Human Population Increase, Economic Growth, and Fish Conservation

Collision course or savvy stewardship?

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ABSTRACT: Globally, fishes and fisheries are in severe decline, driven in large part by economic and human population growth. Despite progress in environmental philosophies, legislation, and protection, conflicts between economic/human population growth and fish conservation remain and are intensifying at continental and global scales. The growth of the human enterprise *ad infinitum* is impossible because of dependence on finite resources; hence policies should leave a margin of error when dealing with the biophysical environment. We suggest a re-definition of Earth stewardship to serve as a conceptual bridge between ecology and economics, recognizing the hubris behind most economic models, which assume that the biosphere is a subset of the economy or else an externality, when in fact *Homo sapiens* is a species operating within the biosphere. Additional indicators that focus on a different suite of values (e.g., social justice, corporate responsibility, and ethics) would underscore the complexity of economic and human population growth effects on societies and ecosystems, and could help guide us away from unsustainable actions toward those that are "savvier" in terms of co-existence with the resources upon which we depend.

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Introduction

Over the past few years, a debate took place within the American Fisheries Society (AFS) as to whether or not to adopt a policy statement on economic growth, fisheries, and a fundamental conflict of these activities with fish biodiversity and conservation. The debate was a healthy one, and included a series of articles (e.g., Czech et al. 2004; Miller-Reed and Czech 2005; Bigford et al. 2006; Hyatt et al. 2007) that played out on the pages of this magazine for over two years. Ultimately, that policy was not adopted, the reason being that "…the draft document did not meet the rigorous requirements of a policy statement that would represent a position of the American Fisheries Society on the potential effects of economic activity on fish conservation" (Franzin 2009, p. 135). Franzin (2009) provides a full chronology of the debate.

As part of the vetting of the draft policy statement, three of us (KL, RH, DJ) were asked to develop a white paper, building upon the earlier work of a committee composed of members of the Water Quality Section and Resource Policy Committee. The intent of the white paper was to clarify points made in the draft, as well as to provide additional documentation of the need for such a policy. Here, we (together with BC) provide a condensed, updated version of the white paper and offer it as an opinion piece to the AFS readership. Our emphasis is on North American fisheries, but we recognize that the issue is a global one.

Globally, fisheries are in decline

Numerous studies indicate that wild fish and shellfish stocks are down virtually everywhere compared to several decades ago (Pauly and Palomares 2005, Myers and Worm 2003, SOFIA 2008), especially preferred stocks. Serial depletion of fish stocks by overfishing is a worldwide phenomenon (Pauly and Palomares 2005). Myers and Worm (2003) projected that 90 percent of large predatory fish are

gone from global oceans. Diadromous species are in massive decline, many by > 95 percent, in the North Atlantic (Limburg and Waldman 2009) and elsewhere.Unfortunately, in North America, examples abound (e.g., McEvoy 1986, Helfman 2007).…

The generic drivers of these adverse changes are human population and economic growth. A growing human population demands more fish for food (76 percent of world fisheries production) and other purposes (24 percent), causing more and more effort to be applied to continually decreasing stocks.…

From an economic perspective, overfishing is driven in part by overcapacity and subsidies (Sumaila and Pauly 2007). Furthermore, environmental change (e.g., global warming, land use, hydrological modification, and habitat alteration) and its attendant uncertainty result from human population and economic growth pressures. This sets the stage for increased incidence of unexpected events, tipping points, and sudden collapses. Increasingly, cultural eutrophication in a warming climate is tipping coastal ecosystems into hypoxic episodes that have direct and indirect impacts on fisheries. Low returns of Chinook salmon (*O. tshawytscha*) because of historical overexploitation and habitat change, coupled with poor ocean conditions, have predicated the closure of commercial and recreational fisheries for this species off the coasts of California and most of Oregon during the summers of 2008-2010 for the first time in history.

Native species in decline

Within North America, recent studies document marked declines in fish species and fish assemblages at regional and continental scales. At least 700 North American freshwater fishes are endangered, threatened, or vulnerable (Jelks et al. 2008); at least 167 distinct population segments of marine North American fishes are so classified (Musick et al. 2000).…

Human population and economic growth are major drivers for these declines, incorporating all sectors of the economy. In the U.S. and Canada, the leading anthropogenic factors currently contributing to fish species listings under the U.S. federal Endangered Species Act (ESA) and the Canadian Species At Risk Act (SARA) are surface water diversion, agriculture, invasive species, urbanization, and pollution, often in combination (Miller-Reed and Czech 2005, Rose 2005). These drivers are indicators of economic activity and they are especially acute in coastal areas where more than half of U.S. citizens reside, and where most growth is projected.…

Why we cannot grow (or shop) our way out of this problem

The U.S. comprises less than 5 percent of the world's population, but consumes over 30 percent of the resources used for economic growth (EarthTrends 2010). During the latter half of the twentieth century, U.S. per capita resource use rose 45 percent overall (Suzuki 1998). The economy of the U.S. depends heavily on fossil fuel combustion, accounting in 2005-2007 for approximately 21 percent of annual consumption worldwide (EIA 2010). Much of this characterizes a "consumer society" in which discretionary spending is a mass phenomenon stimulated by government policies, not just practiced by the rich or the middle classes.…

A common critique of GDP and GNP is that these are poor indicators of economic welfare, much less overall human welfare, yet they typically are assumed to be indicators of welfare by some economists and many policy makers. GDP and GNP reflect the amount of economic activity taking place. Concomitantly they reflect the amount of natural capital re-allocated from "the economy of nature" to the human economy (Czech 2008). That explains the tight connection of GDP and GNP growth with energy and material throughput (Daly and Farley 2003), and with environmental impacts such as biodiversity decline.…

There are many who believe that economic growth and technological innovation can solve environmental problems and maximize human welfare, a "win-win" strategy. Evidence suggests that this is a naïve and ultimately risky perspective, as recently demonstrated in the Deepwater Horizon oil spill catastrophe in the Gulf of Mexico and the current debate over risking the world's largest sustainable sockeye salmon (*Oncorhynchus nerka*) fishery (Bristol Bay, Alaska) for a few decades of copper (Keim 2010).…

Recognition that human activities can be used to mitigate the conflict between economic/population growth and fish conservation

Proactive stewardship of natural resources has deep roots in human history.… In North America there have been champions for earth stewardship whose voices were (fortunately) heard "in the wilderness" of nation-building enterprise.… In response, much has been done to protect and restore landscapes. In the U.S., national legislation and regulatory agencies were created during periods of progressive thought to mitigate the effects of economic and population growth, either directly or indirectly.…

However, the conflicts between human population and economic growth and fish conservation, while mitigated to some extent by the preceding initiatives, still remain and are intensifying at continental and global scales. Are we on a collision course with biodiversity and the Earth's restorative capabilities? If these conflicts are not proactively addressed, we will lose fish, fisheries, and treasured traditions of interacting with them. But if the conflicts are addressed proactively, we might enter into an era of "savvy stewardship."

A framework to assist society at large in re-directing lifestyles and satisfaction away from a consumptive perspective toward a sustainable perspective

There is a need for broad-reaching policy acknowledging that (1) economies and populations cannot grow *ad infinitum*, as they depend on finite resource bases (Meadows et al. 2004), (2) a margin of error should be left when dealing with the biophysical environment (the precautionary approach, Daly and Farley 2003), and (3) that fisheries management should be geared to protecting and fostering ecosystem services as much as for protection of single species of interest….

Re-definition of Earth stewardship serves as a conceptual bridge between ecology and economics. But what *are* the appropriate relationships of humans to the planet? Stewardship and respect for the Earth are often-repeated mantras of the conservation community, but the actions of society at large demonstrate these attitudes only infrequently. Rather, the "tragedy of the commons" (Hardin 1968) plays out repeatedly. And sadly, fisheries declines and collapses and threats to or loss of fish species form a solid core of cases in point.

Key to re-defining Earth stewardship is to recognize the hubris behind most economic models of humanity, which assume that the biosphere is a subset of the economy or else an externality, when in fact *H. sapiens* is a species operating within and as part of the biosphere (Costanza et al. 1997, Daly and Farley 2003)….

It is especially incumbent on the U.S., which exemplifies the highest population growth rate of the industrial democracies and is the poster child for conspicuous consumption, once again to lead the world in a different direction (Czech 2000). Our predecessors did exactly this with enlightened political discourse in the 1770s, the conservation movement of the late nineteenth century, and enlightened environmental protections in the 1970s.

In this vein, it has long been an obligation of professional societies as a group to support progressive policies for which some members, acting as individuals, might be threatened with scorn or firing. Such progressive policies provide essential political maneuvering space for managers, politicians, and citizens to freely discuss challenging issues and propositions that might otherwise appear radical or impossible. Therefore we, as members of professional scientific societies, call on the AFS, religious leaders, scientists, economists, journalists, and politicians, working in concert with fisheries and other natural resources professionals, to support a markedly reduced ecological footprint for much of North America by advocating and deliberately moving towards zero then negative population growth and economic growth, first in the U.S. and then throughout the North American continent.

We realize that this will not be easy, given current national and international policies and political perspectives. We also understand that the recommended actions should not occur so rapidly as to incur excessive social unrest (as witnessed by the current global recession). However, we (all North American nations) must move in this direction, because a Malthusian future in a massively degraded world with dysfunctional environmental services will be even more unpleasant than the prospects or even the manifestation of social unrest. There are multiple examples of societies and civilizations that have failed or faded into degraded landscapes (e.g., Diamond 2005), so there is no reason to believe that this is impossible for the U.S. and other high consuming nations. And because economies, resource demands, and environmental threats are global and interlinked, solutions ultimately must be global. But before the U.S. and other North American nations can take on the role of partnering with the global community and move towards a sustainable future, we must begin by doing so ourselves…. ■

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