

...intended for ToR c) Re-examine and update (if necessary) MSY and PA reference points according to ICES guidelines (see Technical document on reference points).

## Weight-at-age in the stock for North Sea cod

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### Introduction.

ICES WGNSSK uses annual weight-at-age in the catch as weight-at-age for the North Sea cod stock (ICES 2020). These are combined with stock number-at-age from 1 January to obtain total stock biomass (TB) and in combination with maturity-at-age, spawning stock size (SSB). In this way the stock biomass estimates get overestimated, because of the growth of individual cod between 1<sup>st</sup> January and the time they are caught (on average about mid-year). The present analysis suggests a way of correcting this and come up with a stock weight-at-age matrix to be used in combination with stock numbers-at-age to obtain unbiased TB and SSB by year.

### Approach.

In terms of stock weight-at-age it is problematic to use weight-at-age in the catch because the fishing is size selective. At least for age-1 this is a problem. Rather, weight-at-age from the IBTS survey could be used, as the gear electivity for the survey is small.

The length distribution from the IBTS 1q survey was used and the CPUE (no/hr) as weighted (by the area of a RF) mean of mean CPUE by RF was calculated. The results are shown in Figure 1. The first peak is representing age-1 cod. The peak is around 15-16 cm of length and quite constant across years. The STD is about 2 cm. If condition factor is assumed to be 1 this means an average weight of about 35 g of age 1 cod.

For ages 2-6+, the ICES weight at age in the stock is used, but for each age the mean of two values is used in order to represent the situation at 1<sup>st</sup> January each year. The two values are 1) the one of a given age group

and year and 2) the one from the age group 1 year younger from the previous year. This is expected to be a reasonable representation of the weight at age at 1<sup>st</sup> January each year.

The resultant weight-at-age matrix is presented in Table 1.

Table 2 gives the maturity by age and this together with stock numbers-at-age (Table 3) and weight-at-age (Table 1) gives spawning stock biomass (SSB) by year (Table 3).

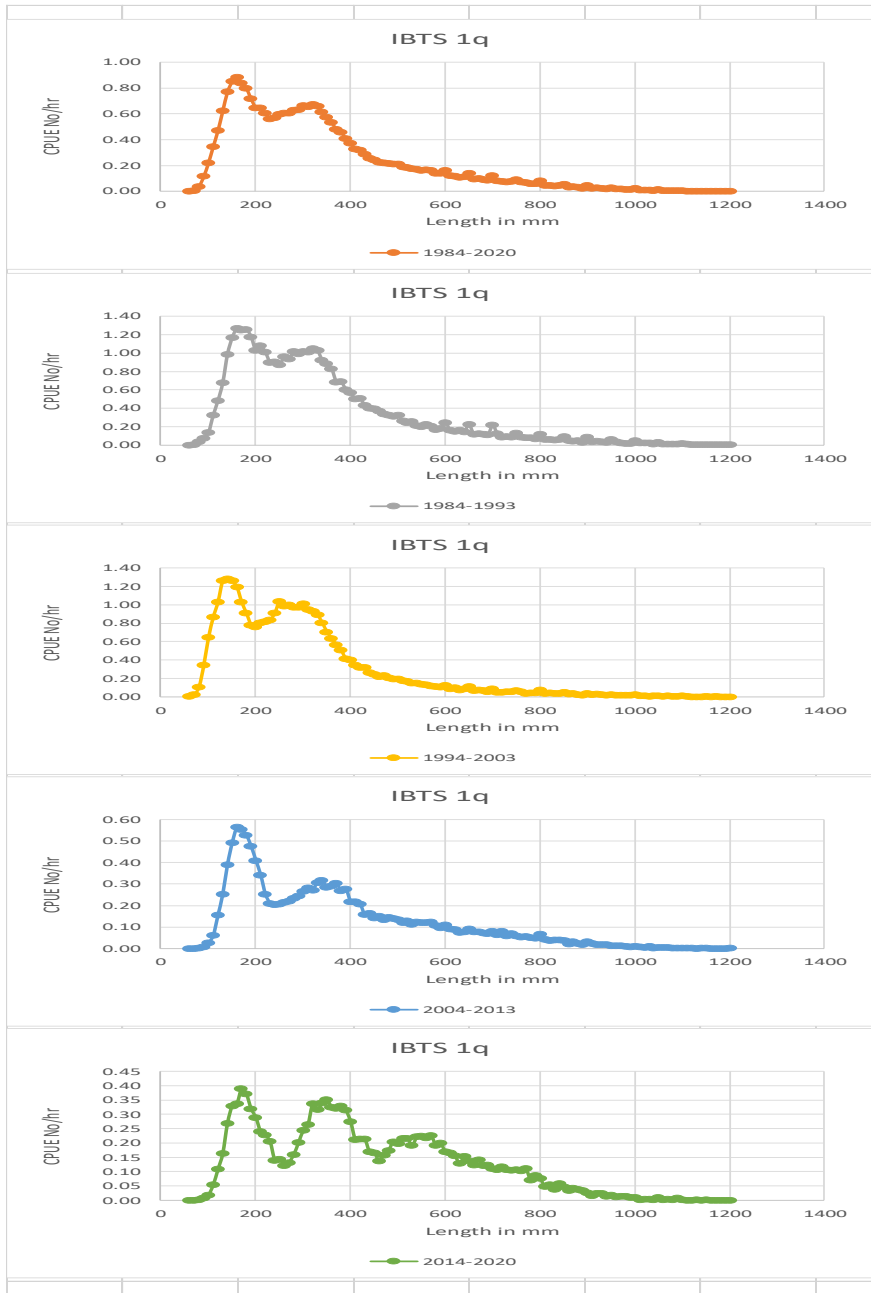
Compared to the TB and SSB from ICES 2020 the new TB and SSB are lower as expected because the weight-at-age is lower. On average the new TB is as much as 52 % lower and SSB 21 % lower than ICES values.

### **Conclusion.**

New improved estimates of weight-at-age in the stock at 1<sup>st</sup> January each year is made available as well as new improved TB and SSB time series. These new values can be used for instance in surplus production models of the North Sea cod stock dynamics.

### **References**

ICES. 2020. Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK). ICES Scientific Reports. 2:61. 1140 pp. <http://doi.org/10.17895/ices.pub.6092>.



**Figure 1.** North Sea cod. Length distribution from the IBTS 1q survey. CPUE (no/hr) as weighted (by the area of a RF) mean of mean CPUE by RF.

**Table 1.** *North Sea cod. Weight-at-age by year in the stock. For age-1 IBTS data are used. For ages 2-6+, the ICES weight at age in the stock is used but for each age the mean of two values is used in order to represent the situation at 1<sup>st</sup> January each year. The two values are the one of a given age group and year and the one from the age group 1 year younger from the previous year.*

	IBTS	WEST constructed as mean of present age a and past year age a-1					
	age 1	age 2	age 3	age 4	age 5	age 6	
1963	0.035	0.562	1.728	3.569	5.643	8.102	
1964	0.035	0.559	1.564	3.447	5.488	7.484	
1965	0.035	0.606	1.598	3.404	5.893	8.386	
1966	0.035	0.575	1.637	3.303	5.598	8.313	
1967	0.035	0.597	1.632	2.774	4.978	8.207	
1968	0.035	0.588	1.532	3.155	4.718	6.681	
1969	0.035	0.586	1.441	2.990	4.784	6.219	
1970	0.035	0.647	1.437	3.015	5.066	7.038	
1971	0.035	0.574	1.511	3.223	5.393	7.587	
1972	0.035	0.515	1.405	3.024	4.990	7.129	
1973	0.035	0.518	1.307	2.845	4.632	6.471	
1974	0.035	0.603	1.554	3.181	5.165	7.254	
1975	0.035	0.532	1.554	3.287	5.315	7.548	
1976	0.035	0.460	1.586	3.513	5.536	7.557	
1977	0.035	0.484	1.401	3.367	5.660	7.771	
1978	0.035	0.588	1.372	3.074	5.338	7.599	
1979	0.035	0.598	1.658	3.417	5.501	7.527	
1980	0.035	0.587	1.433	3.175	5.255	7.615	
1981	0.035	0.550	1.478	3.401	5.830	7.965	
1982	0.035	0.633	1.382	2.993	5.458	7.844	
1983	0.035	0.643	1.358	2.857	5.186	7.457	
1984	0.035	0.613	1.539	3.064	5.081	7.276	
1985	0.035	0.557	1.466	3.148	5.244	7.377	
1986	0.035	0.538	1.302	2.663	4.867	7.185	
1987	0.035	0.605	1.364	2.803	4.851	7.180	
1988	0.035	0.610	1.364	2.581	4.590	6.953	
1989	0.035	0.648	1.371	2.698	4.429	6.597	
1990	0.035	0.536	1.428	2.978	4.861	6.911	
1991	0.035	0.641	1.442	2.983	5.027	7.058	
1992	0.035	0.683	1.758	3.385	5.235	7.365	
1993	0.035	0.586	1.662	3.514	5.546	7.317	
1994	0.035	0.547	1.488	3.330	5.819	7.802	
1995	0.035	0.594	1.487	3.250	5.757	8.100	
1996	0.035	0.632	1.463	3.065	5.336	7.566	
1997	0.035	0.592	1.457	2.969	5.025	7.311	
1998	0.035	0.503	1.128	2.559	4.441	6.475	
1999	0.035	0.525	1.069	2.355	4.516	6.565	
2000	0.035	0.629	1.325	2.482	4.060	6.196	
2001	0.035	0.489	1.350	2.878	4.767	6.602	
2002	0.035	0.435	1.074	2.651	4.632	6.772	
2003	0.035	0.533	1.213	2.472	4.528	6.226	
2004	0.035	0.383	1.104	2.394	4.125	6.312	
2005	0.035	0.601	1.195	2.531	4.329	6.163	
2006	0.035	0.243	1.020	2.816	4.747	6.447	
2007	0.035	0.603	1.447	3.014	5.072	7.330	
2008	0.035	0.664	1.435	2.928	5.049	6.849	
2009	0.035	0.770	1.744	3.189	5.089	6.857	
2010	0.035	0.650	1.696	3.303	5.107	7.166	
2011	0.035	0.660	1.677	3.504	5.521	7.151	
2012	0.035	0.537	1.526	3.203	5.273	7.255	
2013	0.035	0.660	1.591	3.155	5.030	7.180	
2014	0.035	0.663	1.582	3.160	4.841	6.495	
2015	0.035	0.656	1.522	3.065	4.917	6.282	
2016	0.035	0.718	1.594	2.971	4.758	6.522	
2017	0.035	0.587	1.582	3.016	4.545	6.077	
2018	0.035	0.545	1.322	2.806	4.692	6.227	
2019	0.035	0.631	1.447	2.862	4.590	6.340	

**Table 2.** *North Sea cod. Maturity-at-age from ICES 2020.*

	age 1	age 2	age 3	age 4	age 5	age 6	
1963	0.01	0.05	0.23	0.62	0.86		1
1964	0.01	0.05	0.23	0.62	0.86		1
1965	0.01	0.05	0.23	0.62	0.86		1
1966	0.01	0.05	0.23	0.62	0.86		1
1967	0.01	0.05	0.23	0.62	0.86		1
1968	0.01	0.05	0.23	0.62	0.86		1
1969	0.01	0.05	0.23	0.62	0.86		1
1970	0.01	0.05	0.23	0.62	0.86		1
1971	0.01	0.05	0.23	0.62	0.86		1
1972	0.01	0.05	0.23	0.62	0.86		1
1973	0.0107	0.0505	0.2355	0.6373	0.8832		1
1974	0.0101	0.0523	0.2292	0.6147	0.8506		1
1975	0.0094	0.0539	0.2232	0.5922	0.8185		1
1976	0.0085	0.0553	0.2177	0.5704	0.7872		1
1977	0.0074	0.0563	0.2131	0.5498	0.7578		1
1978	0.0062	0.057	0.2094	0.5309	0.7312		1
1979	0.0051	0.0575	0.2067	0.5146	0.7085		1
1980	0.0043	0.058	0.2053	0.5017	0.6909		1
1981	0.004	0.0589	0.2054	0.4928	0.6794		1
1982	0.0045	0.0604	0.2079	0.4888	0.6745		1
1983	0.0058	0.063	0.2135	0.49	0.6765		1
1984	0.0077	0.0666	0.2233	0.4969	0.6851		1
1985	0.0102	0.0712	0.2385	0.5094	0.6995		1
1986	0.0126	0.0767	0.2594	0.5272	0.7188		1
1987	0.0148	0.0828	0.2862	0.5494	0.7414		1
1988	0.0162	0.089	0.3177	0.5751	0.766		1
1989	0.0168	0.0952	0.3522	0.6029	0.7911		1
1990	0.0163	0.101	0.3871	0.6314	0.8156		1
1991	0.015	0.1065	0.4197	0.6592	0.8386		1
1992	0.013	0.1119	0.4473	0.685	0.8594		1
1993	0.0107	0.1177	0.4681	0.708	0.8778		1
1994	0.0084	0.1246	0.4815	0.7275	0.8937		1
1995	0.0064	0.1332	0.4882	0.7436	0.9072		1
1996	0.0049	0.1441	0.4905	0.7567	0.9184		1
1997	0.0039	0.1577	0.4915	0.7672	0.9275		1
1998	0.0037	0.1741	0.495	0.7761	0.9347		1
1999	0.004	0.1932	0.5043	0.7843	0.9403		1
2000	0.005	0.2142	0.522	0.7924	0.9444		1
2001	0.0066	0.2364	0.549	0.8011	0.9474		1
2002	0.009	0.2587	0.5843	0.8104	0.9494		1
2003	0.0122	0.2801	0.6255	0.8204	0.9508		1
2004	0.0164	0.2996	0.6686	0.8308	0.9518		1
2005	0.0216	0.3167	0.709	0.8409	0.9526		1
2006	0.0276	0.3308	0.742	0.8504	0.9532		1
2007	0.0342	0.342	0.7639	0.8586	0.9537		1
2008	0.0411	0.3503	0.7727	0.8653	0.954		1
2009	0.0476	0.356	0.7678	0.8701	0.954		1
2010	0.0534	0.3593	0.7509	0.8729	0.9536		1
2011	0.0577	0.3606	0.7249	0.874	0.9527		1
2012	0.0603	0.36	0.6941	0.8734	0.9514		1
2013	0.0608	0.3576	0.6629	0.8714	0.9497		1
2014	0.0591	0.3532	0.6354	0.8684	0.9478		1
2015	0.0554	0.347	0.6146	0.8645	0.9458		1
2016	0.0499	0.339	0.602	0.8601	0.9439		1
2017	0.0429	0.3294	0.5978	0.8554	0.9422		1
2018	0.0349	0.3186	0.6004	0.8505	0.9407		1
2019	0.0264	0.3069	0.6076	0.8455	0.9394		1

**Table 3.** *North Sea cod. Stock biomass by age and total (TB) and for the spawning stock (SSB) based on the new weight-at-age data from the present analysis. The column to the right is the ratio between TB and SSB.*

	age 1	age 2	age 3	age 4	age 5	age 6+		TB (SOP)	SSB (SOP)	ratio
1963	397861	169136	19981	10202	8074	4834		264553	113746	2.33
1964	648833	120038	51671	11449	5179	6603		287896	120486	2.39
1965	874576	205548	40351	22827	6145	5169		376884	144019	2.62
1966	1061485	252191	67644	16285	9275	5781		446503	159136	2.81
1967	891940	308060	72859	28418	7957	7733		515902	183249	2.82
1968	448109	264046	90089	28690	14211	6649		510744	197832	2.58
1969	391264	127074	72201	33933	11282	9507		406731	196216	2.07
1970	1319001	118310	38843	32127	15236	7915		408248	199253	2.05
1971	1735275	383556	33619	14922	15970	10049		542156	203427	2.67
1972	431001	479254	90919	12126	5949	12271		543182	177585	3.06
1973	634169	108934	105900	29917	4940	6727		368436	153638	2.40
1974	630369	163167	23639	36321	10890	5283		367198	170966	2.15
1975	1085628	157334	36828	9673	16331	6787		348749	158742	2.20
1976	754498	272390	34026	13664	3788	9388		345570	133730	2.58
1977	1831202	165785	51095	10763	5093	5813		326046	107178	3.04
1978	1115005	429908	30878	18767	5630	4359		454816	109229	4.16
1979	1396762	256450	80948	8878	7291	3300		431737	105674	4.09
1980	2247728	300326	59297	24517	3957	4415		472146	115034	4.10
1981	874072	479396	59288	17582	8719	3397		519293	124685	4.16
1982	1405138	181734	93768	16989	6556	5319		422155	124821	3.38
1983	778856	301549	33505	21169	5381	4224		386386	102088	3.78
1984	1427094	168957	52221	7949	6698	3603		318465	86856	3.67
1985	351191	318467	33145	14675	2753	3948		328026	87100	3.77
1986	1576892	82597	58106	10126	5573	2794		249405	77513	3.22
1987	604506	374644	16620	15346	2975	3154		350570	82541	4.25
1988	415364	147750	71286	5241	4881	2190		252981	79307	3.19
1989	725003	103327	30572	17193	1812	2759		206850	74074	2.79
1990	290041	175799	20356	7797	5016	1537		191662	66100	2.90
1991	331095	73122	30594	5935	2641	2760		153034	65963	2.32
1992	755064	87312	14917	8677	1985	1877		165825	61613	2.69
1993	383798	191166	17633	4830	2717	1413		197132	62624	3.15
1994	914881	103143	35458	5257	1634	1521		180027	65794	2.74
1995	523283	240054	23071	9898	1711	1156		246590	78075	3.16
1996	336084	135053	39556	5437	3196	1255		198196	78506	2.52
1997	1021714	95432	25825	9169	1775	1493		176892	67608	2.62
1998	108417	287112	20900	6693	2883	1084		208733	69103	3.02
1999	218912	31538	52619	5160	1925	1368		110267	58267	1.89
2000	404922	63068	8175	9241	1389	913		98869	43368	2.28
2001	148931	121308	13654	2062	2114	628		103116	42621	2.42
2002	223024	46490	24849	3669	559	817		72565	36768	1.97
2003	111362	64256	10562	6820	1010	445		75157	38601	1.95
2004	189388	36025	13890	2903	1875	486		53493	30692	1.74
2005	152981	53042	8179	3259	951	904		64938	33567	1.93
2006	346800	47639	12886	2159	1056	797		53088	29003	1.83
2007	166035	100988	10347	4067	933	679		103644	52475	1.98
2008	186679	47106	24252	3089	1538	828		95094	59021	1.61
2009	179811	53075	11463	7332	1308	938		103595	63314	1.64
2010	264120	53437	13063	3750	2958	862		99795	60998	1.64
2011	129315	75712	13292	4030	1564	1717		111811	67277	1.66
2012	176577	38765	19628	5554	1722	1459		94403	63417	1.49
2013	218392	49609	10931	8057	2568	1390		106082	68091	1.56
2014	303724	61583	15089	4665	3684	1722		119058	71093	1.67
2015	148305	87244	19251	5881	2098	2913		138305	81768	1.69
2016	111470	39083	24513	9103	2786	2067		124800	82472	1.51
2017	284201	28581	11533	9689	4444	2212		107825	74325	1.45
2018	72495	67972	8663	4591	3804	3498		103539	68289	1.52
2019	156655	17693	15365	2365	1870	3029		73426	50063	1.47

## Annex 1. Weight-at-age from ICES 2020 (WGNSSK).

North Sea/Skagerrak/Eastern Channel Cod; H Cons Catch Weights updated 16 Apr 20

	Human consumption weca														
	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8	age 9	age 10	age 11	age 12	age 13	age 14	age 15
1963	0.538	1.004	2.657	4.491	6.794	9.409	11.562	11.942	13.383	13.756	0	0	0	0	0
1964	0.496	0.863	2.377	4.528	6.447	8.52	10.606	10.758	12.34	12.54	0	0	0	0	18
1965	0.581	0.965	2.304	4.512	7.274	9.498	11.898	12.041	13.053	14.441	12.64	17.434	0	16.928	0
1966	0.579	0.994	2.442	4.169	7.027	9.599	11.766	11.968	14.06	14.746	14.825	17.45	0	0	0
1967	0.59	1.035	2.404	3.153	6.803	9.61	12.033	12.481	13.589	14.271	18.583	19.103	0	0	0
1968	0.64	0.973	2.223	4.094	5.341	8.02	8.581	10.162	10.72	12.497	11.518	11.807	0	0	0
1969	0.544	0.921	2.133	3.852	5.715	6.722	9.262	9.749	10.384	12.743	11.017	13.718	8.095	0	0
1970	0.626	0.961	2.041	4.001	6.131	7.945	9.953	10.131	11.919	12.554	14.473	14.225	0	0	0
1971	0.579	0.941	2.193	4.258	6.528	8.646	10.356	11.219	12.881	13.147	15.676	15.176	0	0	0
1972	0.616	0.836	2.086	3.968	6.011	8.246	9.766	10.228	11.875	12.53	14.455	14.272	0	0	0
1973	0.559	0.869	1.919	3.776	5.488	7.453	9.019	9.81	11.077	12.359	12.892	12.899	12.832	0	0
1974	0.594	1.039	2.217	4.156	6.174	8.333	9.889	10.791	12.175	12.425	13.66	14.049	14.309	0	0
1975	0.619	0.899	2.348	4.226	6.404	8.691	10.107	10.91	12.339	12.976	13.831	17.41	15.662	0	0
1976	0.568	1.029	2.47	4.577	6.494	8.62	10.132	11.34	12.888	14.139	14.705	14.376	20.738	0	0
1977	0.541	0.948	2.16	4.606	6.714	8.828	10.071	11.052	11.824	13.134	14.417	14.513	14.16	0	0
1978	0.573	0.937	2.001	4.146	6.53	8.667	9.685	11.099	12.427	12.778	13.847	13.739	17.148	0	0
1979	0.55	0.936	2.411	4.423	6.579	8.474	10.637	11.55	13.057	14.148	15.982	15.394	0	0	0
1980	0.55	1.003	1.948	4.401	6.109	9.12	9.55	11.867	12.782	14.081	16.475	12.166	0	0	0
1981	0.723	0.837	2.19	4.615	7.045	8.884	9.933	11.519	13.338	14.897	16.987	18.129	28.496	0	0
1982	0.589	0.962	1.858	4.13	6.785	8.903	10.398	12.5	13.469	12.89	13.998	15.879	0	0	0
1983	0.632	0.919	1.835	3.88	6.491	8.423	9.848	11.837	12.797	12.562	14.117	15.238	0	0	0
1984	0.594	1.007	2.156	3.972	6.19	8.362	10.317	11.352	13.505	13.408	12.886	14.086	0	18.203	14.516
1985	0.59	0.932	2.141	4.164	6.324	8.43	10.362	12.074	13.072	14.443	16.85	14.591	16.263	0	16.148
1986	0.583	0.856	1.834	3.504	6.23	8.14	9.896	11.94	12.951	13.859	14.794	13.866	12.968	0	28.015
1987	0.635	0.976	1.955	3.65	6.052	8.307	10.243	11.461	12.447	18.691	16.11	16.389	18.508	16.02	0
1988	0.585	0.881	1.982	3.187	5.992	7.914	9.764	12.127	14.242	17.787	16.134	14.614	21.61	17.894	15.068
1989	0.673	1.052	1.846	3.585	5.273	7.921	9.724	11.212	12.586	15.557	14.107	16.802	15.478	22.499	0
1990	0.737	0.976	2.176	3.791	5.931	7.89	10.235	10.923	12.803	15.525	14.064	19.833	31.261	16.162	17.687
1991	0.67	1.078	2.038	3.971	6.082	8.033	9.545	10.948	13.481	13.171	14.566	15.187	20.188	17.547	0
1992	0.699	1.146	2.546	4.223	6.247	8.483	10.101	10.482	11.849	13.904	14.039	16.126	16.603	19.2	0
1993	0.699	1.065	2.479	4.551	6.54	8.094	9.641	10.734	12.329	13.443	11.895	15.385	15.194	18.907	19.208
1994	0.677	1.075	2.201	4.471	7.167	8.436	9.537	10.323	12.223	14.247	12.5	12.501	13.601	14.855	0
1995	0.721	1.021	2.21	4.293	7.22	8.98	10.282	11.743	13.107	12.052	13.993	13.657	14.467	0	0
1996	0.699	1.117	2.147	4.034	6.637	8.494	9.729	11.08	12.264	12.756	10.621	11.201	16.749	0	10.613
1997	0.656	0.96	2.12	3.821	6.228	8.394	9.979	11.424	12.3	12.761	13.222	11.034	14.871	16.344	0
1998	0.542	0.922	1.724	3.495	5.387	7.563	9.628	10.643	11.499	13.085	12.432	18.742	15.926	21.273	16.746
1999	0.64	0.935	1.663	3.305	5.726	7.403	8.582	10.365	11.6	12.33	11.667	16.974	0	0	0
2000	0.611	1.021	1.747	3.216	4.903	7.488	9.636	10.671	10.894	11.414	15.089	15.004	0	0	0
2001	0.725	1.004	2.303	3.663	5.871	7.333	9.264	10.081	12.062	12.009	9.324	15.805	0	0	0
2002	0.626	0.996	1.844	3.735	5.537	8.006	9.451	10.012	11.888	12.795	13.208	10.045	0	0	0
2003	0.573	1.079	1.895	3.347	5.757	6.694	8.838	12.674	11.518	11.053	14.988	14.894	15.661	0	0
2004	0.726	1.072	2.089	3.252	5.184	7.438	8.974	9.894	11.857	12.095	14.206	13.005	0	0	0
2005	0.747	1.16	1.952	3.647	5.244	7.225	9.457	10.567	12.015	12.066	23.997	13.482	0	0	0
2006	0.793	1.2	2.239	3.894	5.676	7.234	9.243	10.477	12.325	14.862	17.875	18.411	0	0	0
2007	0.83	1.182	2.365	4.05	6.053	8.25	9.262	10.015	12.282	14.559	22.018	12.61	7.671	0	0
2008	1.067	1.389	2.456	4.063	6.224	7.393	9.651	11.489	11.387	12.725	15.381	0	0	0	0
2009	0.788	1.412	2.674	4.145	6.119	7.49	8.968	11.447	11.291	11.716	25.448	12.037	13.563	16.906	13.1
2010	0.715	1.292	2.671	4.223	6.049	8.299	9.472	11.631	12.827	12.083	10.052	0	0	0	0
2011	0.862	1.328	2.525	4.596	6.481	7.843	9.681	9.629	10.845	14.436	12.588	11.364	0	0	0
2012	0.938	1.369	2.354	4.175	6.391	8.115	9.092	11.799	12.548	11.436	21.367	18.379	0	0	0
2013	0.883	1.24	2.461	4.164	6.187	8.347	9.817	9.486	11.364	10.935	41.862	11.681	21.494	21.494	0
2014	0.699	1.213	2.39	4.18	5.678	7.435	9.191	9.18	11.469	16.456	34.656	0	0	0	0
2015	0.596	1.206	2.291	4.112	5.935	6.92	8.775	9.622	10.654	13.838	17.397	37.83236	0	0	0
2016	0.8	1.315	2.342	3.862	5.744	7.342	7.928	8.717	10.367	11.926	13.077	21.45347	0	0	0
2017	0.753	1.119	2.379	3.906	5.393	6.897	8.906	8.664	9.586	17.579	21.881	10.596	18.6096	18.6096	0
2018	0.607	1.065	1.943	3.838	5.633	6.829	7.683	8.867	8.481	8.972	16.877	18.521	20.221	27.865	28.027
2019	0.764	1.119	2.136	3.707	5.504	7.188	7.764	9.667	6.793	11.469	17.414	15.522	22.418	24.925	29.95





	WEST	From WGNSSK 2020													
	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8	age 9	age 10	age 11	age 12	age 13	age 14	age 15
1963	0.314	0.809	2.647	4.491	6.794	9.409	11.562	11.942	13.383	13.756	0	0	0	0	0
1964	0.357	0.761	2.366	4.528	6.447	8.52	10.606	10.758	12.34	12.54	0	0	0	0	18
1965	0.312	0.9	2.295	4.512	7.274	9.498	11.898	12.041	13.053	14.441	12.64	17.434	0	16.928	0
1966	0.313	0.836	2.437	4.169	7.027	9.599	11.766	11.968	14.06	14.746	14.825	17.45	0	0	0
1967	0.326	0.868	2.395	3.153	6.803	9.61	12.033	12.481	13.589	14.271	18.583	19.103	0	0	0
1968	0.327	0.848	2.215	4.094	5.341	8.02	8.581	10.162	10.72	12.497	11.518	11.807	0	0	0
1969	0.417	0.755	2.127	3.852	5.715	6.722	9.262	9.749	10.384	12.743	11.017	13.718	8.095	0	0
1970	0.449	0.845	2.028	4.001	6.131	7.945	9.953	10.131	11.919	12.554	14.473	14.225	0	0	0
1971	0.314	0.834	2.188	4.258	6.528	8.646	10.356	11.219	12.881	13.147	15.676	15.176	0	0	0
1972	0.3	0.729	2.08	3.968	6.011	8.246	9.766	10.228	11.875	12.53	14.455	14.272	0	0	0
1973	0.335	0.7	1.913	3.776	5.488	7.453	9.019	9.81	11.077	12.359	12.892	12.899	12.832	0	0
1974	0.304	0.901	2.206	4.156	6.174	8.333	9.889	10.791	12.175	12.425	13.66	14.049	14.309	0	0
1975	0.304	0.76	2.348	4.226	6.404	8.691	10.107	10.91	12.339	12.976	13.831	17.41	15.662	0	0
1976	0.198	0.722	2.449	4.577	6.494	8.62	10.132	11.34	12.888	14.139	14.705	14.376	20.738	0	0
1977	0.294	0.673	2.128	4.606	6.714	8.828	10.071	11.052	11.824	13.134	14.417	14.513	14.16	0	0
1978	0.432	0.743	2.001	4.146	6.53	8.667	9.685	11.099	12.427	12.778	13.847	13.739	17.148	0	0
1979	0.291	0.905	2.411	4.423	6.579	8.474	10.637	11.55	13.057	14.148	15.982	15.394	0	0	0
1980	0.257	0.917	1.948	4.401	6.109	9.12	9.55	11.867	12.782	14.081	16.475	12.166	0	0	0
1981	0.33	0.769	2.186	4.615	7.045	8.884	9.933	11.519	13.338	14.897	16.987	18.129	28.496	0	0
1982	0.358	0.908	1.856	4.13	6.785	8.903	10.398	12.5	13.469	12.89	13.998	15.879	0	0	0
1983	0.403	0.882	1.834	3.88	6.491	8.423	9.848	11.837	12.797	12.562	14.117	15.238	0	0	0
1984	0.305	0.921	2.156	3.972	6.19	8.362	10.317	11.352	13.505	13.408	12.886	14.086	0	18.203	14.516
1985	0.314	0.8	2.132	4.164	6.324	8.43	10.362	12.074	13.072	14.443	16.85	14.591	16.263	0	16.148
1986	0.293	0.782	1.822	3.504	6.23	8.14	9.896	11.94	12.951	13.859	14.794	13.866	12.968	0	28.015
1987	0.437	0.773	1.955	3.65	6.052	8.307	10.243	11.461	12.447	18.691	16.11	16.389	18.508	16.02	0
1988	0.466	0.753	1.975	3.187	5.992	7.914	9.764	12.127	14.242	17.787	16.134	14.614	21.61	17.894	15.068
1989	0.364	0.932	1.81	3.585	5.273	7.921	9.724	11.212	12.586	15.557	14.107	16.802	15.478	22.499	0
1990	0.382	0.69	2.165	3.791	5.931	7.89	10.235	10.923	12.803	15.525	14.064	19.833	31.261	16.162	17.687
1991	0.393	0.889	1.995	3.971	6.082	8.033	9.545	10.948	13.481	13.171	14.566	15.187	20.188	17.547	0
1992	0.395	0.97	2.546	4.223	6.247	8.483	10.101	10.482	11.849	13.904	14.039	16.126	16.603	19.2	0
1993	0.326	0.846	2.477	4.551	6.54	8.094	9.641	10.734	12.329	13.443	11.895	15.385	15.194	18.907	19.208
1994	0.305	0.788	2.188	4.471	7.167	8.436	9.537	10.323	12.223	14.247	12.5	12.501	13.601	14.855	0
1995	0.42	0.768	2.206	4.293	7.22	8.98	10.282	11.743	13.107	12.052	13.993	13.657	14.467	0	0
1996	0.433	0.831	2.095	4.034	6.637	8.494	9.729	11.08	12.264	12.756	10.621	11.201	16.749	0	10.613
1997	0.386	0.797	2.117	3.821	6.228	8.394	9.979	11.424	12.3	12.761	13.222	11.034	14.871	16.344	0
1998	0.372	0.634	1.622	3.495	5.387	7.563	9.628	10.643	11.499	13.085	12.432	18.742	15.926	21.273	16.746
1999	0.318	0.732	1.405	3.305	5.726	7.403	8.582	10.365	11.6	12.33	11.667	16.974	0	0	0
2000	0.354	0.903	1.747	3.216	4.903	7.488	9.636	10.671	10.894	11.414	15.089	15.004	0	0	0
2001	0.372	0.606	2.093	3.663	5.871	7.333	9.264	10.081	12.062	12.009	9.324	15.805	0	0	0
2002	0.298	0.572	1.576	3.726	5.537	8.006	9.451	10.012	11.888	12.795	13.208	10.045	0	0	0
2003	0.285	0.781	1.645	3.298	5.757	6.694	8.838	12.674	11.518	11.053	14.988	14.894	15.661	0	0
2004	0.269	0.496	1.712	3.075	5.175	7.449	8.974	9.894	11.857	12.095	14.206	13.005	0	0	0
2005	0.342	0.86	1.529	3.533	5.124	7.201	9.457	10.567	11.384	12.066	23.997	13.482	0	0	0
2006	0.25	0.236	1.804	3.828	5.665	7.229	9.262	10.477	12.325	14.862	17.875	18.411	0	0	0
2007	0.313	0.893	2.001	4.026	6.117	8.543	9.255	10.293	12.282	14.559	22.018	12.61	7.671	0	0
2008	0.424	0.904	1.966	3.89	6.207	7.491	9.644	11.489	11.387	12.725	15.381	0	0	0	0
2009	0.406	1.133	2.355	4.023	6.154	7.56	9.733	11.447	11.291	11.786	25.448	12.037	13.563	16.906	13.1
2010	0.335	0.965	2.426	4.18	6.033	8.299	9.472	11.631	12.827	12.083	10.052	0	0	0	0
2011	0.405	0.915	2.438	4.569	6.472	7.829	9.656	9.461	10.853	14.436	12.588	11.364	0	0	0
2012	0.274	0.8	2.252	4.154	6.392	8.117	9.095	11.799	12.548	11.754	21.367	18.379	0	0	0
2013	0.388	0.932	2.249	4.06	5.999	8.36	9.385	9.486	11.364	11.68	41.862	11.681	21.494	21.494	0
2014	0.398	0.927	2.237	4.083	5.598	7.392	9.19	9.18	11.469	16.456	34.656	0	0	0	0
2015	0.366	0.945	2.098	4.031	5.802	6.761	8.602	9.41	8.663	13.838	17.397	37.832	0	0	0
2016	0.387	1.049	2.138	3.803	5.712	7.332	7.928	8.717	10.367	11.926	13.077	21.453	0	0	0
2017	0.249	0.925	2.238	3.794	5.296	6.857	8.85	8.618	9.586	17.579	21.881	10.596	18.61	18.61	0
2018	0.3	0.79	1.853	3.759	5.624	6.829	7.683	8.867	8.546	8.972	16.877	18.521	20.221	27.865	28.027
2019	0.405	0.857	2.036	3.687	5.492	7.188	7.764	9.667	6.793	11.469	17.414	15.522	22.418	24.925	29.95