Witch (*Glyptocephalus cynoglossus*) in Subarea 4 and divisions 3.a and 7.d (North Sea, Skagerrak and Kattegat, eastern English Channel)

ICES advice on fishing opportunities

In the context of the EU multiannual plan for demersal fisheries in the North Sea, in which this stock is considered bycatch, the EC has requested that ICES provide advice based on the precautionary approach. ICES advises that catches of up to 1651 tonnes are considered to be precautionary.

ICES advises that witch should be managed using a single-species TAC covering the entire stock distribution area (i.e. ICES Division 3.a, Subarea 4, and Division 7.d).

Stock development over time

Fishing mortality (F) has been above F_{MSY} since the beginning of the time-series. Spawning-stock biomass (SSB) that was below B_{lim} around 2010, has increased since then and is now above MSY $B_{trigger}$. Recruitment (R) has declined since 2010 and is currently at a low level.
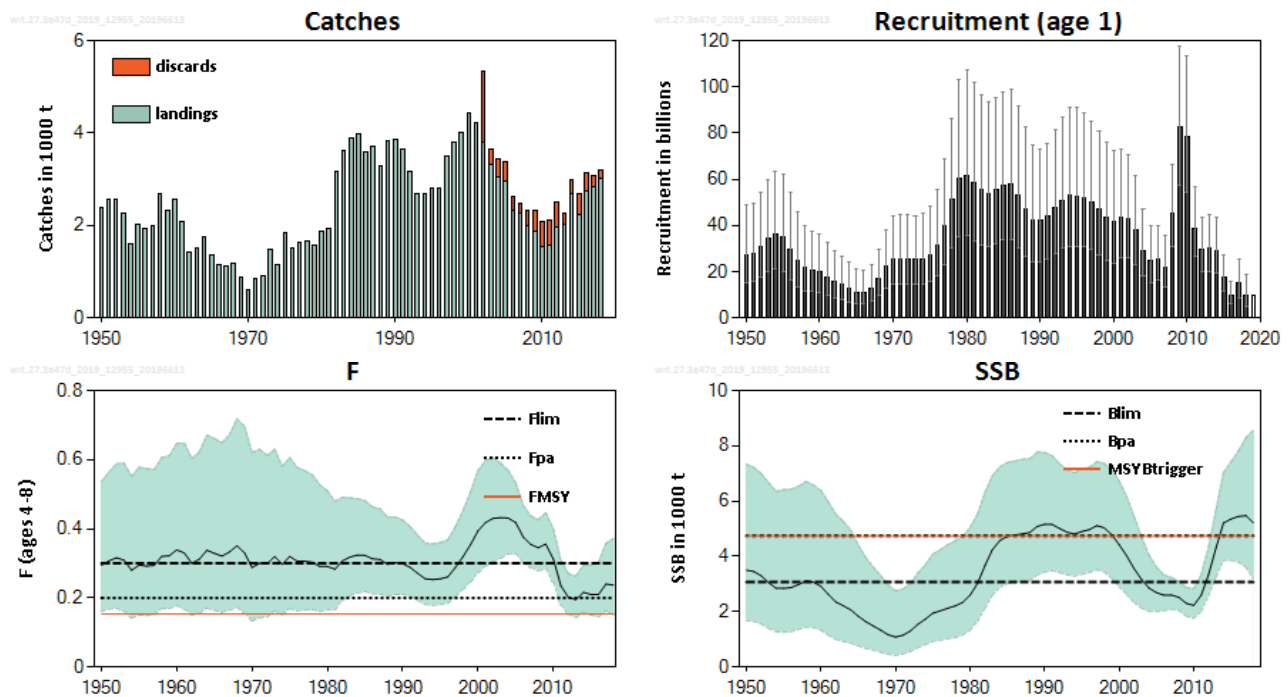

Figure 1   Witch in Subarea 4 and divisions 3.a and 7.d. Official landings and discards (in thousand tonnes); discard information is available since 2002. SSB, F, and R are shown with 95% confidence intervals. Assumed recruitment is unshaded. SSB is estimated at the middle of the year (i.e. spawning time).

Stock and exploitation status

ICES assesses that fishing pressure on the stock is above F_{MSY} and between F_{pa} and F_{lim}, and that spawning stock size is above MSY $B_{trigger}$, B_{pa}, and B_{lim}.

Table 1   Witch in Subarea 4 and divisions 3.a and 7.d. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size			
		2016	2017	2018			2016	2017	2018
Maximum sustainable yield	F_{MSY}	❌	❌	❌ Above	MSY $B_{trigger}$		✅	✅	✅ Above trigger
Precautionary approach	F_{pa}, F_{lim}	🟠	🟠	🟠 Increased risk	B_{pa}, B_{lim}		✅	✅	✅ Full reproductive capacity
Management plan	F_{MGT}	—	—	—	B_{MGT}		—	—	—

Catch scenarios

Table 2   Witch in Subarea 4 and divisions 3.a and 7.d. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
F_{4-8} (2019)	0.237	F_{sq} = F_{4-8} (2018).
SSB (2019)	4748	Tonnes; SSB at the middle of the year (i.e. spawning time) before the TAC year.
$R_{age\ 1}$ (2019, 2020, 2021)	9761	Thousands; Median of the resampled recruitment estimates of 2016–2018.
Total catch (2019)	2368	Tonnes; Short-term forecast.
Wanted catch (2019)	2346	Tonnes; Based on wanted catch fraction (average 2016–2018).
Unwanted catch (2019)	22	Tonnes; Based on unwanted catch fraction (average 2016–2018).

Table 3   Witch in Subarea 4 and divisions 3.a and 7.d. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2020)	Wanted catch (2020) *	Unwanted catch (2020) *	F_{total} ages 4–8 (2020 & 2021)	SSB (2020)	SSB (2021)	% SSB change **	% Advice change ***
ICES advice basis								
Precautionary approach: F_{pa}	1651	1608	43	0.20	4101	3622	−11.7	−31
Other scenarios								
MSY approach: F_{MSY}	1301	1266	35	0.154	4206	3915	−6.9	−46
$F_{MSY-upper}$ [†]	1726	1680	47	0.21	4078	3559	−12.7	−28
$F_{MSY-lower}$	938	913	25	0.108	4315	4229	−2	−61
F = 0	0	0	0	0	4578	5027	9.8	−100
F_{pa}	1651	1608	43	0.2	4101	3622	−11.7	−31
F_{lim}	2350	2286	64	0.3	3880	3061	−21	−1.66
F_{sq}	1924	1866	59	0.24	4011	3393	−15.4	−19.5
SSB (2021) = B_{lim}	2339	2275	64	0.3	3883	3069	−21	−2.1
SSB (2021) = B_{pa}	312	304	7	0.035	4492	4745	5.6	−87
SSB (2021) = MSY $B_{trigger}$	312	304	7	0.035	4492	4745	5.6	−87
Roll-over advice	2390	2326	64	0.31	3866	2846	−26	0

* "Wanted" and "unwanted" catch are used to describe fish that would be landed and discarded in the absence of the EU landing obligation, based on average discard rate estimates for 2016–2018.
** SSB in 2021 relative to SSB in 2020.
*** Total catch in 2020 relative to advice value 2019 (2390 tonnes).

The change in advice (−31%) is due to a changed perception of the stock following a benchmark in 2018 (ICES, 2018a), during which the advice basis for witch changed from a category 3 to a category 1 stock.

[†] Version 2. FMSY upper scenario updated.

Basis of the advice

Table 4   Witch in Subarea 4 and divisions 3.a and 7.d. The basis of the advice.

Advice basis	Precautionary approach.
Management plan	The EU multiannual plan (MAP) for stocks in the North Sea (EU, 2018) and adjacent waters applies to by-catches of this stock. The EC has requested that ICES provide advice based on the precautionary approach.

Quality of the assessment

Witch was benchmarked in 2018 (ICES, 2018a), changing the perception of stock status and trends compared with previous advice.

Witch are generally distributed in deeper areas, and the IBTS survey does not cover some of that habitat. A fisheries-independent survey that has both adequate catchability of large flatfish and covers the entire distribution area of the stock, would improve the assessment.

Age information is only available from 2009 onwards, increasing the uncertainty prior to 2009 in the assessment.

Issues relevant for the advice

This is the first time ICES provides advice for witch as a category 1 stock.

The basis for the advice this year is the precautionary approach, as requested by the European Commission.

The precautionary advice for this stock is based on a constant fishing mortality that has a low probability of bringing SSB below B_{lim} in the long term ($F_{P.05}$ = 0.20; see ICES, 2018b). This would imply a decrease in F compared to current levels (0.24), but still above F_{MSY} (0.154).

Witch is mainly a bycatch species in mixed fisheries. Witch and lemon sole are largely caught by different fisheries in different areas. Management of lemon sole and witch under a combined species TAC may hinder effective management of the single-species exploitation rates and could potentially lead to the overexploitation of witch. A single-species TAC for witch, covering the entire stock, would be more appropriate.

Reference points

Table 5   Witch in Subarea 4 and divisions 3.a and 7.d. Reference points, values, and their technical basis. All weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	4 745	Set equal to B_{pa}.	ICES (2018a)
	F_{MSY}	0.154	EQsim simulation of long-term yield.	ICES (2018a)
Precautionary approach	B_{lim}	3 069	Breakpoint in a segmented regression, based on recruitment 1940–2016.	ICES (2018a)
	B_{pa}	4 745	$B_{lim} \times \exp(1.645 \times \sigma)$, where σ = 0.265 is the standard deviation of the $\ln(SSB(2017))$.	ICES (2018a)
	F_{lim}	0.30	Simulation using B_{lim} and B_{pa} with no assessment and advice noise.	ICES (2018a)
	F_{pa}	0.20	$F_{P.05}$ without ICES advice rule.	ICES (2019)

Basis of the assessment

Table 6   Witch in Subarea 4 and divisions 3.a and 7.d. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018b).
Assessment type	Age-based analytical assessment (SAM; ICES, 2018a).
Input data	In order to obtain convergence, artificial catch-at-age data were added to the beginning of the time-series (1940–1944), leaving a period of five years without data before the total landings series started in 1950. Commercial catches (international landings and ages from catch sampling by métier, raised in Intercatch). Three survey indices (IBTS Q1 from 1983, IBTS Q3 from 1991, BTS Q3 from 1991); age-based from 2009-2018, total biomass until 2008. Assumed constant natural mortality (over ages and years) and maturity ogive (over years).
Discards and bycatch	Discards were quantified for the years 2002–2018. Discards ranged between 9.5% and 23.3% of the total catches. The discard coverage in 2018 was 91%.
Additional indicators	None.
Other information	Benchmarked in 2018 (ICES, 2018a).
Working group	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK)

Information from stakeholders

There is no additional available information for this stock.

History of the advice, catch, and management

Table 7   Witch in Subarea 4 and divisions 3.a and 7.d. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice	Predicted landings corresp. to advice	Predicted catches corresp. to advice	Agreed TAC* 2.a and 4	Official landings 4, 3.a, 7.d	Official landings 4, 3.a, 7.d	ICES landings 4, 3.a, 7.d	ICES discards 4, 3.a, 7.d	ICES catch 4, 3.a, 7.d
		witch		witch and lemon sole		witch			
2006				6175	6593	2303	2335	296	2631
2007				6175	6725	2237	2271	199	2470
2008				6793	5929	1954	1999	318	2317
2009				6793	5212	1818	1863	455	2319
2010				6521	4691	1490	1531	559	2090
2011				6391	5552	1530	1567	547	2114
2012	Reduce catches			6391	5922	1896	1952	555	2507
2013	No new advice, same as for 2012			6391	5754	1993	2013	254	2267
2014	Decrease landings by 4% (last 3 years' average)	< 1574 **		6391	6335	2646	2685	307	2992
2015	No new advice, same as for 2014	< 1574 **		6391	5752	2359	2240	449	2690
2016	Precautionary approach (increase catches by no more than 20%)		≤ 2212	6391	6463	2658	2744	390	3135

Year	ICES advice	Predicted landings corresp. to advice	Predicted catches corresp. to advice	Agreed TAC* 2.a and 4	Official landings 4, 3.a, 7.d	Official landings 4, 3.a, 7.d	ICES landings 4, 3.a, 7.d	ICES discards 4, 3.a, 7.d	ICES catch 4, 3.a, 7.d
		witch		witch and lemon sole		witch			
2017	Precautionary approach (same advised catch value as given for 2016)		≤ 2212	6391	6064	2811	2850	236	3085
2018	Precautionary approach (increase catches by no more than 8%)		≤ 2390	6391	5966	3001	3010	199	3209
2019	Precautionary approach (same advised catch value as given for 2018)		≤ 2390	7874					
2020	Precautionary approach		≤ 1651						

* EU combined TAC for witch and lemon sole in EU waters of Subarea 4 and Division 2.a.

** Advice based on official landings.

History of the catch and landings

Table 8　　Witch in Subarea 4 and divisions 3.a and 7.d. Catch distribution by fleet in 2018 as estimated by ICES.

Catch (2018)	Landings		Discards
3209 tonnes	Bottom otter trawl 90.5%	Others 9.5%	199 tonnes
	3010 tonnes		

Table 9 Witch in Subarea 4 and divisions 3.a and 7.d. History of official landings (3.a and 4), and ICES estimates of landings, catches, and discards (Division 3.a, Subarea 4, and Division 7.d). All weights are in tonnes.

Year	Belgium	Germany		Denmark		Faroe Islands	France	Netherlands		Norway		Sweden		UK	Total landings	ICES estimates (3.a, 4, 7.d)		
	4	3.a	4	3.a	4	4	4	3.a	4	3.a	4	3.a	4	4	3.a and 4	landings	discards	catches
1968	15	0	21	173	108	0	0	0	0	12	5	0	0	840	1174			
1969	3	0	9	150	153	0	0	0	0	6	7	0	0	563	891			
1970	5	0	5	108	112	0	0	0	0	10	9	0	0	348	597			
1971	6	0	6	142	191	0	0	0	0	20	16	0	0	462	843			
1972	0	0	12	219	221	0	0	0	0	16	16	0	0	424	908			
1973	0	0	25	253	215	0	0	0	0	24	516	0	0	461	1494			
1974	0	0	18	291	221	0	0	0	0	13	3	0	0	592	1138			
1975	0	0	20	484	242	0	0	0	0	14	2	474	20	585	1841			
1976	0	0	24	441	175	0	0	0	0	18	3	319	5	511	1496			
1977	0	0	73	444	92	0	0	0	0	13	2	281	0	713	1618			
1978	0	0	37	473	87	0	1	0	0	14	1	232	0	819	1664			
1979	0	0	7	456	91	0	3	0	0	21	1	201	0	792	1572			
1980	0	0	23	569	111	0	2	0	0	49	2	256	0	871	1883			
1981	0	0	17	643	123	0	0	0	0	94	2	307	0	747	1933			
1982	0	0	16	953	495	0	0	0	0	79	2	421	4	1185	3155			
1983	0	0	19	1108	685	0	5	0	0	99	2	391	1	1296	3606			
1984	0	0	11	1158	687	0	4	0	0	158	3	480	3	1399	3903			
1985	0	0	21	1374	460	0	1	0	0	98	2	449	3	1571	3979			
1986	0	0	18	992	436	0	12	0	0	82	2	352	3	1682	3579			
1987	0	0	7	894	571	0	35	0	0	86	5	272	3	1827	3700			
1988	0	0	6	810	447	0	13	0	9	74	9	326	3	1593	3290			
1989	0	0	5	963	452	0	14	0	10	164	15	393	4	1821	3841			
1990	0	0	3	994	532	0	20	0	4	157	40	347	6	1759	3862			
1991	0	0	3	789	512	0	9	0	2	160	75	352	12	1727	3641			
1992	0	0	5	609	460	0	13	0	7	134	46	494	5	1391	3164			
1993	0	0	3	453	383	0	14	0	13	100	52	397	3	1255	2673			
1994	0	0	5	400	458	1	2	0	14	61	57	310	3	1385	2696			
1995	0	0	9	513	384	4	0	0	7	86	14	340	2	1451	2810			
1996	0	0	7	563	434	0	0	0	0	66	14	273	2	1431	2790			
1997	0	0	9	1074	488	1	0	0	1	76	10	352	3	1480	3494			
1998	0	0	13	1430	476	1	0	0	4	112	27	444	4	1275	3786			
1999	0	1	8	1629	486	1	0	0	9	111	23	499	2	1256	4025			
2000	0	0	13	1821	517	0	0	0	7	85	12	571	8	1388	4422			
2001	0	0	8	1304	744	0	0	0	1	72	16	563	12	1486	4206			
2002	0	0	5	1364	543	0	0	0	0	66	16	576	8	1062	3640	3813	1529	5341

Year	Belgium	Germany		Denmark		Faroe Islands	France	Netherlands		Norway		Sweden		UK	Total landings	ICES estimates (3.a, 4, 7.d)		
	4	3.a	4	3.a	4	4	4	3.a	4	3.a	4	3.a	4	4	3.a and 4	landings	discards	catches
2003	0	0	2	1036	771	0	0	0	0	64	23	546	3	836	3281	3308	349	3657
2004	0	1	3	1188	623	0	0	0	1	51	36	549	3	575	3030	3059	369	3428
2005	0	3	4	1006	715	0	0	0	4	42	40	557	2	443	2816	2960	419	3379
2006	0	2	6	635	654	0	0	0	3	37	31	369	2	564	2303	2335	296	2631
2007	0	2	10	618	531	0	0	0	7	45	28	284	6	706	2237	2271	199	2470
2008	0	1	6	476	351	0	0	0	19	46	58	260	19	717	1953	1999	318	2317
2009	0	0	5	593	350	0	0	0	12	28	57	152	6	615	1816	1863	455	2319
2010	0	1	7	537	251	0	0	0	9	25	40	112	1	507	1489	1531	559	2090
2011	0	1	25	565	245	0	0	0	18	23	25	104	1	523	1530	1567	547	2114
2012	0	0	4	921	246	0	0	0	19	31	20	153	2	499	1895	1952	555	2507
2013	5	1	6	803	252	0	0	0	21	28	89	169	1	618	1993	2013	254	2267
2014	15	1	7	1275	237	0	0	2	24	24	119	260	1	681	2646	2685	307	2992
2015	12	0	7	943	291	0	0	2	12	25	92	282	0	532	2196	2240	449	2690
2016	12	0	10	989	534	0	0	10	20	39	164	210	2	694	2684	2744	390	3135
2017	9	0	8	945	542	0	0	3	70	27	107	214	1	939	2865	2850	236	3086
2018	16	1	15	795	499	0	0	2	108	20	255	160	1	1129	3001	3010	199	3209

Summary of the assessment

Table 10 Witch in Subarea 4 and divisions 3.a and 7.d. Assessment summary. Weights are in tonnes.

Year	Recruitment			SSB			Landings	Discards	F		
	Age 1	High	Low	SSB	High	Low			Ages 4–8	High	Low
1950	26944	48817	14871	3504	7335	1674	2379		0.29	0.54	0.161
1951	27793	49372	15646	3456	7217	1655	2568		0.31	0.56	0.168
1952	30773	54222	17465	3297	6994	1555	2554		0.32	0.59	0.170
1953	34413	59817	19798	3049	6665	1395	2263		0.31	0.59	0.161
1954	36464	63404	20971	2843	6352	1272	1590		0.28	0.55	0.142
1955	35019	62309	19682	2842	6411	1260	2027		0.30	0.58	0.150
1956	29793	54317	16341	2871	6426	1283	1936		0.29	0.57	0.149
1957	24563	45612	13227	2981	6541	1359	1991		0.29	0.57	0.152
1958	21609	39582	11797	3114	6709	1445	2678		0.32	0.61	0.169
1959	20731	37121	11578	3070	6581	1432	2333		0.32	0.61	0.170
1960	19743	36066	10808	2919	6382	1335	2563		0.34	0.65	0.177
1961	17640	32696	9517	2622	5969	1151	2093		0.33	0.65	0.168
1962	15696	28765	8564	2352	5526	1001	1419		0.30	0.60	0.150
1963	14369	26347	7836	2216	5272	931	1523		0.31	0.62	0.156
1964	12766	24044	6778	2070	4955	865	1760		0.34	0.67	0.170
1965	11182	21291	5873	1839	4415	766	1356		0.33	0.66	0.164
1966	10978	20428	5899	1641	3963	679	1137		0.32	0.65	0.159
1967	12773	22782	7162	1490	3619	613	1125		0.33	0.67	0.165
1968	17221	29773	9961	1338	3312	541	1174		0.35	0.72	0.172
1969	22223	38188	12933	1170	2971	461	891		0.33	0.70	0.156
1970	25286	43970	14541	1083	2750	427	597		0.29	0.62	0.134
1971	25586	44361	14757	1150	2819	469	843		0.30	0.63	0.143
1972	25417	44670	14462	1303	3013	564	908		0.30	0.61	0.146
1973	25125	44196	14283	1544	3404	700	1494		0.32	0.63	0.162
1974	25542	45131	14456	1732	3695	812	1138		0.30	0.58	0.152
1975	27424	48446	15524	1947	4082	929	1841		0.32	0.61	0.169
1976	31600	55277	18065	2032	4235	975	1496		0.31	0.58	0.163
1977	39875	68590	23181	2127	4420	1023	1618		0.31	0.57	0.165
1978	51233	86114	30481	2212	4565	1071	1664		0.30	0.56	0.166
1979	60194	102830	35236	2337	4723	1156	1572		0.29	0.53	0.161
1980	61641	107193	35446	2600	5045	1340	1883		0.29	0.51	0.166
1981	58389	101975	33433	3022	5527	1652	1933		0.28	0.48	0.167
1982	55230	96509	31607	3671	6312	2135	3155		0.31	0.49	0.193
1983	53634	93401	30798	4242	6915	2602	3606		0.32	0.49	0.21
1984	55235	95055	32096	4574	7239	2891	3903		0.32	0.49	0.22
1985	57446	97559	33826	4724	7397	3016	3979		0.32	0.48	0.22
1986	57725	98674	33769	4774	7452	3058	3579		0.31	0.46	0.21
1987	52809	91660	30426	4814	7510	3086	3700		0.31	0.46	0.21
1988	46776	82338	26574	4864	7527	3143	3290		0.30	0.43	0.20
1989	42465	74791	24111	5083	7766	3327	3841		0.30	0.43	0.21
1990	41986	73164	24094	5163	7759	3436	3862		0.30	0.43	0.21
1991	43865	75541	25472	5160	7640	3485	3641		0.29	0.41	0.21
1992	47786	81480	28025	5013	7355	3416	3164		0.27	0.38	0.193
1993	50974	86734	29958	4879	7141	3333	2673		0.26	0.36	0.181
1994	52920	91137	30729	4807	7025	3289	2696		0.25	0.36	0.179
1995	52717	90767	30618	4901	7163	3354	2810		0.26	0.36	0.181
1996	52098	88844	30550	4969	7222	3418	2790		0.26	0.37	0.185
1997	49996	85312	29299	5111	7423	3519	3494		0.29	0.41	0.21
1998	46864	80980	27120	5032	7361	3440	3786		0.32	0.45	0.23
1999	43244	75677	24711	4788	7130	3215	4024		0.35	0.51	0.25
2000	41436	72639	23637	4424	6730	2908	4422		0.39	0.57	0.27
2001	43501	72932	25947	4021	6169	2621	4206		0.42	0.60	0.29
2002	42636	70324	25849	3562	5441	2332	3813	1529	0.43	0.61	0.31
2003	37802	61543	23219	3171	4712	2134	3308	349	0.43	0.59	0.32

Year	Recruitment			SSB			Landings	Discards	F		
	Age 1	High	Low	SSB	High	Low			Ages 4–8	High	Low
2004	29129	47057	18031	2853	4048	2010	3059	369	0.43	0.57	0.33
2005	24642	39611	15330	2691	3612	2005	2960	419	0.42	0.53	0.33
2006	25433	39658	16310	2600	3328	2031	2335	296	0.38	0.47	0.30
2007	22011	35702	13570	2605	3240	2094	2271	199	0.36	0.44	0.29
2008	45048	66212	30649	2522	3105	2048	1999	318	0.35	0.43	0.28
2009	82315	117821	57509	2303	2874	1846	1863	455	0.36	0.45	0.28
2010	78253	113109	54138	2229	2830	1756	1531	559	0.31	0.40	0.25
2011	38770	56948	26395	2592	3327	2020	1567	547	0.24	0.31	0.180
2012	29349	43249	19916	3350	4344	2584	1952	555	0.20	0.27	0.152
2013	30023	44556	20230	4320	5702	3273	2013	254	0.195	0.26	0.144
2014	28852	43596	19094	5210	7033	3859	2685	307	0.22	0.29	0.159
2015	17677	27426	11393	5350	7418	3858	2240	449	0.21	0.29	0.150
2016	9761	16029	5944	5449	7816	3799	2744	390	0.21	0.30	0.146
2017	14992	25658	8760	5472	8291	3612	2850	236	0.24	0.36	0.162
2018	9679	18848	4970	5217	8566	3177	3010	199	0.24	0.37	0.152
2019	9761*										

* Resampled from 2016–2018 recruitment.

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