

ECOREGION Faroe Plateau ecosystem
STOCK Cod in Subdivision Vb₁ (Faroe Plateau)

Advice for 2015

ICES advises on the basis of the MSY approach that effort should be reduced such that fishing mortality in 2015 will be no more than $F = 0.20$, corresponding to a 23% reduction in the 2013 fishing mortality. All catches are assumed to be landed.

Stock status

		Fishing pressure		
		2011	2012	2013
MSY (F_{MSY})		✗	✗	✓ Below target
Precautionary approach (F_{pa}, F_{lim})		○	○	✓ Harvested sustainably
		Stock size		
		2012	2013	2014
MSY ($B_{trigger}$)		✗	✗	✗ Below trigger
Precautionary approach (B_{pa}, B_{lim})		○	○	○ Increased risk

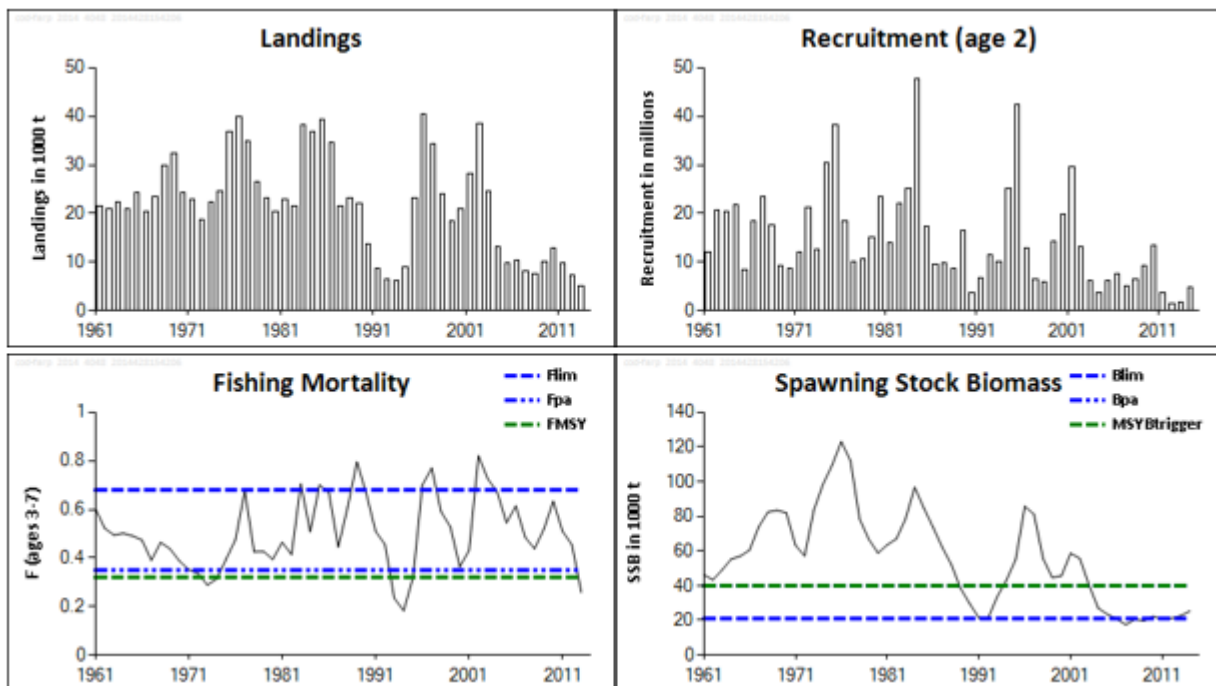
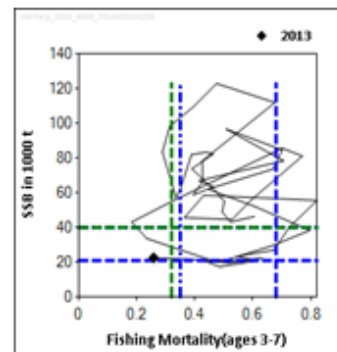


Figure 4.3.1.1 Cod in Subdivision Vb₁ (Faroe Plateau). Summary of stock assessment (weights in thousand tonnes). Top right: SSB/F for the time-series used in the assessment.

SSB has remained around B_{lim} since 2005. Fishing mortality has decreased since 2010 and is now below F_{lim} , F_{pa} , and F_{MSY} . The 2009–2012 year classes are estimated to be below average.

Management plans

A group representing the Ministry of Fisheries, the Faroese industry, the University of the Faroe Islands, and the Faroe Marine Research Institute has developed a management plan based on general maximum sustainable yield (MSY) principles developed by ICES. The plan has not yet been approved by the authorities.

Biology

Work suggests that cannibalism is a controlling factor of recruitment. Some years cod move into the near-shore nursery areas of 1-group cod, which reduces the recruitment of 2-year-old cod the following year. In addition, there is a positive relationship between recruitment and the stock size of cod, although the mechanism is poorly known.

Environmental influence on the stock

The productivity of the Faroe Shelf ecosystem is important to the cod stock, but plankton characteristics and temperature seem also to be important, although the mechanisms are poorly known.

The fisheries

Cod are mainly taken in a directed cod and haddock fishery with longlines, in a directed jigging fishery, and as bycatch in the trawl fishery for saithe.

Catch distribution Total catch (2013): 5 kt, where 5 kt were estimated landings (61% longlines, 8% jigging, 31% trawlers, and 0.1% other gear types), 0 kt industrial bycatch, and 0 kt unaccounted removals.

Quality considerations

The landing data are considered accurate. There are no incentives to discard fish under the effort management system. The sampling of the landings is believed to be adequate. Estimates of F in the terminal year have varied considerably.

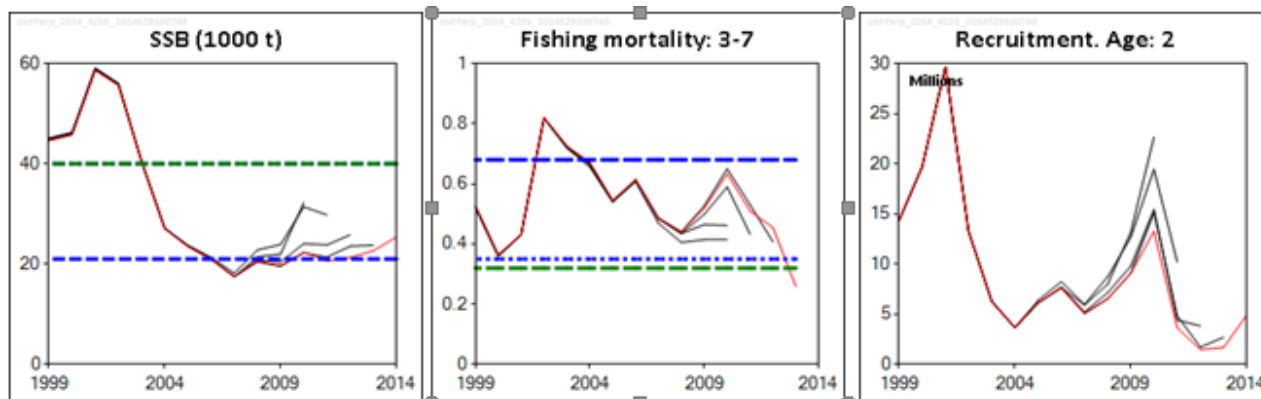


Figure 4.3.1.2 Cod in Subdivision Vb₁ (Faroe Plateau). Historical assessment results (final-year recruitment estimates included).

Scientific basis

Stock data category	1 (ICES, 2014a).
Assessment type	XSA using landings-at-age data and age-disaggregated indices.
Input data	Commercial catches: Mainly Faroese landings, ages and length frequencies from catch sampling. ; survey indices (FO-GFS-Q1 and FO-GFS-Q3); annual maturity data from FO-GFS-Q1; natural mortalities set at 0.2.
Discards and bycatch	Not included, considered negligible.
Indicators	None.
Other information	The stock assessment was last benchmarked by NWWG in 2005.
Working group	North-Western Working Group (NWWG).

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Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY approach	MSY B _{trigger}	40 000 t.	B _{pa} .
	F _{MSY}	0.32	Provisional maximum sustainable yield, FLR stochastic simulations.
Precautionary approach	B _{lim}	21 000 t.	Lowest observed SSB (1998 assessment).
	B _{pa}	40 000 t.	B _{lim} e ^{1.645σ} , assuming a σ of about 0.40 to account for the relatively large uncertainties in the assessment.
	F _{lim}	0.68	F _{pa} e ^{1.645σ} , assuming a σ of about 0.40 to account for the relatively large uncertainties in the assessment.
	F _{pa}	0.35	Close to F _{max} (0.34) and F _{med} (0.38) (1998 assessment).

(Last changed in: 2011)

Yield and spawning biomass per Recruit F-reference points (2013):

	Fish Mort Ages 3–7	Yield/R	SSB/R
Average last 3 years	0.41	1.42	3.94
F _{max}	0.25	1.46	5.87
F _{0.1}	0.11	1.32	9.84
F _{med}	0.34	1.44	4.53

Outlook for 2015

Basis: F (2014) = average F (2011–2013) scaled to (2013) = 0.26; SSB (2015) = 25; Recruitment (2014) = R (age 2 from XSA) = 4.9 million; Catch (2014) = 7.

Rationale	F (2015)	Catch (2015)	Basis	SSB (2016)	%SSB change¹⁾
MSY approach	0.20	4.5	F _{MSY} × SSB ₂₀₁₄ /B _{trigger}	26	1
Precautionary approach	0.35	7.2	F _{pa}	23	-11
Zero catch	0.00	0.0	F = 0	31	22
<i>Status quo</i>	0.26	5.5	F _{sq}	24	-4
	0.13	3.0	F _{sq} × 0.50	28	8
	0.19	4.3	F _{sq} × 0.75	26	2
	0.32	6.7	F _{MSY} = F _{pa} × 0.90	23	-9
	0.23	5.1	F _{sq} × 0.90	25	-1
	0.28	6.0	F _{sq} × 1.1	24	-6

Weights in thousand tonnes.

¹⁾ SSB 2016 relative to SSB 2015.

Management plan

A management system based on number of fishing days, closed areas, and other technical measures was introduced in 1996 to ensure sustainable demersal fisheries in Division Vb. This was before ICES introduced precautionary approach (PA) and MSY reference values, and at that time it was believed that the purpose was achieved if the total allowable number of fishing days was set such that on average 33% of the cod exploitable stock in numbers would be harvested annually. This translates into an average F of 0.45, above the F_{pa} and F_{MSY} of 0.35 and 0.32, respectively. ICES considers this to be inconsistent with the PA and the MSY approaches. Work is ongoing in the Faroes to move away from the F_{target} of 0.45 to be consistent with the ICES advice. This new management plan should include a stepwise reduction of the fishing mortality to F_{MSY} in 2015 and a recovery plan if the SSB declines below the B_{trigger}. The MSY B_{trigger} has been defined at 40 kt (the former B_{pa}), and F_{MSY} at 0.32. If the SSB declines below the MSY B_{trigger}, the

fishing mortality will be reduced by the relationship $F_{MSY} \times B_{act}/B_{trigger}$ until the SSB has increased again above the MSY $B_{trigger}$ and is thereafter kept at F_{MSY} .

MSY approach

ICES advises on the basis of the MSY approach to reduce fishing mortality by 23% in 2015 to 0.20. This is 37% below F_{MSY} , because SSB in 2014 is 37% below MSY $B_{trigger}$.

Precautionary approach

The fishing mortality is below the F_{pa} of 0.35.

Additional considerations

Management considerations

The present estimate of F_{MSY} should be regarded as provisional. Simulation studies that take the productivity of the ecosystem into account have been tried, but this model is still under development.

One of the expected benefits of the effort management system was more stability for the fishing fleet. The fleets were expected to target the most abundant fish species, thus reducing the fishing mortality on stocks that are at low levels. However, low prices on saithe and haddock and high prices for cod have kept the fishing mortality high on cod; the economic factors seem to be more important than the relative abundance of the stocks in determining which species is targeted. When considering future management, protection mechanisms should be included to ensure that appropriate action is taken when one or more stocks or fisheries develop in an unfavourable way.

It is not easy to control fishing mortality by effort management if catchability varies. For baited hook gear, catchability may be related to the amount of food available in the ecosystem (Steingrund *et al.*, 2009). Therefore, during the current low productive period, fishing mortality may increase even though the number of fishing days is decreased.

Regulations and their effects

An effort management system was implemented 1 June 1996. Fishing days are allocated to all fleets fishing in waters < 380 m depth for the period 1 September–31 August. In addition the majority of the waters < ca. 200 m depth are closed to trawlers, and are mainly utilized by longliners. The main spawning areas for cod are closed for nearly all fishing gears during spawning time. In a two-year period from July 2011 to August 2013, additional areas were closed to protect incoming year classes of cod.

Changes in fishing technology and fishing patterns

The effort management system can lead to improvement of fishing technology and efficiency. When such improvements have been documented, the effort needs to be adjusted to take account of the increased catchability. Presently, ICES is not able to quantify these changes.

Comparison of the basis of previous assessment and advice

The basis for the assessment has not changed from last year.

The basis for the advice this year is the same as last year: the MSY approach.

Sources

- ICES. 2013. Report of the North-Western Working Group (NWWG), 25 April–02 May 2013, ICES Headquarters, Copenhagen. ICES CM 2013/ACOM:07. 1538 pp.
- ICES. 2014a. Advice basis. *In* Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 1, Section 1.2.
- ICES. 2014b. Report of the North-Western Working Group (NWWG), 24 April–1 May 2014, ICES Headquarters, Copenhagen, Denmark. ICES CM 2014/ACOM:07. 902 pp.
- Steingrund, P., Clementsen, D. H., and Mouritsen, R. 2009. Higher food abundance reduces the catchability of cod (*Gadus morhua*) to longlines on the Faroe Plateau. *Fisheries Research*, 100: 230–239.

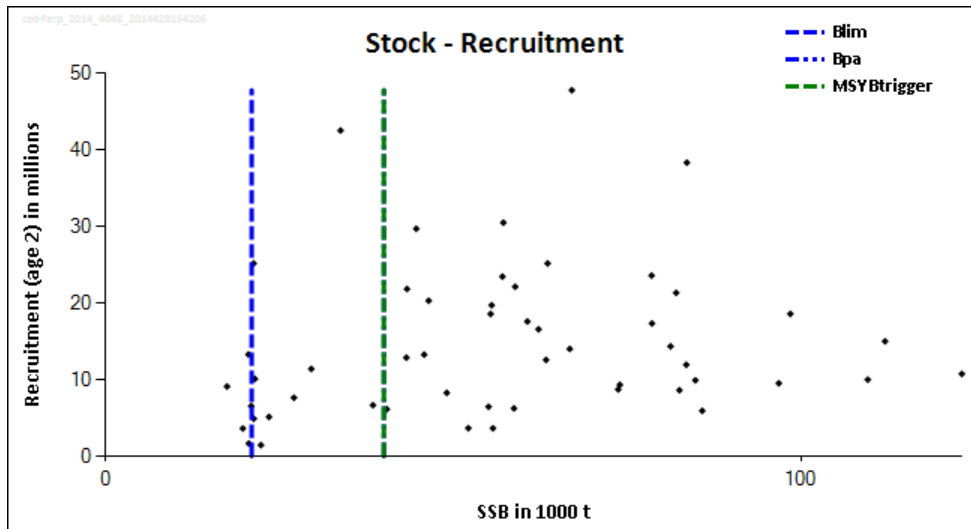


Figure 4.3.1.3 Cod in Subdivision Vb₁ (Faroe Plateau). Stock–recruitment plot.

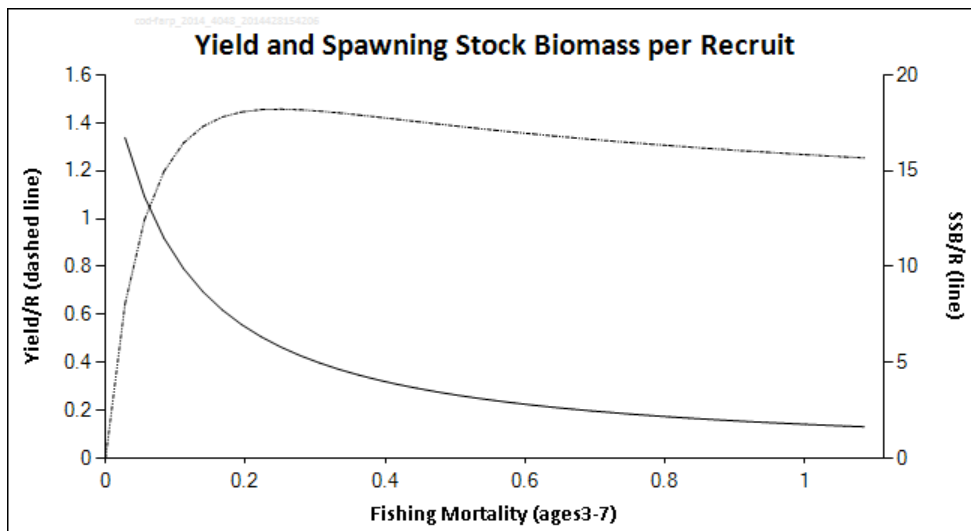


Figure 4.3.1.4 Cod in Subdivision Vb₁ (Faroe Plateau). Yield and spawning-stock biomass per recruit.

Table 4.3.1.1 Cod in Subdivision Vb₁ (Faroe Plateau). ICES advice, management, and landings.

Fishing Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ICES landings
1987	No increase in F	< 31		21.4
1988	No increase in F (Revised estimate)	< 29 (23)		23.2
1989	No increase in F	< 19		22.1
1990	No increase in F	< 20		13.5
1991	TAC	< 16		8.8
1992	No increase in F	< 20		6.4
1993	No fishing	0		6.1
1994	No fishing	0	8.5/12.5 ^{a,b}	9.0
1995	No fishing	0	12.5 ^a	23.0
1996	F at lowest possible level	-	20 ^b	40.4
1997	80% of F(95)	< 24	-	34.3
1998	30% reduction in effort from 1996/97	-	-	24.0
1999	F less than proposed F _{pa} (0.35)	< 19		18.3
2000	F less than proposed F _{pa} (0.35)	< 20		21.0
2001	F less than proposed F _{pa} (0.35)	< 16		28.2
2002	75% of F(2000)	< 22		38.5
2003	75% of F(2001)	< 32		24.5
2004	25% reduction in effort	-		13.2
2005	Rebuilding plan involving large reduction	-		9.9
2006	Rebuilding plan involving large reduction	-		10.5
2007	Rebuilding plan involving large reduction in effort	-		8.1
2008	No fishing. Development of a rebuilding plan.	0		7.5
2009	No fishing. Development of a rebuilding plan.	0		10.0
2010	No fishing. Development of a rebuilding plan.	0		12.8
2011	Reduce F to below F _{pa}	< 16		9.8
2012	MSY framework, reduce F by 30%	< 10		7.2
2013	MSY approach, F < 0.20	4.8		5.0
2014	MSY approach, reduce F by 69 %	3.6		
2015	MSY approach, reduce F by 23 %	4.5		

Weights in thousand tonnes.

¹⁾ In the quota year 1 September–31 August the following year.

²⁾ The TAC was increased during the quota year.

The fishing year runs from 1 September to 31 August the following year.

Table 4.3.1.2 Faroe Plateau cod (Subdivision Vb₁). Nominal catch statistics (in tonnes) per country.

	Denmark	Faroe Islands	France	Germany	Iceland	Norway	Greenland	Portugal	UK (E/W/N)	UK (Scotland)	United Kingdom	Total
1986	8	34,492	4	8		83	-		-	-	-	34,595
1987	30	21,303	17	12		21	-		8	-	-	21,391
1988	10	22,272	17	5		163	-		-	-	-	22,467
1989	-	20,535	-	7		285	-		-	-	-	20,827
1990	-	12,232	-	24		124	-		-	-	-	12,380
1991	-	8,203	- ¹	16		89	-		1	-	-	8,309
1992	-	5,938	3 ²	12		39	-		74	-	-	6,066
1993	-	5,744	1 ²	+		57	-		186	-	-	5,988
1994	-	8,724	-	2		36	-		56	-	-	8,818
1995	-	19,079	2 ²	2		38	-		43	-	-	19,164
1996	-	39,406	1 ²	+		507	-		126	-	-	40,040
1997	-	33,556	-	+		410	-		61 ²	-	-	34,027
1998	-	23,308	- [*]	-		405	-		27 ²	-	-	23,740
1999	-	19,156	- [*]	39		450	-		51	-	-	19,696
2000	-	0	1	2		374	-		18	-	-	395
2001	-	29,762	9 ²	9		531 [*]	-		50	-	-	30,361
2002	-	40,602	20	6	5	573	-		42	-	-	41,248
2003	-	30,259	14	7	-	447	-		15	-	-	30,742
2004	-	17,540	2	3 ²		414	-	1	15	-	-	17,975
2005	-	13,556	-			201	-		24	-	-	13,781
2006	-	11,629	7	1 ²		49	5		1	-	-	11,692
2007	-	9,905	1 ²			71	7		3	358	-	10,347
2008	-	9,394	1			40				383	-	9,818
2009	-	10,736	1			14	7			300	-	11,058
2010	-	13,878	1			10				312	-	14,201
2011	-	11,348	-								-	11,348
2012	-	8,437	0		28						-	8,465
2013 [*]	-	5,706	0		20		2				-	5,728

^{*} Preliminary, ¹ Included in Vb2, ² Reported as Vb.

Table 4.3.1.3 Faroe Plateau cod (Subdivision Vb₁). Officially reported catches as well as the corrections done to obtain the catches, which were used in the assessment.

Year	Faroe catches:				Catches reported as Vb2:		Foreign catches:			Used in the assessment		
	Officially reported	in Vb1	Corrections in Vb1	on Faroe-Iceland ridge in IIA within Faroe area jurisdiction	UK (E/W/N)	UK (Scotland)	UK	French ²	Greenland ²		Russia ²	UK ²
1986	34595											34595
1987	21391											21391
1988	22467				715							23182
1989	20827				1229			12				22068
1990	12380				1090	-	205	17				13692
1991	8309				351	-	90					8750
1992	6066				154	+	176					6396
1993	5988						1	118				6107
1994	8818						1	227				9046
1995	19164	3330 ³			-		551					23045
1996	40040				-		382					40422
1997	34027				-		277					34304
1998	23740				-		265					24005
1999	19696			-1600	-		210					18306
2000	395	21793 [*]		-1400	-		245					21033
2001	30361		-1766	-700	-		288					28183
2002	41248		-2409	-600	-		218	-				38457
2003	30742		-1795	-4700	-		254	-				24501
2004	17975		-1041	-4000	-		244	-				13178
2005	13781		-804	-4200	-		1129	-				9906
2006	11692		-690	-800	-		278					10480
2007	10347		-588	-1800	-		53			6		8018
2008	9818		-557	-1828	-		32					7465
2009	11058		-637	-487	-		38			26	4	10002
2010	14201		-823	-680	-		54			5		12757
2011	11348		-673	-918	-					3		9760
2012	8465		-500	-760	-					5		7210
2013	5728 [*]		-339	-387	-						0.2	5002

¹ Preliminary, ² In order to be consistent with procedures used previous years, ³ Reported to Faroese Coastal Guard, ⁴ expected misreporting/discard.

Table 4.3.1.4

Faroe Plateau cod (Subdivision Vb₁). Summary of the stock assessment.

Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-7
1961	12019	46439	21598	0.606
1962	20654	43326	20967	0.523
1963	20290	49054	22215	0.494
1964	21834	55362	21078	0.502
1965	8269	57057	24212	0.491
1966	18566	60629	20418	0.474
1967	23451	73934	23562	0.390
1968	17582	82484	29930	0.464
1969	9325	83487	32371	0.438
1970	8608	82035	24183	0.388
1971	11928	63308	23010	0.353
1972	21320	57180	18727	0.336
1973	12573	83547	22228	0.289
1974	30480	98434	24581	0.314
1975	38319	109566	36775	0.395
1976	18575	123077	39799	0.475
1977	9995	112057	34927	0.676
1978	10748	78497	26585	0.426
1979	14998	66723	23112	0.427
1980	23583	58887	20513	0.395
1981	14001	63562	22963	0.465
1982	22128	67033	21489	0.414
1983	25162	78543	38133	0.706
1984	47770	96775	36979	0.508
1985	17325	84791	39484	0.701
1986	9515	73701	34595	0.669
1987	9915	62255	21391	0.445
1988	8720	52143	23182	0.607
1989	16568	38440	22068	0.796
1990	3656	29569	13692	0.665
1991	6666	21456	8750	0.510
1992	11396	21287	6396	0.455
1993	10099	33794	6107	0.234
1994	25168	43250	9046	0.183
1995	42516	55059	23045	0.320
1996	12862	85775	40422	0.701
1997	6455	81226	34304	0.770
1998	5924	55506	24005	0.591
1999	14335	44671	18306	0.528
2000	19710	45793	21033	0.364
2001	29692	58700	28183	0.431
2002	13260	55699	38457	0.821
2003	6244	40414	24501	0.726
2004	3647	27073	13178	0.672
2005	6130	23500	9906	0.545
2006	7629	20946	10480	0.614
2007	5129	17473	8018	0.485
2008	6547	20551	7465	0.438
2009	9097	19752	10002	0.519
2010	13279	22342	12757	0.633
2011	3622	20592	9760	0.510
2012	1449	21297	7210	0.454
2013	1656	22635	5002	0.259
2014*	4898	25410		
Average	14728	55854	21908	0.502

* Prediction.