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Can the United States have its fish and eat it too?

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ABSTRACT

As domestic affluence increases, nations advocate for conservation policies to protect domestic biodiversity that often curtail natural resource production activities such as fishing. If concomitant consumption patterns remain unchanged, environmentally conscious nations with high consumption rates such as the U.S. may only be distancing themselves from the negative environmental impacts associated with consuming resources and commodities produced elsewhere. This unintended displacement of ecosystem impacts, or leakage, associated with conservation policies has not been studied extensively in marine fisheries. This paper examines this topic, drawing on case studies to illustrate the ways in which unilateral marine conservation actions can shift ecosystem impacts elsewhere, as has been documented in land use interventions. The authors argue that the U.S. should recognize these distant ecological consequences and move toward greater self-sufficiency to protect its seafood security and minimize leakage as well as undertake efforts to reduce ecosystem impacts of foreign fisheries on which it relies. Six solutions are suggested for broadening the marine conservation and seafood consumption discussion to address leakage induced by U.S. policy.

1. Introduction

The implementation of biodiversity conservation policies usually translates into improved environmental quality but often at the expense of curtailed production activities. If concomitant consumption remains unchanged, environmentally conscious consumer nations may only be isolating themselves from the environmental impacts associated with consumed resources and commodities produced elsewhere [1–4]. Globalized trade moves agricultural products, natural resources, and manufactured goods from the producing but relatively low-income countries to consuming and relatively high-income countries [5–7]. One result of this demand for resources and commodities produced elsewhere is that consumer countries with strong environmental oversight can cause biodiversity threats to species located in the producer countries [7,8].

Due to the spatial separation of production from consumption activities, consumers in higher-income countries may be unaware or otherwise fail to account for the full environmental costs caused by the production of goods they utilize [9]. These negative environmental externalities, or impacts which manifest outside existing borders, are referred to as "leakage",[2] of which there are four types: conservation, production, consumption, and trade. Conservation leakage results when domestic measures to conserve resources lead to negative environmental impacts from an increase in foreign production to meet persistent demand; production leakage arises when regulation of domestic producers results in a transfer of production effort to foreign producers; consumption leakage results when unmet internal consumption demand is satisfied by external supplies (e.g., imports); and trade leakage results when an import ban from particular industries causes a redirection in the flow of trade to other consumer markets [11].

Leakage related to land use including forest conservation policies has been well documented at local and national [12–16] and at international [17–20] scales. Similar efforts to evaluate leakage caused

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[2] Leakage refers to the displacement of environmental impact occurring when use policies aimed at reducing environmental pressure in a particular locale lead to a countervailing effect in another locale, offsetting the intended benefits of the initial policy [10]. Other terms characterizing this concept include "unequal ecological exchange," "displaced environmental load," "market transfer effect" and "spillover."

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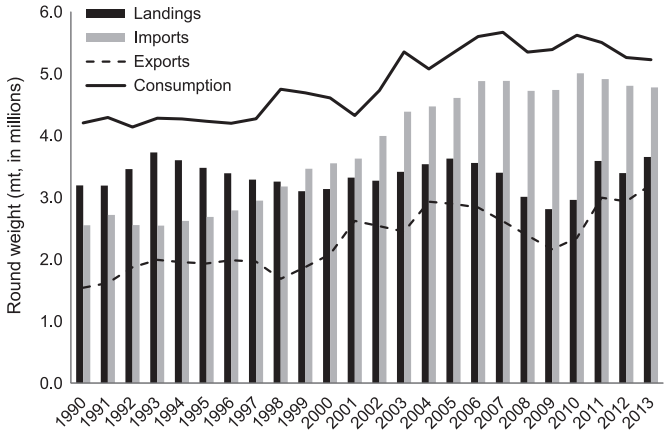

Fig. 1. U.S. consumption, landing and trade of edible fishery products by round weight, 1990–2013.
(Data source: NOAA National Marine Fisheries Service [26]).

by marine conservation policies affecting U.S. fishery production systems (*i.e.*, the capture or culture of finfish and shellfish resources) are limited (i.e., [21–25], even though the U.S. continues to be a major importer of seafood [26], ranked second only to Japan for all fishery and fishery product imports [27].

A recent debate has emerged over whether U.S. marine conservation policies[3] that curtail fishing activities externalize negative environmental impacts of U.S. seafood consumption to other jurisdictions. Some conservation policy advocates argue that marine conservation efforts in the U.S do not redistribute ecosystem impacts.[4] However, the potential for transnational leakages seems probable when U.S. consumers rely on fishery production systems beyond the reach of U.S. management authority. Given international trade in seafood products, a unilateral conservation regulation that reduces production in one nation's fishery can be met by increased production in another nation where such conservation measures may be less stringent, thereby offsetting the environmental protections in the regulated fishery. Furthermore, the limited availability of information on such conservation leakage impacts makes them difficult to detect - much less address [28,29].

This paper seeks to broaden the conversation about U.S. marine conservation policy to encompass the implications of leakage caused by outsourcing fishery production. The examination is set against the backdrop of U.S. seafood security, especially seafood self-sufficiency, that is, producing the food a nation needs or that which its population demands. Section 2 of this paper summarizes general U.S. consumption patterns on a global scale. Section 3 focuses on seafood consumption trends in the U.S. with particular attention to two examples of U.S. reliance on foreign imports. Section 4 discusses studies that have addressed the unintended external conservation, production, consumption, and trade impacts resulting from unilaterally imposed policies on U.S. fisheries. Following discussion in Section 5, Section 6 highlights potential solutions for addressing policy-induced leakage and provides concluding remarks.

2. Global consumption

The relationship between domestic economic growth and improved environmental quality was first hypothesized to follow the trajectory of the Kuznets curve where environmental degradation was predicted to decrease as national affluence increased (see review in Yandle et al. [30]. Rothman [31] was one of the first to argue that when international trade is considered, the behavior of the end-consumer rather than the producer is the principal driver of associated environmental impacts.

Various consumption-based approaches have been used to quantify ecological accountability among nations based on their consumption patterns and related impacts. Dietz et al. [32] used an ecological footprint[5] assessment for attributing environmental stresses to the country where consumption occurs. Of the 20 nations evaluated, the U.S. had the largest footprint, followed closely by China. Bradshaw et al. [35] assessed nations' relative environmental impacts on their rankings for seven environmental variables and concluded that Brazil, the U.S., China, Indonesia, Japan, Mexico, India, Russia, Australia and Peru had the highest absolute impact (i.e., total resource use, emissions produced, and species threatened). Consistent with Bradshaw et al. [35], Selles [36] ranked China, the U.S., India, Brazil, Russia, Indonesia, Mexico, Australia, Japan and Germany as having the highest overall impact based on their contributions to global resource consumption and ecological degradation. Using a material footprint approach, Wiedmann et al. [37] determined that by absolute value, the U.S. is the largest importer and China is the largest exporter of primary resources embodied in trade. Using a species-threats approach based on net trade balances and foreign consumption (i.e., biodiversity footprint), Lenzen et al. [8] concluded that out of 187 countries, the U.S., members of the European Union (primarily, Germany, France, U.K., Italy and Spain), and Japan were the top final destinations of traded commodities whose production posed the greatest threats to biodiversity.

3. U.S. seafood consumption

Fish and shellfish imports into the U.S. have accounted for an average of over 17% of animal food product imports annually since 1999.[6] Seafood imports have constituted up to 90%[7] by weight of domestically consumed seafood in recent years compared to 61% in the early 1990s (Fig. 1, Table 1). One reason for this increase is that while total U.S. seafood consumption has increased over the last two decades from an annual average of 4.2 million metric tons (mt) during the period 1990–1995 to 5.4 million mt for the period 2010–2013, production has not matched U.S. preferences and buying habits.

Two examples of imported seafood favored by U.S. consumers underscore this point. Average annual consumption of shrimp in the U.S. has increased from about 265,000 mt in the mid-1970s to about 670,000 mt in recent years, far exceeding U.S. production (Fig. 2). Wild-caught shrimp used to account for nearly all shrimp consumption in the U.S., but imported cultured shrimp increasingly has substituted for this commodity over the past decade. Imports now make up the largest proportion of shrimp consumed whether captured or cultured having increased nearly six-fold from about 91,000 mt in 1975 to 509,000 mt in 2013. Similarly, imported swordfish satisfies the majority of U.S. demand, accounting for more than 80% of U.S. swordfish consumption by weight (Fig. 3). Both per capita and total consumption of swordfish peaked during the late 1990s, with total U.S. consumption tapering off to half at around 20,000 mt over the last several years.

[3] U.S. marine conservation policies are embodied in and implemented through numerous statutes including the National Marine Sanctuaries Act, the Magnuson-Stevens Fishery Conservation and Management Act, the National Park Service Organic Act, the National Wildlife Refuge System Improvement Act, the Endangered Species Act, the Marine Mammal Protection Act, and more recently, the Antiquities Act.

[4] http://www.pcouncil.org/wp-content/uploads/K5c_SUP_PC_PPT3_TIRN_MAR2014BB.pdf (slide 9).

[5] Ecological footprint is one of many types of assessments used to assess the environmental impacts of production and consumption; other assessments include carbon and water footprints (see review by Galli et al. [33]). Life-cycle assessments are another tool used to measure such impacts [34].

[6] http://www.ers.usda.gov/data-products/us-food-imports.aspx#25418, accessed June 9, 2016.

[7] A portion of these imports are caught by U.S. fishermen, exported overseas for processing and then reimported.