Economic Growth as a Threat to Fish Conservation in Canada

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Introduction

The Economic Growth Forum has clearly demonstrated the links between economic growth and fish conservation from an American perspective. Czech and Pister (2005) introduced the macroeconomics of the fundamental conflict between economic growth and fish conservation; Krall (2005) provided a critique of conventional microeconomics as it applies to fisheries management and related natural resources; Whitehead et al. (2005) clarified aspects of the neoclassical economics perspective; Lackey (2005) outlined the conflict between economic growth and salmon recovery in the western United States; Ericson (2005) linked the threat of invasive species to economic growth via international trade; and Thompson and Alam (2005) illustrated the threat to fish conservation from the growing live bait industry in the United States. Miller Reed and Czech (2005) established the links between fish endangerment and the structure of the American economy. Such observations are not limited to the United States and evidence will be presented showing that the inland freshwater fisheries resources of Canada are suffering the consequences of the conflict between economic growth and conservation. Furthermore, it will also be demonstrated that threats faced by Canadian inland freshwater fish species are linked to Canadian economic sectors, and as the economy grows the threats will increase.

Threatened Freshwater Fishes in Canada

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was established by the government of Canada in 1977 as an independent body of experts responsible for identifying and assessing Canadian species considered to be at risk of extinction. COSEWIC uses a process based on science, aboriginal traditional knowledge, and community knowledge to classify species at risk of extinction. The function of COSEWIC was brought into law in 2003 with the passing of the Species at Risk Act (SARA). The purpose of SARA is to protect wildlife species (including vertebrates, invertebrates, plants, mosses, and lichens) at risk in Canada. Species that have been designated by COSEWIC may then qualify for legal protection and recovery under SARA.

COSEWIC has listed 467 species as *extinct, extirpated, endangered, threatened,* or *of special concern* (Canadian Wildlife Service 2004). Vertebrates account for 56% (262 records) of the listed species, and fish account for 32% (83 records) of that list. Canada is home to 230 resident species of freshwater fishes (Canadian Endangered Species Conservation Council 2001) and they make up the largest group of listed fishes with 83% (69 records). Of the freshwater fishes listed there are 4 *extinct* species and 3 *extirpated* species; 11 freshwater fishes and 3 anadromous fishes are listed as *endangered*; 18 are listed as *threatened*; and, 27 are listed as *of special concern*.

Sources of Fish Endangerment

COSEWIC catalogues the general reasons for fish endangerment. The threats faced by freshwater fishes include: habitat loss or degradation, pollution, exotic species, dams and barriers, water management, urban development, over-exploitation, climate change, and aquaculture. The most common threats are habitat loss or degradation, pollution, and exotic species. On average, the 69 different freshwater fishes are endangered by 2.4 causes each (i.e., they are being threatened by more than one factor). Table 1 summarizes the causes endangering the listed freshwater fish species in Canada.

All of the threats faced by the listed fishes can be linked directly or indirectly to specific economic sectors. The three leading sources of fish endangerment are examples of the effects of economic activity: habitat loss and degradation are linked most closely to the resource extraction sectors (e.g., mining and forestry) and the construction sector (e.g., transportation corridors, pipelines, utilities, and housing and business infrastructure); pollution is primarily a by-product of the mining, forestry, agricultural, chemical, petrochemical, and manufacturing sectors (e.g., heavy metals, herbicide, pesticide, PCBs, chlorine, dioxins, furans, endocrine disruptors, etc,); and alien invasive species are a by-product of the transportation sector (e.g., zebra mussels *Dreissena polymorpha* introduction from ship ballast water), the aquatic live food trade, the live bait industry, and the aquarium trade. The effects of dam construction and related water management are a result of the energy sector (e.g., hydroelectricity generation) and also the necessity of flood control to protect municipal and private infrastructure, thereby interfering in natural flow regimes, wetland and flood plain functions, and altering or eliminating important fish habitats.

The other listed sources are related to economic sectors as follows: urban development, including road construction, is linked to the construction sector and represents the proliferation of the labor force, light manufacturing, and service sectors (Miller Reed and Czech. 2005); over-exploitation is a result of the aboriginal, recreational, and commercial fishing industries (e.g., the primary cause of the

extinction of the blue walleye *Sander vitreum glaucus*); climate change is an indirect consequence of the energy, transportation and the manufacturing sectors (i.e., mainly an effect of our dependence on fossil fuels). Impacts associated with the aquaculture industry are habitat destruction, accidental release of alien invasive species, etc.

These finding are consistent with those of Freese and Trauger (2000) who reported that economic interests lead to loss of wildlife populations and biodiversity in four basic ways: over-harvesting of wild populations; conversions of habitat to alternative land uses; economic specialization in production of wild species, leading to habitat change and biodiversity loss; and negative environmental externalities, particularly contaminants.

Natural habitat changes were only linked to the endangerment of three fish species (e.g., Banff longnose dace *Rhinichthys cataractae smithi*) and in all cases habitat fragmentation or water fluctuations resulting from beaver activity were responsible for the threat.

Economic Objectives and the Continued Threat

Trauger et al. 2003 found that economic growth and wildlife conservation are conflicting societal goals and that economic growth is the overriding goal in the United States. This situation is mirrored in Canada. For example the mandate of the Department of Finance Canada (2003) states "the Department is committed to making a difference for Canadians by helping the government develop and implement economic, social, security and financial policies and programs that foster strong and sustainable economic growth, emphasizing fiscal, economic, social, and security objectives." The Canadian government also has the responsibility of fisheries conservation, which is one of several mandates of Fisheries and Oceans Canada. However economic growth appears to be the much higher priority of the Canadian government, which included in its overview of the 2005 budget a priority of "achieving a productive and growing economy" (Department of Finance Canada 2005). Perhaps this was tempered by another listed priority, "moving towards a green economy and sustainable communities," but the listing of both priorities suggests the Canadian government may not recognize the conflict between economic growth and economic sustainability.

The most compelling empirical evidence for the fundamental conflict between economic growth and fish and wildlife conservation was described by Trauger et al. 2003. They noted that a strong correlation exists between species endangerment and economic growth in the United States (R^2=98.4%) and that this correlation was no coincidence, but was based upon the fact that the causes of species endangerment were sectors of the American economy. Therefore as the economy grows, species become endangered at an increasing rate. Consider a system without humans; all natural capital is available as habitat for non-human species. As the scale of the human economy expands, natural capital is re-allocated from non-human uses to the human economy (Czech 2000). This demonstrates the ecological principle of competitive exclusion, with the human economy growing at the expense of other species.

The above mentioned relationship was also reported to be generally true for Canada (Trauger et al. 2003). The Canadian economy has been reasonably prosperous since 1997. Between 1997 and 2003, gross domestic product (GDP) growth was positive for the economy and the mean compound annual growth rate was 3.6% (Industry Canada 2005). The Canadian GDP in 2001 was roughly the GDP of the U.S. in the early 1970s and the number of listed species was also in the same range as the number of listed species in the United States during the early 1970s (Trauger et al. 2003). Therefore considering the relationship between economic growth and species endangerment, the fact that both the Canadian economy and number of listed species are similar to the United States in the 1970s, and the growth of U.S. and Canadian economies, it is reasonable to assume that the rate of species endangerment in Canada is also increasing.

Table 1. Sources of freshwater fish species endangerment in Canada.

Ranking	Source of Endangerment	Number of Species	% of Listed Species
1	Habitat Loss/Degradation	49	71.0%
2	Pollution	27	39.1%
3	Alien Invasive Species	22	31.9%
4	Barriers/Dams	14	20.3%
5	Water Management	13	18.8%
6	Urban Development	13	18.8%
7	Over Exploitations	9	13.0%
8	Natural Habitat Change	3	4.3%
9	Climate Change	3	4.3%
10	Aquaculture	1	1.4%

Source: Canadian Wildlife Service 2004 (www.speciesatrisk.gc.ca/)

Conclusion

The arguments put forth in the Economic Growth Forum are not limited to the United States. The inland freshwater fisheries resources of Canada are suffering similar consequences from the conflict between economic growth and biodiversity conservation. Thirty percent of Canada's freshwater fish species are listed by COSEWIC (Canadian Endangered Species Conservation Council 2001)

and they are threatened by the activities of economic sectors within the Canadian economy. Economic growth is a national Canadian goal. The economic growth rate is related to the rate of species endangerment, and as the economy grows so do the threats endangering our fisheries resources. Therefore fisheries resources will continue to be threatened, at an increasing rate, as long as the Canadian economy continues to grow, ensuring the competitive exclusion of fishes and other aquatic species.

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