

11 Icelandic summer spawning herring

Because of the Covid-19 outbreak the Ministry of Industries and Innovation in Iceland does not require advice from ICES for Icelandic summer spawning herring for 2021. This is done to reduce travelling of Icelandic experts and the workload of both MRFI and ICES (see letter to ICES dated March 12, 2020 in the Introduction chapter).

The assessment of Icelandic summer spawning herring was therefore not presented and discussed during the NWWG in April. Data input tables in the report were updated but not text and figures.

Tables

Table 11.1.1.1. Icelandic summer-spawning herring. Acoustic estimates (in millions) in the winters 1973/74-2019/20 (age refers to the autumns). No surveys (and gaps in the time-series) were in 1976/77, 1982/83, 1986/87, 1994/95.

YEAR\AGE	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	Total
1973/74	154.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	154
1974/75	5.000	137.000	19.000	21.000	2.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	186
1975/76	136.000	20.000	133.000	17.000	10.000	3.000	3.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	322
1977/78	212.000	424.000	46.000	19.000	139.000	18.000	18.000	10.000	0.000	0.000	0.000	0.000	0.000	0.000	886
1978/79	158.000	334.000	215.000	49.000	20.000	111.000	30.000	30.000	20.000	0.000	0.000	0.000	0.000	0.000	967
1979/80	19.000	177.000	360.000	253.000	51.000	41.000	93.000	10.000	0.000	0.000	0.000	0.000	0.000	0.000	1004
1980/81	361.000	462.000	85.000	170.000	182.000	33.000	29.000	58.000	10.000	0.000	0.000	0.000	0.000	0.000	1390
1981/82	17.000	75.000	159.000	42.000	123.000	162.000	24.000	8.000	46.000	10.000	0.000	0.000	0.000	0.000	666
1983/84	171.000	310.000	724.000	80.000	39.000	15.000	27.000	26.000	10.000	5.000	12.000	0.000	0.000	0.000	1419
1984/85	28.000	67.000	56.000	360.000	65.000	32.000	16.000	17.000	18.000	9.000	7.000	4.000	5.000	5.000	689
1985/86	652.000	208.000	110.000	86.000	425.000	67.000	41.000	17.000	27.000	26.000	16.000	6.000	6.000	1.000	1688
1987/88	115.544	401.246	858.012	308.065	57.103	32.532	70.426	36.713	23.586	18.401	24.278	10.127	3.926	4.858	1965
1988/89	635.675	201.284	232.808	381.417	188.456	46.448	25.798	32.819	17.439	10.373	9.081	5.419	3.128	5.007	1795
1989/90	138.780	655.361	179.364	278.836	592.982	179.665	22.182	21.768	13.080	9.941	1.989	0.000	0.000	0.000	2094
1990/91	403.661	132.235	258.591	94.373	191.054	514.403	79.353	37.618	9.394	12.636	0.000	0.000	0.000	0.000	1733
1991/92	598.157	1049.990	354.521	319.866	89.825	138.333	256.921	21.290	9.866	0.000	9.327	0.000	0.000	1.494	2850
1992/93	267.862	830.608	729.556	158.778	130.781	54.156	96.330	96.649	24.542	1.130	1.130	3.390	0.000	0.000	2395
1993/94	302.075	505.279	882.868	496.297	66.963	58.295	106.172	48.874	36.201	0.000	4.224	18.080	0.000	0.000	2525
1995/96	216.991	133.810	761.581	277.893	385.027	176.906	98.150	48.503	16.226	29.390	47.945	4.476	0.000	0.000	2197
1996/97	33.363	270.706	133.667	468.678	269.888	325.664	217.421	92.979	55.494	39.048	30.028	53.216	18.838	12.612	2022
1997/98	291.884	601.783	81.055	57.366	287.046	155.998	203.382	105.730	35.469	27.373	14.234	36.500	14.235	11.570	1924
1998/99	100.426	255.937	1081.504	103.344	51.786	135.246	70.514	101.626	53.935	17.414	13.636	2.642	4.209	8.775	2001
1999/00	516.153	839.491	239.064	605.858	88.214	43.353	165.716	89.916	121.345	77.600	21.542	3.740	11.149	0.000	2823
2000/01	190.281	966.960	1316.413	191.001	482.418	34.377	15.727	37.940	14.320	15.413	14.668	1.705	3.259	0.000	3284
2001/02	1047.643	287.004	217.441	260.497	161.049	345.852	62.451	57.105	38.405	46.044	38.114	21.062	3.663	0.000	2586

YEAR\AGE	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	Total
2002/03	1731.809	1919.368	553.149	205.656	262.362	153.037	276.199	99.206	47.621	55.126	18.798	24.419	24.112	1.377	5372
2003/04	1115.255	1434.976	2058.222	330.800	109.146	100.785	38.693	45.582	7.039	6.362	7.509	10.894	0.000	2.289	5268
2004/05	2417.128	713.730	1022.326	1046.657	171.326	62.429	44.313	10.947	23.942	12.669	0.000	1.948	11.088	0.000	5539
2005/06	469.532	443.877	344.983	818.738	1220.902	281.448	122.183	129.588	73.339	65.287	10.115	9.205	3.548	12.417	4005
2006/07	109.959	608.205	1059.597	410.145	424.525	693.423	95.997	123.748	48.773	0.955	0.000	0.000	0.000	0.480	3576
2007/08	90.231	456.773	289.260	541.585	309.443	402.889	702.708	221.626	244.772	13.997	22.113	68.105	10.136	2.800	3376
2008/09	149.466	196.127	416.862	288.156	457.659	266.975	225.747	168.960	29.922	26.281	17.790	9.881	0.974	3.195	2258
2009/10	151.066	315.941	490.653	554.818	271.445	327.275	149.143	83.875	156.920	36.666	13.649	8.507	1.458	5.590	2567
2010/11	106.178	280.582	228.857	304.885	296.254	138.686	301.285	60.997	141.323	97.412	37.006	0.000	4.019	0.000	1997
2011/12	704.863	977.323	434.876	313.742	272.140	239.320	154.581	175.088	84.582	92.435	89.376	17.638	6.808	4,989	3676
2012/13	178.500	781.083	631.421	166.627	126.961	142.044	110.084	97.000	74.340	69.473	43.376	38.450	7.458	0.773	2468
2013/14	15.919	314.865	218.715	344.981	151.631	132.767	120.756	118.377	89.555	74.602	48.695	44.637	31.096	11.598	1718
2014/15	152.422	90,269	330.084	260.919	259.079	187.905	111.955	91.629	37.855	76.680	30.366	10.619	22.799	10.108	1667
2015/16	381.900	164.221	174.507	312.350	225.836	215.207	93.743	62.753	75.339	41.961	15.696	26.756	20.159	5.401	1816
2016/17	97.036	220.642	137.217	151.937	262.488	136.801	241.382	61.220	55.869	62.805	11.435	20.135	13.733	0.313	1473
2017/18	32.749	22.947	95.097	171.664	201.944	319.933	209.174	255.348	75.813	34.505	83.460	54.903	25.370	28.115	1611
2018/19	306.295	137.402	67.933	201.362	101.946	110.810	167.397	163.804	73.346	30.040	29.950	38.499	9.138	7.271	1445
2019/20	1525	229.841	158.605	103.631	211.106	98.785	53.723	59.527	42.221	37.186	21.341	15.089	10.393	0.986	2568

Table 11.1.1.2. Icelandic summers-spawning herring. Number of fish aged (number of scales) and number of samples taken in the annual acoustic surveys in the seasons 1987/88-2019/20 (age refers to the former year, i.e. autumns). In 2000 seven samples were used from the fishery. No survey was conducted in 1994/95.

Year age	Number of scales															N of samples		
	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	Total	Totall	West	East
1987/88	11	59	246	156	37	28	58	33	22	16	23	10	5	8	712	8	1	7
1988/89	229	78	181	424	178	69	50	77	42	29	23	13	7	12	1412	18	5	10
1989/90	38	245	96	132	225	35	2	2	3	3	2	0	0	0	783	8		8
1990/91	418	229	303	90	131	257	28	6	3	8	0	0	0	0	1473	15		15
1991/92	414	439	127	127	33	48	84	5	3	0	2	0	0	1	1283	15		15
1992/93	122	513	289	68	73	28	38	34	6	2	2	6	0	0	1181	12		12
1993/94	63	285	343	129	13	15	7	14	11	0	1	3	0	0	884	9		9
1994/95*																		
1995/96	183	90	471	162	209	107	38	18	8	14	18	2	0	0	1320	14	9	5
1996/97	24	150	88	351	141	137	87	32	15	10	7	14	4	2	1062	11	4	7
1997/98	101	249	50	36	159	95	122	62	21	13	8	15	8	5	944	14	7	7
1998/99	130	216	777	72	31	65	59	86	37	22	17	5	6	11	1534	17	10	7
1999/00	116	227	72	144	17	13	26	26	27	10	8	2	1	0	689	7	3	4
2000/01	116	249	332	87	166	10	7	21	8	14	11	3	1	0	1025	14	10	4
2001/02	61	56	130	114	62	136	25	24	17	21	17	10	3	0	676	9	4	5
2002/03	520	705	258	104	130	74	128	46	26	25	13	15	10	1	2055	22	12	10
2003/04	126	301	415	88	35	32	15	17	3	4	4	6	1	1	1048	13	8	5
2004/05	304	159	284	326	70	29	17	5	8	4	0	3	3	0	1212	13	4	9
2005/06	217	312	190	420	501	110	40	38	26	18	5	5	5	7	1894	22	14	8
2006/07	19	77	134	64	71	88	22	4	2	2	0	0	0	1	484	6	4	2
2007/08	58	288	180	264	85	80	104	19	15	2	2	6	1	3	1107	17	13	4
2008/09	274	208	213	136	204	123	125	97	18	13	9	7	4	17	1448	29	19	10
2009/10	104	100	105	116	60	74	34	19	36	8	3	4	2	2	667	17	10	7
2010/11	35	74	102	157	139	61	119	22	52	36	13	0	1	0	811	11	8	3
2011/12	229	330	134	115	100	106	74	87	45	48	51	10	3	3	1335	15	9	6
2012/13 [‡]	42	266	554	273	220	252	198	165	126	114	69	61	12	2	2370	60	55 [‡]	5
2013/14	26	472	275	414	199	200	199	208	163	138	90	85	60	23	2552	45	37 [‡]	8
2014/15	83	50	96	71	72	53	32	26	11	22	8	3	6	4	534	10	8	2
2015/16	229	112	131	208	148	123	47	32	32	22	13	7	12	4	1120	14	7	7 [§]
2016/17	66	164	122	137	202	117	169	43	50	44	14	15	9	4	1162	14	12	2
2017/18	35	58	82	77	75	101	65	77	29	11	27	18	8	9	672	10	5	5
2018/19	28	39	31	98	50	53	77	75	36	15	15	21	5	4	547	7	5	2
2019/20	265	143	94	48	101	60	43	54	45	43	27	26	20	6	975	10	5	5

*No survey

[‡]Samples in the western part were mainly from the commercial catch as there was impossible to secure a usable research survey samples from Kolgrafafjörður where most of the herring was observed.

[§]Three samples were taken in the east and south in this survey (B1-2016), while four were taken in the west and used also in the age-length key.

Table 11.2.1. Icelandic summer spawners. Landings, catches, recommended TACs, and set National TACs (both covering 1 Sept. to 31 August following year) in thousand tonnes.

YEAR	LANDINGS	CATCHES	RECOM. TACs	NAT. TACs	YEAR	LANDINGS	CATCHES	RECOM. TACs	NAT. TACs
1972	0.31	0.31			2007/2008	158.9	158.9	130	150
1973	0.254	0.254			2008/2009	151.8	151.8	130	150
1974	1.275	1.275			2009/2010	46.3	46.3	40	47
1975	13.28	13.28			2010/2011	43.5	43.5	40	40
1976	17.168	17.168			2011/2012 [‡]	49.4	49.4	40	45
1977	28.925	28.925			2012/2013 [‡]	72.0	72.0	67	68.5
1978	37.333	37.333			2013/2014 [‡]	72.1	72.1	87	87
1979	45.072	45.072			2014/2015 ^{‡§}	95.0	95.0	83	83
1980	53.268	53.268			2015/2016 [‡]	69.7	69.7	71	71
1981	39.544	39.544			2016/2017 [‡]	60.4	60.4	63	63
1982	56.528	56.528			2017/2018 [‡]	35.0	35.0	39	39
1983	58.867	58.867			2018/2019 [‡]	40.7	40.7	35.1	35.1
1984	50.304	50.304			2019/2020 [‡]	30.0	30.0	34.6	34.6
1985	49.368	49.368	50	50	2020/2021			35.5	35.5
1986	65.5	65.5	65	65					
1987	75	75.4	70	73					
1988	92.8	92.8	90	90					
1989	97.3	101.0	90	90					
1990/1991	101.6	105.1	80	110					
1991/1992	98.5	109.5	80	110					
1992/1993	106.7	108.5	90	110					
1993/1994	101.5	102.7	90	100					
1994/1995	132.0	134.0	120	120					
1995/1996	125.9	125.9	110	110					
1996/1997	95.9	95.9	100	100					
1997/1998	64.7	64.9	100	100					
1998/1999**	87.2	87.2	90	70					
1999/2000	92.9	92.9	100	100					
2000/2001	100.3	100.3	110	110					
2001/2002	95.7	95.7	125	125					
2002/2003*	96.2	96.2	105	105					
2003/2004*	125.7	125.7	110	110					
2004/2005	114.2	114.2	110	110					
2005/2006	103.0	103.0	110	110					
2006/2007	135.3	135.3	130	130					

*Summer fishery in 2002 and 2003 included

** TAC was decided 70 thous. tonnes but because of transfers from the previous quota year the national TAC became 90 thous. tonnes.

[‡] Landings and catches include bycatch of Icelandic summer-spawning herring in the mackerel and NSS herring fishery during the preceding summer (i.e. from the fishing season before in June-August).

[§] The landings and catches in 2014/2015 consist of transfer of 7 kt from the year before and 5 kt from the year to come, which explains the discrepancy to the TACs.

Table 11.2.2.1. Icelandic summer-spawning herring. Catch in numbers (millions) and total catch in weight (thous. tonnes) (1981 refers to season 1981/1982 etc).

YEAR\AGE	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	CATCH
1975	1.518	2.049	31.975	6.493	7.905	0.863	0.442	0.345	0.114	0.004	0.001	0.001	0.001	0.001	13.280
1976	0.614	9.848	3.908	34.144	7.009	5.481	1.045	0.438	0.296	0.134	0.092	0.001	0.001	0.001	17.168
1977	0.705	18.853	24.152	10.404	46.357	6.735	5.421	1.395	0.524	0.362	0.027	0.128	0.001	0.001	28.925
1978	2.634	22.551	50.995	13.846	8.738	39.492	7.253	6.354	1.616	0.926	0.4	0.017	0.025	0.051	37.333
1979	0.929	15.098	47.561	69.735	16.451	8.003	26.04	3.05	1.869	0.494	0.439	0.032	0.054	0.006	45.072
1980	3.147	14.347	20.761	60.727	65.328	11.541	9.285	19.442	1.796	1.464	0.698	0.001	0.11	0.079	53.268
1981	2.283	4.629	16.771	12.126	36.871	41.917	7.299	4.863	13.416	1.032	0.884	0.760	0.101	0.062	39.544
1982	0.454	19.187	28.109	38.280	16.623	38.308	43.770	6.813	6.633	10.457	2.354	0.594	0.075	0.211	56.528
1983	1.475	22.499	151.718	30.285	21.599	8.667	14.065	13.713	3.728	2.381	3.436	0.554	0.100	0.003	58.867
1984	0.421	18.015	32.244	141.354	17.043	7.113	3.916	4.113	4.517	1.828	0.202	0.255	0.260	0.003	50.304
1985	0.112	12.872	24.659	21.656	85.210	11.903	5.740	2.336	4.363	4.053	2.773	0.975	0.480	0.581	49.368
1986	0.100	8.172	33.938	23.452	20.681	77.629	18.252	10.986	8.594	9.675	7.183	3.682	2.918	1.788	65.500
1987	0.029	3.144	44.590	60.285	20.622	19.751	46.240	15.232	13.963	10.179	13.216	6.224	4.723	2.280	75.439
1988	0.879	4.757	41.331	99.366	69.331	22.955	20.131	32.201	12.349	10.250	7.378	7.284	4.807	1.957	92.828
1989	3.974	22.628	26.649	77.824	188.654	43.114	8.116	5.897	7.292	4.780	3.449	1.410	0.844	0.348	101.000
1990	12.567	14.884	56.995	35.593	79.757	157.225	30.248	8.187	4.372	3.379	1.786	0.715	0.446	0.565	105.097
1991	37.085	88.683	49.081	86.292	34.793	55.228	110.132	10.079	4.155	2.735	2.003	0.519	0.339	0.416	109.489
1992	16.144	94.86	122.626	38.381	58.605	27.921	38.42	53.114	11.592	1.727	1.757	0.153	0.376	0.001	108.504
1993	2.467	51.153	177.78	92.68	20.791	28.56	13.313	19.617	15.266	4.254	0.797	0.254	0.001	0.001	102.741
1994	5.738	134.616	113.29	142.876	87.207	24.913	20.303	16.301	15.695	14.68	2.936	1.435	0.244	0.195	134.003
1995	4.555	20.991	137.232	86.864	109.14	76.78	21.361	15.225	8.541	9.617	7.034	2.291	0.621	0.235	125.851
1996	0.717	15.969	40.311	86.187	68.927	84.66	39.664	14.746	8.419	5.836	3.152	5.18	1.996	0.574	95.882
1997	2.008	39.24	30.141	26.307	36.738	33.705	31.022	22.277	8.531	3.383	1.141	10.296	0.947	2.524	64.931
1998	23.655	45.39	175.529	22.691	8.613	40.898	25.944	32.046	14.647	2.122	2.754	2.15	1.07	1.011	87.238
1999	5.306	56.315	54.779	140.913	16.093	13.506	31.467	19.845	22.031	12.609	2.673	2.746	1.416	2.514	92.896
2000	17.286	57.282	136.278	49.289	76.614	11.546	8.294	16.367	9.874	11.332	6.744	2.975	1.539	1.104	100.332
2001	27.486	42.304	86.422	93.597	30.336	54.491	10.375	8.762	12.244	9.907	8.259	6.088	1.491	1.259	95.675
2002	11.698	80.863	70.801	45.607	54.202	21.211	42.199	9.888	4.707	6.52	9.108	9.355	3.994	5.697	96.208
2003	24.477	211.495	286.017	58.120	27.979	25.592	14.203	10.944	2.230	3.424	4.225	2.562	1.575	1.370	125.717
2004	23.144	63.355	139.543	182.45	40.489	13.727	9.342	5.769	7.021	3.136	1.861	3.871	0.994	1.855	114.237
2005	6.088	26.091	42.116	117.91	133.437	27.565	12.074	9.203	5.172	5.116	1.045	1.706	2.11	0.757	103.043
2006	52.567	118.526	217.672	54.800	48.312	57.241	13.603	5.994	4.299	0.898	1.626	1.213	0.849	0.933	135.303
2007	10.817	94.250	83.631	163.294	61.207	87.541	92.126	23.238	11.728	7.319	2.593	4.961	2.302	1.420	158.917
2008	10.427	38.830	90.932	79.745	107.644	59.656	62.194	54.345	18.130	8.240	5.157	2.680	2.630	1.178	151.780
2009	5.431	21.856	35.221	31.914	18.826	22.725	10.425	9.213	9.549	2.238	1.033	0.768	0.406	0.298	46.332
2010	1.476	8.843	22.674	29.492	24.293	14.419	17.407	10.045	7.576	8.896	1.764	1.105	0.672	0.555	43.533
2011	0.521	9.357	24.621	20.046	22.869	23.706	13.749	16.967	10.039	7.623	7.745	1.441	0.618	0.785	49.446
2012*	0.403	17.827	89.432	51.257	43.079	51.224	41.846	34.653	27.215	24.946	15.473	13.575	2.595	0.253	71.976
2013	6.888	46.848	24.833	35.070	17.250	18.550	19.032	21.821	15.952	15.804	10.081	9.775	6.722	2.486	72.058
2014	0.000	3.537	53.241	50.609	70.044	34.393	22.084	22.138	13.298	17.761	7.974	4.461	2.862	1.746	94.975
2015	0.089	6.024	29.89	53.573	43.501	43.015	15.533	10.76	8.664	8.161	6.981	2.726	2.467	1.587	69.729
2016	0.072	10.740	25.575	29.908	41.952	25.823	24.925	9.516	7.734	6.088	4.284	7.154	3.108	0.827	60.403
2017	1.262	5.236	31.855	18.113	10.239	15.506	10.223	8.830	5.676	3.399	1.616	2.220	1.533	1.596	35.034
2018	0.000	8.911	19.642	34.284	16.847	12.376	17.161	6.978	7.379	3.482	1.713	1.153	2.159	0.489	40.683
2019	0.461	4.601	15.845	12.970	16.084	12.244	6.944	9.531	6.167	4.732	2.983	2.808	2.200	1.866	30.038

* Includes both the landings (73.4 kt) and the herring that died in the mass mortality (52.0 kt) in the winter 2012/13 in Kolgrafafjörður.

Table 11.2.2.2. Icelandic summer-spawning herring. The mean weight (g) at age from the commercial catch (1981 refers to season 1981/1982 etc).

YEAR\AGE	2	3	4	5	6	7	8	9	10	11	12	13	14	15+
1975	110	179	241	291	319	339	365	364	407	389	430	416	416	416
1976	103	189	243	281	305	335	351	355	395	363	396	396	396	396
1977	84	157	217	261	285	313	326	347	364	362	358	355	400	420
1978	73	128	196	247	295	314	339	359	360	376	380	425	425	425
1979	75	145	182	231	285	316	334	350	367	368	371	350	350	450
1980	69	115	202	232	269	317	352	360	380	383	393	390	390	390
1981	61	141	190	246	269	298	330	356	368	405	382	400	400	400
1982	65	141	186	217	274	293	323	354	385	389	400	394	390	420
1983	59	132	180	218	260	309	329	356	370	407	437	459	430	472
1984	49	131	189	217	245	277	315	322	351	334	362	446	417	392
1985	53	146	219	266	285	315	335	365	388	400	453	469	433	447
1986	60	140	200	252	282	298	320	334	373	380	394	408	405	439
1987	60	168	200	240	278	304	325	339	356	378	400	404	424	430
1988	75	157	221	239	271	298	319	334	354	352	371	390	408	437
1989	63	130	206	246	261	290	331	338	352	369	389	380	434	409
1990	80	127	197	245	272	285	305	324	336	362	370	382	375	378
1991	74	135	188	232	267	289	304	323	340	352	369	402	406	388
1992	68	148	190	235	273	312	329	339	355	382	405	377	398	398
1993	66	145	211	246	292	324	350	362	376	386	419	389	389	389
1994	66	134	201	247	272	303	333	366	378	389	390	412	418	383
1995	68	130	183	240	277	298	325	358	378	397	409	431	430	467
1996	75	139	168	212	258	289	308	325	353	353	377	404	395	410
1997	63	131	191	233	269	300	324	341	355	362	367	393	398	411
1998	52	134	185	238	264	288	324	340	348	375	406	391	426	456
1999	74	137	204	233	268	294	311	339	353	362	378	385	411	422
2000	62	159	217	268	289	325	342	363	378	393	407	425	436	430
2001	74	139	214	244	286	296	324	347	354	385	403	421	421	433
2002	85	161	211	258	280	319	332	354	405	396	416	433	463	460
2003	72	156	189	229	260	283	309	336	336	369	394	378	412	423
2004	84	149	213	248	280	315	331	349	355	379	388	412	419	425
2005	106	170	224	262	275	298	324	335	335	356	372	394	405	413
2006	107	189	234	263	290	304	339	349	369	416	402	413	413	467
2007	93	158	221	245	261	277	287	311	339	334	346	356	384	390
2008	105	174	232	275	292	307	315	327	345	366	377	372	403	434
2009	113	190	237	274	304	318	326	335	342	360	372	394	409	421
2010	87	204	243	271	297	315	329	335	341	351	367	366	405	416
2011	97	187	245	283	309	328	343	352	356	364	375	386	378	432
2012	65	206	244	282	301	320	333	344	350	359	364	367	373	391
2013	95	182	238	271	300	322	337	349	360	365	362	375	377	394
2014		202	259	288	306	328	346	354	362	366	367	380	383	403
2015	107	203	249	275	299	313	329	347	352	358	361	368	380	378
2016	129	202	242	281	303	322	336	355	359	368	369	379	386	402
2017	95	192	252	281	303	324	341	350	367	376	384	389	395	402
2018		191	252	293	317	333	347	350	366	375	389	388	392	383
2019	103	175	244	282	305	308	328	340	349	357	360	366	374	374

Table 11.2.2.3. Icelandic summer-spawning herring. Proportion mature at age (1981 refers to season 1981/1982 etc).

YEAR\AGE	2	3	4	5	6	7	8	9	10	11	12	13	14	15+
1975	0	0.27	0.97	1	1	1	1	1	1	1	1	1	1	1
1976	0	0.13	0.9	1	1	1	1	1	1	1	1	1	1	1
1977	0	0.02	0.87	1	1	1	1	1	1	1	1	1	1	1
1978	0	0.04	0.78	1	1	1	1	1	1	1	1	1	1	1
1979	0	0.07	0.65	0.98	1	1	1	1	1	1	1	1	1	1
1980	0	0.05	0.92	1	1	1	1	1	1	1	1	1	1	1
1981	0	0.03	0.65	0.99	1	1	1	1	1	1	1	1	1	1
1982	0.02	0.05	0.85	1	1	1	1	1	1	1	1	1	1	1
1983	0	0	0.64	1	1	1	1	1	1	1	1	1	1	1
1984	0	0.01	0.82	1	1	1	1	1	1	1	1	1	1	1
1985	0	0	0.9	1	1	1	1	1	1	1	1	1	1	1
1986-2019	0	0.2	0.85	1	1	1	1	1	1	1	1	1	1	1

Table 11.3.2.1. Icelandic summer-spawning herring. Natural mortality at age for the different years (refers to the autumn) where the deviation from the fixed $M=0.1$ is due to the *Ichthyophonus* infection (1981 refers to season 1981/1982 etc). The estimate of, for example, M for age 4 in 2018 represents estimated infection rate of age 3 in 2017.

YEAR\AGE	3	4	5	6	7	8	9	10	11	12	13	14	15	13+
1987-2008	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
2009*	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
2010*	0.29	0.29	0.28	0.26	0.25	0.24	0.24	0.24	0.23	0.23	0.23	0.23	0.23	0.23
2011*	0.13	0.26	0.26	0.25	0.23	0.24	0.25	0.24	0.20	0.21	0.21	0.21	0.21	0.21
2012-2016	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
2017**	0.111	0.118	0.124	0.173	0.175	0.175	0.207	0.187	0.256	0.279	0.210	0.180	0.191	0.183
2018**	0.116	0.112	0.172	0.162	0.175	0.228	0.226	0.247	0.275	0.338	0.307	0.184	0.186	0.250
2019**	0.111	0.135	0.144	0.168	0.216	0.169	0.171	0.183	0.245	0.189	0.243	0.182	0.140	0.189
2020***	0.110	0.116	0.152	0.186	0.158	0.154	0.196	0.195	0.238	0.226	0.179	0.225	0.308	0.235

* Based on prevalence of infection estimates and acoustic measurements (M_{infected} multiplied by 0.3 and added to 0.1; Óskarsson et al. 2018b).

** Based on prevalence of infection estimates in the winter 2016/17, 2017/18, 2018/19 (multiplied by 0.3 and added to 0.1; Óskarsson and Pálsson 2017; 2018; 2019).

*** Based on prevalence of infection estimates in the winter 2019/20 (multiplied by 0.3 and added to 0.1) and should be applied in the prognosis in the 2020 assessment.

Table 11.3.2.2. Model settings and results of model parameters from NFT-Adapt run in 2020 for Icelandic summer spawning herring.

VPA Version 3.3.0

Model ID: Final run 2020

Input File: C:\HAFRONET_GOGN\NWWG OG UTTEKTIR\NWWG2020\RUN1\RUN1.DAT

Date of Run: 17-APR-2020

Time of Run: 13:57

Levenburg-Marquardt Algorithm Completed 5 Iterations
 Residual Sum of Squares = 57.1711

Number of Residuals = 256
 Number of Parameters = 9
 Degrees of Freedom = 247
 Mean Squared Residual = 0.231462
 Standard Deviation = 0.481105

Number of Years = 33
 Number of Ages = 11
 First Year = 1987
 Youngest Age = 3
 Oldest True Age = 12

Number of Survey Indices Available = 10
 Number of Survey Indices Used in Estimate = 8

VPA Classic Method - Auto Estimated Q's

Stock Numbers Predicted in Terminal Year Plus One (2020)

Age	Stock Predicted	Std. Error	CV
4	227635.383	0.111347E+06	0.489146E+00
5	114512.644	0.419559E+05	0.366386E+00
6	35276.924	0.126362E+05	0.358199E+00
7	86701.068	0.267123E+05	0.308096E+00
8	50162.555	0.148560E+05	0.296158E+00
9	37523.096	0.103559E+05	0.275988E+00
10	54268.825	0.143971E+05	0.265292E+00
11	42393.945	0.106972E+05	0.252328E+00
12	44650.752	0.123525E+05	0.276647E+00

Catchability Values for Each Survey Used in Estimate
 INDEX Catchability Std. Error CV

1	0.100969E+01	0.930178E-01	0.921252E-01
2	0.128594E+01	0.106942E+00	0.831620E-01
3	0.140231E+01	0.892475E-01	0.636431E-01
4	0.148639E+01	0.968623E-01	0.651663E-01
5	0.159025E+01	0.118133E+00	0.742861E-01
6	0.177578E+01	0.144510E+00	0.813783E-01
7	0.183505E+01	0.194530E+00	0.106008E+00
8	0.172448E+01	0.188418E+00	0.109261E+00

-- Non-Linear Least Squares Fit --

Maximum Marquadt Iterations = 100
 Scaled Gradient Tolerance = 6.055454E-05
 Scaled Step Tolerance = 1.000000E-18
 Relative Function Tolerance = 1.000000E-18
 Absolute Function Tolerance = 4.930381E-32
 Reported Machine Precision = 2.220446E-16

VPA Method Options

- Catchability Values Estimated as an Analytic Function of N
- Catch Equation Used in Cohort Solution
- Plus Group Forward Calculation Method Used
- Arithmetic Average Used in F-Oldest Calculation
- F-Oldest Calculation in Years Prior to Terminal Year
 Uses Fishing Mortality in Ages 8 to 11
- Calculation of Population of Age 3 In Year 2020
 = Geometric Mean of First Age Populations
 Year Range Applied = 1991 to 2013
- Survey Weight Factors Were Used

Stock Estimates for Age 4 to Age 12

Full F in Terminal Year = 0.1666

F in Oldest True Age in Terminal Year = 0.1298

Full F Calculated Using Classic Method

F in Oldest True Age in Terminal Year has been
 Calculated in Same Manner as in All Other Years

Age	Input Partial Recruitment	Calc Partial Recruitment	Fishing Mortality	Used In Full F	Comments
3	0.500	0.065	0.0189	NO	Stock Estimate in T+1
4	0.800	0.414	0.1214	NO	Stock Estimate in T+1
5	1.000	1.000	0.2931	YES	Stock Estimate in T+1
6	1.000	0.536	0.1570	YES	Stock Estimate in T+1
7	1.000	0.672	0.1971	YES	Stock Estimate in T+1
8	1.000	0.534	0.1566	YES	Stock Estimate in T+1
9	1.000	0.508	0.1490	YES	Stock Estimate in T+1
10	1.000	0.424	0.1242	YES	Stock Estimate in T+1
11	1.000	0.304	0.0893	YES	Stock Estimate in T+1
12	1.000	0.443	0.1298		F-Oldest

Table 11.3.2.3. Icelandic summer spawners stock estimates (from NFT-Adapt in 2020) in numbers (millions) by age (years) at January 1st during 1987-2020.

YEAR\AGE	3	4	5	6	7	8	9	10	11	12	13+	Total
1987	529.83	988.97	300.67	84.60	69.14	107.46	42.63	38.03	26.41	34.26	34.29	2256
1988	271.00	476.42	852.47	214.85	56.99	43.83	53.49	24.15	21.19	14.26	36.99	2066
1989	447.33	240.69	391.82	676.97	128.70	29.84	20.62	18.03	10.18	9.48	26.10	2000
1990	300.83	383.26	192.47	280.67	433.68	75.61	19.30	13.07	9.41	4.69	26.46	1739
1991	840.57	258.05	292.67	140.37	178.35	243.51	39.78	9.72	7.68	5.31	24.86	2041
1992	1033.13	676.34	186.92	183.02	94.01	109.04	116.17	26.44	4.86	4.36	24.19	2458
1993	635.47	844.70	495.59	132.71	110.07	58.60	62.27	54.88	12.96	2.77	23.67	2434
1994	691.76	526.40	595.62	360.46	100.34	72.51	40.39	37.75	35.19	7.69	22.92	2491
1995	202.73	498.18	368.81	403.42	243.44	67.16	46.36	21.12	19.31	17.95	23.14	1912
1996	181.41	163.50	320.65	251.32	261.54	147.51	40.53	27.52	11.03	8.38	27.53	1441
1997	772.64	148.98	109.71	208.42	162.05	156.43	95.86	22.71	16.93	4.46	22.16	1720
1998	320.55	661.82	106.20	74.31	153.71	114.64	112.11	65.61	12.47	12.10	10.03	1644
1999	552.79	246.94	432.40	74.56	59.06	100.30	79.12	71.06	45.47	9.27	13.41	1684
2000	391.62	446.69	171.47	257.73	52.20	40.63	60.93	52.77	43.42	29.19	11.68	1558
2001	469.14	299.96	275.02	108.43	160.58	36.28	28.89	39.62	38.38	28.54	25.27	1510
2002	1458.58	384.30	189.49	160.18	69.35	93.67	22.99	17.84	24.24	25.33	32.48	2478
2003	1077.89	1242.93	280.53	128.19	93.58	42.65	44.85	11.44	11.68	15.75	25.71	2975
2004	667.12	774.60	853.31	198.69	89.45	60.41	25.13	30.20	8.24	7.32	28.29	2743
2005	994.44	543.45	568.44	599.00	141.36	67.90	45.79	17.27	20.66	4.49	24.08	3027
2006	742.30	875.01	451.72	402.46	415.40	101.75	49.98	32.70	10.72	13.85	20.52	3116
2007	666.62	559.14	585.29	356.68	318.28	321.51	79.15	39.53	25.51	8.85	26.70	2987
2008	532.34	514.21	427.87	377.91	262.40	203.04	202.34	49.41	24.62	16.11	21.48	2632
2009	450.12	444.79	378.96	311.47	239.90	180.84	124.77	131.56	27.54	14.47	22.98	2327
2010	469.30	342.77	326.54	276.51	233.87	172.79	136.24	92.20	97.36	20.17	27.90	2196
2011	601.03	342.85	236.48	222.00	192.18	169.47	120.05	98.19	65.97	69.31	34.53	2152
2012	389.92	519.00	243.09	165.52	152.82	131.39	121.42	78.87	68.53	47.04	75.07	1993
2013	464.95	335.87	384.72	171.32	108.91	89.74	79.23	77.01	45.58	38.38	80.25	1876
2014	212.64	376.20	280.31	314.79	138.63	80.94	63.14	51.00	54.55	26.28	79.78	1678
2015	207.92	189.04	289.85	205.60	218.38	92.82	52.30	36.17	33.54	32.53	79.79	1438
2016	272.03	182.41	142.67	211.42	144.76	156.78	69.24	37.11	24.51	22.60	88.56	1352
2017	96.93	235.94	140.76	100.72	151.48	106.47	118.20	53.61	26.24	16.40	85.99	1133
2018	175.61	81.80	179.71	107.36	75.35	113.00	80.04	88.16	39.32	17.34	77.06	1035
2019	259.22	147.98	54.62	120.00	75.82	51.96	74.74	57.64	62.37	26.85	67.61	999
2020	678.00	227.64	114.51	35.28	86.70	50.16	37.52	54.27	42.39	44.65	69.20	1330

Table 11.3.2.4. Estimated fishing mortality at age of Icelandic summer-spawning herring (from NFT-Adapt in 2020) by age (years) during 1987-2019 (referring to the autumn of the fishing season) and weighed average F by numbers for age 5-10.

YEAR\AGE	3	4	5	6	7	8	9	10	11	12	13+	WF5-10
1987	0.0063	0.0485	0.2361	0.2951	0.3557	0.5977	0.4684	0.4849	0.5164	0.5169	0.5169	0.347
1988	0.0186	0.0955	0.1305	0.4124	0.5471	0.654	0.9877	0.7636	0.7039	0.7773	0.5064	0.266
1989	0.0546	0.1236	0.2336	0.3453	0.4319	0.3355	0.3561	0.5502	0.6744	0.4791	0.1105	0.322
1990	0.0534	0.1697	0.2156	0.3534	0.4772	0.5422	0.5861	0.4312	0.4715	0.5078	0.071	0.400
1991	0.1174	0.2225	0.3694	0.3009	0.3921	0.6401	0.3086	0.5924	0.4662	0.5018	0.0553	0.436
1992	0.1014	0.211	0.2425	0.4085	0.3727	0.4602	0.6498	0.6133	0.4648	0.547	0.0233	0.415
1993	0.0883	0.2494	0.2184	0.1796	0.3174	0.2721	0.4004	0.3445	0.4214	0.3596	0.0114	0.248
1994	0.2283	0.2558	0.2896	0.2925	0.3014	0.3473	0.5484	0.5706	0.5733	0.5099	0.0898	0.312
1995	0.1151	0.3406	0.2836	0.3334	0.401	0.4051	0.4214	0.55	0.7345	0.5278	0.154	0.343
1996	0.097	0.299	0.3308	0.3388	0.414	0.331	0.4794	0.3863	0.8041	0.5002	0.3495	0.361
1997	0.0548	0.2385	0.2895	0.2045	0.2461	0.2332	0.2792	0.4995	0.2353	0.3118	1.0422	0.250
1998	0.1609	0.3257	0.2537	0.1297	0.3269	0.2709	0.356	0.2667	0.1967	0.2725	0.582	0.280
1999	0.1131	0.2647	0.4174	0.2566	0.2741	0.3984	0.305	0.3927	0.3433	0.3598	0.734	0.377
2000	0.1666	0.385	0.3583	0.3731	0.2639	0.2409	0.3306	0.2185	0.3196	0.2774	0.6987	0.335
2001	0.0995	0.3593	0.4406	0.3469	0.439	0.3562	0.3823	0.3912	0.3155	0.3613	0.456	0.414
2002	0.06	0.2147	0.2908	0.4374	0.3862	0.6366	0.5975	0.3237	0.3311	0.4722	0.9452	0.417
2003	0.2304	0.2761	0.245	0.2599	0.3377	0.4288	0.2955	0.2286	0.3671	0.33	0.2543	0.279
2004	0.105	0.2095	0.2539	0.2404	0.1756	0.177	0.2753	0.2794	0.508	0.3099	0.2864	0.244
2005	0.028	0.0849	0.2453	0.266	0.2288	0.2064	0.2367	0.3766	0.3005	0.28	0.2221	0.252
2006	0.1834	0.3021	0.1362	0.1347	0.1562	0.1512	0.1345	0.1485	0.0921	0.1316	0.1663	0.143
2007	0.1596	0.1676	0.3374	0.207	0.3495	0.3631	0.3711	0.3734	0.3596	0.3668	0.4163	0.320
2008	0.0797	0.2052	0.2175	0.3544	0.2723	0.3869	0.3305	0.4845	0.4314	0.4084	0.3804	0.307
2009	0.0555	0.0921	0.0982	0.0695	0.1111	0.0662	0.0856	0.0841	0.0946	0.0826	0.0738	0.087
2010	0.022	0.0792	0.1089	0.1048	0.0721	0.1202	0.0865	0.0967	0.1078	0.1028	0.0982	0.099
2011	0.0167	0.0849	0.1008	0.1234	0.1483	0.0954	0.1731	0.1217	0.1362	0.1316	0.0953	0.124
2012*	0.0492	0.1994	0.2499	0.3185	0.4323	0.4058	0.3553	0.4482	0.4797	0.4223	0.2606	0.349
2013	0.1118	0.0808	0.1006	0.1117	0.1968	0.2515	0.3405	0.2449	0.4509	0.322	0.285	0.162
2014	0.0176	0.1608	0.21	0.2657	0.3012	0.3367	0.4573	0.3192	0.417	0.3826	0.1271	0.276
2015	0.0309	0.1814	0.2155	0.2509	0.2314	0.1931	0.243	0.2892	0.2945	0.255	0.0934	0.230
2016	0.0424	0.1592	0.2482	0.2333	0.2072	0.1825	0.1558	0.2466	0.3017	0.2216	0.1409	0.214
2017	0.0587	0.1542	0.1469	0.1171	0.1181	0.1104	0.0862	0.1231	0.1582	0.1195	0.0708	0.118
2018	0.0552	0.2919	0.2319	0.1858	0.1966	0.1854	0.1023	0.099	0.1065	0.1233	0.0573	0.178
2019	0.0189	0.1214	0.2931	0.157	0.1971	0.1566	0.149	0.1242	0.0893	0.1298	0.1181	0.175

* Derived from both the landings ($WF_{5-10} \sim 0.209$) and the herring that died in the mass mortality (0.148) in the winter 2012/13 in Kolgrafafjörður (Óskarsson et al. 2018a). WF_{5-10} without the mass mortality was 0.214.

Table 11.3.2.5. Summary table from NFT-Adapt run in 2020 for Icelandic summer spawning herring

Year	Recruits, age 3 (millions)	Biomass age 3+ (kt)	Biomass age 4+ (kt)	SSB (kt)	Landings age 3+ (kt)	Yield/SSB	WF _{age 5-10}	HR 4+
1987	530	504	415	384	75	0.20	0.35	0.182
1988	271	495	452	423	93	0.22	0.27	0.205
1989	447	459	401	386	101	0.26	0.32	0.251
1990	301	410	371	350	104	0.30	0.40	0.281
1991	841	424	310	310	107	0.34	0.44	0.344
1992	1033	502	349	343	107	0.31	0.42	0.307
1993	635	546	454	424	103	0.24	0.25	0.226
1994	692	553	461	441	134	0.30	0.31	0.290
1995	203	462	435	406	125	0.31	0.34	0.288
1996	181	348	322	307	96	0.31	0.36	0.297
1997	773	368	267	269	65	0.24	0.25	0.243
1998	321	366	323	298	86	0.29	0.28	0.266
1999	553	373	297	290	93	0.32	0.38	0.312
2000	392	387	324	306	100	0.33	0.33	0.308
2001	469	348	283	272	94	0.34	0.41	0.331
2002	1459	513	278	298	96	0.32	0.42	0.345
2003	1078	580	412	390	129	0.33	0.28	0.313
2004	667	617	518	488	112	0.23	0.24	0.217
2005	994	708	539	528	102	0.19	0.25	0.190
2006	742	790	649	615	130	0.21	0.14	0.200
2007	667	704	599	572	158	0.28	0.32	0.264
2008	532	691	599	570	151	0.26	0.31	0.252
2009	450	636	551	495	46	0.09	0.09	0.083
2010	469	610	514	457	43	0.09	0.10	0.084
2011	601	594	482	437	49	0.11	0.12	0.102
2012*	390	557	476	450	125	0.28	0.35	0.263
2013	465	502	417	401	71	0.18	0.16	0.171
2014	213	492	449	421	95	0.23	0.28	0.212
2015	208	414	372	355	70	0.20	0.23	0.188
2016	272	392	337	324	60	0.19	0.21	0.179
2017	97	343	325	294	35	0.12	0.12	0.107
2018	176	317	283	259	41	0.16	0.18	0.144
2019	259	276	231	215	30	0.14	0.18	0.130
2020**	678 [§]	363	237	219				
Mean	535	500	415	393	94	0.24	0.28	0.23

* The mass mortality of 52 thousand tons in Kolgráfjörður in the winter 2012/13 is not included in the landings, yield/SSB, or WF, even if included as landings in the analytical assessment.

[§] Number at age 3 in 2020 is predicted from a survey index of number at age 1 in 2018 (see section 11.6.1).

** SSB in 2020 accounts for the estimated *Ichthyophonus* mortality in 2020.

Table 11.3.2.6. The residuals from survey observations and NFT-Adapt 2020 results for Icelandic summer spawning herring (no surveys in 1987 and 1995) on 1st January.

Year\Age	4	5	6	7	8	9	10	11
1987								
1988	-0.181	-0.245	0.022	-0.394	-0.762	-0.299	-0.188	-0.438
1989	-0.188	-0.772	-0.912	-0.015	-0.021	-0.004	0.000	0.000
1990	0.527	-0.322	-0.345	-0.084	0.402	-0.435	-0.001	-0.002
1991	-0.678	-0.375	-0.735	-0.328	0.284	0.116	0.007	-0.003
1992	0.430	0.389	0.220	-0.442	-0.226	0.219	-0.824	0.002
1993	-0.026	0.135	-0.159	-0.224	-0.543	-0.138	-0.041	0.094
1994	-0.051	0.142	-0.018	-0.801	-0.682	0.392	-0.349	-0.517
1995								
1996	-0.210	0.614	-0.238	-0.010	-0.282	0.310	-0.040	-0.159
1997	0.588	-0.054	0.472	0.114	0.269	0.245	0.803	0.643
1998	-0.105	-0.522	-0.597	0.228	-0.156	0.021	-0.130	0.501
1999	0.026	0.665	-0.012	-0.528	-0.165	-0.689	-0.249	-0.374
2000	0.621	0.081	0.517	0.128	-0.399	0.426	-0.074	0.483
2001	1.161	1.314	0.228	0.704	-0.518	-1.182	-0.650	-1.531
2002	-0.302	-0.114	0.148	0.446	0.842	0.425	0.557	-0.085
2003	0.425	0.427	0.135	0.635	0.814	1.244	1.553	0.861
2004	0.607	0.629	0.172	-0.197	0.048	-0.143	-0.195	-0.007
2005	0.263	0.335	0.220	-0.204	-0.548	-0.607	-1.063	-0.398
2006	-0.688	-0.521	0.372	0.682	0.554	0.320	0.770	1.378
2007	0.074	0.342	-0.198	-0.108	0.305	-0.381	0.534	0.103
2008	-0.128	-0.643	0.022	-0.231	0.221	0.671	0.894	1.752
2009	-0.828	-0.156	-0.416	0.250	-0.074	0.019	-0.357	-0.462
2010	-0.091	0.156	0.358	-0.247	0.175	-0.484	-0.702	-0.068
2011	-0.210	-0.284	-0.021	0.036	-0.664	0.346	-1.083	0.217
2012	0.623	0.330	0.301	0.181	0.136	-0.333	0.190	-0.334
2013	0.834	0.244	-0.366	-0.243	-0.005	-0.245	-0.376	-0.056
2014	-0.188	-0.500	-0.247	-0.307	0.031	0.074	0.235	-0.049
2015	-0.749	-0.121	-0.100	-0.225	0.241	0.187	0.323	-0.424
2016	-0.115	-0.050	0.052	0.048	-0.147	-0.271	-0.082	0.578
2017	-0.077	-0.277	0.073	0.153	-0.213	0.140	-0.474	0.211
2018	-1.281	-0.888	0.131	0.589	0.577	0.386	0.456	0.112
2019	-0.084	-0.033	0.180	-0.100	0.293	0.232	0.437	-0.383
2020	0.000	0.074	0.739	0.494	0.214	-0.215	-0.515	-0.549
Max. Residuals	1.161	1.314	0.517	0.704	0.842	1.244	1.553	1.752

Table 11.6.1.1. The input data used for prognosis of the Icelandic summer-spawning herring in the 2020 assessment: the predicted weights, the selection pattern, M, proportion of M before spawning, and the number-at-age derived from NFT-Adapt run.

Age (year class)	Mean weights (kg)	M	Maturity ogive	Selection pattern	Mortality prop. before spawning		Number at age
					F	M	
							1 January 2020
3 (2017)	0.170	0.11	0.200	0.306	0.000	0.500	678.0
4 (2016)	0.226	0.12	0.850	0.692	0.000	0.500	227.6
5 (2015)	0.280	0.15	1.000	1.000	0.000	0.500	114.5
6 (2014)	0.309	0.19	1.000	1.000	0.000	0.500	35.3
7 (2013)	0.327	0.16	1.000	1.000	0.000	0.500	86.7
8 (2012)	0.330	0.15	1.000	1.000	0.000	0.500	50.2
9 (2011)	0.345	0.20	1.000	1.000	0.000	0.500	37.5
10 (2010)	0.355	0.19	1.000	1.000	0.000	0.500	54.3
11 (2009)	0.362	0.24	1.000	1.000	0.000	0.500	42.4
12 (2008)	0.368	0.23	1.000	1.000	0.000	0.500	44.7
13+ (2007+)	0.370	0.24	1.000	1.000	0.000	0.500	69.2

Table 11.6.2.1. Icelandic summer-spawning herring. Catch options table for the 2020/2021 season according to the Management plan where the basis is: SSB (1st July 2020) 219 kt (accounted for $M_{infection}$ in 2019); Biomass age 4+ (1st Jan. 2020) is 237 kt; Catch (2019/20) 30 kt; HR (2019) 0.144, and WF_{5-10} (2019) 0.175. Other options are also shown, including MSY approach, where $SSB_{2019} < MSY B_{trigger}=273$ kt, hence resulting F is $F_{MSY} \times SSB_{2020}/B_{trigger} = 0.22 \times 219/273 = 0.176$.

Rationale	Catches 2020/21	Basis	F (2020/2021)	Biomass of age 4+ (2021)	SSB 2021	%SSB change *	% TAC change **
Management plan	35.5	HR =0.15	0.171	290	276	26	3
MSY approach	36.6	F_{MSY}	0.176	289	275	26	6
Zero catch	0.0	$F=0$	0.000	324	307	40	-100
Fpa	44.8	$F_{pa}=0.22$	0.220	281	267	22	30
Flim	107.0	$F_{lim}=0.61$	0.610	221	212	-3	209

*SSB 2021 relative to SSB 2020

**TAC 2020/21 relative to landings 2019/20