Methodology for Estimating World Salmon Production and Consumption

In Chapter VI we present estimates of consumption in major world salmon markets, by source of supply. Table VI-2, which is reproduced below as Table B-1, provides annual averages of these estimates for the years 2000-2004. Figures VI-2, VI-3, VI-5, VI-10 and VI-15 show annual estimates of consumption for different major markets (aggregated for North American wild salmon, Japanese and Russian wild salmon, farmed salmon, and farmed trout).

In this appendix, we describe the methodology used to develop these estimates. As noted in the chapter, the estimates are based on numerous data sources and assumptions of varying reliability and should be considered only approximate. Our purpose was to provide general indicators of the relative scale of different markets, the relative rates of growth of consumption in different markets, and the relative importance of different sources of supply for each market.

Table B-1 **Approximate Annual Average World Salmon Production and Consumption, 2000-04 (thousand metric tons)**

Type of salmon	Producing country	Total production (round weight basis)	Consumption by End-Market (processed weight basis)					Weight loss in processing
			United States fresh & frozen markets	EU Fresh & frozen markets	Japanese fresh & frozen markets	Canned salmon markets	Other markets	
North American wild salmon	United States	346	38	18	32	86	49	123
	Canada	28	9	0	5	11	0	5
	Total	**374**	**47**	**18**	**37**	**97**	**49**	**128**
Japanese & Russian wild salmon	Japan	249	0	0	161	5	38	46
	Russia	205	0	0	27	11	99	68
	Total	**454**	**0**	**0**	**188**	**15**	**136**	**114**
Farmed salmon	Norway	483	7	249	34	1	86	105
	Chile	370	94	18	75	2	28	152
	UK	143	8	105	1	0	0	29
	Canada	104	61	0	0	0	0	42
	United States	17	10	0	0	0	6	1
	Japan	10	0	0	11	0	0	0
	Others	86	3	65	4	0	12	3
	Total	**1,213**	**184**	**437**	**126**	**3**	**133**	**333**
Farmed trout	Norway	67	0	9	29	0	12	17
	Chile	105	3	1	61	0	7	34
	Others	16	0	3	4	0	4	5
	Total	**188**	**3**	**13**	**95**	**0**	**22**	**56**
Total		**2,229**	**234**	**468**	**446**	**115**	**341**	**631**

Note: Estimates of consumption by end-market are based on numerous assumptions and should considered only approximate indicators of relative volumes. See Appendix B for details of data and assumptions.

We divided world salmon consumption into five major markets: Japanese fresh and frozen salmon markets, European Union fresh and frozen salmon markets, United States fresh and frozen salmon markets, canned markets, and "other markets." The "European Union" includes all countries which were European Union members in May 2005 (and excludes European countries that are not EU members, such as Norway). "Canned markets" includes all canned salmon markets worldwide. "Other markets" includes all countries not included in the other four markets (for example, all consumption in countries such as Canada, Russia, Norway, China, Australia and Brazil).

We divided sources of supply into "North American wild salmon," "Japanese and Russian wild salmon," "farmed salmon," and "farmed trout." The choice of these five markets and these four sources of supply was based primarily on our goal of contrasting major differences between the Japanese, European Union and United States fresh and frozen markets and partly on the limits of available data—which would have made it difficult to develop more detailed estimates. Production was estimated on a round-weight basis. Consumption was estimated on a processed weight basis. Since most of the consumption estimates are based on export or import data, the weight basis is the weight of products exported or imported.

In discussing our methodology, we use the reference codes shown below for different combinations of producing countries and consuming end markets.

Table C3 summarizes the data sources and assumptions used to derive production or consumption estimates for each reference code. It also serves to illustrate the complexity of the world salmon market and the challenges in deriving the estimates presented in Chapter VI of changes in world salmon consumption and production.

Table B-2 Reference Codes for Discussion of Estimates

Type of salmon	Producing country	Total production (round weight basis)	Consumption by End-Market (processed weight basis)					Weight loss in processing
			United States fresh & frozen markets	EU Fresh & frozen markets	Japanese fresh & frozen markets	Canned salmon markets	Other markets	
North American wild salmon	United States	A1	B1	C1	D1	E1	F1	G1
	Canada	A2	B2	C2	D2	E2	F2	G2
Japanese & Russian wild salmon	Japan	A3	B3	C3	D3	E3	F3	G3
	Russia	A4	B4	C4	D4	E4	F4	G4
Farmed salmon	Norway	A5	B5	C5	D5	E5	F5	G5
	Chile	A6	B6	C6	D6	E6	F6	G6
	UK	A7	B7	C7	D7	E7	F7	G7
	Canada	A8	B8	C8	D8	E8	F8	G8
	United States	A9	B9	C9	D9	E9	F9	G9
	Japan	A10	B10	C10	D10	E10	F10	G10
	Others	A11	B11	C11	D11	E11	F11	G11
Farmed trout	Norwary	A12	B12	C12	D12	E12	F12	G12
	Chile	A13	B13	C13	D13	E13	F13	G13
	Others	A14	B14	C14	D14	E14	F14	G14

Table B-3 Methodology for Derivation of Production and Consumption Estimates

Codes	Type of Estimate	Methdology
A1-A14	Total Production	All data are FAO Fishstat+ data except that data for U.S. wild salmon production are the sum of Alaska data from CFEC Alaska Salmon Summary Data 1980-2005 and Pacific Northwest data from NMFS catch data. Data for "Farmed trout" includes only farmed rainbow trout raised in salt water.
G1-G14	Weight Loss in Processing	Weight loss in processing was calculated by subtracting estimated consumption in all five-end markets from total production. Note that weight loss in processing will be under-estimated if consumption is over-estimated or if production is under-estimated (and vice versa). For most type-of-salmon/producing-country combinations, estimated weight loss in processing represented between 25% and 35% of total production for the 2000-2004 period. For a few type-of-salmon/producing-country combinations (U.S. farmed salmon, Japan farmed salmon, and Other farmed salmon), estimated weight loss in processing was less than 10% of total production for the 2000-2004 period—an unrealistically low estimate, suggesting that total consumption was over-estimated or total production was under-estimated. For a small number of year/type-of-salmon/producing-country combinations, estimated total consumption exceeded estimated total production. For these combinations, weight loss in processing was set equal to zero.

Codes	Salmon Type	Producing Country	Market	Methdology
B1	Wild	USA	USA	Estimated using the United States Salmon Market Database described in Appendix C. Based primarily on NMFS Trade data, ADFG COAR data, NFPA Canned Pack Data, NMFS Catch Data, and PACFIN Salmon Data. Note that estimates omit U.S. consumption of fresh and frozen wild salmon imported from countries other than Canada, Japan and Russia—including imports from China—which have increased significantly in recent years. As a result estimates of U.S. consumption of wild salmon shown in Chapter VI are slightly less than estimates shown in Chapter VIII. Although most of the wild salmon imported from other countries such as China was probably originally harvested in the United States, Canada, Japan or Russia, we have no way of determining its original country of origin.
B2	Wild	Canada	USA	Based on U.S. imports reported in NMFS Trade data. See Appendix C for discussion of how salmon imports were coded as wild or farmed.
B3	Wild	Japan	USA	
B4	Wild	Russia	USA	
B5	Farmed	Norway	USA	
B6	Farmed	Chile	USA	
B7	Farmed	UK	USA	
B8	Farmed	Canada	USA	
B10	Farmed	Japan	USA	
B11	Farmed	Others	USA	

B9	Farmed	USA	USA	Estimated using the United States Salmon Market Database described in Appendix C. Based primarily on NMFS Trade Data, Maine DMR Farmed Salmon Data, and Washington DFW Farmed Salmon Data.
B12	Trout	Norway	USA	Assumed to be zero. U.S. fisheries trade data do not distinguish between imports of "salmon trout" and other trout. In addition, Chilean exports of trout to the U.S. are roughly similar to total U.S. 'trout" imports.
B14	Trout	Others	USA	
B13	Trout	Chile	USA	Estimated in the same way as for Chilean farmed salmon consumption for the EU (reference cell C6).
C1	Wild	USA	EU	Based on U.S. exports reported in NMFS Trade data.
C2 C8	Wild Farmed	Canada Canada	EU EU	Assumed to be zero. Although some Canadian salmon were exported to the EU, available data (DFO Canada Salmon Export Data 1989-1999) suggest that these exports were relatively small volumes, and that most Canadian fresh and frozen salmon exports were to the United States and Japan. FAO Globefish Salmon Commodity Update data report annual EU imports of Canadian salmon of between 2300 and 6300 metric tons for the period 1989-2004. However, these data do not distinguish between farmed and wild Canadian salmon.
C3 C4 C10	Wild Wild Farmed	Japan Russia Japan	EU EU EU	Assumed to be zero. No data were available to estimate exports of fresh or frozen salmon from Japan or Russia to the EU or EU imports of fresh or frozen salmon from Japan or Russia.
C5	Farmed	Norway	EU	EU imports from Norway reported in Globefish Commodity Update Salmon 2006, page 26.
C6	Farmed	Chile	EU	2000-2004: Based on SalmonChile data for Chilean Atlantic and coho salmon exports to the EU. For 1991-1999 data were only available for total salmon exports (not for exports to the EU). For these years, exports to the EU were estimated by assuming that exports of Atlantic and coho salmon to different markets were in the same proportions as in 2000. No export data were available for 1989. Exports were estimated to be the same proportion of total production (as reported by FAO Fishtstat+ data) as in 1991, with exports to different markets in the same proportions as in 2000.
C7	Farmed	UK	EU	World consumption of fresh and frozen salmon from UK production was assumed to be equal to 80% of the round weight of production as reported in FAO Fishstat+ data. EU consumption of UK production was assumed to be equal to world consumption minus assumed consumption of UK farmed salmon in the United States (reference code B7) and Japan (reference code D7).
C9	Farmed	USA	EU	Based on U.S. exports reported in NMFS Trade data.
C11	Farmed	Others	EU	Based on data reported in FAO Globefish Salmon Commodity Update 2006, "EU imports of fresh, chilled, frozen salmon, by country of origin" (page 26). Estimated as total of EU imports from Ireland, the Faeroe Islands, Iceland and "other" farmed salmon producers (excluding major producers reported in the table).

C12	Trout	Norway	EU	Estimated from Norwegian trout exports reported in Statistics Norway "Fish Farming 2003" report, Table 5.5, as the sum of exports to those EU countries for which exports were reported. May understate total Norwegian trout exports to the EU. Export data for 2004 were not available and were estimated based on the assumption that the ratio of Norwegian exports to Norwegian production (as reported in FAO Fishstat+ data) stayed the same as in 2003.
C13	Trout	Chile	EU	Estimated in the same way as for Chilean farmed salmon consumption for the EU (reference cell C6).
C14	Trout	Others	EU	Calculated based on two assumptions: (1) Production weight share of total round weight was equal to share of Norwegian trout export weight share of Norwegian trout production round weight; (2) That portion of production not exported to Japan was consumed in either the EU fresh or frozen market or "Other markets" in the same proportion as the relative volumes of these two markets in Norwegian exports.
D1	Wild	USA	Japan	Based on U.S. exports reported in NMFS Trade data.
D2	Wild	Canada	Japan	Sources: 1989-1990: Japan Tariff Association Fisheries Trade Data; 1991-2004: BANR Japanese Salmon Import Data.
D3	Wild	Japan	Japan	1989-90: Assumed to be 80% of the volume of Japanese wild salmon catches as reported in FAO Fishstat+ data. 1991-2004: Based on Japanese domestic wild salmon supply data in various editions of the Seafood News Power Data Book, page 3. 1991 data are from the 2001 edition; 1992-2001 data are from the 2002 edition; 2002-2004 data are from the 2005 edition. For the years 2000-2004, Japanese salmon exports, as reported in NMFS Japan Export Data, were subtracted from domestic wild salmon production.
D4	Wild	Russia	Japan	Sources: 1989-1990: Japan Tariff Association Fisheries Trade Data; 1991-2004: BANR Japanese Salmon Import Data.
D5	Farmed	Norway	Japan	1989-2003: Norwegian salmon exports to Japan reported in Statistics Norway "Fish Farming 2003" report, Table 5.2. 2004: Norwegian salmon exports to Japan reported in FAO Globefish Salmon Commodity Update 2006, "Yearly production and exports by destination countries of farmed salmon from Norway" (pages 49 & 50).
D6 D7 D8 D11	Farmed Farmed Farmed Farmed	Chile UK Canada Others	Japan Japan Japan Japan	1988-2001: Japan Tariff Association Fisheries Trade Data; 2002-2004, Norway and Canada: FAO Globefish Salmon Commodity Update 2006, "Imports of fresh and frozen salmon into Japan"; 2002-2004, UK: BANR Japanese Salmon Import Data (data are for fresh Atlantic salmon only).
D9	Farmed	USA	Japan	Based on U.S. exports reported in NMFS Trade data.
D10	Farmed	Japan	Japan	1989-1990: Assumed to be equal to Japanese farmed coho salmon production reported in FAO Fishstat+ data. 1991-2004: Based on Japanese domestic farmed salmon supply data in various editions of the Seafood News Power Data Book, page 3. 1991 data are from the 2001 edition; 1992-2001 data are from the 2002 edition; 2002-2004 data are from the 2005 edition.

D12	Trout	Norway	Japan	Sources: 1988-1990: Japan Tariff Association Fisheries Trade Data; 1991-2004: BANR Japanese Salmon Import Data. Note: Beginning 2001, data include imports of trout fillets.
D13	Trout	Chile	Japan	
D14	Trout	Others	Japan	
E1	Wild	USA	Canned	Based on NFPA Canned Pack data and ADFG COAR data. NFPA Canned Pack data converted to metric tons based on assumption of 44.25 pounds per 48-tall case. NFPA Canned Pack data used for Washington State Production. NFPA Canned Pack data or ADFG COAR data was used for Alaska production—whichever was higher.
E2	Wild	Canada	Canned	BC Canned Salmon Pack Bulletin data, converted to metric tons based on assumption of 44.25 pounds per 48-tall case.
E3	Wild	Japan	Canned	1989-2003: Data for Japan reported in Globefish Salmon Commodity Update 2006, "Yearly production of canned salmon by major producing countries" (page 72). 2004: Estimated from FAO Fishstat+ catch data assuming the same ratio of canned production to catch as in 2003.
E4	Wild	Russia	Canned	1989-2003: Data for Russia and Korea reported in Globefish Salmon Commodity Update 2006, "Yearly production of canned salmon by major producing countries" (page 72). 2004: Estimated from FAO Fishstat+ catch data assuming the same ratio of canned production to catch as in 2003.
E5	Farmed	Norway	Canned	Estimated in the same way as for Japanese wild salmon (reference code E3), except that 2004 canned production was assumed to be the same as 2003.
E6	Farmed	Chile	Canned	Estimated in the same way as for Japanese wild salmon (reference code E3)
E7	Farmed	UK	Canned	Assumed to be zero
E8	Farmed	Canada	Canned	
E9	Farmed	USA	Canned	
E10	Farmed	Japan	Canned	
E11	Farmed	Others	Canned	
E12	Trout	Norway	Canned	
E13	Trout	Chile	Canned	
E14	Trout	Others	Canned	
F1	Wild	USA	Other	Calculated by subtracting U.S. fresh and frozen salmon exports to the EU and Japan from total U.S. salmon exports of all salmon products except canned salmon, as reported in NMFS Fisheries Trade data.
F9	Farmed	USA	Other	
F2	Wild	Canada	Other	Assumed to be zero
F3	Wild	Japan	Other	1989-1999: assumed to be zero. 2000-2004: Japanese salmon exports as reported in NMFS Japanese Export Data.
F4	Wild	Russia	Other	Product volume assumed to be 66.6% of round weight of production as reported in FAO Fishstat+ data. Volume consumed in "Other Markets" estimated as product volume minus estimated consumption in the US, EU, and Japan fresh and frozen markets and in canned markets.

F5	Farmed	Norway	Other	1989-2003: Estimated from Norwegian salmon exports reported in Statistics Norway “Fish Farming 2003” report, Table 5.2, by subtracting reported exports to the United States, Japan, and selected EU countries. May overstate exports to “other countries” because export data were not available for all EU countries. 2004: same methodology, but based on data reported in FAO Globefish Salmon Commodity Update 2006, “Yearly production and exports by destination countries of farmed salmon from Norway” (pages 49 & 50).
F6	Farmed	Chile	Other	Exports to the USA and Japan were estimated using the same methodology as described for exports to the EU (reference code C6). Exports to “Other Markets” were estimated by subtracting estimated exports to the the USA, Japan, and the EU from total exports. Note that this method omits consumption in Chile of Chilean farmed salmon.
F7	Farmed	UK	Other	Assumed to be zero
F8	Farmed	Canada	Other	Assumed to be zero
F10	Farmed	Japan	Other	Assumed to be zero
F11	Farmed	Others	Other	Assumed to be equal to Australia and New Zealand production, adjusted for assumed 80% yield from round weight, minus assumed exports from those countries to Japan as reported in (for 1989-90) Japan Tariff Association Fisheries Trade Data and (for 1991-2004) BANR Japanese Salmon Import Data.
F12	Trout	Norway	Other	Estimated from Norwegian trout exports reported in Statistics Norway “Fish Farming 2003” report, Table 5.5, by subtracting reported exports to the United States, Japan, and selected EU countries. May overstate exports to “other countries” because export data were not available for all EU countries. Export data for 2004 were not available and were estimated based on the assumption that the ratio of Norwegian exports to Norwegian production (as reported in FAO Fishstat+ data) stayed the same as in 2003.
F13	Trout	Chile	Other	Estimated in the same way as for Chilean farmed salmon consumption for “Other Markets” (reference cell F6).
F14	Trout	Others	Other	Calculated based on two assumptions: (1) Production weight share of total round weight was equal to share of Norwegian trout export weight share of Norwegian trout production round weight; (2) That portion of production not exported to Japan was consumed in either the EU fresh or frozen market or “Other markets” in the same proportion as the relative volumes of these two markets in Norwegian exports.