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SEAFOOD ETHICS
Reconciling Human Well-Being with Fish Welfare

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Introduction

Globally, enough food is produced to feed the world's population (Pogge 2016), yet in 2017, approximately 821 million people (roughly one in nine, but see Pogge 2016, for critique of estimates) suffered from undernourishment or chronic food deprivation, and more than 672 million adults (over one in eight) were obese (FAO et al. 2018). Both undernourishment and obesity are forms of malnutrition that often arise from food insecurity, that is, the lack of access to safe, nutritious, sufficient, and culturally appropriate food (FAO 2001; Cassman 2012). In 2017, an estimated 770 million people—10% of the world's population—experienced severe food insecurity, going without food for a day or more (FAO et al. 2018). Undernourishment and severe food insecurity, respectively, are dominant in Africa (20.4% and 29.4%) and Asia (11.4% and 6.9%), while adult obesity is most prevalent in North America (FAO et al. 2018). The rising trends of world hunger, adult obesity, and food insecurity signal an ethical crisis of distributional inequity in the global food supply, exacerbated by growing demands from a surging, more affluent, yet socioeconomically disparate human population.

Distributional inequity in food provisioning is just one food ethics issue (Mepham 2008). A complex suite of ethical issues arises along the entire food value chain, including food security, human health, social justice, animal welfare, and ecosystem integrity (Lam 2016a, 2016b). Resource access, allocation, and trade decisions can trigger food security or insecurity, ecological sustainability or degradation, peace or conflict, so coordinated, normatively guided actions among diverse institutions are needed for effective yet fair policies and governance (Lam 2016a, 2016b). Food policies are often debated around human well-being, choice, and fairness, but concern is growing over animal welfare and the environmental impacts of food systems. Food ethics issues impact global society vis-à-vis five grand challenges: population growth, climate change, natural resource access, health, and markets (Kaiser and Algers 2016). A concerted and deliberative approach is needed that supports ethical decision-making in food and natural resource policy and governance toward a more sustainable and just global society.

Food ethics issues challenge governance by blurring the distinction between facts and values (Lam 2016a, 2016b). Food governance links three key human institutions that govern political, economic, and social interactions, namely, the government, the market, and civil society (Lam and Pauly 2010; Lam and Pitcher 2012a). Government policies regulate the food sector by trying to minimize risks to public health and the environment, that is, by preventing harm to society, but harm is a normative concept reflecting underlying social judgments of good and bad. The global market is equally incapable of finding equilibria to balance the diverse values brought into the food sector, as social actors act according to their own values, which vary with financial and cultural contexts, as well as constraints from governmental regulations and sectoral norms. Meanwhile, within civil society, non-governmental organizations (NGOs) and scientists often conduct (or fund) policy-relevant research, communicate science to decision-makers, and educate the public, but research findings are often inconclusive. For such value-laden issues in plural democratic societies, a science of deliberation (Dryzek et al. 2019) is needed. This includes structured deliberative processes and robust decision-support tools that can integrate diverse, contested knowledge within ethical governance frameworks (Lam et al. 2019).

In the global seafood sector, diverse social actors harvest, process, trade, and consume fish, often across multiple jurisdictions. Complex seafood value chains (Lam 2016a, 2016b; Drury O'Neill and Crona 2017) thus connect producers, processors, distributors, traders, wholesalers, retailers, and consumers. Actors may interact directly, at a local fish market, or indirectly, through complex global trade networks connecting disparate geographies and cultures. Governing such diverse, complex, and dynamic systems across multiple spatiotemporal scales (Kooiman and Bavinck 2005) is "wicked" (Rittel and Webber 1973). That is, seafood policy and governance problems often have no unique definition, let alone solution (Jentoft and Chuenpagdee 2009; Lam et al. 2019), given the plurality of values guiding multiple actors in their decisions along complex value chains. As the world's seafood production comes primarily from regions with weak governance, improved governance is essential to enhancing the contribution of seafood to food security (Smith et al. 2010). Seafood ethics thus offers a novel, integrated approach to fishery resource sustainability through not only the descriptive and evaluative, but also normative study of values, value-based trade-offs, and ethical dilemmas of multiple stakeholders, including citizens, interacting along diverse seafood value chains (Lam 2016a).

Seafood Production: Fisheries and Aquaculture

Global fish production, including capture fisheries and aquaculture, was a record-high 171 million tonnes in 2016 (Figure 14.1a), reported the United Nations Food and Agriculture Organization (FAO; 2018). FAO (2018) attributes this to a relatively stable capture fisheries production (53% of the total), continued aquaculture growth (47% of the total), and reduced wastage (27% of landed fish and 35% of global catches – if discards prior to landing are added – are lost or wasted). 88% of global production (China produced 19% of this total) is destined for direct human consumption, although the actual amount consumed is less, owing to losses and waste (FAO 2018). Reconstructions of total fish removals estimate marine capture fisheries account for 120 million tonnes (cf. 79 million tonnes reported by FAO; 2018), with declining trends (Pauly and Zeller 2016a; Figure 14.1b). The reconstructed global catches account for all marine fisheries, including illegal, unregulated, and unreported (IUU) fishing, fishing in the (unregulated and largely unreported) high seas, and discarded bycatch, that is, the unintentional catch of fish or marine species when fishing for a target species. The reported marine catches assembled by FAO are from voluntary submissions by its members of national catches in their Exclusive Economic Zones (EEZs). EEZs are the sea zones, stretching 200 nautical miles from the coast, in which states have specified rights and duties of management and use of fishery resources, as prescribed by the third United Nations Convention on the Law of the Sea (UNCLOS III 1982). Pauly and Zeller (2016a) argue that FAO's reported catches underestimate by one third the actual catches for the 1950–2010 period. This controversy (Pauly and Zeller 2017a, 2017b; Ye et al. 2017) of whether fisheries are stable or declining has significant economic, social, and ecological implications for policy and governance.

On behalf of the European Commission, the commissioner for environment, maritime affairs and fisheries recently asked, "How can more food and biomass be obtained from the oceans in a way that does not deprive future generations of their benefits?" In response, the *Food From the Oceans*

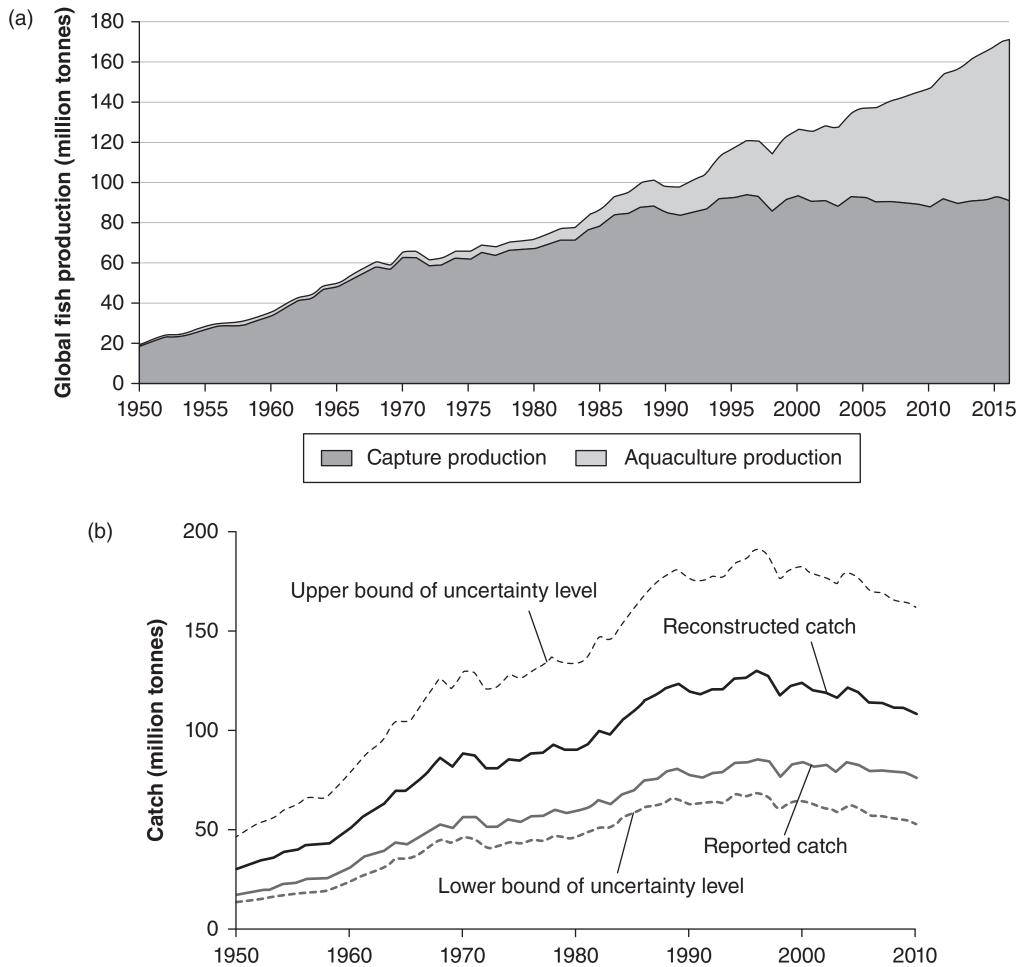

Figure 14.1 (a) World capture fisheries and aquaculture production, reported (for 1950–2016) by the United Nations Food and Agriculture Organization (Redrawn from FAO; 2018), including fish, crustaceans, molluscs and other aquatic animals (henceforth, denoted as 'fish'), but excluding aquatic mammals, reptiles, seaweeds and other aquatic plants, and (b) catch reconstructions of global marine fisheries (for 1950–2015), including illegal, unregulated, and unreported fishing, high-seas fishing, and discarded bycatch, shown with FAO's reported catch and upper and lower uncertainty levels

Source: Redrawn from Pauly and Zeller (2016a).

evidence review report (SAPEA 2017) was written to support the Scientific Advice Mechanism High-Level Group of Scientific Advisors (SAM 2017). The main outcome was to recommend increasing fish capture and culture at lower trophic levels, that is, levels in the ocean food web below the carnivorous levels currently most exploited (SAPEA 2017; SAM 2017). Mariculture, that is, marine aquaculture, notably of herbivorous filter feeders (e.g., molluscs) and omnivorous bottom fish (e.g., mullet), was identified to have the greatest potential for direct human consumption. Mariculture and cultivated algae were promoted as more ecologically efficient sources of feed for farmed marine carnivores (e.g., most finfish and shrimp). Pilot fishing of unexploited lower trophic-level species and vast but diffuse populations of mesopelagic fish was also promoted (SAPEA 2017; SAM 2017). These recommendations resonate with the recent finding that farming molluscs and pelagic fish species were the most environmentally friendly among a variety of food production systems (Hilborn et al. 2018).

These recommendations to increase global fish production, however, come at a time when the status of the world's fish stocks shows alarming trends (Figure 14.2). One third of fish stocks are classified by the FAO (2018) as overfished, that is, fished at biologically unsustainable levels (Figure 14.2a). These stocks are less abundant than that needed to produce maximum sustainable yield (MSY), that is, the largest catch that can be taken from a fish population sustained at its maximum growth rate. In Pauly (2016), more than 40% of the world's stocks (nearly 60% in Pitcher and Cheung 2013) are overexploited (biomass less than half of the biomass at MSY) or collapsed (biomass less than 10% of the historic maximum of unfished levels), and more than 80% (almost 90% in Pitcher and Cheung 2013) are fully exploited, overexploited, or collapsed, with increasing trends (Figure 14.2b).

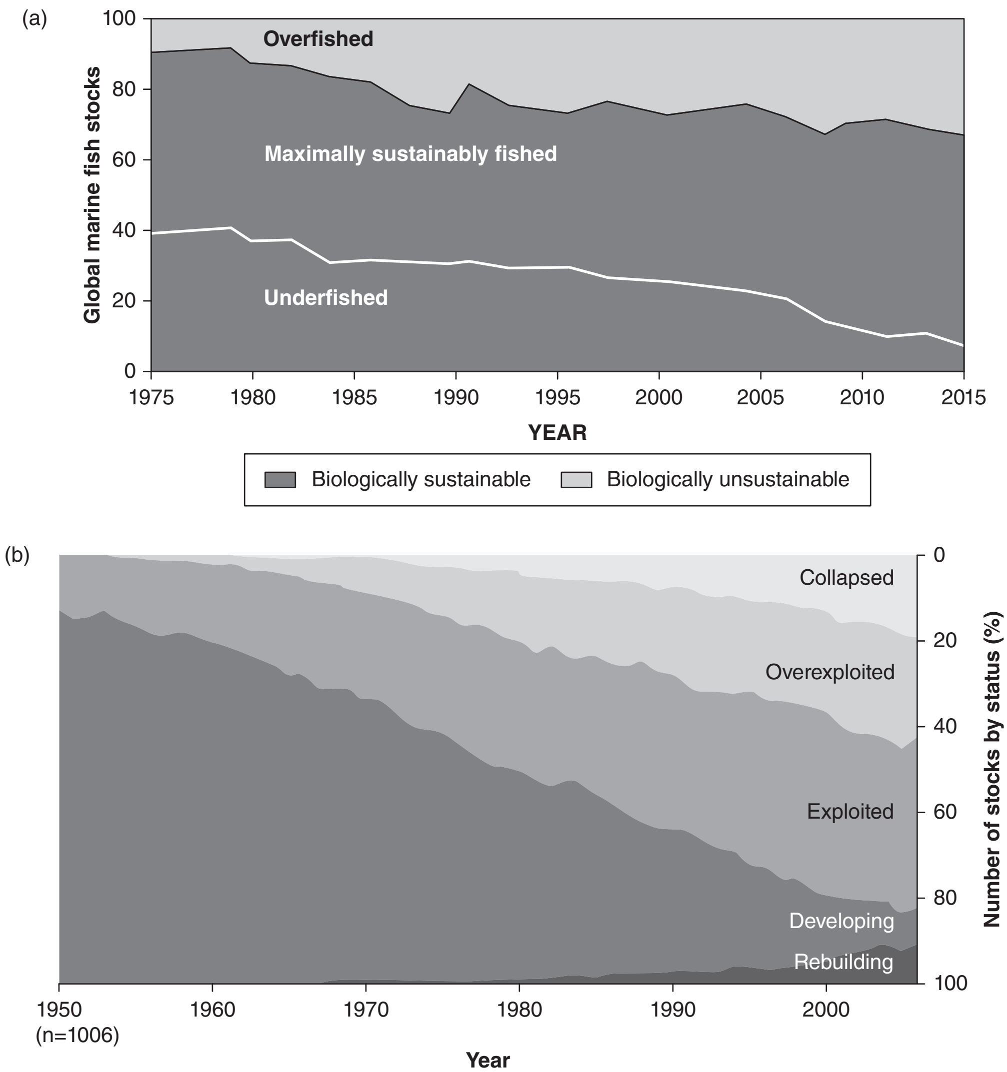

Figure 14.2 Status of the world's marine fish stocks (a) from 1975 to 2015, redrawn from FAO (2018), and (b) from 1950 to 2013, redrawn from Pauly (2016): overfished (collapsed and overexploited), maximally sustainably fished (exploited), underfished (developing), and rebuilding (only in b)

Such discrepancies in global stock status, as in global fish production, arise from different definitions, assessments, and methodologies used to interpret catch statistics and biomasses. Fisheries science, consequently, is subject to opposing views of "doom and gloom" (Pauly 2007) and "management successes" (Hilborn 2007). These scientific uncertainties need to be acknowledged, along with methodological, epistemological, and societal dimensions of uncertainty, when communicating science for policy, and shift instead to knowledge quality assessments to inform decision-making (van der Sluijs 2017).

Fishing is the capture of aquatic organisms in marine, coastal, and inland areas. Capture fisheries are typically categorized as either large- or small-scale, though the distinctions, often by vessel size or engine power, can vary by country and fishing sector. Large-scale, industrial fisheries use large specialized vessels, such as trawlers, purse seiners, long liners, and gill netters, with salaried crews. Small-scale, artisanal fisheries tend to rely on small owner- or family-operated crafts, some non-motorized, operated mostly inshore with more selective, multiple fishing gear technologies. Fishing causes ecological impacts through fishing mortality and collateral impacts (to species and habitats), leading to incidental mortality and decline in mean trophic level and, ultimately, altered ecosystem structure and function (Figure 14.3; Morgan and Chuenpagdee 2003).

Decline in mean trophic level is also known as "fishing down marine food webs," as high-trophic-level piscivorous bottom fish are caught, decreasing in numbers and size, followed by serial depletions

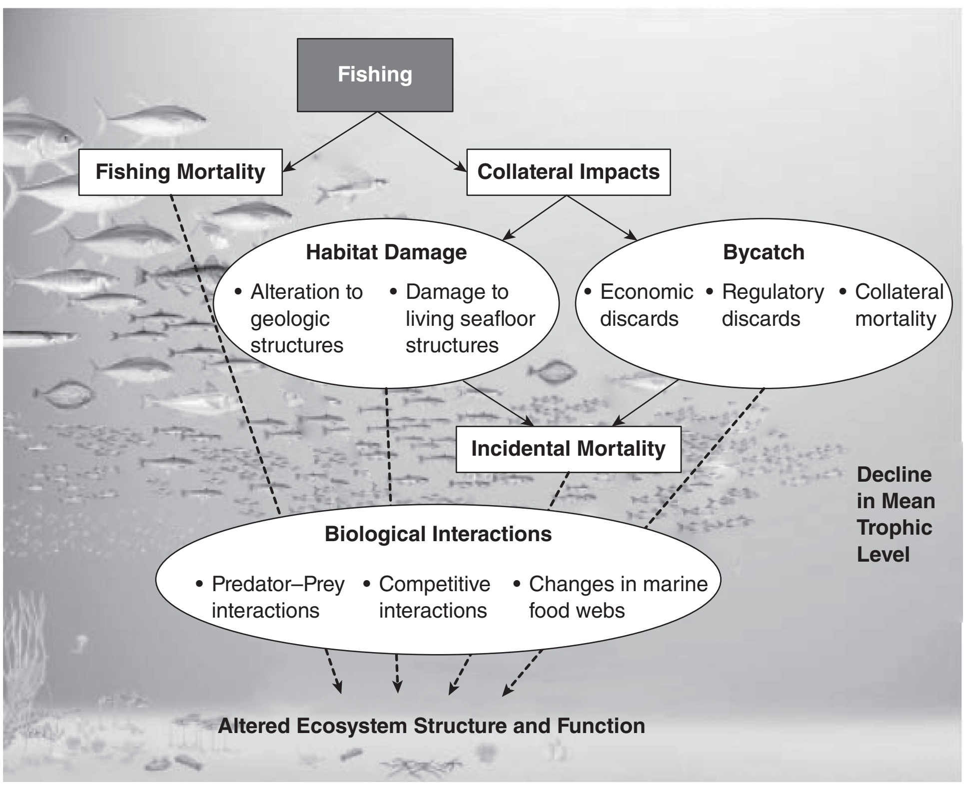

Figure 14.3 Ecological impacts of fishing: fishing mortality and collateral impacts, such as habitat damage and bycatch, leading also to incidental mortality. Fishing often leads to a decline in the mean trophic level, as large fish are removed from the food web, and altered ecosystem structure and function

Source: Redrawn from Morgan and Chuenpagdee (2003).

of smaller species, leaving lower-trophic-level planktivorous pelagic fish (Pauly et al. 1998). Fishing gear types, however, have vastly different impacts on fish and ecosystems: some (high-impact) gears can destroy critical habitats, while others (with low selectivity) result in high bycatch and discard levels of (both target and nontarget) species. The most severe ecological impacts are associated with bottom trawl gear, bottom gillnets, and dredges, while pots and traps and purse seines have intermediate impacts, and hook and line (e.g., rod and reel, troll, and hand lining) have the lowest impacts (Morgan and Chuenpagdee 2003; Fuller et al. 2008). Large-scale fisheries contribute almost twice as much fish globally for human consumption as small-scale fisheries, but their fuel use, government subsidies (Schuhbauer et al. 2017), catch for industrial reduction (as feed for aquaculture; Cashion et al. 2017a, 2017b), and discards at sea (Zeller et al. 2018) are much greater, while the number of fishers employed (FAO 2015) is much less (see summary in Figure 14.4, from Pauly and Zeller 2016b; Lam 2016b).

Of all people directly dependent on capture fisheries, 90% work in the small-scale fisheries sector, often supplying fish for direct consumption within their own households and local communities (FAO 2015).

Large-scale fisheries, comprising industrial commercial fishing fleets that are generally of high volume and profit, have contributed to global overfishing and declining fish stocks (Pauly et al. 2002; Worm et al. 2009; Pitcher 2012; Pitcher and Cheung 2013; Pauly and Zeller 2016a; Costello et al. 2016). After World War II, national fishing fleets were heavily subsidized to expand, with environmental impacts largely unrecognized. As global fish stocks have declined, industrial fleets fish farther (Swartz et al. 2010) and deeper (Morato et al. 2006), with more advanced technology (Rousseau et al. 2019), continuing the vicious cycle of "too many boats chasing too few fish." Government subsidies (Sumaila et al. 2010, 2016) and the historical legacy of the "public right to fish" have fostered a sense of entitlement among fishers, with the consequence that private fishing enterprises exploit public resources without compensation to the national treasury (Lam and Pauly 2010). Fishing rights should be tethered to responsibilities of resource stewardship and marine conservation, with access to fishing grounds granted as a "privilege to fish" (Lam and Calcari-Campbell 2012). To address this missing ethical dimension, "pay-as-you-fish" policies have been proposed that charge extraction fees for fish landed (Bromley 2008, 2009). This could be incorporated by adopting a harm principle in fisheries that charges a progressive tax or restricts access according to the potential damage to fish and ecosystems caused by vessel or gear types (Lam 2012).

Small-scale fisheries (Jentoft and Chuenpagdee 2015; Chuenpagdee and Jentoft 2016), meanwhile, encompass artisanal, recreational, and subsistence fisheries. They contribute to food security, nutrition, poverty alleviation, livelihoods, and rural development, vitally in many developing countries, but are often unreported or unregulated in open-access regimes or in poorly managed community fishing grounds (Lam 2016b). Problematic aspects of small-scale fisheries include income and asset poverty, vulnerability to climate and other variability, exclusion from decision-making, a lack of recognition in planning, limited access to social services and infrastructure, and political marginalization (Béné et al. 2007). Human rights (Allison et al. 2011, 2012) and well-being (Weeratunge et al. 2014) are critical to achieving sustainable development for small-scale fisheries and the supported fishing communities. Securing human rights for fishers to decent standards of living, work, health care, and education will require changes to the governance institutions and power structures that determine resource allocation and access.

John Shepherd famously said (ca. 1978): "Managing fisheries is hard: it's like managing a forest, in which the trees are invisible and keep moving around." The voluntary guidelines for securing small-scale fisheries in the context of food security and poverty eradication address the vital importance of small-scale fisheries (FAO 2015). It complements the FAO's Code of Conduct for Responsible Fisheries (1995), which sets out principles and international standards of behaviour for responsible practices, but has poor compliance (Pitcher et al. 2008, 2009). The only legally binding international

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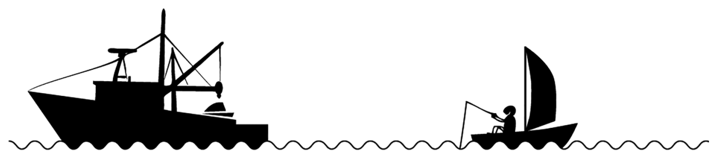

Fisheries benefits	Large-scale	Small-scale
Annual landings for human consumption	about 60 million tonnes	about 27 million tonnes
Annual catch discarded at sea	9 million tonnes	Almost none
Annual catch for industrial reduction to fishmeal and oil, etc.	26 million tonnes	Almost none
Fuel used per tonne of fish for human consumption	10-20 tonnes	2-5 tonnes
Number of fishers employed	about 1/2 million	about 12 million
Government subsidies (billions of USD)	$ $ $ $ $ 25-30 billion USD	$ 5-7 billion USD

Figure 14.4 Comparison of benefits for large- and small-scale fisheries, with data for the 2000–2010 period reconstructed from Pauly and Zeller 2016a (Figure 14.4, Pauly and Zeller (2016b)

framework for the oceans and responsible fisheries management is UNCLOS III (1982), which specified national jurisdiction of coastal states to within their EEZs. Few judicial mechanisms exist to enforce compliance by coastal states within their EEZs, whereas outside their EEZs, in the High Seas, freedom to fish currently prevails. Calls for a complete ban of fishing in the international open waters of the high seas (White and Costello 2014), however, is gaining traction. Such a ban would create a huge marine protected area that would allow wild fish to recover from overfishing, leading to more fish overall without reducing global catches, as well as creating more equitable economic benefits for smaller fishing nations to fish in their EEZs (Sumaila et al. 2015). The current inequity is because the high-seas fishing fleet is heavily subsidized and dominated by six large fishing nations (Sala et al. 2018).

Meanwhile, the phenomenal growth in aquaculture, that is, the cultivation or farming of aquatic organisms, such as fish, shellfish, and aquatic plants, promises enhanced resilience through diversification of global food production systems, but policies must incentivize resource efficiency, equity, and environmental protection (Troell et al. 2014). Aquaculture systems vary greatly in their intensification, integration, technology, and farmed species (Lam 2016b). Commercial farms use intensive methods to produce commodities for global and regional markets, while family and cooperative farms rely on less intensive practices and low-value species for household subsistence or local markets. Marine fish and crustaceans are typically reared near shore and in coastal ponds, respectively, modifying habitats and degrading ecosystem services, while farmed freshwater finfish are often integrated within agricultural and polyculture systems, causing less environmental damage. Culture system improvements, alternative feed strategies, and species selection offer some remedies (Klinger and Naylor 2012), but less harmful, more expensive technologies are less competitive in the marketplace, as aquaculture systems are not charged for discharges of wastes and effluents or other adverse environmental impacts (Lam 2016b). Farmed carnivorous species rely on wild fish inputs, making them fish consumers, while omnivorous and herbivorous species are often net fish producers, consuming primary producers (e.g., aquatic plants and plankton), organic detritus, and/or low-trophic-level forage fish. More than half of aquaculture production is internationally traded, with a net flow from developing to developed countries, generating issues of distributional equity, energy use, and food miles. As well, global aquaculture production does not substantially displace (to lower resource consumption), but rather, supplements fisheries capture (Longo et al. 2019), despite it often being touted as a solution to food security. This suggests that aquaculture is creating more pressure overall on marine resources through its dependence on feeds, as well as freshwater and land resources for facilities, while exacerbating food inequity. Some of these ecological and social issues may be addressed by enhancing ethical frameworks for aquaculture standards (Haugen et al. 2017) and practices (Lam 2016b).

Farming high-value, high-trophic-level, carnivorous species (e.g., salmon and shrimp) requires wild-caught fish for feed (Naylor et al. 2000, 2009; Naylor and Burke 2005). Atlantic salmon, for example, are fed fishmeal and fish oils from the reduction of forage fish (e.g., herring, sardines, and anchovies), with (wet biomass) ratios of wild fish input to total farmed-fish output (fish in–fish out, FIFO) that were as high as 4:1 (Naylor et al. 2000). Farmed salmon are exported predominantly to affluent countries in the global North, but feed predominantly on forage fish often consumed as food by the poor in the global South and that provide essential ecosystem services. Aquaculture feed efficiency is improving (Naylor et al. 2009), however, with inputs from plant-based sources (e.g., soybeans and grains), single-cell protein and oil, insect and krill protein, and animal and fish processing by-products that were previously waste (fish by-products are now 25%–35% by volume; FAO 2018). The Marine Ingredients Organisation (2017) reported the FIFO for the aquaculture sector overall to be 0.22 in 2015, down from 0.63 in 2000. And for the first time, the FIFO for farmed salmon and trout dropped below 1 to 0.82, making them net fish producers, compared with 2.57 in 2000 (cf., Naylor et al. 2009, Bendiksen et al. 2011). Given their mixed feed, farmed salmon are now "more like pigs" (Cressey 2009), but with reduced health benefits due to their lower omega-3 unsaturated fatty acid contents.

Aquaculture facilities that confine large numbers of carnivorous fish or crustaceans in ponds, tanks or cages in coastal waters, especially mangroves and wetlands, can cause unmitigated environmental damage (Naylor et al. 2000, 2001a, 2001b) and fish welfare concerns. Environmental concerns include nursery habitat destruction; chemical pollution and eutrophication via excessive nutrients, wastes, and antibiotics, causing algal blooms and oxygen dead zones; threats to wild species by farmed-fish escapes (interbreeding and competing with wild populations), parasites (e.g., sea lice), and disease outbreaks (Naylor et al. 2000, 2001a, 2001b; Klinger and Naylor 2012; Ahmed and Thompson 2019). Selective breeding and gene transfer technology are introducing fast maturation and disease resistance traits in farmed species, but raise ecological (Li et al. 2014) and human health concerns (Bremer et al. 2013, 2015). Closed-pen recirculation systems treat and reuse wastewater, which avoids potential hazards of open cages in the ocean, but this eco-friendly technology has costs not borne by open systems unregulated for environmental damage (Lam 2016b). Offshore farms have higher water quality and fewer conflicts with recreational water users than do near-shore farms, but have more complex engineering and licensing requirements (Cressey 2009).

Omnivorous (e.g., Nile tilapia) and herbivorous (e.g., carp) species and filter feeders (e.g., oysters, clams, and mussels) are lower in the food web, with fewer adverse impacts on ecosystems. The Nile tilapia, an omnivorous freshwater fish named the "aquatic chicken" for its speedy and efficient growth, is a net fish producer, with a FIFO ratio of 1:3 (Cressey 2009). Tilapia are less likely to build up toxins such as mercury in their flesh and have a sweet and inoffensive flavour, but are viewed as bland and not favoured in the West, being a third less valuable than Atlantic salmon. They also have a tangible danger of escaping and becoming invasive. Industrial-scale farming of omnivorous and herbivorous species may still divert food away from human consumption, livestock production, and other industrial uses, as they use roughly 15% fishmeal and fish oil for compound feeds, with lower omega-3 contents than in carnivorous fish. Ethical issues in aquaculture (and capture fisheries) production are thus highly complex, with differential benefits and impacts on diverse human populations, fish species, and ecosystems.

Fish Welfare

Beyond the values that humans associate with fish, the ethical aspects of fish welfare also need to be considered in the context of the global seafood industry. Fish have neuro-architecture analogous to mammals: they can process and integrate complex information and organize behaviour in response to environmental stimulation (Huntingford et al. 2006; Andersen et al. 2016). Cognitive and emotional capacities and behavioural patterns of fish vary, both between and within species (Braithwaite et al. 2013). Individual fish can even exhibit distinct "personalities" (Kalueff et al. 2012), behaviours (Martins et al. 2012), and stress-coping styles (Braithwaite et al. 2013), suggesting fish are sentient beings capable of pain, fear, stress, and suffering. Animal welfare is defined as the absence of suffering and is predicated on animal health and wants (Dawkins 2008). Ethically, it has been argued that fish should be given the benefit of the doubt and treated humanely (Sneddon 2006, 2011). Expanding the "moral circle" (Singer 2011) to include fish so that they receive moral consideration in their own right (Meijboom and Bovenkerk 2013) would ensure their basic welfare (Lund et al. 2007). Fish welfare could adopt the five freedoms of animal welfare, namely, freedom from hunger and thirst; freedom from discomfort; freedom from pain, injury or disease; freedom from fear and distress; and freedom to express normal behaviour (Farm Animal Welfare Council 2009). However, normative theories differ in how fish should be treated, depending on how fish physiology is assessed (Broom 2016; Rose et al. 2014) and whether fish are given moral consideration or moral significance (Bovenkerk and Meijboom 2012, 2013).

For seafood producers, fish welfare and other ethical considerations are often tightly interwoven with pragmatic decisions of market choices and technological constraints. Within the aquaculture industry, it is recognized that promoting fish welfare is sound business practice, for both product quality and social acceptability. Thus, knowledge of fish behaviour and ecology are being incorporated into aquaculture practices, driven largely by economic considerations and state regulations of fish welfare requirements in the industry. There is active research and development into improved feeds and feeding methods, treatment for and reduction of conditions leading to sea lice infestations, other parasites, and diseases, and enhanced habitats through reduced densities, recirculating aquaculture systems, and integrated multi-trophic aquaculture. From an ethical perspective, aquaculture could be designed so that animals are treated respectfully and are killed without suffering, i.e., painlessly and unknowingly (Lund and Olsson 2006).

In capture fisheries, however, little to no recognition and regulations of fish welfare exist. Caught wild fish typically asphyxiate or are gutted while still alive on board fishing vessels before being transported for processing or distribution (Metcalfe 2009). Ethical issues in capture fisheries (FAO 2005; Sandøe et al. 2009; Lam 2016b) vary with the individual fish, population, species, and fishery. Target and nontarget species can either be captured (dead or alive) or escape (damaged or undamaged), with differential survival rates (Metcalfe 2009). How fish are treated in the harvesting process (capture, handling, and killing) varies with gear type and selectivity, the type and value of the fish, and whether the fish is killed upon capture or upon landing or processing (Metcalfe 2009). Welfare issues identified in current fishing practices include the specificity of gear and capture method and the experience of pain suffered by the target and nontarget fish, whether the captured target species are killed humanely, and damage to escapes and discards (Metcalfe 2009). Steps towards increasing fish welfare in capture fisheries include bans by the European Union (EU) on "ghost" drift nets lost at sea, in which fish, birds, and cetaceans often become entangled, and live-finning of sharks, as well as bans on the discard of non-target fish species within Norway and the EU Common Fisheries Policy.

Fish welfare in transport and handling through the processing, distribution, and trade of fish is particularly important for live fish and local niche markets and community-supported fisheries. The stress and suffering of fish under various conditions of human treatment have been investigated biologically (Braithwaite and Huntingford 2004; Huntingford et al. 2006; Dawkins 2008; Braithwaite et al. 2013) and ethically (Bergqvist and Gunnarsson 2013). Again, the ethical treatment of farmed fish is more advanced than that of wild fish, owing to differential welfare regulations and the paucity of scientific attention devoted to fish welfare in general. Research into fish cognition and behaviour is growing, however, and new regulations are emerging that, while not explicitly citing fish welfare, do protect aspects of fish welfare, and arguably, instil nascent notions of seafood ethics in fisheries management (Lam 2012; Lam and Pitcher 2012a).

Despite the attention being devoted by global NGOs and prominence within civil society of animal welfare issues, consumer awareness of fish welfare issues is low (Röcklinsberg 2015). Ethical consumerism, however, is rising, particularly in Western developed nations, owing to environmental and animal welfare concerns and recent highly publicized human rights violations in seafood production. For consumers, making sound ethical decisions, such as whether to buy local, organic, or fair-trade seafood, depends on a complex suite of factors specific to the seafood system and opaque interactions with other value chains (Lam 2016b). Consumer decisions, particularly with regard to health and safety concerns, require adequate information. Seafood certification and tracing schemes and awareness campaigns (Ward and Phillips 2010), such as through eco-labels, buying guides, and rating systems, notably the Marine Stewardship Council (Jacquet et al. 2010) and Aquaculture Stewardship Council (Bush et al. 2013), aid consumers to choose sustainably harvested or ethically sourced seafood (Lam and Pitcher 2012a). Meanwhile, ethical consumers have been advised to avoid eating farmed carnivorous, "smart" octopus and instead, to opt for filter-feeding bivalves, such as clams, oysters, and mussels (Jacquet 2017).

Human Values of Fish

The global seafood industry encompasses both wild capture fisheries and aquaculture. Seafood demand is rising along with global human population, affluence, and per capita consumption, while seafood supply is rising with advances in aquaculture, despite declining wild fish stocks. How governments regulate these two seafood production systems has ethical implications for global food security, local resource access, income distribution, and ecological sustainability. Meanwhile, the global seafood market is being influenced by consumer demand for sustainable and ethical fish products and heightened corporate social responsibility. Human rights violations in the global fishing industry, notably forced labour of migrant crews in Thailand (Chantavanich et al. 2016) and on South Korean foreign charter vessels in the New Zealand deep-sea fishery (Simmons and Stringer 2014), often co-occur with other illegal fishing practices, such as discharging bilge oil, high-grading quota species, and dumping rubbish and nonquota species. The sustainability and ethics of the global seafood industry are intricately linked (Lam 2016b): the profits, livelihoods, and choices of social actors along diverse seafood commodity, labour, and value chains directly impact the resilience and well-being of human fishing and coastal communities, as well as wild fish stocks and marine ecosystems. Understanding the complex suite of values that humans associate with fish can foster human well-being and ethical decision-making in seafood policy and governance. These fish values include food and nutritional, socioeconomic (livelihoods and income), cultural, and ecological values (Figure 14.5).

Fish, crustaceans, molluscs, and other aquatic animals provide about 10% of global caloric intake (UNEP 2012). They account for approximately 17% of global animal protein and 7% of all proteins consumed, and over half of the animal protein and minerals for some of the world's poorest (FAO 2018). From 1961 to 2016, global food fish consumption increased annually on average by 3.2%,

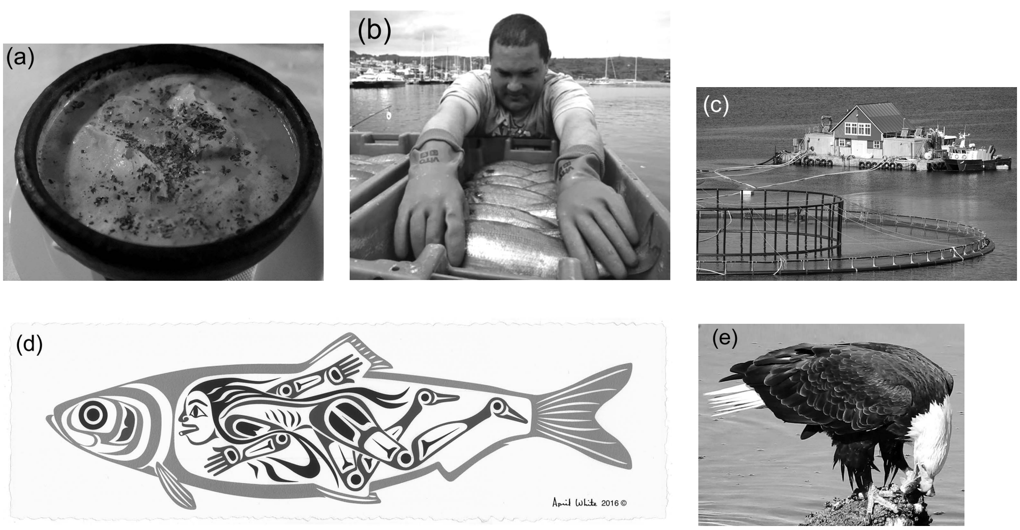

Figure 14.5 Diverse values of fish: (a) food and nutritional value, depicted by congrio chowder, a Chilean national dish (photo: Mimi E. Lam); (b) livelihood value, represented by a small-scale fisher in the Azores, Portugal (photo: Mimi E. Lam); (c) income value, shown by a salmon aquaculture facility in Hardangerfjord, Norway (photo: Mimi E. Lam); (d) cultural value, as depicted in *Herring People* art series showing different predators of herring, here, a female human, inside its silvery outline (© Haida artist, April S.-J. White); and (e) ecological value, captured as a bald eagle feeds upon a spawning herring, Hornby Island, Canada (video still: Barb Biagi)

twice the population growth, and in 2017, was 20.5 kilogram per capita (FAO 2018). Nutritionally, seafood products are important sources of proteins, lipids, vitamins, and micronutrients, with regular fish consumption related to positive health benefits, such as decreased risks of coronary heart and cardiovascular diseases, inflammatory diseases, and cancer (Tilami and Sampels 2017). Analysis of the micronutrient content of 367 marine finfish species worldwide suggests that fish-based food strategies have the potential to substantially contribute to global food and nutrition security, particularly for coastal populations suffering from micronutrient deficiencies (Hicks et al. 2019, Pauly 2019).

Fish have important socioeconomic value as a source of income and livelihoods. Fish products are the most traded food commodities in the world (Lam and Pitcher 2012), accounting for over USD 152 billion in global export trade value in 2017, an increase of 7% from 2016 (FAO 2018). A single bluefin tuna sold at a Japanese fish market for a record USD 1.74 million in 2013, purchased by a restaurateur for its auspicious entry into the New Year. Of the total first sale value of seafood production in 2016, estimated at USD 362 billion, almost two thirds came from aquaculture, the faster-growing food sector. The fish sector supports the livelihoods of 10% to 12% of the global population, with 59.6 million people in 2016 engaged in the primary sector of capture fisheries (40.3 million) and aquaculture (19.3 million) (FAO 2018). Fish workers are concentrated in Asia (85%), Africa (10%), and Latin America and the Caribbean (4%), with 96% of all aquaculture workers in Asia (FAO 2018). Historically, commercial herring fisheries in the North Sea contributed to not only the local food and economy, but also the social fabric, sustaining community relationships and trade in the Hanseatic League for centuries (Pitcher and Lam 2015).

Fish also embody cultural identities, relations of reciprocity, and shared knowledge (Lam and Pitcher 2012b), notably traditional ecological knowledge of indigenous communities (Berkes 2012) and local ecological knowledge of fishers (Haggan et al. 2007). Subsistence and informal exchange economies around fish have preserved its relational value in indigenous cultures, such as for the Saami in Norway (Lam and Borch 2011), the Māori in New Zealand (Lam 2015), and the Haida in Canada (Lam et al. 2019; Pitcher et al. 2017; Jones et al. 2017). In the Pacific Northwest, salmon, herring, and other fish species are believed by indigenous people to be kindred spirits that must be treated respectfully to ensure their return. Cultural taboos and indigenous fishing protocols often proscribe to take only what is needed to meet immediate dietary needs, to gift fish for food, and to not be wasteful. Formalized as Haida ethics (Jones and Williams-Davidson 2000; Jones et al. 2010) or Māori rāhui (McDowall 2011), for example, this may have promoted sustainable practices (Johnsen 2010; Lam 2015). For maritime nations, such as Norway (Kolle et al. 2017), indigenous and local people have relied historically on fish, shaping their values, beliefs, identities, communities, and economies. Fishery collapses, notably the northern Atlantic cod in Canada (Rose 2006), have had profound effects on coastal communities reliant on fishing as a way of life.

Fish are important ecological nodes in complex webs of interactions linking marine organisms. This is particularly evident for forage fish, small pelagic fish that eat planktonic invertebrates and are themselves prey to larger vertebrate consumers, such as predatory fish, marine mammals, and seabirds (Cury et al. 2011; Pikitch et al. 2012, 2014; Sydeman et al. 2017; Surma et al. 2018). The ecosystem-provisioning role of forage fish has inspired international calls for ecosystem-based management (Pikitch et al. 2012, 2014) over the single-species-based management traditionally practised around the world. Not managing fisheries for the ecological interactions of target fish species can lead to unintended consequences with ethical implications. The collapse of Atlantic Canada's cod fishery led to a regime shift in the ecosystem, with cod's invertebrate prey species, for example, lobster, crab, and shrimps, and their lucrative fisheries, now predominating, displacing not only the cod but also the fishers that had fished it for centuries (Levin and Möllmann 2015). Sustaining fisheries and fishery resources thus can be seen as an ethical dilemma of how to reconcile trade-offs among conflicting human values, particularly given the differential costs and benefits impacting diverse social actors along seafood value chains and across sectors.

Seafood Ethics

Seafood ethics adds a value dimension to marine resource management that has the potential to weigh diverse stakeholders' values in public decision-making and shift it towards more ethical governance. These diverse human values along seafood value chains, however, need to be balanced against the intrinsic value of fish and ecosystems. Seafood policies and governance typically focus on promoting ecological sustainability and human well-being, but integrated, comprehensive frameworks that can evaluate the sustainability and ethics of seafood systems are emerging (Lam 2016a, 2016b). Understanding the relationship between sustainability and ethics along integrated seafood value chains is critical to meeting food security, social justice, and environmental challenges. Recent calls for socially responsible seafood have focused on three pillars: to protect human rights and dignity and respect access to resources, to ensure equality and equitable opportunities to benefit, and to improve food and livelihood security (Kittinger et al. 2017; Teh et al. 2019).

To rationally analyse and balance the diverse global seafood values and interests, practical ethics tools (Kaiser 2006) are needed that offer robust ethical deliberation and decision support. One tool, the ethical matrix (Mepham 2000), has been adapted to evaluate the ethics of fisheries (Kaiser and Forsberg 2001; FAO 2005; Lam and Pitcher 2012b), aquaculture (Kaiser and Stead 2002; Kaiser et al. 2007), and seafood production systems generally (Lam 2016b). The (Western) ethical principles of well-being, freedom and justice are evaluated for their impacts on seafood interest groups among the natural system (individual fish, fish populations, and the ecosystem) and the human system (consumers, producers, government agents, other stakeholders, society, and future generations). A specific in-depth ethical analysis will depend on developing quantitative indicators for the seafood system and incorporating the cultural values and ethical perspectives of the stakeholders within the affected community or society. However, to spur on ethical reflection and deliberation in relation to seafood systems now, the ethics of large- and small-scale fisheries (Figure 14.6) and farming carnivorous versus omnivorous species (Figure 14.7) are qualitatively compared (after Lam 2016b).

Another practical ethics approach is to identify empirically stakeholder values and preferences in relation to resource management. For instance, aquaculture stakeholders were asked to rank values, to map value landscapes for development scenarios, and to produce sustainability indicators (Bremer et al. 2016). Stakeholder values and principles were elicited to guide fishery governance (Song and Chuenpagdee 2015) and to examine how people prioritize outcomes of marine management (Loring and Hinzman 2018). Practical ethics also was incorporated into a value- and ecosystem-based management approach (VEBMA) developed to help resolve the Pacific herring fishery conflict in western Canada (Lam et al. 2019). VEBMA combined a participatory approach to reveal diverse stakeholders' values, knowledge, and preferences for herring fishery management with ecological modelling to reveal ecological and socio-economic impacts and risks associated with different management scenarios. It culminated in a science-policy table, a deliberation and decision-support tool that made explicit the societal and ecological implications of alternative fishery policy choices. VEBMA is thus both descriptive and evaluative and prepares the ground for normative judgments in ethical decision-making and governance in resource management (Lam et al. 2019).

Ethical considerations of humans, of fish, and of the environment should be considered along the entire seafood value chain. Narrowly focusing on growing seafood production systems to address global food security often misses distributional inequity and other food ethics issues. Regulations restrict the treatment of farmed, but not wild fish, with largely economic drivers of fish welfare. Meanwhile, the legal landscape vis-à-vis nature is changing, as New Zealand's Whanganui River is now a person under domestic law, India's Ganges River has been granted human rights, and in Ecuador and Bolivia, nature has a "right to integral respect" (Tanasescu 2017). Progress in seafood ethics can be made via governance that invokes not only government regulations, but also the participation, and indeed, cooperation, of the seafood industry with civil society to establish acceptable ethical

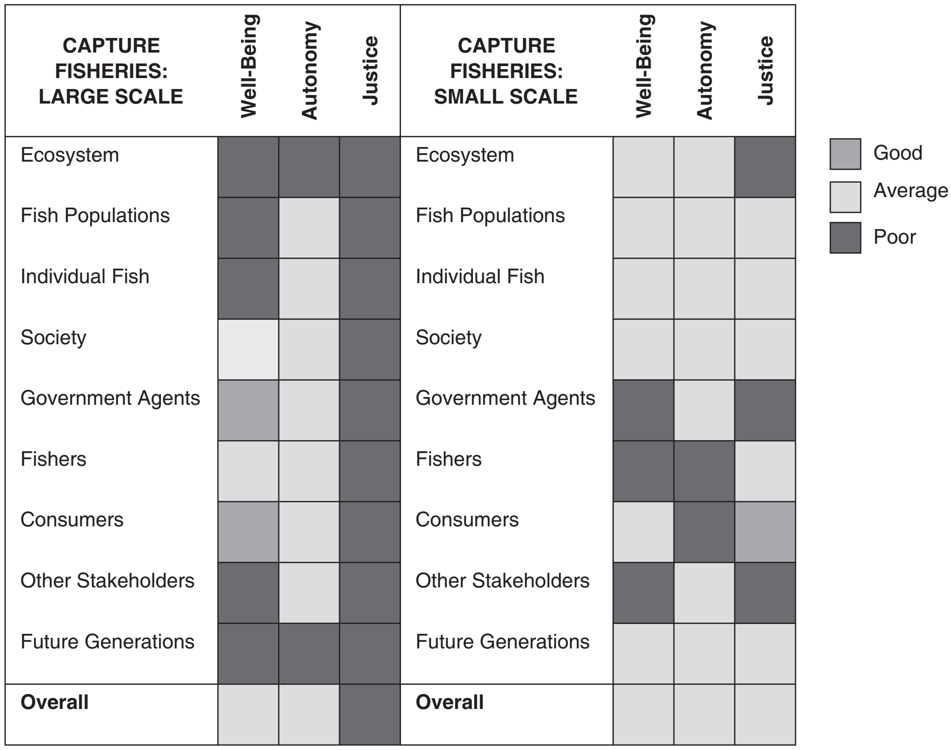

Figure 14.6 Comparing the ethics of global large- and small-scale fisheries

Source: Redrawn from Lam (2016b).

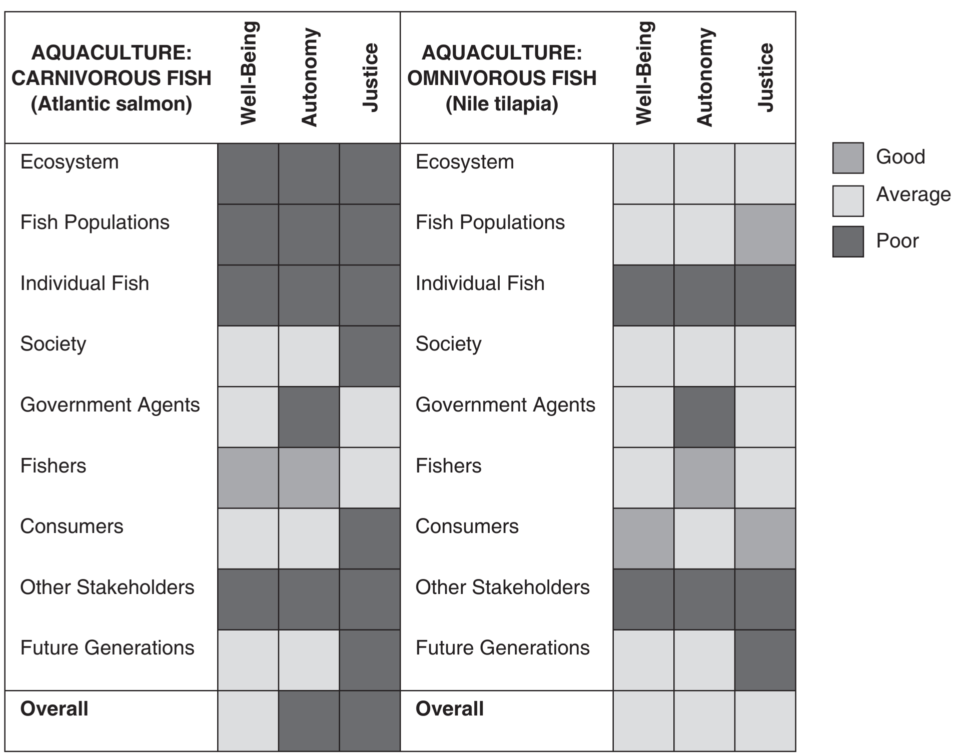

Figure 14.7 Comparing the ethics of farmed carnivorous and omnivorous species

Source: Redrawn from (Lam 2016b).

standards and performance metrics. In the Seafood Business for Ocean Stewardship (SeaBOS) Initiative, chief executive officers of the major global seafood companies, in collaboration with scientists, have made a declaration in connection with the United Nations Sustainable Development Goals to actively work to increase sustainable seafood production, corporate social responsibility, and healthy oceans (Österblom et al. 2017). Incorporating ethical considerations into the management of fishery resources might achieve more sustainable seafood systems. This can be accomplished through ethical governance, that is, participatory, deliberative, transparent, and accountable decision-making, designed to synthesize diverse sources of knowledge and reconcile a plurality of values (Lam et al. 2019).

Conclusion

Resolving ethical issues in seafood policy and governance is a "wicked" problem, as there is no one solution and even the problem definition is complex and varies with one's values and needs. Fish can mean a source of food, income, livelihood, or culture, depending on the fish species or the individual person. Fish also have non-instrumental, intrinsic value and can represent a moral commitment of all humanity to care for and respect non-human animals and the environment. Reconciling these diverse values of fish necessitates explicit answers to questions not typically asked when managing fishery resources, which tend to focus on how much fish to catch and by whom, where, and when. Instead, the conversation needs to expand to include not just fishery stakeholders and managers but all of society, both to ask and to answer questions, such as why and how are we fishing, who is benefitting and who is being harmed, and is it really necessary to fish at all, at least, here and now? That is, instead of racing to grow or catch more, we should learn from the biblical parable of the "Feeding of the 5000" to concentrate our energies on less fish production and waste and more reflection and sharing (Figure 14.8).

Figure 14.8 Logo for Marie Skłodowska-Curie Individual Fellowship project, *eSEAS: Enhancing Seafood Ethics and Sustainability* (funded by the European Union), designed to promote greater reflection in understanding humanity's relationships with, and impacts on fish (© Mimi E. Lam)

Acknowledgments

I am indebted to Bob Fischer for his invitation to contribute this chapter and for his encouragement throughout the writing process. I also would like to thank Tony J. Pitcher and Matthias Kaiser for their constructive comments on my manuscript draft. Finally, I gratefully acknowledge funding for my *eSEAS* project from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 753937.

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