



TRADEX

SUPPLY MARKET STUDY – Pacific Cod Prospects 2008-2011

Market Analysis

May 2008

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1. PREAMBLE

1.1. Disclaimer

The information in this report is for informational purposes only. The conclusions herein are forward looking and represent Tradex Foods' best estimate based on current available information. We have used data from sources we believe to be reliable but we can not guarantee that they are complete or accurate. Although we believe the expectations reflected in our forward-looking statements are reasonable, results may vary, and we cannot guarantee future results.

1.2. Feedback

Tradex Foods welcomes your feedback about this report and our other market analysis offerings. Should you have a comment or question, please contact us:

- Email: tradex@tradexfoods.com
- Phone: 1.877.479.1355

2. EXECUTIVE SUMMARY

2.1. Introduction

- As at 2004, five countries harvested Pacific cod:
 - Canada
 - Japan
 - Korea
 - Russia
 - USA
- US harvesters accounted for 71% of the global harvest in 2004, with Russia and Japan as second tier harvesting nations:

PACIFIC COD HARVEST, 2004		
<i>all figures in metric tonnes (MT)</i>		
Country	Harvest	% of total
USA	266,108	71.2%
Russia	63,241	16.9%
Japan	37,502	10.0%
Korea	5,444	1.5%
Canada	1,322	0.4%
Total	373,617	100.0%

- Due to the dominance of the US fishery, this report will focus exclusively on the US fishery.

2.2. Management

- The North Pacific Fisheries Management Council (NPFMC) governs Alaska's groundfish fisheries, including Pacific cod.
- NPFMC is comprised of industry stakeholders.
- Nominal decision making authority rests with the US Department of Commerce (DOC), although the DOC rarely contradicts NPFMC recommendations.
- The National Marine Fisheries Service (NMFS), a DOC department, manages Alaska's federal fisheries according to NPFMC policies.
- NMFS conducts much of the scientific research used by NPFMC to make its policy decisions.
- NMFS also expresses its opinion on policy questions to NPFMC, meaning it is not a pure operational agency.

2.3. Harvest areas

- NPFMC divides Alaska’s Pacific cod fisheries into two large areas:
 - Bering Sea and Aleutian Islands (BSAI)
 - Gulf of Alaska (GOA)
- NMFS manages the two areas quite differently
- NPFMC divides the BSAI Pacific cod TAC into gear types to better manage the distinct impacts (especially bycatch) of each type.
- The council further divides gear types into at-sea processors (called catcher-processors) and shore-based vessels.
- GOA Pacific cod fisheries produce much lower volumes than the BSAI fisheries.
- NPFMC divides all GOA fisheries into regional sub areas: Western, Central, and Eastern.
- NPFMC further divides the fisheries into “inshore” and “offshore” components.
- GOA groundfish stocks, caught as bycatch by trawlers directing for cod, are in poor shape compared to the BSAI, so GOA cod fisheries often close because of bycatch limits before fishermen have reached the fishery’s cod quota.
- Since the late 1990s NPFMC has been slowly pursuing a rationalisation of GOA groundfish fisheries, in which severely diminished stocks are pursued by an overcapacity of fishing and processing infrastructure. The process is ongoing.

2.4. Historical

2.4.1. Harvests

- After 1998, harvests settled for a number of years in the 250,000-270,000MT range.
- At 212,000MT, the 2007 harvest represents the largest season-to-season harvest drop since the end of the historic high harvests of the mid-1990s.
- The 2007 figure is also well below the 2000-2007 average harvest of 246,000MT.

2.4.2. Quotas

- From 2000-2007 NPFMC has released 97% of its ABC as TAC to fishermen, presumably because new technology has given the council confidence in the accuracy of its stock assessments.

- As such we will use a 99% catch-TAC adjustment factor to predict future BSAI harvests.
- By contrast with the BSAI, GOA figures show that NPFMC has become more conservative in recent years, releasing only an average of 77% of ABC as TAC from 2000-2007, compared to an average of 84% since 1981.
- We will therefore use 80% of NPFMC's TAC projections as our estimated future harvest.
- In the last two seasons fishermen have caught approximately 80% of their TAC.

2.5. Forecasts

2.5.1. Current plan (2008-2009)

- NPFMC set 2008 TACs in the BSAI even with those in 2007 and plans to hold them at the same level in 2009.
- In the GOA, the council set 2008 TACs only slightly lower and also plans to hold this level in 2009.

CATCH PROJECTIONS FOR ALASKAN PACIFIC COD FISHERIES, 2007-09							
<i>all figures in metric tons (MT) unless otherwise noted</i>							
Area	Catch/TAC factor	2007		2008 (proj.)		2009 (proj.)	
		TAC	Actual catch	TAC	Proj. catch	TAC	Proj. catch
BSAI	0.99	170,720	170,154	170,720	169,013	170,720	169,013
GOA	0.80	52,264	41,728	50,269	40,215	50,269	40,215
Total		222,984	211,882	220,989	209,228	220,989	209,228

- These projections show a 2008 harvest of approximately 209,000MT, similar to 2007 levels.

2.5.2. Next plan (2010-2011)

- By cross-referencing age class estimates with biomass calculations, we see an above average year 1 class in 2005 followed in 2006 by the strongest year 1 class since 2001.
- As these two above average year classes flow through the scale, this suggests higher catches from 2009 onward.
- We therefore expect that TACs and catches for 2010-2011 will improve after subpar years in 2008-09.

CATCH PROJECTIONS FOR ALASKAN PACIFIC COD FISHERIES, 2008-2011 <i>all figures in metric tons (MT) unless otherwise noted</i>				
Area	2008 (proj.)	2009 (proj.)	2010 (proj.)	2011 (proj.)
BSAI	169,013	169,013	179,154	189,903
GOA	40,215	40,215	42,628	45,186
Total	209,228	209,228	221,782	235,089

- We expect statewide annual harvests to rise to 222,000MT in 2010 and 235,000MT in 2011.

3. INTRODUCTION

3.1. Species description¹

Scientific name:	Gadus macrocephalus
Common names:	Pacific cod, grey cod
Maximum length:	119cm
Maximum weight:	22.7kg
Maximum age:	18 years
Distribution:	North Pacific: Yellow Sea to Bering Strait and Aleutian Islands, rare occurrences south to Los Angeles, CA

- Trawl nets can begin to select large three year-old Pacific cod, but the usual harvest age is between four and seven years of age²

3.2. Global harvests³

- As at 2004, five countries harvested Pacific cod:
 - Canada
 - Japan
 - Korea
 - Russia
 - USA
- US harvesters accounted for 71% of the global harvest in 2004, with Russia and Japan as second tier harvesting nations:

PACIFIC COD HARVEST, 2004		
<i>all figures in metric tonnes (MT)</i>		
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Korea	5,444	1.5%
Canada	1,322	0.4%
Total	373,617	100.0%

- Due to the dominance of the US fishery, this report will focus exclusively on the US fishery.

4. MANAGEMENT

4.1. Organisations

- Twelve regional fisheries councils govern the USA's federal fisheries, defined as those that fall between the three mile boundary of states' waters and the 200 mile boundary of the USA's Exclusive Economic Zone (EEZ).
- The North Pacific Fisheries Management Council (NPFMC) governs groundfish fisheries in the federal waters off Alaska's coast.
- NPFMC reviews scientific stock data and recommends quotas and dates for fisheries to the US Department of Commerce (DOC) for approval.
- Although DOC is the government agency ultimately responsible for approving or rejecting NPFMC's proposals, it rarely questions the council's recommendations.
- Once the NPFMC sets policy and the DOC approves it, the National Marine Fisheries Service (NMFS), a DOC agency, manages the fisheries.
- NMFS's management duties include, among other things: managing the licencing of fishing vessels, monitoring vessel activity and landings, monitoring total landings against quota, and announcing fishery openings and closures.
- In addition to its management duties NMFS conducts the bulk of the scientific fisheries research used by NPFMC in its policy decision making.
- NMFS also presents its opinions to NPFMC on issues for which NMFS has a desired policy in mind. This means that NMFS is not a pure operational agency, but has a governance role as well.

4.2. Process

- NMFS collects data from a number of sources, both ongoing monitoring and periodic studies, compiling them into stock assessments for individual species.
- Over the years NMFS has refined its modelling, so stock assessments in earlier years may have been calculated with a different model using different variables.
- These stock assessments are the foundation on which NPFMC and other policy makers determine the current and future health of the stock and decide on appropriate conservation and/or harvesting policies.

- Presently NPFMC creates a biennial plan for the Alaskan Pacific cod fisheries.
- The current plan covers 2008-2009.

4.3. Key stock assessment data

- NMFS's stock assessments lay out an upper and lower projection of biomass for the year. The average of these two outliers is usually quoted as the estimated biomass for the year, although actual results vary substantially within the upper and lower limit.
- From that figure NMFS determines the Overfishing Level (OFL), past which the species would be considered to be overfished.
- An Allowable Biological Catch (ABC) is set below the OFL with sufficient buffer room in the case of a lower than expected biomass and/or a higher than expected harvest.
- Using the ABC as an upper limit, NMFS sets the Total Allowable Catch (TAC), usually referred to as "quota."
- NMFS hold a portion of the intended TAC as a reserve to be released to harvesters mid-season on a "wait-and-see" basis.
- Naturally the stock assessments contain myriad other terms including Optimum Yield (OY) and Domestic Annual Harvest (DAH), but this report will focus on ABC and actual catch / TAC prospects for Pacific cod.

4.4. Harvest areas

- NPFMC divides Alaska's Pacific cod fisheries into two large areas:
 - Bering Sea and Aleutian Islands (BSAI)
 - Gulf of Alaska (GOA)
- NMFS manages the two areas quite differently

4.4.1. BSAI

- The BSAI is by far the more important area for Pacific cod and for most other major Alaskan fisheries.
- The BSAI area is a combination of two large, distinct areas: the East Bering Sea (EBS) and the Aleutian Islands (AI).
- NPFMC divides the BSAI Pacific cod TAC into gear types to better manage the distinct impacts (especially bycatch) of each type.
- The council further divides gear types into at-sea processors (called catcher-processors) and shore-based vessels.
- Major Pacific cod fisheries in the BSAI include:

- Longline catcher processors
- AFA trawl catcher-processors (the pollock fleet)
- Amendment 80 trawl catcher-processors (the non-pollock H&G fleet)
- Trawl catcher vessels
- Pot catcher vessels

4.4.2. GOA

- GOA Pacific cod fisheries produce much lower volumes than the BSAI fisheries.
- NPFMC divides all GOA fisheries into regional sub areas: Western, Central, and Eastern.
- As the abundance of Pacific cod falls the further south and east you travel, the main GOA cod fisheries occur in the western and central regions.
- NPFMC further divides the fisheries into “inshore” and “offshore” components.
- GOA groundfish stocks, caught as bycatch by trawlers directing for cod, are in poor shape compared to the BSAI, so GOA cod fisheries often close because of bycatch limits before fishermen have reached the fishery’s cod quota.
- Since the late 1990s NPFMC has been slowly pursuing a rationalisation of GOA groundfish fisheries, in which severely diminished stocks are pursued by an overcapacity of fishing and processing infrastructure. The process is ongoing.

5. HISTORICAL

5.1. Harvests⁴

- NMFS reports the following landings for Pacific cod:

ALASKA PACIFIC COD LANDINGS 1981-2007				
<i>all figures in metric tonnes (MT) unless otherwise noted</i>				
Year	BSAI	GOA	Total	Yearly change (%)
1981	63,941	36,131	100,072	
1982	69,501	29,465	98,966	(1.1%)
1983	103,231	36,540	139,771	41.2%
1984	133,084	23,898	156,982	12.3%
1985	150,384	14,428	164,812	5.0%
1986	142,511	25,012	167,523	1.6%
1987	163,110	32,939	196,049	17.0%
1988	208,236	33,802	242,038	23.5%
1989	182,865	43,293	226,158	(6.6%)
1990	179,608	72,517	252,125	11.5%
1991	219,266	76,328	295,594	17.2%
1992	208,046	80,746	288,792	(2.3%)
1993	167,389	56,487	223,876	(22.5%)
1994	193,802	47,484	241,286	7.8%
1995	245,029	68,985	314,014	30.1%
1996	240,673	68,280	308,953	(1.6%)
1997	257,762	77,017	334,779	8.4%
1998	193,253	72,524	265,777	(20.6%)
1999	173,995	81,784	255,779	(3.8%)
2000	191,056	66,559	257,615	0.7%
2001	176,659	51,541	228,200	(11.4%)
2002	197,352	54,483	251,835	10.4%
2003	209,114	52,498	261,612	3.9%
2004	213,810	54,591	268,401	2.6%
2005	205,434	47,541	252,975	(5.7%)
2006	191,906	42,734	234,640	(7.2%)
2007	170,154	41,728	211,882	(9.7%)
Average 1981-2007	179,673	51,457	231,130	3.9%
Average 2000-2007	194,436	51,459	245,895	(2.1%)

- Pacific cod harvests reached a peak in the mid-1990s.
- After 1998, harvests settled for a number of years in the 250,000-270,000MT range.
- At 212,000MT, the 2007 harvest represents the largest season-to-season harvest drop since the end of the historic high harvests of the mid-1990s.

- The 2007 figure is also well below the 2000-2007 average harvest of 246,000MT.

5.2. Quotas

- Before analysing NPFMC's 2008 stock projections, we must review how closely previous stock assessments indicated eventual actual landings.

5.2.1. BSAI⁴

BSAI PACIFIC COD ABC, TAC AND CATCH 1981-2007					
<i>all figures in metric tonnes (MT) unless otherwise noted</i>					
Year	ABC	TAC	TAC as % of ABC	Catch	Catch as % of TAC
1981	160,000	78,700	49.2%	63,941	81.2%
1982	168,000	78,700	46.8%	69,501	88.3%
1983	298,200	120,000	40.2%	103,231	86.0%
1984	291,300	210,000	72.1%	133,084	63.4%
1985	347,400	220,000	63.3%	150,384	68.4%
1986	249,300	229,000	91.9%	142,511	62.2%
1987	400,000	280,000	70.0%	163,110	58.3%
1988	385,300	200,000	51.9%	208,236	104.1%
1989	370,600	230,681	62.2%	182,865	79.3%
1990	417,000	227,000	54.4%	179,608	79.1%
1991	229,000	229,000	100.0%	219,266	95.7%
1992	182,000	182,000	100.0%	208,046	114.3%
1993	164,500	164,500	100.0%	167,389	101.8%
1994	191,000	191,000	100.0%	193,802	101.5%
1995	328,000	250,000	76.2%	245,029	98.0%
1996	305,000	270,000	88.5%	240,673	89.1%
1997	306,000	270,000	88.2%	257,762	95.5%
1998	210,000	210,000	100.0%	193,253	92.0%
1999	177,000	170,000	96.0%	173,995	102.4%
2000	193,000	193,000	100.0%	191,056	99.0%
2001	188,000	188,000	100.0%	176,659	94.0%
2002	223,000	200,000	89.7%	197,352	98.7%
2003	223,000	207,500	93.0%	209,114	100.8%
2004	223,000	215,000	96.4%	213,810	99.4%
2005	206,000	206,000	100.0%	205,434	99.7%
2006	194,000	194,000	100.0%	191,906	98.9%
2007	176,000	170,720	97.0%	170,154	99.7%
Average 1981-2007	252,059	199,437	82.5%	179,673	90.8%
Average 2000-2007	203,250	196,778	97.0%	194,436	98.8%

- From 2000-2007 NPFMC has released 97% of its ABC as TAC to fishermen, presumably because new technology has given the council confidence in the accuracy of its stock assessments.

- Similarly, the period 2000-2007 has seen a much closer relationship between TAC and fishermen's actual catch, again presumably due to improved fish finding technology such as GPS.
- We can therefore be relatively confident that in the BSAI:
 - NPFMC's ABC numbers will approximately equal the eventual TAC released to fishermen.
 - Actual catches will approximately equal the TAC in a given year.
- As such we will use a 99% catch-TAC adjustment factor to predict future harvests.

5.2.2. GOA⁵

GOA PACIFIC COD ABC, TAC AND CATCH 1981-2007					
<i>all figures in metric tonnes (MT) unless otherwise noted</i>					
Year	ABC	TAC	TAC as % of ABC	Catch	Catch as % of TAC
1981	na	70,000		36,131	51.6%
1982	na	60,000		29,465	49.1%
1983	na	60,000		36,540	60.9%
1984	na	60,000		23,898	39.8%
1985	na	60,000		14,428	24.0%
1986	136,000	75,000	55.1%	25,012	33.3%
1987	125,000	50,000	40.0%	32,939	65.9%
1988	99,000	80,000	80.8%	33,802	42.3%
1989	71,200	71,200	100.0%	43,293	60.8%
1990	90,000	90,000	100.0%	72,517	80.6%
1991	77,900	77,900	100.0%	76,328	98.0%
1992	63,500	63,500	100.0%	80,746	127.2%
1993	56,700	56,700	100.0%	56,487	99.6%
1994	50,400	50,400	100.0%	47,484	94.2%
1995	69,200	69,200	100.0%	68,985	99.7%
1996	65,000	65,000	100.0%	68,280	105.0%
1997	81,500	69,115	84.8%	77,017	111.4%
1998	77,900	66,060	84.8%	72,524	109.8%
1999	84,400	67,835	80.4%	81,784	120.6%
2000	76,400	58,715	76.9%	66,559	113.4%
2001	67,800	52,110	76.9%	51,541	98.9%
2002	57,600	44,230	76.8%	54,483	123.2%
2003	52,800	40,540	76.8%	52,498	129.5%
2004	62,810	48,033	76.5%	54,591	113.7%
2005	58,100	44,433	76.5%	47,541	107.0%
2006	68,859	52,264	75.9%	42,734	81.8%
2007	68,859	52,264	75.9%	41,728	79.8%
Average 1981-2007	75,497	61,278	83.5%	51,457	86.0%
Average 2000-2007	64,154	49,074	76.5%	51,459	105.9%

- By contrast with the BSAI, GOA figures show that NPFMC has become more conservative in recent years, releasing only an average of 77% of ABC as TAC from 2000-2007, compared to an average of 84% since 1981.
- This is likely to compensate for the fact that the different management structure in the GOA has allowed fishermen to exceed the annual TAC by an average of 6% from 2000-2007.
- In the last two seasons fishermen have caught approximately 80% of their TAC.
- We will therefore use 80% of NPFMC's TAC projections as our estimated future harvest.

6. CURRENT PLAN (2008-2009)^{2,6,7}

- NPFMC set 2008 TACs in the BSAI even with those in 2007 and plans to hold them at the same level in 2009.
- In the GOA, the council set TACs only slightly lower and also plans to hold this level in 2009.

CATCH PROJECTIONS FOR ALASKAN PACIFIC COD FISHERIES, 2007-09							
<i>all figures in metric tons (MT) unless otherwise noted</i>							
Area	Catch/TAC factor	2007		2008 (proj.)		2009 (proj.)	
		TAC	Actual catch	TAC	Proj. catch	TAC	Proj. catch
BSAI	0.99	170,720	170,154	170,720	169,013	170,720	169,013
GOA	0.80	52,264	41,728	50,269	40,215	50,269	40,215
Total		222,984	211,882	220,989	209,228	220,989	209,228

- These projections show a 2008 harvest of approximately 209,000MT, similar to 2007 levels.

7. NEXT PLAN (2010-2011)

7.1. Age composition and biomass estimates²

- In the absence of NPFMC's ABC or TAC projections for 2008-2009, we have chosen to use age composition and biomass estimates from the EBS as an indicator of the proportion of the Pacific cod stock that will fall within the usual harvesting age (4-7 years) and therefore the volume of future catches.

AGE COMPOSITION ESTIMATES FROM THE EBS 1996-2006							
<i>all figures in metric tons (MT) unless otherwise noted</i>							
Age	2000	2001	2002	2003	2004	2005	2006
1	118,376	216,484	49,580	90,065	84,832	110,855	165,560
2	61,408	205,735	115,913	98,908	96,831	154,570	74,704
3	88,518	170,987	192,609	154,207	167,455	112,788	88,164
4	130,848	78,411	151,593	133,977	77,668	83,504	61,088
5	82,599	76,244	45,484	73,893	79,579	37,495	48,974
6	31,444	58,579	35,680	24,954	54,207	50,899	32,719
7	5,707	19,665	24,200	17,625	20,656	29,284	24,487
8	6,342	4,666	4,033	9,146	10,567	14,672	15,013
9	1,480	1,167	1,117	1,999	3,701	6,400	5,022
10	1,374	750	310	182	657	966	1,501
11	370	500	0	182	836	2,415	466
12+	0	83	62	424	0	0	104
Total biomass	528,466	833,272	620,520	605,682	596,988	603,788	517,698
<i>BSAI catch</i>	<i>191,056</i>	<i>176,659</i>	<i>197,352</i>	<i>209,114</i>	<i>213,810</i>	<i>205,434</i>	<i>191,906</i>

- A correlation is difficult to establish between the age composition estimates, but a few loose trends emerge:
 - Catches are higher in the year after which there is a rise in biomass.
 - The strength of the year 1 class in a given year predicts the size of the commercial harvest three years onward.
 - For example, a strong year 1 class in 2000-2001 flowed through the later years, contributing to an improved harvest in 2004.
 - The 2006 year 1 class was the strongest since 2001.

7.2. Conclusions

- An above average year 1 class in 2005 was followed in 2006 by the strongest year 1 class since 2001.

- As these two above average year classes flow through the scale, this suggests higher catches from 2009 onward.
- We therefore expect that TACs and catches for 2010-2011 will improve after subpar years in 2008-09.

CATCH PROJECTIONS FOR ALASKAN PACIFIC COD FISHERIES, 2008-2011				
<i>all figures in metric tons (MT) unless otherwise noted</i>				
Area	2008 (proj.)	2009 (proj.)	2010 (proj.)	2011 (proj.)
BSAI	169,013	169,013	179,154	189,903
GOA	40,215	40,215	42,628	45,186
Total	209,228	209,228	221,782	235,089

- We expect statewide annual harvests to rise to 222,000MT in 2010 and 235,000MT in 2011.

8. APPENDIX

8.1. Acronyms

ABC	Allowable Biological Catch
BSAI	Bering Sea / Aleutian Islands
DAH	Domestic Annual Harvest
DOC	US Department of Commerce
EBS	Eastern Bering Sea
EEZ	Exclusive Economic Zone
GOA	Gulf of Alaska
MT	metric tonnes
NMFS	National Marine Fisheries Service (NOAA Fisheries)
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fisheries Management Council
OFL	Over Fishing Level
OY	Optimum Yield
TAC	Total Allowable Catch (a.k.a. quota)

¹ <http://fishbase.org/Summary/SpeciesSummary.php?id=308>

² <http://www.afsc.noaa.gov/refm/docs/2007/BSAIPcod.pdf>

³ <http://fishbase.sinica.edu.tw/report/FAO/FAOCatchList.cfm?scientific=Gadus+macrocephalus>

⁴ <http://www.afsc.noaa.gov/refm/docs/2007/BSAIPcod.pdf>,

<http://www.afsc.noaa.gov/refm/docs/2007/GOAPcod.pdf>

⁵ <http://www.afsc.noaa.gov/refm/docs/2007/GOAPcod.pdf>

⁶ http://www.fakr.noaa.gov/sustainablefisheries/specs08_09/goatable1.pdf

⁷ http://www.fakr.noaa.gov/sustainablefisheries/specs08_09/goatable2.pdf