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# INTERNATIONAL TRADE DEVELOPMENTS

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## Measuring the Link Between Trade and Environment: An Application to North American Fisheries

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*Using a method designed to provide an upper bound for measuring the effects on production and environmental indicators from trade liberalization for North American fisheries, the authors' final results imply that such effects are negligible.*

### Introduction

Despite substantial interest in measuring the links between trade liberalization and the environment,<sup>2</sup> economic theory offers an ambiguous causation between trade liberalization and environmental quality. Trade liberalization may help the environment, harm the environment, or leave it relatively unaffected, depending on particular circumstances. Little empirical work has addressed the issue of sustainability of fisheries under trade liberalization. The production of

ocean catch fisheries<sup>3</sup> can result in an overutilization of a renewable resource if the stocks of fish fall below a level that supports the maximum sustainable yield. Fishery stocks can also be underutilized if the current stocks are above the level necessary to support the maximum sustainable yield. Thus, changes in imports and exports—due to price changes—can affect production of fishery products, which can influence the utilization status of the fishery, moving it closer to or further away from the ideal situation of production at maximum sustainable yield. In this paper, the authors develop a method for measuring effects of NAFTA tariff elimination on North American fisheries production and such environmental indicators as stock levels and utilization rates.

The primary constraint in analyzing the links between trade liberalization and natural resource use is the incompatibility of trade, production, and environmental data. In the case of North American fisheries, these trade data are compiled in terms related to consumer goods. The HS tariff codes do not in fact identify fishery products by region of catch, and the tariff

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<sup>2</sup> Proceedings of recent international expert conferences on the topic include Per Fredriksson, ed. (1999), *Trade, Global Policy, and the Environment* (The World Bank: Washington, DC), OECD (1999), *Assessing the Environmental Effects of Trade Liberalisation Agreements: Methodologies* (OECD: Paris); and World Wildlife Fund and Futuro Latinoamericano (2000), *Background Material Prepared for the International Experts Meeting on Sustainability Assessments of Trade Liberalisation: 6-8 March 2000, Quito, Ecuador*; and the subsequent rapporteur's reports published

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<sup>3</sup> In this study, the authors examine common property ocean catch fisheries, as opposed to private fish farming enterprises.

codes are not always species-specific. On the other hand, fisheries production data and environmental indicators are compiled in terms of regions and species and not consumer goods. Imperfect concordance of trade statistics with production and environmental indicators complicates the analysis of many product and species categories. Currently available data cannot directly chart the changes in trade flows to sustainability of individual fisheries in North American waters.

The results, however, do suggest that NAFTA tariff elimination has a minimal impact on North American fishery trade flows. Although data constraints drawing conclusions regarding the specific effect of NAFTA on environmental indicators for most specific North American fisheries, currently available data on the size of trade flow changes relative to NAFTA country production and supply of fisheries products make it possible to observe indirectly the effect of NAFTA tariff liberalization on overall sustainability of North American fisheries. Even when using a methodology designed to provide an upper bound, the authors still find that final results are negligible. In the case of Mexico, which had the highest pre-NAFTA tariff rates, trade liberalization under NAFTA may have slightly relieved pressure on fisheries in the aggregate by permitting substitution of imported fish for domestic fish production. In the cases of Canada and the United States, the fact that trade occurs primarily in unprocessed fisheries products, with correspondingly low pre-NAFTA tariffs, implies that the effect of NAFTA tariff elimination on fisheries production also has been negligible.

## Measuring the Link Between Trade Flows and Environmental Indicators

Trade liberalization can stimulate increased trade, increasing production in the exporting country's fisheries sector. Similarly, substitution of imports for domestically caught fish may reduce pressure on the importing country's fisheries. Thus, the environmental effect of NAFTA trade liberalization on the sustainability of North American fisheries may be positive, negative, or negligible *a priori*. The health of the fishery prior to trade liberalization, as measured by its utilization status, will have a key impact on the effect of trade policy changes. If a fishery is underutilized by an exporting country, a significant increase in exports can increase the efficiency of resource use. Alternatively, a significant increase in imports will reduce stress on the

importing country's fishery. The data analysis must include environmental indicators on specific species and fisheries to estimate these trade liberalization effects on the health of a given fishery.

## Data Issues

Some analysts express concern about the feasibility of showing cause-and-effect between trade policies and environmental indicators.<sup>4</sup> These difficulties arise as a result of data constraints, measurement errors, or choice of modeling. Concordance problems are particularly severe in trade-environment research since data on environmental indicators are frequently collected for different purposes, and use different categories, than data on economic indicators. In order to estimate potential effects of NAFTA tariff liberalization on North American fisheries, data were examined on tariffs, trade flows, fisheries production, and environmental indicators.<sup>5</sup>

Data on trade flows between Canada, Mexico, and the United States are available by HS categories. All of HS chapter 3 and two subheadings in chapter 16 (1604-1605) capture most trade in fisheries products. The HS tariff line descriptions in chapter 16 represent processed consumer products, such as frozen fillets, fish roe, or canned tuna. Many tariff lines include unidentified or mixed species. The categories used in production and trade data are primarily motivated by commercial interests rather than environmental interests. Data on fisheries environmental indicators are based on species-specific regional locations that account for habitats and migration routes of the fish. A fish species habitat identified by an environmental indicator may not match regions identified in production data. Moreover, the categorization of fisheries regions by different organizations collecting production and sustainability data is nonstandard. The U.S. National

<sup>4</sup> Commission for Environmental Cooperation (CEC) (1999), *Assessing Environmental Effects of the North American Free Trade Agreement (NAFTA): An Analytic Framework (Phase II) and Issue Studies* (Montreal, CEC), p. 45.

<sup>5</sup> Data and information sources: Food and Agricultural Organization of the United Nations, *Fish and Fishery Products*, FAO Fisheries Circular No. 821 Revision 4 (1998), Rome, Italy; Food and Agriculture Organization of the United Nations, *The State of the World Fisheries and Aquaculture 1996*, Rome, Italy, (1997); Stock Status Reports of the Canadian Stock Assessment Secretariat (CSAS), Fisheries and Oceans Canada, found at Internet address <http://www.ncr.dfo.ca/csas/csas/status>; National Marine Fisheries Service, *Our Living Oceans: Report on the Status of U.S. Marine Resources, 1999*; U.S. Department of Commerce NOAA Technical Memo NMFS-F/SPO-41; and U.S. International Trade Commission data web, compiled from official statistics of the U.S. Department of Commerce, found at Internet address <http://www.usitc.gov>.

Marine Fisheries Service's (NOAA) environmental indicators include only fisheries within the 200-mile Exclusive Economic Zone (EEZ) of the United States, while the data of the U.N. Food and Agricultural Organization (FAO) include all oceans. Thus, data on U.S. fisheries in the Pacific Ocean are divided into the Alaska Region, the Pacific Coast Region (continental United States), and the Western Pacific Region (the EEZ around Hawaii and other U.S. islands), while the comparable data for the FAO are categorized under the Western Pacific, the Eastern Central Pacific, and the Western Pacific, none of which come close to matching the NOAA regions or the regional indicators available for some species in the U.S. trade data.

## Trade Policy Analysis

The strongest conclusion from the current research concerns the magnitude of NAFTA tariff-induced changes on North American trade flows and the relative importance of these trade flow changes with respect to North American production and supply of fisheries products. Table 1 illustrates that most tariffs on fisheries trade in North America were low even prior to NAFTA tariff liberalization. Categories with significant applied tariffs included imports of processed products (HS 1604-1605) by all three NAFTA countries and imports of primary products (HS chapter 3) by Mexico. Although Canada and the United States had low pre-NAFTA average applied tariff rates in HS chapter 3, there were a few lines with tariff peaks. (See Table 1.)

Canada and Mexico are consistently net exporters of fisheries products, while the United States is consistently a net importer. For the period 1992-1995,<sup>6</sup> Canada exported approximately two-thirds of fishery output and imported approximately two-thirds of supply for the domestic market. Over the same period, U.S. exports constituted 20 to 25 percent of output and imports contributed 40 percent to U.S. supply. The Mexican market is the most protected of the three, as measured by the height of tariffs, as well as the most closed as measured by the ratio of trade to supply and demand, with exports accounting for only 5 to 20 percent of output and imports contributing about 3 to 6 percent of Mexican supply.<sup>7</sup>

<sup>6</sup> This data period contains two pre-NAFTA and two post-NAFTA observations.

<sup>7</sup> For a more detailed description of trade shares for the first 5 years of NAFTA, see the USITC Office of Economics Working Paper EC2000-09b, "NAFTA Environmental Impacts on North American Fisheries," table 2, downloadable at <ftp://ftp.usitc.gov/pub/reports/studies/EC200009b.pdf>.

It should be noted that intra-NAFTA trade accounts for a minority of fishery products trade of the NAFTA member countries. About 42 percent of Canada's fisheries imports, 50 percent of Mexico's imports, and 78 percent of U.S. imports during the first 5 years under NAFTA were from non-NAFTA countries. When the intra-NAFTA fisheries products trade is limited to high-tariff NAFTA trade (HS 1604-1605 for all NAFTA members and HS 03 for Mexico), the volume is relatively small compared to total fisheries trade for Canada and the United States. High-tariff NAFTA trade shares were 7.2 percent for Canadian fishery exports and 9.2 percent for imports. High-tariff NAFTA imports accounted for 4.8 percent of total U.S. exports and 2.4 percent of U.S. imports of fishery products. Mexico was the exception with a 19.4-percent share for high-tariff NAFTA fisheries exports and a 50.4-percent share for imports. As previously mentioned, Mexico had the largest share of high-tariff NAFTA trade to total trade due to the higher incidence of significant pre-NAFTA tariffs in HS chapter 3 and HS 1604-1605.

How can NAFTA tariff eliminations in the high-tariff NAFTA trade categories be linked to potential changes in production and domestic supply in the NAFTA member countries? These effects can be calculated using the following method. The relative importance of intra-NAFTA exports as a share of domestic production was determined for each NAFTA member using HS-based trade flow data as measured in product weight. A ratio of high-tariff NAFTA fisheries exports to NAFTA member fisheries exports to the world gives the relative importance of trade in the pre-NAFTA high-tariff categories. Another ratio was constructed of NAFTA member fisheries exports to the world divided by fisheries production measured in live weight equivalent. The first ratio was multiplied by the second ratio to obtain high-tariff NAFTA fisheries exports as a share of domestic fisheries production. Using the same method, the relative importance of intra-NAFTA fisheries imports was calculated as a share of a each NAFTA member country's domestic fisheries supply. The calculated ratios show high-tariff NAFTA fisheries exports as a percent of domestic fisheries production to be approximately 5 percent for Canada, 2 percent for Mexico, and 1 percent for the United States. High-tariff NAFTA imports as a percentage of domestic supply are approximately 7 percent for Canada, 2 percent for Mexico, and zero for the United States.<sup>8</sup> (See table 2)

<sup>8</sup> These numbers are probably biased upward because the high-tariff processed fish products (HS 1604-1605) have higher unit values, and the ratio of product weight to live weight is lower than in primary products (HS 3).

Finally, the effect was estimated on high-tariff intra-NAFTA trade flows from elimination of NAFTA tariffs<sup>9</sup> in these high-tariff fisheries categories.<sup>10</sup> Assuming fisheries supply is perfectly elastic will give an upper bound estimate,<sup>11</sup> or the maximum possible effect on intra-NAFTA fisheries trade flows from

<sup>9</sup> The tariffs are approximately 6 percent on Canadian and U.S. imports of processed fisheries products (HS 1604-1605) and 20 percent on Mexican imports in HS chapter 3 and HS 1604-1605.

<sup>10</sup> This is a long-run analysis with no attempt to adjust for tariff phase-in. All tariffs are assumed to go to zero upon implementation of the agreement.

<sup>11</sup> This is an unrealistic assumption in fisheries production, where scarcity from over-fishing or environmental degradation can affect catch and catch effort. However, data constraints prevent distinguishing between individual fisheries and precludes fine-tuning of fisheries supply response in over- or in underutilized fisheries.

NAFTA tariff elimination.<sup>12</sup> Despite several sources of upward bias in the calculations, the results illustrate that NAFTA tariff elimination has a negligible effect on intra-NAFTA fisheries trade, and thus production (table 2). Canadian fisheries exports as a share of domestic production increase approximately 1 percent. Mexican and U.S. fisheries exports increase by less than one-half of 1 percent of domestic production levels. Fisheries imports by Canada and Mexico increase by less than 2 percent of domestic supply. The change in U.S. imports relative to U.S. supply is approximately zero. (See table 3.)

<sup>12</sup> Elasticity estimates in the literature range from -0.5 to -2.0, with some as large as -3 for Mexican consumer goods. We chose an elasticity of -4 to obtain an upper bound on the impact of NAFTA tariff elimination on intra-NAFTA fisheries trade.

**Table 1**  
**Pre-NAFTA (Pre-Uruguay Round) applied tariffs, HS chapters 3 and 1604-1605**  
(Percent)

Country	Chapter 3		Chapter 1604-1605	
	Simple average	Range	Simple average	Range
Canada .....	0.8	0.0 to 6.8	6.2	0.0 to 15.0
Mexico .....	19.6	0.0 to 20.0	20.0	20.0 to 20.0
United States .....	1.3	0.0 to 15.0	5.7	0.0 to 35.0

Source: WTO-IDB database, 1996 tariff schedules.

**Table 2**  
**High-tariff NAFTA trade as a percentage of production and supply**  
(Percent)

Country	High-tariff NAFTA exports/production	High-tariff NAFTA imports/supply
Canada .....	5.1	6.9
Mexico .....	1.8	1.9
United States .....	1.1	0.1

Source: Compiled by the authors. See footnote 7 for sources and methods.

**Table 3**  
**NAFTA-induced changes in fisheries product trade, as a percentage of production and supply**  
(Percent)

Country	Increased exports/production	Increased imports/supply
Canada .....	1.20	1.70
Mexico .....	0.40	1.50
United States .....	0.40	0.02

Source: Compiled by the authors. See footnote 7 for sources and methods.