



*Insight*, part of a Special Feature on [The Privilege to Fish](#)

## Who is Right to Fish? Evolving a Social Contract for Ethical Fisheries

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**ABSTRACT.** Most debates on government fisheries management, focusing on dramatic fishery collapses, have skirted the ethical dimension implicit in the exploitation, for private gain, of fishery resources that are publicly owned. The privilege to fish, a conditional right often nefariously perceived as a legislated “right,” implies ethical responsibilities linked to marine stewardship. To date, however, granting this privilege to fish has not been legally tethered to the fiduciary responsibilities of businesses to their clients or governments to their citizens: sustainable management of fisheries and conservation of living marine resources. Legal rights must be coupled with moral responsibilities if governments, private fishing enterprises, and civil society are to conserve marine resources for present and future generations. Evolving a social contract for ethical fisheries that explicitly mandates collaborative governance and corporate responsibility can protect public goods and society’s right to fish, both to eat and to exist in the sea.

**Key Words:** *collaborative governance; corporate responsibility; fisheries management; fishing privileges; marine stewardship; public ownership; subsidies; tragedy of the commons*

### INTRODUCTION

“Beyond the limits of his confining skin, no man can own any thing. ‘Property’ refers not to things owned but to the rights granted by society; they must periodically be re-examined in the light of social justice.” (Hardin 1972:127)

In *The Tragedy of the Commons* (1968), Garrett Hardin gave two examples of problems with “no technical solutions”: overgrazing in the “common” pasture and overpopulation on a “common” Earth. Both of these, in fact, are open-access problems (Berkes et al. 1989, Feeny et al. 1990, Ostrom et al. 1999, Dietz et al. 2003), exacerbated since Hardin’s seminal article (1968) by continuing unprecedented human exploitation and population growth. A legacy of the industrial revolution, the cumulative impacts of human activities are now stressing the Earth’s ecosystems and climate beyond safe operating limits (Rockström et al. 2009). Human technology has created a pernicious threat of collective extinction, as growth rates in human population and resource consumption are incompatible with a finite Earth (Wackernagel and Rees 1996). Solutions to our ecological challenges

will require scientific and technological ingenuity, but also social inventiveness and political will. Despite the article’s flaws (Dasgupta 1982), Hardin’s solution of “mutual coercion, mutually agreed upon” (Hardin 1968:1247) swelled a wave of advocacy for government regulation and privatization of natural resources.

The current fisheries and natural resources literature is dominated by controversies about rights, ownership, and privatization of fishery resources (Macinko and Bromley 2002, 2004, Hannesson 2005, Grafton et al. 2006, Beddington et al. 2007, Costello et al. 2008, Bromley 2008, 2009, Clark et al. 2010, Pitcher and Lam 2010). The debate is polarized along the concept of property, which, in law and economics, is not a thing, as in common parlance, but a benefit, or income stream. Property implies a social contract with rights and obligations, between rights holders and duty bearers, concerning a valuable item, such as fish, recognized by both and sanctioned by social institutions (Bromley 1992, Kirsch 2001). Four property regimes have been identified in environmental policy (Bromley 1992): (1) open-access, where natural resources are owned by no one, (2) private, where resources are

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owned by individuals or corporations, (3) common, where resources are owned by many individuals, and (4) state, where resources are owned by the public but managed and controlled by the state. In fisheries-management regimes, particularly private and state or public ownership (Eagle and Kuker 2010), “[f]ishing is often treated as a right without attendant responsibilities” (Costanza et al. 1998:198), but the tide is shifting to now encompass a sea ethic (Safina 2003).

Marine fish, as “common-property resources” (Gordon 1954), are characterized both by the difficulty to exclude would-be fishers and the loss of benefits from competing fishers (Berkes et al. 1989, Feeny et al. 1990). However, communities have adopted institutional and governance arrangements to manage “common-property resources” sustainably, with outcomes more nuanced than Hardin’s overly deterministic “tragedy of the commons” (Ostrom 1990). Common-property regimes work as any other: sometimes they work, and sometimes they don’t (Bromley 1992). Effective resource management, whether communal or state, requires adaptive governance institutions (Folke et al. 2005) that are matched to both the resources and the community (Acheson 2006). Governance of marine ecosystems embraces the arrangements, institutions, and mores that structure resource use (Juda and Hennessey 2001, Sissenwine and Mace 2003). To manage fishery resources for ecological and socioeconomic sustainability, governing interactions among diverse societal actors, both private and public, must evolve (Kooiman 2003, Kooiman et al. 2005): arrangements may be formal, as in the design and implementation of social institutions, and informal, as in voluntary compliance to accepted community or societal norms of behavior.

To resolve ethical dilemmas emerging in the “Anthropocene” (Crutzen 2002, Steffen et al. 2007, Zalasiewicz et al. 2008) and to gain some relief from resource tragedies, global society needs governance mechanisms for human-dominated ecosystems that can impose moral responsibilities with legal rights as conditions of resource use. Fishing rights tethered with legal duties can bind government agents, private enterprises, and public users to sustainably manage and benefit from fisheries, while also conserving living marine resources for present and future generations. “Property rights” in marine fisheries (Wyman 2008, Libecap 2008) are evolving from open-access to restricted common, state, and

private property regimes. Emerging collaborative governance (Zadek 2006) mechanisms can help evolve ethical social contracts among governments (O’Brien et al. 2009) and businesses (White 2007) with society. In particular, private fishing enterprises and corporations can be encouraged, with socioeconomic incentives and environmental laws, to adopt social responsibility in their use of public goods and to bear the ecological costs of fishing currently borne by global society.

## **EVOLUTION OF RIGHTS WITH SOCIAL RESPONSIBILITY IN RESOURCE USE**

### **Shared Resource Use: Balancing Individual versus Collective Rights and Duties**

“Responsibility is the product of definite social arrangements,” wrote Charles Frankel (as cited in Hardin 1968:1247). Social contracts are implied agreements, wherein a nation’s citizens relinquish some individual rights to government for social order. Social contract theory, as articulated by Thomas Hobbes in his *Leviathan*, asserts that legitimate state authority must be derived from the consent of the governed. The theory of democracy, as argued by John Locke, emphasizes individualism and rejects subordinating individual liberty to the sovereign state. Popular sovereignty by the indivisible and inalienable “general will,” advocated by Jean-Jacques Rousseau, “forces people to be free” and decides what is good for society. Modern resource conflicts over property rights and social responsibility manifest these philosophical debates. Originally, social contracts defined reciprocal rights, obligations, and responsibilities between states and their citizens (see O’Brien et al. 2009 for a historical perspective), but increasingly, the social contract between businesses and society is gaining definition, as modern corporations compete with governments for use and provision of public goods (Zadek 2006, White 2007).

The ethical dimension of fisheries resource conflicts (see also Pitcher and Lam 2010) is analogous to asking if parenthood is a right or a privilege, i.e., a conditional right with responsibilities, in global population contexts (Hardin 1972). Transitioning from a private-enterprise system to the welfare state separated parenting “power” from “responsibility”: the power to produce children resides in the family, whereas the ultimate responsibility to take care of

children resides with the state (Hardin 1972:127). The power or ability to act comes with rights or legal entitlements, whereas responsibilities are the moral obligations or duties imposed by society on individuals and collective bodies. The “parenting commons problem” created, Hardin argued (1972:189), can be solved if we bring “power and responsibility together once more, this time in the community.” However, advocating for state-imposed population control strikes a nervous chord in people of “a Draconian dictatorship over private lives” (Davis 1973:28). However rational the argument, it invariably elicits passionate defenses for the individual’s “inalienable right to procreate.” If the human community took responsibility for its environmental impacts with a global population policy, it would gain collective freedom but lose some individual “rights.” Today, whether managing population growth or fisheries, global society faces an ethical issue of shared resource use, that is, how to balance individual versus collective rights and duties. As Daly argued (1991:271): “Distribution involves an ethical question of justice. Scale involves an ecological question of sustainability. Neither is reducible to a problem in efficient allocation.” The ecological and ethical lessons learned in fisheries conflicts will inform future environmental decision making and policy vis-à-vis individual rights and freedoms and the imperative of social responsibility in resource use.

### **From Fishing Rights to Privileges: the Ethical Dimension of Fisheries Management**

Our title asks both “who is legally right to fish?” and “who is morally right to fish?” We emphasize the adjective meaning of “right” or “being in accordance with what is just, good, or proper,” i.e., socially acceptable, rather than the noun meaning of “something to which one has a just claim,” i.e., implying ownership or possession. A legal right of use (Bader 1998) vests a fisher or fishing enterprise owning a license with the power to fish in a specified area for a specified period, using specified gear to catch a specified amount of fish. A moral right is determined by societal codes of ethics and values to judge if an intended or executed action is morally right or wrong, and to constrain or punish individual behaviors based on accepted norms and laws. An evolving social contract for ethical fisheries among governments, citizens, and businesses must couple both legal and moral rights to sustain fisheries and conserve marine resources for present and future

generations. This includes both economic sustainability of the fishing industry and ecological sustainability of living marine resources. Ethical or “responsible fisheries,” i.e., the “sustainable production of human benefits that are distributed ‘fairly’ without causing ‘unacceptable’ changes in marine ecosystems” (Sissenwine and Mace 2003:363), require new policies to sustain economic security, ecological integrity, and social equity (National Council for Science and the Environment 2000).

A local marine stewardship ethic was ensured by precontact Pacific Northwest indigenous communities through an intimate coupling of responsibility, via cultural norms and community sanctions, to salmon resource management and “ownership” rights (Copes 2000, Trospen 2002, Menzies and Butler 2007, Johnsen 2009). Tribal stream “ownership” was contingent proprietorship (Trospen 2003, 2009), a conditional right with responsibilities to manage resources for communal benefit that could be revoked if necessary. In Canada, following the Sparrow decision of 1990, the Crown has a fiduciary obligation to recognize and affirm Aboriginal rights and title, including priority access to fish, after conservation but before commercial fisheries, for food, social, and ceremonial purposes (Harris 2009). Thus, Aboriginal rights to fish are constitutionally protected by a legal contract between the government of Canada and its Aboriginal people. Similarly, in the United States, the Boldt decision (1974) affirmed a 50% allocation, with co-management rights, of the harvestable fish to treaty tribes in the state of Washington (Pinkerton 1999, Harris 2008). We contend that a similar recontracting between the governments and societies of individual fishing countries is needed to preserve fish for food, social, and cultural purposes for all citizens of the global community.

Modern governments, however, have failed both to stop fisheries collapses (Pauly et al. 2002, 2003, Worm et al. 2006) and to reflect the ethical dimension of fisheries management (Coward et al. 2000, Bundy et al. 2008). We posit these failures are correlated. Fisheries policies have relied on market forces to regulate individual behaviors, leading to numerous market and government failures (Peltzman 1993), as well as community failures (McCay and Jentoft 1998). The private privilege to exploit a public resource implies ethical responsibilities of fishing enterprises, corporations, and government regulators. To date, the privilege

to fish has not been tethered to the societal goals of sustainable fisheries management and conservation of living marine resources. Rather, fishing has often been seen as an unconditional “right” (Russ and Zeller 2003, Huppert 2005): for example, claiming that fishing should be free, U.S. anglers contested \$25 licensing fees proposed for a New England recreational fishery (Daley 2008). However, the primary law governing U.S. marine fisheries, the Magnuson–Stevens Fishery Conservation and Management Act (Macinko and Bromley 2002, Safina et al. 2005), explicitly states that assigned catch shares (and hence Individual Transferable Quotas; see below) in commercial fisheries are not rights, titles, or interests, but limited access privileges, i.e., permit holders are not entitled to just compensation (Bromley 2008, 2009). Advocacy for property rights and privatization of fishery resources has blurred this legal distinction between fishing rights and privileges (see Macinko and Bromley 2002, 2004).

### **Reframing Fisheries as an Evolving Social Contract: Collaborative Governance**

With modern industrialized and mixed-stock fisheries, various management tools have been implemented to allocate harvest of dwindling fishery resources, with variable success rates. Individual Transferable Quotas (ITQs), often confusingly called “rights” or “incentive”-based management regimes (Hannesson 2005, Hilborn et al. 2005a,b, Fujita and Bonzon 2005, Grafton et al. 2006, Beddington et al. 2007, Clark et al. 2007, Hilborn 2007a, Costello et al. 2008, Branch 2009, Gibbs 2009), have been effective in reducing overcapacity, ending the competitive “race for fish” (Gordon 1954) and improving harvest compliance, when fishing enterprises, assured of shares of the total allowable catch, maintain only the needed fleet capacity to catch them (Chu 2008). However, there are many caveats associated with ITQ-based schemes (Copes 1986). Most noteworthy here is that ITQs, in allocating quota shares that can be sold and leased (Pinkerton and Edwards 2009), give private access, withdrawal, and alienation rights (Schlager and Ostrom 1992) to public fishery resources (Bromley 2008) without compensation to or consent from their owners. This violates the social contract in fisheries, as citizens have relinquished their collective-choice rights of management and exclusion to governments for resource benefits, but now suffer increasing environmental costs of

fisheries (Wiber 2000). The initial allocation and potential for fleet consolidation with ITQs (Copes 1986, Huppert 2005) also raise ethical issues of distributive justice (Ethórrsson 2000), as ITQs privilege some fishers over others, and certainly fishers over the rest of society.

Declining fishery resources (Hilborn et al. 2003, Pauly 2007) raise fishers’ incentives (Hanna 1998, Hilborn et al. 2005a, Grafton et al. 2006, Hilborn 2007a,b, Rosenberg 2009) to “race for fish” (Gordon 1954) and violate regulations (Kuperan and Sutinen 1998, Sutinen and Kuperan 1999). This is indicated by escalating serial depletions of fish stocks (Pauly et al. 1998, 2002) and illegal, unregulated, and unreported catches (Sumaila et al. 2006, Agnew et al. 2008), as well as noncompliance to the United Nations *Code of Conduct for Responsible Fisheries* (Pitcher et al. 2009). Fisheries can be managed effectively (Mora et al. 2009), by evolving social institutions and governance based on an understanding of the motivations and behaviors of not only fishers (Hilborn 2007b), but also government agents (elected representatives and public servants), consumers, and citizens. Fisheries would benefit from a new social contract (Jentoft 2003, O’Brien et al. 2009), a credible commitment, designed by emerging societal consensus that acknowledges the socioecological value of protecting living fish, while constraining sustainable exploitation of fishery resources with corporate responsibility. The role of business in society is being renegotiated and realigned, through the “contingent, negotiated pathway” of corporate responsibility that is shifting “the underlying social contract that *defines* the very nature of business” (Zadek 2006:16, italics in the original).

Collaborative governance establishes rules of behavior governing multiple stakeholders who deliberate on their development with potentially a broader community of actors (Zadek 2006). It can restructure government management of fisheries to preserve not only private interests, as captured by the market, but also the social responsibility and ethical obligations of fishers, consumers, and corporations, as negotiated by civil society. The separation of fishing power from social responsibility occurring to date has allowed fishing without imposing stringent legal or moral obligations. Granting private access with conditions for social responsibility can couple social with economic incentives in policies, and individual

rights with societal objectives in governing institutions (Wilson 2007). Society can manifest its collective responsibility by establishing new criteria for conservative catch limits and crafting environmental legislation that shifts societal norms to require marine resource conservation and sustainable exploitation of fish. To sustain fisheries, the social contract must evolve so that fishers pay the ecological and social costs (Coase 1960) of fishing, i.e., pay for the privilege to fish.

## **ECOLOGICAL AND SOCIAL COSTS OF FISHERIES**

### **History of Resource Appropriation and Internalization of “External Costs”**

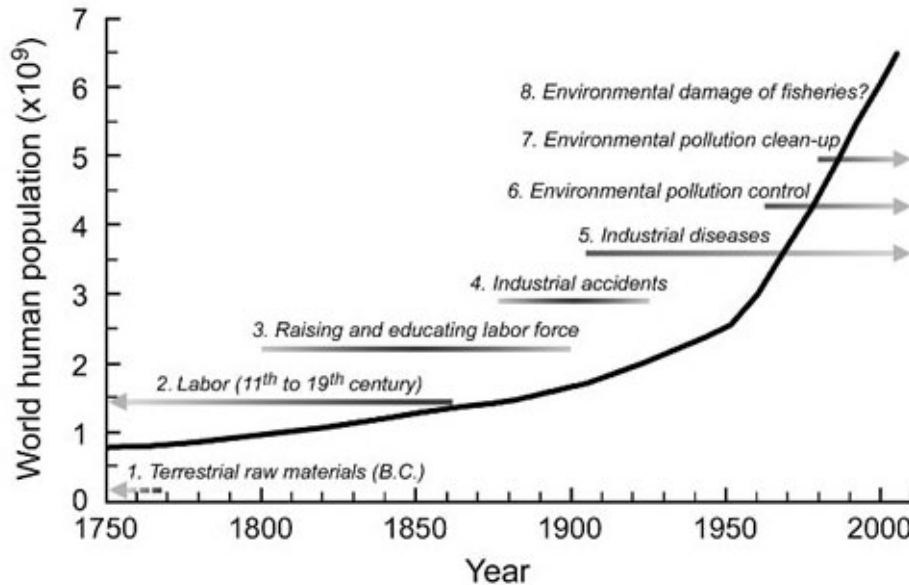
Figure 1 shows that modern society’s perceived “inalienable rights” or “reasonable costs of doing business” were not always so, as societal norms have shifted over time. With industrialization, human resource use and population growth accelerated, redefining individual rights and duties to society so as to “internalize” costs previously external to resource appropriators or private “owners.” Cost internalization requires that the social or environmental costs of an activity, that is, the “externalities,” are charged to it, so that the private costs of conducting an activity reflect the costs it imposes on society (Bergkamp 2001). Property rights and resource regimes in mining and forestry have shifted gradually from open-access to private, common, or state ownership (Scott 2008), and the basic welfare of human laborers is now protected by firms responsible for exercising due care for their labor force. Social institutions and environmental laws (Pardy 2005, Ruhl 2008, Lam 2010) are evolving to govern resource use with stricter regulations, protective legislation, and liability instruments, e.g., the U.S. Clean Air (1963, 1970) and Water (1977) Acts, the international Montreal Protocol protecting the ozone layer (1989), and the European Community’s polluter-pays principle (1993), where the polluter bears the cost of measures to reduce pollution, and the principle of preventative action (Poostchi 1996). The costs of the ecological damage of fisheries have yet to be internalized, but destructive technologies, such as driftnets, have been banned internationally, based on the precautionary principle (Garcia 1994).

As public awareness grows that the “right to fish,” like the “right to pollute,” is an entitlement that fails to consider external costs, legal duties to compensate the public (Bromley 2008) and protect public resources (Turnipseed et al. 2009) are being proposed that manifest the “privilege to fish.” As global demand escalates for fishery resources, collaborative governance mechanisms beyond the market economy are needed to ensure responsible fisheries management and ethical fishing behaviors (Safina et al. 2005). International law and economy are social institutions that govern the contractual relations where transactions are negotiated and executed (Williamson 1979), but if a social contract, as implicit in fisheries, begins to harm society, its terms must be renegotiated and made explicit. The precautionary principle “ensures that a substance or activity posing a threat to the environment is prevented from adversely affecting the environment, even if there is ‘no conclusive scientific proof’ linking that particular substance or activity to environmental damage” (Cameron and Abouchar 1991, cited in Macdonald 1995). Ratified by the United Nations, it signaled an “ethical evolution in ocean management” (Macdonald 1995:255) to protect the marine environment (Lauck et al. 1998) and its wild living resources (Mangel et al. 1996). Civil society can exercise its collective right to value living fish, and government agencies who manage their use can be made responsible to protect them, or else the landed value of fish in the global market will soar in a race to their depletion.

### **Managing Uncertainty and Risk in Fisheries Science and Policy**

Fisheries management (Pitcher et al. 1998) is widely understood as managing humans, not just fish (Ludwig et al. 1993, Healey and Hennessey 1998, Juda 1999, Juda and Hennessey 2001, Hilborn 2007b, Pitcher and Lam 2010), but fisheries governance is routinely mired in politics masquerading as rational policy responses to scientific uncertainty. Politicians are vulnerable to special-interest groups advocating for increased resource exploitation (Ludwig et al. 1993) and subsidies that enable overharvesting (Munro and Sumaila 2002, Clark et al. 2005, 2007). Differing standards of uncertainty in science and policy, designed to “protect against being wrong” in science and “undue political and social costs” in policy

**Fig. 1.** Historical sequence of internalization of social and environmental “external costs” (adapted from Hardin 1972:81, with global human population superimposed).



1. Terrestrial raw materials: internalized long before the Common Era (C.E.).
2. Labor: transition, with invention of the horse collar in 1000 C.E., increasing efficiency of horse over human labor, away from slavery (abolished in the U.S. with the Emancipation Proclamation in 1863 C.E.).
3. Raising and educating labor force: labor movement to maintain labor force in reasonably good health over lifespan.
4. Industrial accidents: development of probability theory and resulting insurance schemes of accidents as infrequent, but predictable events.
5. Industrial diseases: statistical demonstration of pathological consequences of certain industrial processes, e.g., working with harmful substances, such as lead, asbestos, or radioactive materials.
6. Environmental pollution control: e.g., with U.S. Clean Air Acts (1963, 1970) and Clean Water Act (1977), implemented by Environmental Protection Agency (EPA; created in 1971), the international Montreal Protocol on Substances That Deplete the Ozone Layer (1989), and Article 130r of the European Community Treaty, Green Paper on Remedying Environmental Damage (1993), which incorporates the polluter-pays principle and principle of preventative action.
7. Environmental pollution clean-up: e.g., Superfund Program (1980), administered by EPA, to clean up U.S. uncontrolled hazardous-waste sites.
8. Environmental damage of fisheries: yet to be internalized.

(Kinzig et al. 2003:330), lead to poor coordination of responses to perceived risks. At the fisheries policy–science interface, demands of vociferous fishing entrepreneurs drown uncertainty-ridden scientific advice (Rosenberg 2007). By not confronting this political dynamic of scientific uncertainty, scientists risk not just their advice, but

conservation being marginalized in fisheries management and policy decisions. The emerging coalescence of science, policy, and society in resource conflicts creates an opportunity for unbiased scientific communication to inform ethical sustainability policies (Scott et al. 2008).

## **Mixed Incentive Structure and Complex Political Economy**

Conflicting interests of interacting economic, social, and political actors within the public and private sectors create a mixed incentive structure and complex political economy in fisheries management (Jentoft 1989, Jentoft and McCay 1995) and governance (Juda 1999, Juda and Hennessey 2001, Charles 2001). The fisheries governance system (Fig. 2) typically consists of four interacting components: (1) the legislature, which enacts fisheries laws, (2) the fisheries agency, which implements fishery policies and programs, (3) the fisheries management authority, which develops fishery management plans, and (4) the stakeholders, who include all public owners, but whose diffuse fishing interests are politically dominated by concentrated interest groups (Olson 1965), i.e., fishing entrepreneurs and their allies (see Okey 2003 for U.S. example), environmentalists, and scientists. The formal and informal (e.g., lobbying) processes within this governance structure (see also Sissenwine and Mace 2003) mix political, social, and economic incentives, such that achieving responsible fisheries management balanced with marine conservation is difficult, if not impossible. Governance failure often results: socially undesirable outcomes may stem from special interest effects, rational voter ignorance, bundling of issues, shortsightedness effects, decoupling of costs and benefits, and bureaucratic inefficiencies (Sutinen and Soboil 2003).

In countries such as the U.S., social optima are constrained by the government's conflicting roles as regulator and trustee of public fishery resources and facilitator of private fishing enterprises (Eagle 2007, Eagle and Kuker 2010). Regulators may be "captured" by industry (Stigler 1971, Peltzman 1976, 1993) and the power of governments to prohibit or compel and to take or give money selectively benefits or harms industries and their members (Stigler 1971). Regulatory claims of the Takings Clause, which states that private property shall not be taken for public use without just compensation, are challenging "the proper relationship between the individual and the state" (Epstein 1985, as quoted in Eagle 2007:3) and among all individual citizens, governed and represented by the state. Resolving ethical issues of distributive justice regarding public goods (Raymond 1996), such as evolving the Public Trust Doctrine (Fletcher 2006) to oblige not just state, but

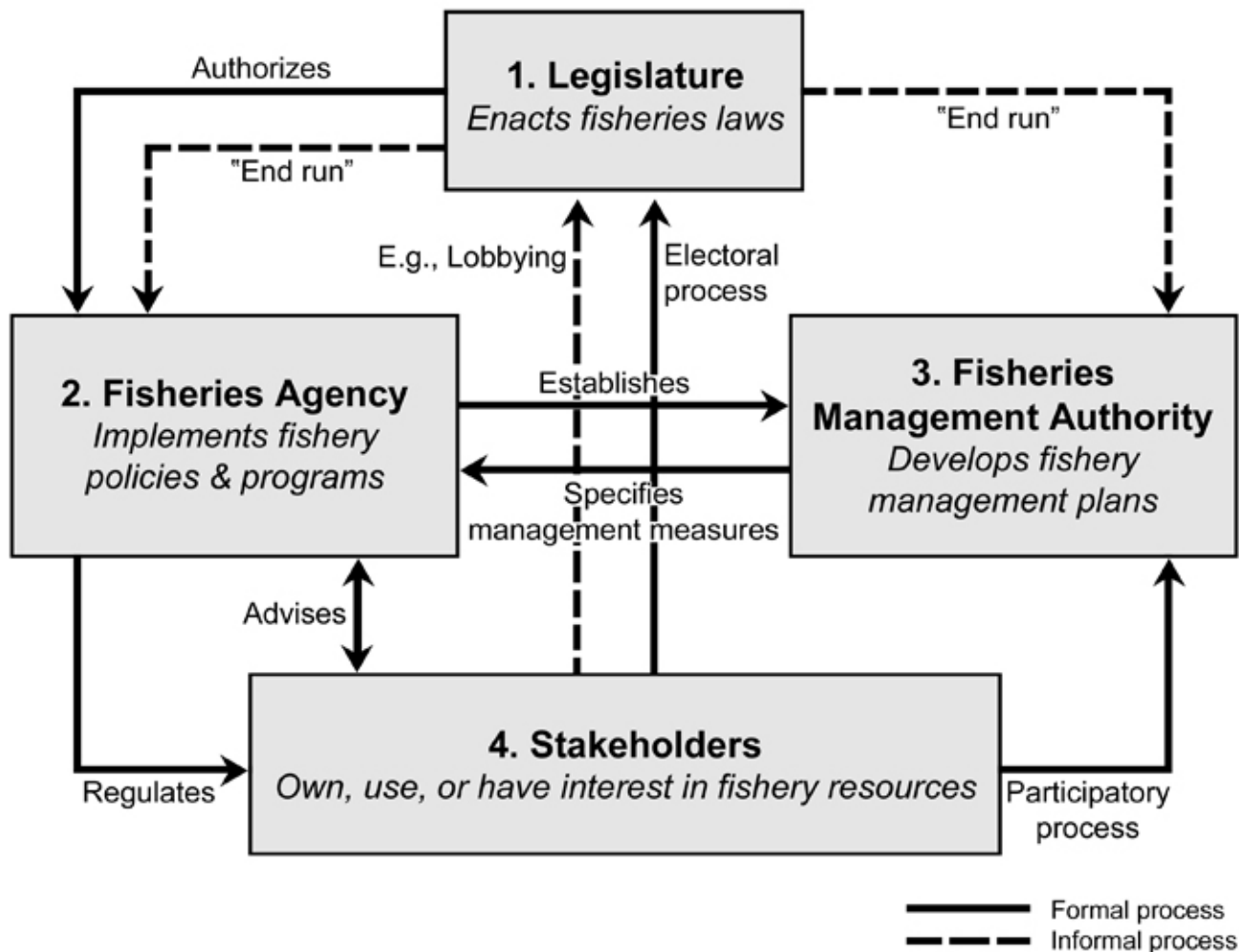
also federal governments to sustainably manage ocean resources for public interests (Turnipseed et al. 2009), are now redefining the social contract in fisheries. In collaborative (Zadek 2006) or interactive fisheries governance (Kooiman 2003, Kooiman et al. 2005, Jentoft 2007), governments, markets, and civil society interact to design policy through social institutions (Acheson 2006), mechanisms (Garcia and Charles 2008), and benchmarks (Grafton et al. 2007) that align private and public interests. Socially desirable outcomes can be achieved with minimal transaction costs (Wilson 2007) by regulating individual behaviors with incentives and granting rights of use with social obligations, such as in community transferrable quotas (Wingard 2000).

## **The Economic Perversion of Government Fishing Subsidies**

Fishing subsidies, including direct and indirect monetary transfers from governments to fishing industries (Munro and Sumaila 2002), underscore the political inefficacy and complexity of government regulations. Estimated at U.S. \$25–\$29 billion in 2003 for 148 fishing countries (Sumaila et al. 2009), subsidies offset fuel and nonfuel costs for private enterprises that otherwise would be unprofitable, if fully exposed to market forces. Subsidies distort local and global markets, with significant trade and distributional implications and adverse impacts on resource management and sustainability (Munro and Sumaila 2002). Countering Adam Smith's "invisible hand," the visible hand of subsidies now skews the global fisheries market to perpetuate historical power imbalances, both within and among countries. Subsidies enable developed countries to feed their citizens' protein-rich and specialized appetites, even as global supplies decline and food insecurity rises in developing countries (Alder et al. 2008). They disadvantage small-scale fisheries in the remote, poorer regions of developed countries (Ommer 2000), as well as developing countries with fishing access agreements, negotiated and paid by industrialized countries to access their coastal waters, e.g., Spain or France and West African countries (Kaczynski and Fluharty 2002).

Government fishing subsidies exist for at least four reasons (see Sumaila et al. 2008): (1) historical: when fishing countries introduced subsidies, their economic competitiveness was enhanced, as

**Fig. 2.** Fisheries governance system (modified from Sutinen and Soboil 2003:303).



The fisheries governance system typically consists of four interacting components: (1) Legislature, (2) Fisheries Agency, (3) Fisheries Management Authority, and (4) Stakeholders. A formal process is any governance mechanism that links these components in developing and implementing fisheries laws, policies, and management plans, including elections, regulations, advising, and participatory decision making. An informal process is any political interference, such as stakeholder lobbying, legal action, campaign contributions, publicity campaigns, and “end runs” (see, for example, Sissenwine and Mace 2003), whereby dissatisfied stakeholders engage elected representatives to pressure the fisheries agency or management authority to change management or policy to outcomes favorable to their interests.



industrial fleets were expanding to distant waters and stocks were still underexploited (i.e., more subsidies, more catch), (2) political: as subsidies became entrenched, they instilled a sense of entitlement and dependence of fishing enterprises and communities on them, so despite that they now contribute to more fish being caught than is sustainable, the political will to eliminate them is lacking (i.e., more subsidies, more overfishing, but more political support), (3) economic: unilateral removal of subsidies would economically disadvantage individual countries within the global fisheries market, yet not reduce overfishing (i.e., less subsidies, less national revenue, yet still overfishing), and (4) social: by maintaining the vitality of remote coastal and rural fishing communities, migration to urban centers and encroachment from neighboring countries is reduced (i.e., more subsidies, more community resilience).

## **MISSING AT SEA: SOCIETAL FEEDBACK**

### **Coupling Private Rights with Social Responsibilities**

In public ownership, government agencies make decisions on behalf of their citizens, to whom they have a fiduciary responsibility to manage fishery resources for societal benefit. However, rights of access are granted to fishing enterprises without a legal responsibility to compensate the public treasury, i.e., they do not pay for the privilege to fish. Citizens do not share the profit if fisheries do well and benefit only by having access to seafood if they pay market prices. If public resources become scarce, either because of poor management or environmentally destructive extraction, the consumer pays more for the resources he or she owns. Society's collective rights to its fishery resources are thus violated by the absence of corresponding moral duties when private rights of access and withdrawal are given under a government's fiduciary rights of management and exclusion. Lack of manifest legal and moral responsibilities with rights granted to fish creates a perverse incentive structure and encourages further and faster depletion, as free private access to public resources increases both private and landed values of scarce fishery resources. For example, amid calls for a world trade ban on the threatened fish species, a single bluefin tuna was sold for 16.28 million yen

(U.S. \$175,000) at a Tokyo fish market in the first global auction of 2010 (Burek 2010).

If social and environmental fishing costs and benefits were internalized and made explicit to citizens, public fisheries (Eagle and Kuker 2010) would be more responsible. Fishing enterprises could be required to pay governments for the privilege to fish (see also Lam 2010) by paying for access to fishery resources, as with royalty auctions for fixed-term permits (Macinko and Bromley 2002), and extraction fees for removal of living marine resources, as with fish landing fees (Bromley 2008). Corporate profits would thus be shared with citizens directly through reduced management costs, or indirectly through the public treasury to help fund social programs. With this explicit feedback, society would reap the benefits of a well-managed fishery and be better informed on the status of public fishery resources, as financial owners typically are of their stock assets. As awareness grows of their global impacts, consumers might also be more responsible in their purchasing decisions.

### **Internalizing the Costs of Fishing Subsidies**

Gross national fishing subsidies (Sumaila et al. 2009) provide an indirect measure of the implicit "willingness to pay" (WTP) by countries for captured wild fish, and the subsidies per capita provide an indirect measure of the implicit WTP by their citizens. If asked directly, would taxpayers be willing to pay these amounts to subsidize the fishing industry? Fish producers and consumers likely would, as costs for their fishing enterprises and fish diets are redistributed to the entire population, but nonconsumers and environmentalists might not. Subsidies may be beneficial (e.g., fisheries management programs and services), capacity enhancing (e.g., fuel and boat construction programs), or ambiguous (e.g., fisher assistance programs), but regardless of their impacts, we argue that these costs, estimated at U.S. \$4.6, \$4.1, and \$1.8 billion for Japan, Mainland China, and the United States, respectively (Sumaila et al. 2009), should be internalized by private fishing activities, i.e., borne by the fishing industry and consumers, not all taxpaying citizens. Government subsidies reflect, *inter alia*, the historical dependence of developing fishing countries to "catch up" to highly industrialized, developed countries in a "national race for fish," as well as the traditional dependence,

cultural value, and tastes of fishing countries and their citizens for fish. Now, subsidies symbolize a breach of the social contract in fisheries.

To put the perversity of fishing subsidies into perspective, consider the following analogy. You own rental property, and rather than earn rental income, you pay property tax as well as paying for its use, whereas your renter does not pay to rent, yet derives an income when others use your property, devaluing it in the process. Although fishers do invest labor and expenses to procure fish from the sea, the public owners are paying taxes to subsidize private enterprises beyond paying market prices as seafood consumers. We argue that, ethically, fishers should pay society for the privilege to access and extract fish, with duties to compensate, through fees from fishing licenses and landings, royalty auctions for assigned shares of the total allowable catch (Macinko and Bromley 2004, Bromley 2008) and investments to manage sustainable fisheries. Government agents should also be bound by duties of care to conserve fishery resources managed in trust (Turnipseed et al. 2009). The ethical lacuna, between governments as trustees and citizens as owners of the fishery resources, can be filled with information and responsibility that shares the societal costs and benefits of marine resource exploitation and conservation.

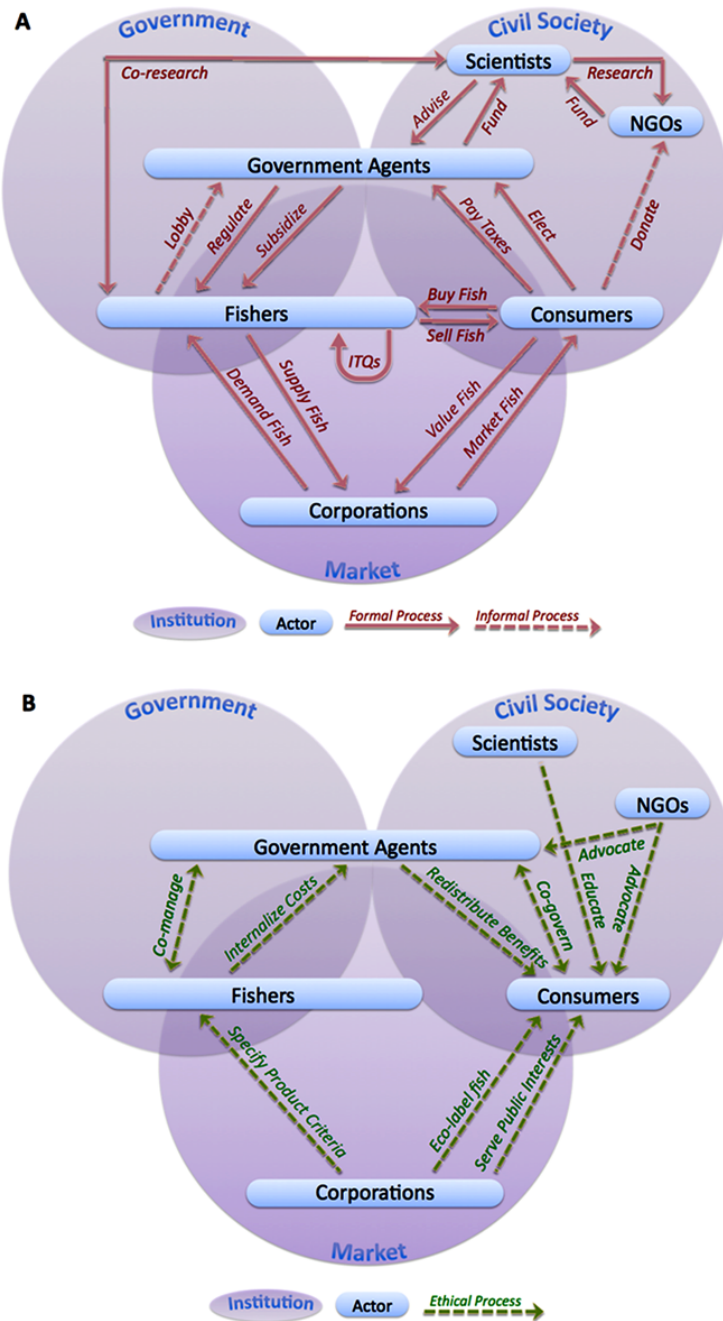
### **Sharing Fishing Power and Responsibility**

Accountability, legitimacy, and compliance in fisheries management and governance can be enhanced by sharing fishing power and responsibility, as well as their associated costs and benefits. Figure 3 depicts the evolving social contract for ethical fisheries, highlighting the formal, informal, and ethical processes linking three key human institutions (Juda 1999, Juda and Hennessey 2001): (1) government (political), responsible for national fisheries policy and management, (2) the market (economic), that determines the global fish supply and demand, and (3) civil society (social), the collective owners of the public fishery resources. Institutional processes or mechanisms are evolving to provide societal feedback that explicitly encompasses the ethical dimension of fisheries. In collaborative governance, power and responsibility are being shared among actors from within the public and private sectors: (1) government agents, (2) fishers, (3) corporations,

(4) consumers, (5) nongovernmental organizations (NGOs), and (6) scientists. Nationally, some government responsibilities, including those of regulator, facilitator, and trustee, are being devolved to civil society, with fishing costs and benefits redistributed to the private users and public owners of the resources. Fishers share scientific and social responsibilities in co-management arrangements (Jentoft 1989, Pinkerton and Weinstein 1995, Pinkerton 1999, Johannes et al. 2000, Johannes 2002, Weber and Iudicello 2005, Haggan et al. 2007) and ecolabeling schemes with NGOs (Jacquet and Pauly 2007). Public participation in environmental policy decision making is increasing (Garcia and Charles 2008), and encouraged (Bromley 2007), to promote social justice and meet societal needs.

Paralleling societal shifts for individuals, the rights and obligations of corporations are being redefined with globalization. The 2006 [United Nations Global Compact](#) presents a universal governance and values framework guiding corporate conduct, including a precautionary approach to environmental challenges, greater environmental responsibility, and environmentally friendly technology (White 2006). Encompassing this vision, a new corporate purpose has been proposed, transitioning from scale, growth, and profit maximization as intrinsic goods, “to harness private interests to serve the public interest” (White 2007). The rights of the corporation are being subordinated to the well-being of global citizens and the environment, with evolving corporate goals of societal solidarity, ecological sustainability, and quality of life promoting corporate responsibility (White 2006). Collaborative governance involves civil society organizations (White 2007) and public-private partnerships (Zadek 2006), such as the [Marine Stewardship Council](#), which offers third-party ecolabeling schemes to certify sustainable seafood products and sustainability assessments in the chain of custody that links suppliers to consumers, including processors, wholesalers, distributors, and large retailers such as Walmart and Loblaw. Providing transnational corporations that have strong purchasing power with information on the status of fish stocks and impacts of fisheries as, e.g., with [FishSource](#), may be effective in promoting market-based solutions (Jacquet et al. 2009). Thus, the social contract between society and business is shifting also, driven by evolving consumer preferences for sustainable seafood products, as

**Fig. 3.** Evolving a social contract for ethical fisheries.



Collaborative fisheries governance includes both (A) formal and informal and (B) ethical processes among key interacting human institutions and actors. Three human (political, economic, and social) institutions are depicted: (1) government, which makes fisheries policy and management decisions, (2) market, which influences private fishing activity and fish supply, based on global consumer preferences and demand, and (3) civil society, which comprises the broad, diffuse group of resource owners, including fishers, consumers, scientists, environmentalists, and government agents. Mechanisms are evolving to share power and responsibility among various political, economic, and social actors, from within both the public and private sectors: (i) government agents, elected representatives and public servants acting as regulators, facilitators, and trustees, who legislate and manage use of public fishery resources by private fishing enterprises, with implied fiduciary responsibilities to sustain fisheries and conserve marine resources for societal benefit, (ii) fishers, concentrated interest group who, operationally, have held the power, by being granted rights to fish without corresponding legal responsibilities or moral duties for the public fishery resources, although some do share scientific and social responsibilities in co-research, co-management, and ecolabeling, (iii) corporations, including corporate seafood traders, that is, wholesalers, processors, distributors, and retailers, who exchange fish on the market according to supply and demand, with financial power and increasing social responsibility to serve public interests, (iv) consumers, the largest subset of public owners, which has voting power, but the majority are often disinterested and ill-informed about fisheries, and so exercise influence predominantly through their purchasing power, and (v) nongovernmental organizations (NGOs) and (vi) scientists, which comprise two interested and informed subsets of public owners sharing some informal social and scientific responsibilities, by funding or conducting, respectively, policy-relevant fisheries research, educating the public, and communicating science to management and policy decision makers.

corporate interests can benefit from the delivery of public goods that translate into enhanced reputations and, ultimately, corporate profits (Zadek 2006).

Within civil society, NGOs and the people and foundations that fund them, e.g., [Greenpeace](#), the [World Wildlife Fund](#), and [Oceana](#), are advocating for greater social responsibility in protecting global marine resources and supporting local coastal communities, while the international academic community increasingly shares with government some scientific responsibilities of fisheries management and governance. Nongovernmental organizations serve informally as societal guardians by advocating for regulatory and legal guidelines that align private incentives with societal values, funding research projects and conservation programs, and informing the public of environmental issues. Academics serve society as unbiased scientific, legal, and policy advisers in fisheries, by contributing multidisciplinary, collaborative research, and educating the public. By devolving and decentralizing some of government's traditional scientific and social responsibilities to scientists, NGOs, corporations, fishing communities, and the public, the government's dual responsibilities to manage fishing enterprises and conserve marine resources for societal benefit may become less entangled and conflicted. Collaborative governance to evolve ethical fisheries is becoming politically feasible, as the behaviors and decisions of governments, corporations, and consumers within the global community are being constrained by emerging social institutions and environmental laws that reflect changing perceptions of human morality.

## CONCLUSION

To define a fair and binding social contract in fisheries, the true social and ecological, not just financial costs and benefits of fishing transactions need to be made explicit to individual fishers, fishing communities, and broader society. Only with responsible fisheries management and governance, through transparent, accessible, and accurate information, costs, and benefits, will the public become vested and responsible resource owners and stewards. To protect living fish, while also benefiting from the capture of wild fish, new legislation and governance mechanisms are needed to enable society to exercise its collective right and moral responsibility to minimize further ecological

damage. The global community has the power to vote in governments that will enact laws and design regulatory incentive structures to protect fish and society; it must also share the responsibility to determine what is acceptable for the present and desirable for future generations. Shifting societal baselines to redefine a dynamic social contract for ethical fisheries is thus a collective choice in which all citizens have a stake, and indeed, a right.

Responses to this article can be read online at:  
<http://www.ecologyandsociety.org/vol15/iss3/art16/responses/>

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## Acknowledgments:

We thank the Gordon and Betty Moore Foundation (GBMF) and M. E. Calcari for supporting this special feature and *The Privilege to Fish* symposium at the American Association for the Advancement of Science Annual Meeting 2008, where D. Pauly presented the paper's main thesis. Discussions with the symposium participants and contributing authors, notably T. J. Pitcher (corporate responsibility and Figure 3), J. G. Sutinen (governance), and U. R. Sumaila (subsidies), clarified our understanding. We also benefited from comments by M. Turnipseed, G. R. Munro, R. L. Trostler, C. Menzies, and two anonymous reviewers. M. Lam was funded by a GBMF Marine Conservation Initiative grant and D. Pauly by the Pew Charitable Trusts' Sea Around Us Project.

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## LITERATURE CITED

**Acheson, J. M.** 2006. Institutional failure in resource management. *Annual Review of Anthropology* 35:117–134.

**Agnew, D., J. Pearce, T. Peatman, T. J. Pitcher, and G. Pramod.** 2008. *The global extent of illegal fishing*. Marine Resources and Fisheries Consultants Ltd., London, UK, and Fisheries Ecosystems Restoration Research, Fisheries Centre, University of British Columbia, Vancouver, Canada.

**Alder, J., B. Campbell, V. Karpouzi, K. Kaschner, and D. Pauly.** 2008. Forage fish: from ecosystems to markets. *Annual Review of Environment and Resources* 33:153–166.

- Bader, H.** 1998. *Who has the legal right to fish? Constitutional and common law in Alaska fisheries management.* Marine Advisory Bulletin No. 49, University of Alaska Sea Grant College Program, Fairbanks, Alaska, USA.
- Beddington, J. R., D. J. Agnew, and C. W. Clark.** 2007. Current problems in management of marine fisheries. *Science* 316:1713–1716.
- Bergkamp, L.** 2001. *Liability and environment: private and public law aspects of civil liability for environmental harm in an international context.* Martinus Nijhoff, Leiden, The Netherlands.
- Berkes, F., D. Feeny, B. J. McCay, and J. M. Acheson.** 1989. Commentary: the benefits of the commons. *Nature* 340:91–93.
- Branch, T. A.** 2009. How do individual transferable quotas affect marine ecosystems? *Fish and Fisheries* 10:39–57.
- Bromley, D. W.** 1992. The commons, common property, and environmental policy. *Environmental and Resource Economics* 2:1–17.
- Bromley, D. W.** 2007. Environmental regulations and the problem of sustainability: moving beyond “market failure.” *Ecological Economics* 63:676–683.
- Bromley, D. W.** 2008. The crisis in ocean governance: conceptual confusion, spurious economics, political indifference. *MAST* 6(2):7–22.
- Bromley, D. W.** 2009. Abdicating responsibility: the deceptions of fisheries policy. *Fisheries* 34(6):280–290.
- Bundy, A., R. Chuenpagdee, S. Jentoft, and R. Mahon.** 2008. If science is not the answer, what is? An alternative governance model for the world’s fisheries. *Frontiers in Ecology and the Environment* 6(3):152–155.
- Burek, R.** 2010. Tuna hits highest price in nine years at Tokyo auction. BBC News, London, UK. [online] URL: <http://news.bbc.co.uk/2/hi/asia-pacific/8440758.stm>.
- Charles, A. T.** 2001. *Sustainable fishery systems.* Blackwell Science, Oxford, UK.
- Chu, C.** 2008. Thirty years later: the global growth of ITQs and their influence on stock status in marine fisheries. *Fish and Fisheries* 10:217–230.
- Clark, C. W., G. R. Munro, and U. R. Sumaila.** 2007. Buyback subsidies and the ITQ alternative. *Land Economics* 83:50–58.
- Clark, C. W., G. R. Munro, and U. R. Sumaila.** 2010. Limits to the privatization of fishery resources. *Land Economics* 86(2):209–218.
- Coase, R. H.** 1960. The problem of social cost. *The Journal of Law and Economics* 3:1–40.
- Copes, P.** 1986. A critical review of the individual quota as a device in fisheries management. *Land Economics* 62(3):278–291.
- Copes, P.** 2000. Aboriginal fishing rights and salmon management in British Columbia: matching historical justice with public interest. Pages 75–91 in E. E. Knudsen, C. R. Steward, D. D. MacDonald, J. E. Williams, and D. W. Reiser, editors. *Sustainable fisheries management: Pacific salmon.* CRC Press LLC, Lewis Publishers, Boca Raton, Florida, USA.
- Costanza, R., F. Andrade, P. Antunes, M. van der Belt, D. Boersma, D. F. Boesch, F. Catarino, S. Hanna, K. Limburg, B. Low, M. Molitor, J. G. Pereira, S. Rayner, R. Santos, J. Wilson, and M. Young.** 1998. Principles for sustainable governance of the oceans. *Science* 281:198–199.
- Costello, C., S. D. Gaines, and J. Lynham.** 2008. Can catch shares prevent fisheries collapses? *Science* 321:1678–1681.
- Coward, H., R. Ommer, and T. Pitcher, editors.** 2000. *Just fish: ethics and Canadian marine fisheries.* Social and Economics Papers No. 23, Institute of Social and Economics Research, Memorial University of Newfoundland, St. John’s, Newfoundland, Canada.
- Crutzen, P. J.** 2002. Geology of mankind: the anthropocene. *Nature* 415:23.
- Daley, B.** 2008. Ocean fishing for sport faces fee: millions of anglers would need license; US seeks better data on what is reeled in. *The Boston Globe*,

12 June 2008. [online] URL: [http://www.boston.com/news/local/massachusetts/articles/2008/06/12/ocean\\_fishing\\_for\\_sport\\_faces\\_fee/](http://www.boston.com/news/local/massachusetts/articles/2008/06/12/ocean_fishing_for_sport_faces_fee/).

**Daly, H. E.** 1991. *Steady-state economics: second edition with new essays*. Island Press, Washington, D.C., USA.

**Dasgupta, P. S.** 1982. *The control of resources*. Blackwell, Oxford, UK.

**Davis, K.** 1973. Zero population growth. *Daedalus* 102(4):15–30.

**Dietz, T., E. Ostrom, P. C. Stern.** 2003. The struggle to govern the commons. *Science* 302:1907–1912.

**Eagle, J.** 2007. A window into the regulated commons: the Takings Clause, investment security, and sustainability. *Ecology Law Quarterly* 34:619–654.

**Eagle, J., and A. Kuker.** 2010. Public fisheries. *Ecology and Society* 15(1): 10. [online] URL: <http://www.ecologyandsociety.org/vol15/iss1/art10/>.

**Epstein, R. A.** 1985. *Takings: private property and the power of eminent domain*. Harvard University Press, Cambridge, Massachusetts, USA.

**Ethórsson, E.** 2000. A decade of ITQ-management in Icelandic fisheries: consolidation without consensus. *Marine Policy* 24:483–492.

**Feeny, D., F. Berkes, B. J. McCay, and J. M. Acheson.** 1990. The tragedy of the commons: twenty-two years later. *Human Ecology* 18(1):1–19.

**Fletcher, K. M.** 2006. Regional ocean governance: the role of the Public Trust Doctrine. *Duke Environmental Law and Policy Forum* 16:187–204.

**Folke, C., T. Hahn, P. Olsson, and J. Norberg.** 2005. Adaptive governance of social–ecological systems. *Annual Review of Environment and Resources* 30:441–473.

**Fujita, R., and K. Bonzon.** 2005. Rights-based fisheries management: an environmentalist perspective. *Reviews in Fish Biology and Fisheries* 15:309–312.

**Garcia, S. M.** 1994. The precautionary principle: its implications in capture fisheries management. *Ocean and Coastal Management* 22(2):99–125.

**Garcia, S. M., and A. T. Charles.** 2008. Fishery systems and linkages: implications for science and governance. *Ocean and Coastal Management* 51:505–527.

**Gibbs, M. T.** 2009. Individual transferable quotas and ecosystem-based fisheries management: it's all in the T. *Fish and Fisheries* 10:470–474.

**Gordon, H. S.** 1954. The economic theory of a common-property resource: the fishery. *The Journal of Political Economy* 62(2):124–142.

**Grafton, R. Q., R. Arnason, T. Bjørndal, D. Campbell, H. F. Campbell, C. W. Clark, R. Connor, D. P. Dupont, R. Hannesson, R. Hilborn, J. E. Kirkley, T. Kompas, D. E. Lane, G. R. Munro, S. Pascoe, D. Squires, S. I. Steinshamn, B. R. Turriss, and Q. Weninger.** 2006. Perspective: incentive-based approaches to sustainable fisheries. *Canadian Journal of Fisheries and Aquatic Sciences* 63:699–710.

**Grafton, R. Q., T. Kompas, R. McLoughlin, and N. Rayns.** 2007. Benchmarking for fisheries governance. *Marine Policy* 31:470–479.

**Haggan, N., B. Neis, and I. G. Baird, editors.** 2007. *Fishers' knowledge in fisheries science and management*. Coastal Management Sourcebooks 4, UNESCO Publishing, Paris, France.

**Hanna, S. S.** 1998. Institutions for marine ecosystems: economic incentives and fishery management. *Ecological Applications* 8(1):S170–S174.

**Hannesson, R.** 2005. Rights based fishing: use rights versus property rights to fish. *Reviews in Fish Biology and Fisheries* 15:231–241.

**Hardin, G.** 1968. The tragedy of the commons. *Science* 162:1243–1248.

**Hardin, G.** 1972. *Exploring new ethics for survival: the voyage for the spaceship Beagle*. Viking, New York, New York, USA.

**Harris, D. C.** 2008. *The Boldt decision in Canada: Aboriginal treaty rights to fish in the Pacific*. In A. Harmon, editor. The power of promises: rethinking Indian treaties in the Pacific Northwest. University of Washington Press, Seattle, Washington, USA.

- Harris, D. C.** 2009. Aboriginal rights to fish in British Columbia. Pages 496–506 in R. B. Anderson and R. M. Bone, editors. *Natural Resources and Aboriginal Peoples in Canada*. Second edition. Captus, Concord, Ontario, Canada.
- Healey, M. C., and T. Hennessey.** 1998. The paradox of fairness: the impact of escalating complexity on fishery management. *Marine Policy* 22(2):109–118.
- Hilborn, R.** 2007a. Defining success in fisheries and conflicts in objectives. *Marine Policy* 31:153–158.
- Hilborn, R.** 2007b. Managing fisheries is managing people: what has been learned? *Fish and Fisheries* 8:285–296.
- Hilborn, R., T. A. Branch, B. Ernst, A. Magnusson, C. V. Minte-Vera, M. D. Scheuerell, and J. L. Valero.** 2003. State of the world's fisheries. *Annual Review of Environment and Resources* 28:359–399.
- Hilborn, R., J. M. (L.) Orensanz, and A. M. Parma.** 2005a. Institutions, incentives and the future of fisheries. *Philosophical Transactions of the Royal Society B* 360:47–57.
- Hilborn, R., J. K. Parrish, and K. Litle.** 2005b. Fishing rights or fishing wrongs? *Reviews in Fish Biology and Fisheries* 15:191–199.
- Huppert, D. D.** 2005. An overview of fishing rights. *Reviews in Fish Biology and Fisheries* 15:201–215.
- Jacquet, J., J. Hocevar, S. Lai, P. Majluf, N. Pelletier, T. Pitcher, E. Sala, R. Sumaila, and D. Pauly.** 2009. Conserving wild fish in a sea of market-based efforts. *Oryx, The International Journal of Conservation* 1–12.
- Jacquet, J. L., and D. Pauly.** 2007. Trade secrets: renaming and mislabeling of seafood. *Marine Policy* 32:309–318.
- Jentoft, S.** 1989. Fisheries co-management: delegating government responsibility to fishermen's organizations. *Marine Policy* 13(2):137–154.
- Jentoft, S.** 2003. A social contract for fisheries? *Samudra Report* 35:14–18. [online] URL: <http://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/2905/art03.pdf?sequence=1>.
- Jentoft, S.** 2007. Limits of governability: institutional implications for fisheries and coastal governance. *Marine Policy* 31:360–370.
- Jentoft, S., and B. McCay.** 1995. User participation in fisheries management: lessons drawn from international experiences. *Marine Policy* 19(3):227–246.
- Johannes, R. E.** 2002. The renaissance of community-based marine resource management in Oceania. *Annual Review of Ecology and Systematics* 33:317–340.
- Johannes, R. E., M. M. R. Freeman, and R. J. Hamilton.** 2000. Ignore fishers' knowledge and miss the boat. *Fish and Fisheries* 1:257–271.
- Johnsen, D. B.** 2009. Salmon, science, and reciprocity on the Northwest Coast. *Ecology and Society* 14(2): 43. [online] URL: <http://www.ecologyandsociety.org/vol14/iss2/art43/>.
- Juda, L.** 1999. Considerations in developing a functional approach to the governance of large marine ecosystems. *Ocean Development and International Law* 30:89–125.
- Juda, L., and T. Hennessey.** 2001. Governance profiles and the management of the uses of large marine ecosystems. *Ocean Development and International Law* 32:43–69.
- Kaczynski, V. M. and D. L. Fluharty.** 2002. European policies in West Africa: who benefits from fisheries agreements? *Marine Policy* 26:75–93.
- Kinzig, A. P., D. Starrett, K. Arrow, S. Aniyar, B. Bolin, P. Dasgupta, P. Ehrlich, C. Folke, M. Hanemann, G. Heal, M. Hoel, A. Jansson, B.-O. Jansson, N. Kautsky, S. Levin, J. Lubchenco, K.-G. Mäler, S. W. Pacala, S. H. Schneider, D. Siniscalco, and B. Walker.** 2003. Coping with uncertainty: a call for a new science–policy forum. *Ambio* 32:330–335.
- Kirsch, S.** 2001. Lost worlds: environmental disaster, “culture loss,” and the law. *Current Anthropology* 42(2):167–198.
- Kooiman, J.** 2003. *Governing as governance*. Sage, London, UK.

- Kooiman, J., M. Bavinck, S. Jentoft, and R. Pullin, editors.** 2005. *Fish for life: interactive governance for fisheries*. Amsterdam University Press, Amsterdam, Netherlands.
- Kuperan, K. and J. G. Sutinen.** 1998. Blue water crime: deterrence, legitimacy, and compliance in fisheries. *Law and Society Review* 32(2):309–338.
- Lam, M. E.** 2010. Of fish and fishermen: shifting baselines to protect our ecology and society. *Ecology and Society*, in press.
- Lauck, T., C. W. Clark, M. Mangel, and G. R. Munro.** 1998. Implementing the precautionary principle in fisheries management through marine reserves. *Ecological Applications* 8(1):S72–S78.
- Libecap, G. D.** 2008. Open-access losses and delay in the assignment of property rights. *Arizona Law Review* 50(2):379–408.
- Ludwig, D., R. Hilborn, and C. Walters.** 1993. Uncertainty, resource exploitation, and conservation: lessons from history. *Science* 260:17–36.
- Macdonald, J. M.** 1995. Appreciating the Precautionary Principle as an ethical evolution in ocean management. *Ocean Development and International Law* 26:255–286.
- Macinko, S., and D. W. Bromley.** 2002. Who owns America's fisheries? Island Press, Washington, D. C., USA.
- Macinko, S., and D. W. Bromley.** 2004. Property and fisheries for the twenty-first century: seeking coherence from legal and economic doctrine. *Vermont Law Review* 28:623–661.
- Mangel, M., L. M. Talbot, G. K. Meffe, M. T. Agardy, D. L. Alverson, J. Barlow, D. B. Botkin, G. Budowski, T. Clark, J. Cooke, R. H. Crozier, P. K. Dayton, D. L. Elder, C. W. Fowler, S. Funtowicz, J. Giske, D. Ludwig, K. Magnusson, B. S. Malayang III, C. Mann, E. A. Norse, S. P. Northridge, W. F. Perrin, C. Perrings, R. M. Peterman, G. B. Rabb, H. A. Regier, J. E. Reynolds III, K. Sherman, M. P. Sissenwine, T. D. Smith, A. Starfield, R. J. Taylor, M. F. Tillman, C. Toft, J. R. Twiss, Jr., J. Wilen, and T. P. Young.** 1996. Principles for the conservation of wild living resources. *Ecological Applications* 6(2):338–362.
- McCay, B. J., and S. Jentoft.** 1998. Market or community failure? Critical perspectives on common property research. *Human Organization* 57(1):21–29.
- Menzies, C. R. and C. F. Butler.** 2007. Returning to selective fishing through indigenous fisheries knowledge. *The American Indian Quarterly* 31(3):441–464.
- Mora, Camilo, R. A. Myers, M. Coll, S. Libralato, T. J. Pitcher, U. R. Sumaila, D. Zeller, R. Watson, K. J. Gaston, and B. Worm.** 2009. Management effectiveness of the world's marine fisheries. *PLoS Biology* 7(6):1–11.
- Munro, G., and U. R. Sumaila.** 2002. The impact of subsidies upon fisheries management and sustainability: the case of the North Atlantic. *Fish and Fisheries* 3:233–290.
- National Council for Science and the Environment (NCSE).** 2000. Recommendations for improving the scientific basis for environmental decisionmaking. NCSE, Washington, D.C., USA.
- O'Brien, K., B. Hayward, and F. Berkes.** 2009. Rethinking social contracts: building resilience in a changing climate. *Ecology and Society* 14(2):12 [online] URL: <http://www.ecologyandsociety.org/vol14/iss2/art12/>.
- Olson, M., Jr.** 1965. The logic of collective action: public goods and the theory of groups. Harvard University Press, Cambridge, Massachusetts, USA.
- Okey, T.** 2003. Membership of the eight Regional Fishery Management Councils in the United States: are special interests over-represented? *Marine Policy* 27:193–206.
- Ommer, R.** 2000. The ethical implications of property concepts in a fishery. Pages 117–139 in H. Coward, R. Ommer, and T. Pitcher, editors. *Just fish: ethics and Canadian marine fisheries*. Social and Economics Papers No. 23, Institute of Social and Economics Research, Memorial University of Newfoundland, St. John's, Newfoundland, Canada.
- Ostrom, E.** 1990. *Governing the commons: the evolution of institutions for collective action*. Cambridge University Press, New York, New York, USA.



- Ostrom, E., J. Burger, C. B. Field, R. B. Norgaard, and D. Policansky.** 1999. Revisiting the commons: local lessons, global challenges. *Science* 284:278–282.
- Pardy, B.** 2005. In search of the holy grail of environmental law: a rule to solve the problem. *McGill International Journal of Sustainable Development Law and Policy* 1(1):30–57.
- Pauly, D.** 2007. The *Sea Around Us* Project: documenting and communicating global fisheries impacts on marine ecosystems. *Ambio* 36(4):290–295.
- Pauly, D., J. Alder, E. Bennett, V. Christensen, P. Tyedmers, and R. Watson.** 2003. The future of fisheries. *Science* 302:1359–1361.
- Pauly, D., V. Christensen, J. Dalsgaard, R. Froese, and F. Torres Jr.** 1998. Fishing down marine food webs. *Science* 279:860–863.
- Pauly, D., V. Christensen, S. Guénette, T. J. Pitcher, U. R. Sumaila, C. J. Walters, R. Watson, and D. Zeller.** 2002. Towards sustainability in world fisheries. *Nature* 418:689–695.
- Peltzman, S.** 1976. Toward a more general theory of regulation. *Journal of Law and Economics* 19 (2):211–240.
- Peltzman, S.** 1993. George Stigler's contribution to the economic analysis of regulation. *The Journal of Political Economy* 101:818–832.
- Pinkerton, E.** 1999. Directions, principles, and practice in the shared governance of Canadian marine fisheries. Pages 340–354 in Newell, D. and R. E. Ommer, editors. *Fishing places, fishing people*. University of Toronto Press, Toronto, Ontario, Canada.
- Pinkerton, E., and D. N. Edwards.** 2009. The elephant in the room: the hidden costs of leasing individual transferable fishing quotas. *Marine Policy* 33:707–713.
- Pinkerton, E., and M. Weinstein.** 1995. *Fisheries that work. Sustainability through community-based management*. The David Suzuki Foundation, Vancouver, British Columbia, Canada.
- Pitcher, T. J., P. J. B. Hart, and D. Pauly, editors.** 1998. *Reinventing fisheries management*. Chapman and Hall Fish and Fisheries Series 23. Kluwer, Dordrecht, The Netherlands.
- Pitcher, T. J., D. Kalikoski, G. Pramod, and K. Short.** 2009. Commentary: not honouring the code. *Nature* 457:658–659.
- Pitcher, T. J., and M. E. Lam.** 2010. Fishful thinking: rhetoric, reality and the sea before us. *Ecology and Society* 15(2): 12. [online] URL: <http://www.ecologyandsociety.org/vol15/iss2/art12/>.
- Poostchi, B.** 1996. Follow-up to the 1993 green paper on environmental liability. *Review of European Community and International Environmental Law* 5(4):328–334.
- Raymond, L.** 1996. The ethics of compensation: takings, utility, and justice. *Ecology Law Quarterly* 23:577–622.
- Rockström, J., W. Steffen, K. Noone, Å. Persson, F. S. Chapin, III, E. F. Lambin, T. M. Lenton, M. Scheffer, C. Folke, H. J. Schellnhuber, B. Nykvist, C. A. de Wit, T. Hughes, S. van der Leeuw, H. Rodhe, S. Sörlin, P. K. Snyder, R. Costanza, U. Svedin, M. Falkenmark, L. Karlberg, R. W. Corell, V. J. Fabry, J. Hansen, B. Walker, D. Liverman, K. Richardson, P. Crutzen, and J. A. Foley.** 2009. A safe operating space for humanity. *Nature* 461:472–475.
- Rosenberg, A. A.** 2007. Fishing for certainty. *Nature* 449:989.
- Rosenberg, A. A.** 2009. Changing U.S. ocean policy can set a new direction for marine resource management. *Ecology and Society* 14(2):6. [online] URL: <http://www.ecologyandsociety.org/vol14/iss2/art6/>.
- Ruhl, J. B.** 2008. Making nuisance ecological. *Case Western Law Review* 58(3):753–785.
- Russ, G. R., and D. C. Zeller.** 2003. From *Mare Liberum* to *Mare Reservarum*. *Marine Policy* 27 (1):75–78.
- Safina, C.** 2003. Launching a sea ethic. *Wild Earth* 12(4):2–5.

- Safina, C., A. A. Rosenberg, R. A. Myers, T. J. Quinn II, and J. S. Collie.** 2005. U.S. ocean fish recovery: staying the course. *Science* 309:707–708.
- Schlager, E., and E. Ostrom.** 1992. Property-rights regimes and natural resources: a conceptual analysis. *Land Economics* 68(3):249–262.
- Scott, A.** 2008. The evolution of resource property rights. Oxford University Press, Oxford, UK.
- Scott, J. M., J. L. Rachlow, and R. T. Lackey.** 2008. The science–policy interface: what is an appropriate role for professional societies? *BioScience* 58(9):865–869.
- Sissenwine, M. P., and P. M. Mace.** 2003. Governance for responsible fisheries: an ecosystem approach. Pages 363–391 in M. Sinclair and G. Valdimarsson, editors. *Responsible fisheries in the marine ecosystem*. Food and Agriculture Organization (FAO), Rome, Italy.
- Steffen, W., P. J. Crutzen, and J. R. McNeill.** 2007. The Anthropocene: are humans now overwhelming the great forces of nature? *AMBIO: A Journal of the Human Environment* 36(8):614–621.
- Stigler, G. J.** 1971. The theory of economic regulation. *Bell Journal of Economics and Management Science* 2:3–21.
- Sumaila, U. R., J. Alder, and H. Keith.** 2006. Global scope and economics of illegal fishing. *Marine Policy* 30(6):696–703.
- Sumaila, U. R., A. S. Khan, A. J. Dyck, R. Watson, G. Munro, P. Tydemers, and D. Pauly.** 2009. A bottom-up re-estimation of global fisheries subsidies. *UBC Fisheries Centre Working Paper Series*. Working paper #2009-11. [online] URL: [ftp://ftp.fisheries.ubc.ca/FCWP/FCWP\\_2009-11\\_Sumaila.pdf](ftp://ftp.fisheries.ubc.ca/FCWP/FCWP_2009-11_Sumaila.pdf).
- Sumaila, U. R., L. Teh, R. Watson, P. Tydemers, and D. Pauly.** 2008. Fuel price increase, subsidies, overcapacity, and resource sustainability. *ICES Journal of Marine Science* 65:1–9.
- Sutinen, J. G., and K. Kuperan.** 1999. A socio-economic theory of regulatory compliance. *International Journal of Social Economics* 26 (1/2/3):174–193.
- Sutinen, J. G., and M. Soboil.** 2003. The performance of fisheries management systems and the ecosystem challenge. Pages 291–309 in M. Sinclair and G. Valdimarsson, editors. *Responsible fisheries in the marine ecosystem*. Food and Agriculture Organization (FAO), Rome, Italy.
- Trosper, R. L.** 2002. Northwest coast indigenous institutions that supported resilience and sustainability. *Ecological Economics* 41:329–344.
- Trosper, R. L.** 2003. Resilience in pre-contact Pacific Northwest social ecological systems. *Conservation Ecology* 7(3):6. [online] URL: <http://www.ecologyandsociety.org/vol7/iss3/art6/>.
- Trosper, R. L.** 2009. *Resilience, reciprocity and ecological economics: Northwest Coast sustainability*. Routledge Taylor and Francis Group, London, UK.
- Turnipseed, M., L. B. Crowder, R. D. Sagarin, and S. E. Roady.** 2009. Legal bedrock for rebuilding America’s ocean ecosystems. *Science* 324:183–184.
- Wackernagel, M., and W. E. Rees.** 1996. *Our ecological footprint: reducing human impact on the Earth*. New Society, Gabriola Island, British Columbia, Canada.
- Weber, M. L., and S. Iudicello.** 2005. *Obstacles and opportunities for community-based fisheries management in the United States*. Coastal Enterprises, Inc., Portland, Maine, USA. [online] URL: <http://www.ceimaine.org/images/stories/pdf/CommunityBasedFisheriesManagementReport.pdf>.
- White, A. L.** 2006. *Transforming the corporation: redesigning the corporation for social purpose*. Chapter 5, Tellus Institute Great Transition Initiative Paper Series: Frontiers of a Great Transition. [online] URL: <http://www.gtinitiative.org/documents/PDFFINALS/5Corporations.pdf>.
- White, A. L.** 2007. *Is it time to rewrite the social contract?* Occasional paper. Business for Social Responsibility. San Francisco, California, USA. [online] URL: [http://www.tellus.org/publications/files/BSR\\_AW\\_Social-Contract.pdf](http://www.tellus.org/publications/files/BSR_AW_Social-Contract.pdf).
- Wiber, M. G.** 2000. Fishing rights as an example of the economic rhetoric of privatization: calling for an implicated economics. *CRSA* 37:267–288.

**Williamson, O. E.** 1979. Transaction-cost economics: the governance of contractual relations. *The Journal of Law and Economics* **22**:233–261.

**Wilson, J.** 2007. Scale and costs of fishery conservation. *International Journal of the Commons* **1**:29–41.

**Wingard, J. D.** 2000. Community transferable quotas: internalizing externalities and minimizing social impacts of fisheries management. *Human Organization* **59**:48–57.

**Worm, B., E. B. Barbier, N. Beaumont, J. E. Duffy, C. Folke, B. S. Halpern, J. B. C. Jackson, H. K. Lotze, F. Micheli, S. R. Palumbi, E. Sala, K. A. Selkoe, J. J. Stachowicz, and R. Watson.** 2006. Impacts of biodiversity loss on ocean ecosystem services. *Science* **314**:787–790.

**Wyman, K. M.** 2008. The property rights challenge in marine fisheries. *Arizona Law Review* **50**(2):511–543.

**Zadek, S.** 2006. *The logic of collaborative governance: corporate responsibility, accountability and the social contract*. Corporate Social Responsibility Initiative, Working Paper No. 17. John F. Kennedy School of Government, Harvard University, Cambridge, Massachusetts, USA.

**Zalasiewicz, J., M. Williams, A. Smith, T. L. Barry, A. L. Coe, P. R. Bown, P. Brenchley, D. Cantrill, A. Gale, P. Gibbard, F. J. Gregory, M. W. Hounslow, A. C. Kerr, P. Pearson, R. Knox, J. Powell, C. Waters, J. Marshall, M. Oates, P. Rawson, and P. Stone.** 2008. Are we now living in the Anthropocene? *GSA Today* **18**(2):4–8.