in Table 1, in the case of cetaceans we have well-developed ASC science and extinction science, sentinels for both kinds of science, advocates, cultural significance, and economic alignment. For tunas we have little to no ASC science but we have extinction science, sentinels for the extinction science, advocates to prevent the overexploitation of tuna, but no cultural significance, and tunas remain high value commodities. With octopuses, we have ASC science but little extinction science, a few not highly visible sentinels for ASC science, some early advocates (mostly based in Europe or the UK), growing cultural significance, but also highly valued as commodities. These points are summarized in Table 1.

Table 1: Some variables in the protection of aquatic animals

	WHALES	TUNAS	OCTOPUSES
ASC science	YES	ABSENT	YES
Extinction science	YES	YES	ABSENT
Sentinels	YES	YES (for extinction only)	YES (for ASC only)
Advocates	YES	YES (for extinction only)	YES (early stage)
Cultural resonance/significance	YES	ABSENT	YES (early stage)
Economic alignment	POSITIVE	NEGATIVE	NEGATIVE

It is difficult to draw invariable positive conclusions, in part because the factors that we have investigated and summarize in this chart interact with each other. But here is a closing thought that goes beyond what we can claim to have discovered in this project.

Our quest for behavior-changing narratives is often guided by a desire to find a better, more compelling narrative than what prevails. It can be as if the audience for the narrative is like an Anglo-American judge, applying a standard of evidence before she will accept a new narrative that might then lead her to a particular judgment, perhaps revising one that she already has made. When advocacy involves litigation or other formal procedures, this might be the right approach. But most people's views and behavior with respect to animals involve no single, coherent narrative that is anchored by *stare decisis* and backed by rules of evidence. Skepticism and disruption might be more effective in leading to behavior change than the marketing of a carefully crafted narrative. At the 1983 "Whales Alive" conference on the "nonconsumptive utilization of cetacean resources," Paul Spong made the case against whale watching by calmly playing into the microphone a recording of a boat engine, blasting its ear-splitting sounds into the hall. This may well have been the most persuasive performance of the conference. Even when we are in the market for a new narrative, we are not usually guided by "the preponderance of evidence" or any other formal standard of proof. The French legal notion of "intime conviction" (deep conviction) may be more to the point (Engel, 2008). Sometimes we neither want nor need to be compelled by evidence. What we want is "un bouquet de fleurs" (a bouquet of flowers) rather than a coercive story. If there is anything to these thoughts, it should lead us to focus more on what it is like to be the audience for someone else's story, rather than the authors of our own.

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