



For millenia, humans have considered ourselves unique among all life forms on earth, closer to gods than beasts. Recall Genesis 1:26: "And God said, Let us make man in our image, after our likeness: and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth."

An air of superiority has long informed man's views of other creatures. It is right, humans told themselves, that we have dominion over the animals because our creator imbued us with gifts—intelligence, language, and others—that are uniquely ours.

Of course, we now know that we are not so different from other living things. We no longer place ourselves at the top of the tree of life, closer to the sun and our gods than other creatures. No longer do we place ourselves above, but among the countless others with which we share the Earth, in a spiraling circle of evolutionary divergence. Genetically, most of us are less than a tenth of a percent different from one another. It's only about 1% of our DNA that separates us from chimpanzees and bonobos, and only a bit more that separates us from the other Great Apes.



For a species that has long held itself apart from and wiser than all other life on Earth, our genetic similarity is a humbling revelation. We can't even lay sole claim to the other behaviors and attributes we used to think of as uniquely human. In recent years, we have learned that many animals are fantastically sophisticated in their use of tools, communication, and interior lives.

We aren't the only creatures smart enough to fashion and use tools. Crows and other corvids use sticks to fish for insects, and many other animals use tools to gather food or for other purposes.

We aren't the only creatures possessed of a language. Honeybee's dance to tell each other where to find the best nectar much more accurately than most of us could provide directions to the closet grocery store. Prairie dogs have a complex language that allows them to not only sound an alarm when a threat approaches, but to warn them of the type of predator and its speed or to describe potential threats they've never seen before. The vocalizations of prairie dogs don't translate to "Hey, look out!", so much as "Hey, look out, there's a predator coming this way–looks like a hawk, but bigger–and it's going to be right over our heads in about 20 seconds."

We aren't the only creatures capable of emotion. For many people of my generation, our first exposure to the interior lives of animals came after school when we tuned in to Reading Rainbow to hear Levar Burton tell us the story of Koko the gorilla and her kitten "All Ball". Koko had been taught to communicate via American Sign Language, which she used to ask for a kitten for her birthday, to describe her feelings for All Ball, and to express her deep grief after her kitty died unexpectedly.

Studies of animal behavior and intelligence are imperfect—even in the case of Koko and other primates taught to communicate via sign language, it's not possible for us to fully understand what goes on in the minds of other living things. And yet we have learned enough from these studies to have a sense that animals are maybe not so different from you and me. And so this leaves us with the uncomfortable knowledge that—like us—many animals have the capacity to feel and to think...yet they die, often so that we may live safe, satiated lives of convenience.



The discomfort we feel in knowing how little separates us from the rest of the animal world is, ironically, what sets us apart. The lioness does not regard the death of her prey with compunction or contemplate the moral implications of her kill. There is no ethical ambiguity for her. The wildebeest's death is necessary to her survival and that of her cubs and her species; all the better if her quarry happens to be very young or very old, wounded or weak.

The same is true of fishes. Not only do these cod eat other fish without guilt, they readily eat *each other* if given the opportunity. Consumption of human flesh is one of the most deeply engrained taboos in nearly all human cultures, but fish cannibalize each other as a matter of course. In fact, it was the commonplace cannibalism of cod that led Benjamin Franklin—famous for his ethical vegetarianism—to reintroduce fish to his diet, writing:

"...In my first voyage from Boston ... our people set about catching cod, and hauled up a great many. Hitherto I had stuck to my resolution of not eating animal food, and on this occasion consider'd ... the taking every fish as a kind of unprovoked murder, since none of them had, or ever could do us any injury that might justify the slaughter. All this seemed very reasonable. But I had formerly been a great lover of fish, and, when this came hot out of the frying-pan, it smelt admirably well. I balanc'd some time between principle and inclination, till I recollected that, when the fish were opened, I saw smaller fish taken out of their stomachs; then thought I, "If you eat one another, I don't see why we mayn't eat you." So I din'd upon cod very heartily, and continued to eat with other people, returning only now and then occasionally to a vegetable diet."

We might call call this lioness merciless, but there shouldn't be any judgment or negative connotation attached to that word. She *is* merciless in the strictest sense of the word, because concepts like mercy, fair play, and morality are exclusive to the human worldview. Morality is our unique gift. All social species create ties within their close-knit communities, but it is our morality that has allowed us to extend these bonds beyond our familial relationships. Morality is the foundation of the social mores that bind us to people we don't know—people we will never know. Nearly all of the people inhabiting the cites we call home are strangers to us. But these strangers believe as we believe, in what is right and what is wrong, and we are bound by this shared sense of ethics. This is the secret of Homo sapiens sapiens' success, and what has allowed us to forge cultures and build civilizations. But with this gift of morality comes an awareness and a responsibility to grapple with the ethical implications of our behavior towards the rest of life on Earth.

And so we are obliged to consider the ethics of raising animals, including fish, for slaughter and consumption.



Fans of Saturday Night Live may recognize these two characters, Vaneta and Wylene Starkie, proprietors of Smokery Farms, fictional purveyors of meat from animals that are individually authenticated as "stupid and bad." Among their wares are bacon from a little piggy that went to market and held it up at gunpoint, Alaskan King Crab that refused to practice safe sex, and a flounder that believed the Earth was as flat as he was. It's a funny sketch, but we don't have to pretend that animals are unworthy of our respect to rationalize farming or consumption of meat.



Personally, I think it would be rather disingenuous of me to draw a line between the trout that help me connect to the natural world as an angler, the trout whose incredible biology that I have studied and sought to understand, and the trout we raise at our farms in Idaho for dinner tables across the country. Each of these species, each of these fish is a small miracle of evolution—I don't have to tell myself that they are not to reconcile my ethics as an angler, biologist, or seafood consumer.

We don't have to mislead ourselves or others into thinking that it's okay to eat fish because they don't have any feelings. We can acknowledge that fish are amazing creatures, and, out of respect for them, raise and consume them ethically.

GENERAL PRINCIPLES	OF WELFARE
BREEDING	
Genetic selection should always take health and weifare into account SAFETY	
The physical environment should be suited to the animal and minimize the risk of injury and disease	
SPACE	
The physical environment should allow for safe, comfortable movement and the expression of normal behavior	ANIMAL
SOCIALIZATION	WELFARE
Groupings of animals should be managed to minimize injury and distress and support positive social behavior	STRATEGY
ENVIRONMENT	
Environmental quality should support good animal health and not be aversive to the animals	

So what does it mean to raise an animal ethically, with care and respect?

There are a variety of standards for animal welfare, the most enduring of which is probably the Five Freedoms, articulated in a report written by a committee appointed by the British government in the 1960s to examine the welfare of farm animals in the UK. The committee's conclusions were that animal welfare is supported by guaranteeing farm animals freedom from 1) hunger and thirst; discomfort; pain, injury, or disease; fear and distress; and the freedom to express normal behavior.

Now there's a lot to unpack in those five freedoms, and I think the World Organization for Animal Health (OIE) has done so rather well in their "General Principles for the Welfare of Animals in Livestock Production Systems", which were adopted in 2012.

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Much of the animal welfare discussion is focused on pain, so let's take a moment to address the question of pain in fish. I don't know whether fish are neurologically equipped to feel pain in the way that we or other vertebrates do—and neither does anyone else, not unequivocally. First, let's be clear that we are talking about is whether an animal is sentient and capable of feeling pain and suffering. This is not the same thing as nociception, which is the ability to sense physical damage to one's body that might be a threat to one's wellbeing. Cockroaches are capable of nociception and avoid chemicals that might be damaging to them, like glucose. In fact, it's not that glucose itself is dangerous, but historically, cockroach baits were made of sugary substances laced with poison. Roaches that liked the taste of sugar tended to die, whereas those that didn't like the taste tended to live. Disliking the taste of glucose has a genetic basis—it activates bitter taste receptors in some individuals. The fact that most cockroaches today are actively repelled by glucose has nothing to do with them learning to avoid poison, but simple genetic selection on the most unlikely of traits—disliking the taste of sugar.

Behavioral scientists call this known as aversive behavior, and it's incredibly common. Aversion is reason that many of you have spent the last hour pushing your vegetables around your plate. Many vegetables have a bitter taste, as do many poisons. Experiences collected over evolutionary time have taught us to avoid foods that are bitter because they might make us sick, whereas foods that are sweet or salty tend to be not only safe, but nourishing. Our distaste for bitter foods helps us avoid danger and so does the sensation we feel when we put our hand on a hot stove. But contrary to what most children and a few adults might claim, eating broccoli or brussell sprouts is not truly painful. This is the difference between aversion and suffering.

There is a good deal of evidence documenting that fish exhibit aversion, avoiding things that they find unpleasant. But these studies haven't documented that what the fish are experiencing is pain. Anatomical studies have shown that fish lack most of the neurological hardware that is associated with agonizing pain in other vertebrates. But they do have a few of the same types of nerves, suggesting that's it's not completely outside the realm of possibility that they are capable of more than strict nociception or aversion. Do fish feel pain? I would argue that anyone that claims to know the answer definitively, either way, is ignoring at least some of the findings from the other ideological camp. I do not personally find the evidence of pain and suffering in fish to be entirely convincing, but I am not so arrogant as to believe that things outside our current understanding are impossible.

Maybe we will one day be able to fully resolve the question of pain in fish--maybe not. That shouldn't interfere with our work to address welfare considerations in aquaculture. You'll note that only one of the OIE's 10 principles for welfare has to do with preventing or minimizing pain. Pain is an important welfare consideration, but it is far from the only one. It's my position that if the only thing you're worried about is whether or not your animals are in pain, you're doing it wrong. The bar should be higher than, "Is this animal in pain? No? Good enough." I don't know whether fish are capable of feeling pain, but that's not really the point.



I would argue that our focus shouldn't be on whether or not our fish experience pain or are living emotionally fulfilling lives—this is, at least for now, an impossible standard and one that might be completely irrelevant to fish as a life form. Animal sentience isn't irrelevant, of course, that shouldn't be the litmus test for whether we provide adequate care for farmed animals. Let's say for the sake of argument that fish are not sentient, that they are incapable of feeling pain or experiencing any form of negative emotional state. Does that mean we are no longer responsible for their condition when in our care? There doesn't seem to be much debate over whether plants are sentient life forms, but does that mean the soybean farmer is uninterested in protecting his crop from disease or that the alfalfa grower need not care to ensure his crop is adequately irrigated? No.

I believe the focus should be whether we have addressed the other principles of welfare. Have we bred our animals for success, have we provided a nutritious diet and good rearing conditions, and have we protected them from pathogens and predators? Have we given them what they need to not just survive, but thrive-to achieve their peak performance as food-animals. And when the time comes to harvest them, do we dispatch them quickly and in a manner that minimizes distress. This approach is known as "functional welfare" or "function-based welfare". Nature-based welfare assumes that an animal's needs have been addressed if they can engage in natural behavior. This standard is difficult to implement objectively and, perhaps more importantly, many of the natural behaviors of fish-cannibalism, for example-would be fairly inconsistent with the welfare of others. At the other end of the spectrum, feelings-based welfare assumes that animals are sufficiently aware to experience positive and negative mental states, and that welfare is satisfied when the potential for emotional suffering from poor culture conditions has been addressed. At the current state of knowledge, it is impossible to know whether such considerations are relevant or, assuming they are, how any action on our part might lead to better or worse outcomes for fish. Functionbased welfare is focused on maintaining the physical health of the animal, and it aligns our ethics with the incentives of improved efficiency, rapid growth, and healthy animals.



The Food and Agriculture Organization of the United Nations released a document earlier this year (Weflare of Fishes in Aquaculture), outlining a functional approach to welfare in aquaculture. It includes a handy decision-tree to help farmers identify and address welfare issues, and I'll just take a couple of minutes to walk you through that.

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This last element isn't addressed in the FAO document, but it's something that I think is just as important as the rest of them. It has to do with intention—what are you raising your fish for. To make money? Well, yes, but for what purpose do your animals live and, ultimately, die? Is it to support a recreational fishery? Then take what steps to can to ensure that as many fish as possible end up on the end of an angler's line. Is to provide food for the dinner table? Then do everything you can to minimize waste during processing and prevent spoilage loss before it reaches consumers. Do what you can to find wise uses for everything that your operation produces, including the fish, of course, but also processing wastes, manure, etc. We can choose to imbue the lives of our fish with value, with meaning, by doing everything we can to ensure that they die for a good reason. Not to be cast aside or wasted, but so that they may be used wisely.



A few concluding remarks...

Animal welfare is sometimes used as a cudgel against animal agriculture, but it's not an opposition talking point. Animal welfare is our responsibility as ethical beings and stewards of private enterprises.

As a practical matter, animal welfare should be a priority because animals raised with care grow faster and more efficiently, have fewer health concerns, yield better quality products, and increase the cost-effectiveness of our operations.

Aquatic livestock are, of course, different from terrestrial animals, but considering their welfare is no less important.

I urge everyone to have the welfare conversation with your staff early and often. Make sure they understand the principles of functional welfare and make sure that they know what normal looks like. The people that are closest to the fish and have the greatest influence on welfare, farm productivity, and so forth are often the names that are at the very bottom of the org chart. We are entrusting all of our livelihoods to those people, so invest in them and their ability to recognize and correct problems and challenge them to do better in terms of fish husbandry.

Recently someone asked me about fish welfare and what's the one thing they can do to make a difference. My answer was simple—be mindful, and have a good reason for everything you do. If you don't have a good reason for why you're withholding feed that day or how you're handling the fish, that's a good sign you need to rethink what you're doing.



Thanks very much for the invitation to be here with you this evening and for all you to do raise fish with care.