A COMPARISON OF INITIAL STATISTICAL CATCH-AT-AGE AND CATCH-AT-LENGTH ASSESSMENTS OF WESTERN ATLANTIC BLUEFIN TUNA

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SUMMARY

A concern associated with existing Atlantic bluefin tuna age-based assessments using Virtual Population Analysis (VPA) is that the catch-at-age data inputs are obtained by the cohortslicing method, which is approximate and might introduce appreciable bias into the results. Current custom in such circumstances is rather to fit the assessment model directly to the basic catch-at-length data available, under the assumption of invariance of the distributions of length-at-age of the fish over time, with statistical models used to formulate the likelihoods maximized in the model fitting process. Initial results are presented for a process of comparing the 2012 ICCAT SCRS VPA assessment of the western stock with first a statistical catch-at-age assessment approach which also uses the same cohort-sliced catch-at-age inputs, and then a statistical catch-at-length method which fits instead to catch-at-length distributions.

RÉSUMÉ

La crainte que suscitent les évaluations existantes basées sur l'âge du thon rouge de l'Atlantique au moyen de l'analyse de population virtuelle (VPA) est que les données de prise par âge sont obtenues par la méthode de découpage des cohortes, laquelle est approximative et pourrait introduire des biais appréciables dans les résultats. La pratique courante dans ces circonstances consiste plutôt à ajuster le modèle d'évaluation directement aux données fondamentales de prise par taille disponibles, sous le postulat d'invariance des distributions de prise par âge du poisson dans le temps, avec des modèles statistiques utilisés pour formuler les vraisemblances maximisées dans le processus d'ajustement du modèle. Les résultats initiaux sont présentés pour un processus de comparaison de l'évaluation du stock de l'Ouest au moyen de la VPA réalisée par le SCRS de l'ICCAT en 2012 avec d'abord une approche d'évaluation de la prise statistique par âge qui utilise aussi les mêmes données d'entrée de prise par âge découpées par cohorte et ensuite une méthode de prise statistique par taille qui s'ajuste plutôt aux distributions de prise par taille.

RESUMEN

Una inquietud asociada con las evaluaciones basadas en la edad del atún rojo del Atlántico existentes realizadas mediante análisis de población virtual (VPA) es que los datos de entrada de captura por edad se obtienen mediante el método de separación de cohortes, que es aproximativo y puede introducir sesgos notables en los resultados. Lo que se suele hacer en estas circunstancias es ajustar el modelo de evaluación directamente a los datos básicos de captura por talla disponibles, partiendo del supuesto de no variación de la distribución de talla por edad de los peces en el tiempo, utilizando modelos estadísticos para formular las verosimilitudes maximizadas en el proceso de ajuste del modelo. Se presentan los resultados iniciales para un proceso de comparación de la evaluación VPA del SCRS de ICCAT de 2012 del stock occidental con un enfoque de evaluación estadístico de captura por edad que utiliza las mismas entradas de captura por talla que se ajusta a distribuciones de captura por talla.

KEYWORDS

Age composition, Biomass, Size composition, Stock assessment, Tuna fisheries

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1. Introduction

The longer-term objective of this work is the development of a two-stock assessment of the North Atlantic bluefin tuna population which takes mixing between the fish of western and of eastern origin into account, in particular by using new information from electronic tags and from otolith microchemistry in the model fitting process (*i.e.* similar to the model developed by Taylor *et al.* 2011). This should provide a more realistically-based assessment of the bluefin tuna in the North Atlantic (and Mediterranean), and would also provide Operating Models for testing candidate Management Procedures for this resource (*i.e.* in the planned Management Strategy Evaluation, or MSE, process).

However a concern with that model, and indeed with the models used currently by ICCAT that assume separate stocks, is that they are fit to catch-at-age data derived using the rather coarse approach of cohort-slicing, which might be introducing considerable bias into the results. Given the increase in computing power that has become available over the most recent decade, current custom in such circumstances is rather to fit the assessment model directly to the basic catch-at-length data available, usually under the assumption of invariance of the distributions of length-at-age of the fish over time, which considerably simplifies the analysis. Rather than utilise Virtual Population Analysis (VPA), which makes the assumption (the more poorly justified in cases where cohort-slicing is used to provide the catch-at-age values input) that the resultant catch-at-age values are error free, statistical models (Statistical Catch at Age, SCAA for age data or Statistical Catch at Length, SCAL when the length data are input directly) are used to formulate the likelihoods maximised in the model fitting process.

Thus the first step required in addressing the longer-term objective for this work is the development of SCAL assessments for the western and eastern (plus Mediterranean) components of the fishery treated as separate stocks as in current ICCAT assessments. In this paper, initial results are presented by way of comparing one of the 2012 ICCAT SCRS VPA assessments (the Continuity Run) for the western stock of North Atlantic bluefin tuna (NABFT) with first two versions of a SCAA approach which also uses the same cohort-sliced catch-at-age inputs, and then a SCAL method which fits instead to catch-at-length distributions. This follows a similar exercise carried out for the eastern (plus Mediterranean) stock (Butterworth and Rademeyer 2012).

2. Data and methods

The data utilised are documented in Appendix A. The choice of historic catch estimates that has been made is the same as used for the VPA continuity run from the 2012 ICCAT assessment meeting (ICCAT 2012).

The details of the SCAA and SCAL methodologies are provided in Appendix B, which also lists the values input for certain parameters for the associated models. Both SCAA and SCAL applications fit to the data series for both CPUE and age (or length) information in manners as similar as possible to those used in the VPA continuity run ICCAT (2012).

Some of the specific choices made within these methodologies for the analyses presented here are simpler than may eventually prove optimal, in line with the initial nature of these analyses. To mention some of the more important, which will be subject to subsequent sensitivity investigations:

- The stock-recruitment form fit is of the Beverton-Holt type, but for practical purposes reflects expected recruitment as independent of spawning biomass through fixing steepness h = 0.98 for the baseline runs. The standard deviation of the residuals of log recruitment about this relationship is assumed to have the value $\sigma_{\rm R} = 0.6$. Thus far, sensitivities to this have been run for one of the SCAA assessments as detailed below.
- To assist stabilise estimation, the resource is assumed to be at its deterministic pre-exploitation equilibrium with the corresponding age structure at the start of the period considered (1950).
- Though one change in selectivity at age/length over time has been introduced to improve fits to the purse seine catch-at-age/length data, further changes might improve the fit further.

- A single variance for all CPUE series has been used, as is understood to have been the case for the VPA continuity run.
- Catch-at-age and catch-at-length contributions to the overall log-likelihood are downweighted by multiplicative factors of 0.1 and 0.05 respectively. This is necessary to take account of the non-independence of such data (fish of similar age or size tend to group together, so that the tuna caught in, for example, the same longline set do not constitute independent samples). However the magnitudes specified for these weights are somewhat arbitrary; the ratio of the length to the age weighting is based on the fact that there are about twice as many length classes as age classes considered in the fitting process.

For the SCAL assessment, the distributions of length-at-age are assumed to be normal with CVs of 20% about their means (**Figure 1** shows the growth curve and the distributions of length-at-age used for the SCAL run). Note that either because the data were not available or for related reasons, this "SCAL" in fact continued to fit to catch-at-age rather than catch-at-length data for a few indices.

3. Results

Two alternatives have been considered for the SCAA implementations: "SCAA-FixedS" for which the abundance indices' selectivities are fixed to those estimated in the VPA continuity run and the selectivity of each of the fleet for the plus group is taken to be the same as that of the immediately lower age (as is done for the VPA continuity run), and "SCAA-EstS" for which all the selectivities are freely estimated (see **Table B1**). For SCAL, the selectivities are freely estimated.

A brief summary of key results for these three models is provided in **Table 1**, which includes values for the contributions of various data sources and penalties to the (penalised) log-likelihood, as well as estimates of current depletion expressed in terms of spawning biomass. The brevity of presentation is deliberate at this stage; given the initial nature of these results, it would not be appropriate to focus on more than broad features at this time.

Figure 2 compares the spawning biomass time-series estimated for the three model implementations, and also shows the results from the VPA continuity run of ICCAT (2012).

Figure 3 compares recruitment time-series, while Figure 4 plots the stock-recruitment relationships and stock-recruitment residuals.

The fits to the various CPUE indices in Figure 5 are not "unreasonable", given the evident noise in these data.

Figure 6 shows the estimated selectivity-at-age vectors for the five fleets for the two SCAA runs, together with their fits (which are generally good) to the age distribution proportions averaged over years and in terms of residuals (bubble plots). The fits to the distributions of proportions of catch-at-length averaged over years under the SCAL model are similarly reasonable (**Figure 7**).

Similarly, **Figures 8, 9 and 10** show the estimated selectivities and fits to the age/length distribution proportions for the abundance indices for the SCAA-FixedS, SCAA-EstS and SCAL respectively.

Figure 11 shows spawning biomass trajectories and stock-recruit relationships for SCAA_EstS for different fixed values for steepness *h*.

4. Discussion

For the two SCAA fits, estimating selectivity ("SCAA-EstS") provides the better fit in terms of the negative loglikelihood (**Table 1**), arising particularly from better fits to the CAA data which in turn reflect greater doming in the selectivities (**Figure 6**) and hence higher biomasses (**Figure 2**).

The SCAL assessment is closer to that of SCAA-EstS, but does not reflect the increase in spawning biomass over the more recent years that SCAA-EstS does. However prior to 1970, the SCAL results look more like those for SCAA-FixedS, with a near discontinuity at 1970 (**Figure 2**). This is a consequence of the very poor fit to the

stock-recruitment "data" (**Figure 4**), which in turn allows for unrealistically large recruitments over a short period in the early 1960s which cause this near-discontinuity. It is important to note that, consistent with the VPA continuity run, there are no abundance indices or age/length composition data prior to 1970 input to these SCAA and SCAL assessments, so that those early estimates of abundance are being driven effectively entirely by the stock-recruitment relationship assumed and the implicit associated assumption of its stationarity.

Some initial sensitivities have been run for SCAA-EstS, focusing on lower values of steepness h which are fixed on input. As h is decreased, the fit improves (**Table 2**), the spawning biomass becomes lower and does not reflect a recent increase, and the Beverton-Holt curve provides a better reflection of the underlying form assumed (**Figure 11**).

There are many assumptions and value choices that have had to be made for these initial SCAA and SCAL assessment runs. Feedback from meeting participants on these, and on how they might be improved/rendered more reliable would be appreciated.

Problems with the data when moving to SCAL

A number of problems have arisen in the process of converting from a SCAA to SCAL assessment formulation:

- Age 0 is not included in VPA and SCAA—but this becomes difficult in SCAL
- The first two CAN CPUE series differ only by age groups (with 2 ages overlapping)—this cannot be effected in SCAL—this is why the SCAL fits to CAA rather than to CAL for these two series, which are not distinguished in the length information as provided
- JLL GOM: the CAA data are not properly described, so that it was not possible to determine an equivalent CAL—hence CAA were used in the SCAL for this series
- US PLL GOM: CAL grouped by length groups, but not consistent and very large grouping—hence CAA were used rather than CAL in the SCAL assessment.

Note: The "Larval zero inflated" index has been treated as an index of spawning biomass, with selectivity not estimated as in VPA.

5. Conclusion

The broad features of these results are rather similar to those found in the corresponding analysis for the eastern Atlantic Bluefin tuna (Butterworth and Rademeyer 2012). Compared to the current ICCAT VPA, biomasses are higher because the data prefer a more domed shape for the selectivity functions, and for the more recent years the SCAL suggests a more stable abundance compared to the increase suggested by the SCAA. Clearly more examination of the consequences of different assumptions for the stock–recruitment relationship is needed in further work. Immediately however, the opportunity provided by the meeting at which this paper is to be presented should be taken to resolve some remaining queries about the catch-at-length data.

Acknowledgements

We thank Laurie Kell for assistance in providing the data used to us. Shannon Cass-Calay and Clay Porch kindly assisted in clarifying some questions about these data.

References

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Table 1. Results for the two SCAA and the SCAL assessments of this paper with steepness h fixed at 0.98. Biomass units are metric tons, and K^{sp} refers to the pre-exploitation equilibrium spawning biomass. Note that the value for the overall negative log likelihood for the two SCAA assessments are comparable to each other, but not to that for the SCAL assessment.

	SCAA-FixedS	SCAA-EstS	SCAL
-lnL: overall	-3566.3	-3628.6	-1176.6
-lnL: CPUE	25.4	31.4	20.7
-lnL: fleet CAA	-2546.2	-2567.1	-
-lnL: fleet CAL	-	-	-738.0
-lnL: index CAA	-1079.0	-1121.1	-279.1
-lnL: index CAL	-	-	-219.0
-lnL: RecRes	33.4	28.1	30.3
Sel smoothing penalty	-	-	8.5
K ^{sp}	82956	126945	79614
$B^{\rm sp}_{2011}$	20379	48308	38456
$B^{\rm sp}_{2011}/K^{\rm sp}$	0.25	0.38	0.48

Table 2. Results for SCAA-EstS for different fixed values of steepness h. Biomass units are metric tons, and K^{sp} refers to the pre-exploitation equilibrium spawning biomass.

	<i>h</i> = 0.98	h = 0.7	h = 0.4
-lnL: overall	-3628.6	-3636.4	-3646.6
-lnL: CPUE	31.4	27.5	27.7
-lnL: fleet CAA	-2567.1	-2567.1	-2568.4
-lnL: index CAA	-1121.1	-1121.1	-1120.9
-lnL: RecRes	28.1	24.3	14.9
K^{sp}	126945	140240	205512
$B^{\rm sp}_{\ \ 2011}$	48308	33434	29484
$B^{\rm sp}_{2011}/K^{\rm sp}$	0.38	0.24	0.14

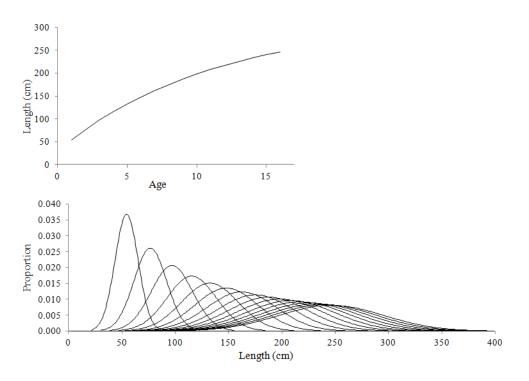


Figure 1. Growth curve and associated length-at-age distributions assumed.

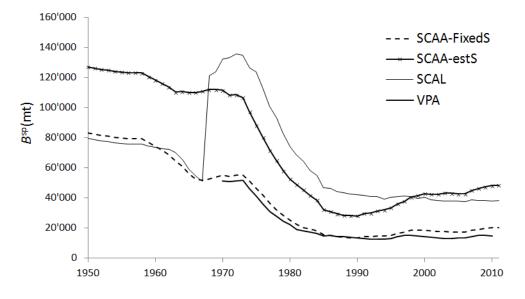


Figure 2. Spawning biomass trajectories. The notation convention used here and below is that VPA refers to Continuation Run from ICCAT (2012), SCAA_FixedS is Statistical Catch at Age with fixed selectivity for the abundance indices and commercial plus group, SCAA_EstS estimates all the selectivities, and SCAL is Statistical Catch at Length with all selectivities estimated. The SCAA and SCAL assessments fix steepness h at 0.98.

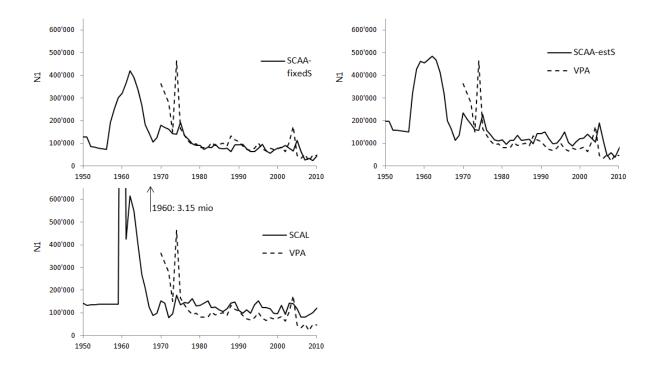


Figure 3. Recruitment (number of 1-year-olds, N_1) trajectories for the four assessments.

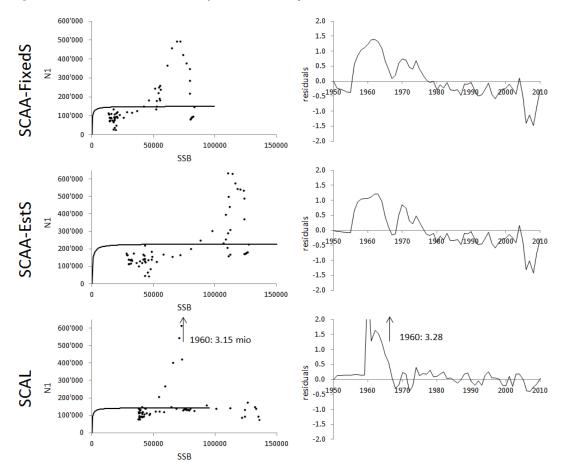


Figure 4. Stock–recruitment relationships (left-hand column) and time series of stock–recruitment residuals for the three new assessments. Spawning stock biomass (SSB) is in metric tons.

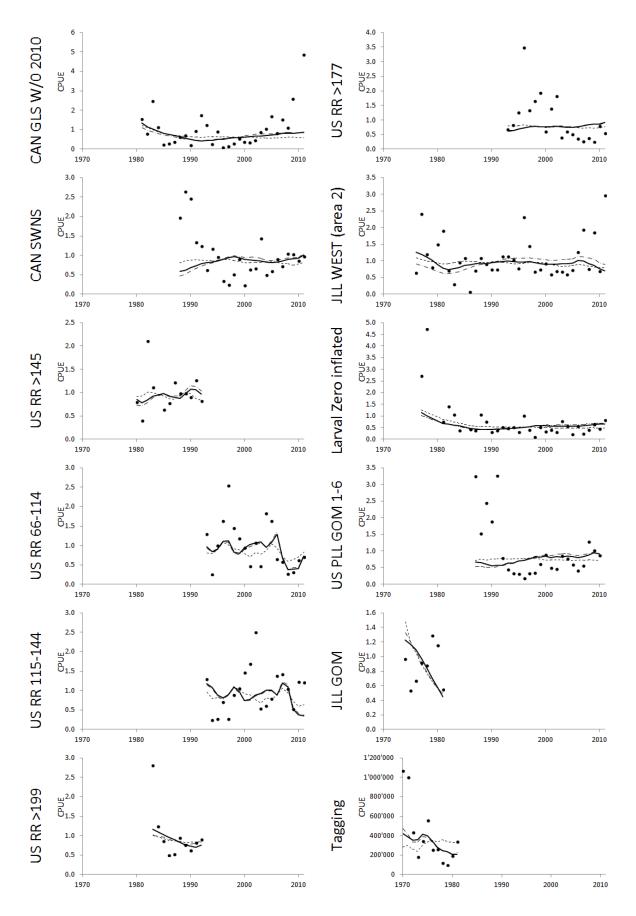


Figure 5. Fits of the new assessment models to the various CPUE series (full line=SCAA_FixedS, dashed-dot=SCAA_EstS and dashed=SCAL).

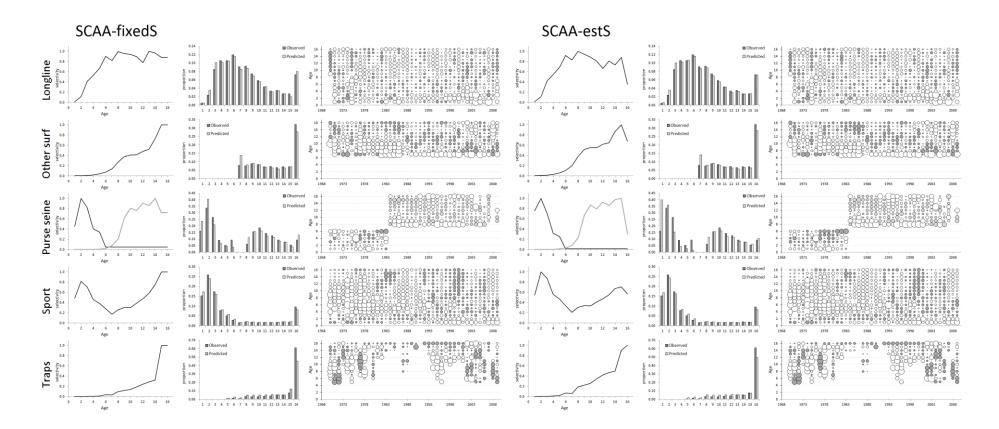


Figure 6. Estimated selectivities-at-age, fits to the CAA data (as averages over all the years with data available) and bubble plots of the CAA standardised residuals for the five fleets for the **SCAA_FixedS** (three left-hand columns) and **SCAA_EstS** (three right-hand columns) assessments. Here and below, in the bubble plots, the size (area) of the bubble is proportional to the magnitude of the corresponding standardised residual. For positive residuals the bubbles are grey, whereas for negative residuals the bubbles are white. Results for the second selectivity period for the purse seine are shown in lighter grey in the plots.

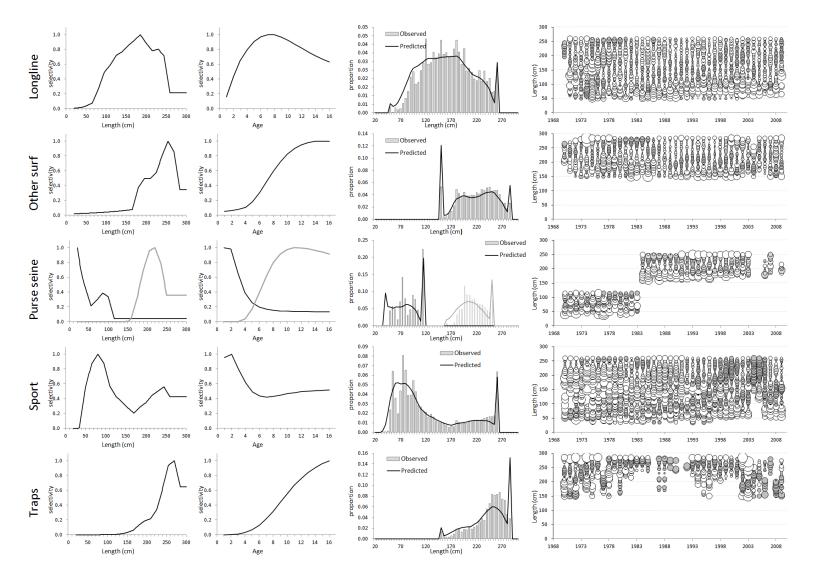


Figure 7. Estimated selectivities-at-length, the effective equivalent selectivities-at-age, fit to the CAL data (as average over all the years with data available), and bubble plots of the CAL standardised residuals for the associated fisheries for the SCAL assessment.

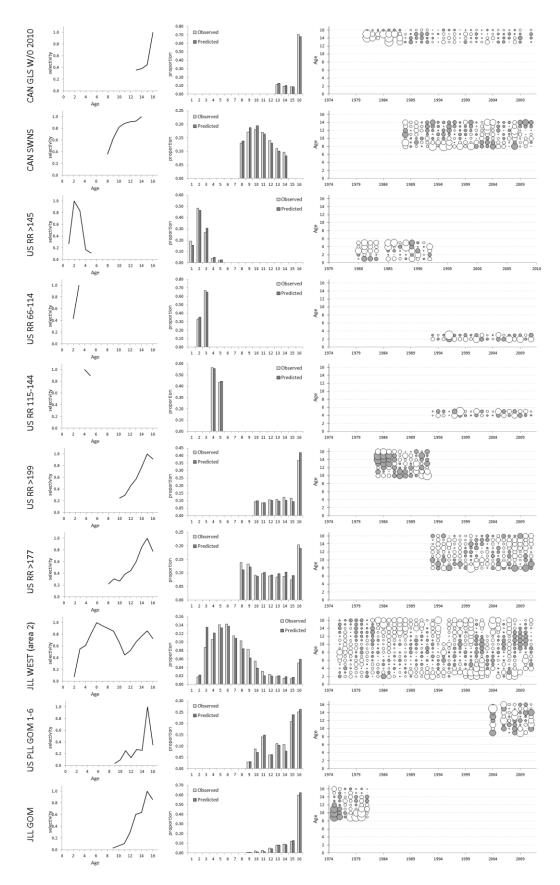


Figure 8. Estimated selectivities-at-age, fit to the CAA data (as average over all the years with data available), and bubble plots of the CAA standardised residuals for the catches associated with indices of abundance for the **SCAA_FixedS assessment**.

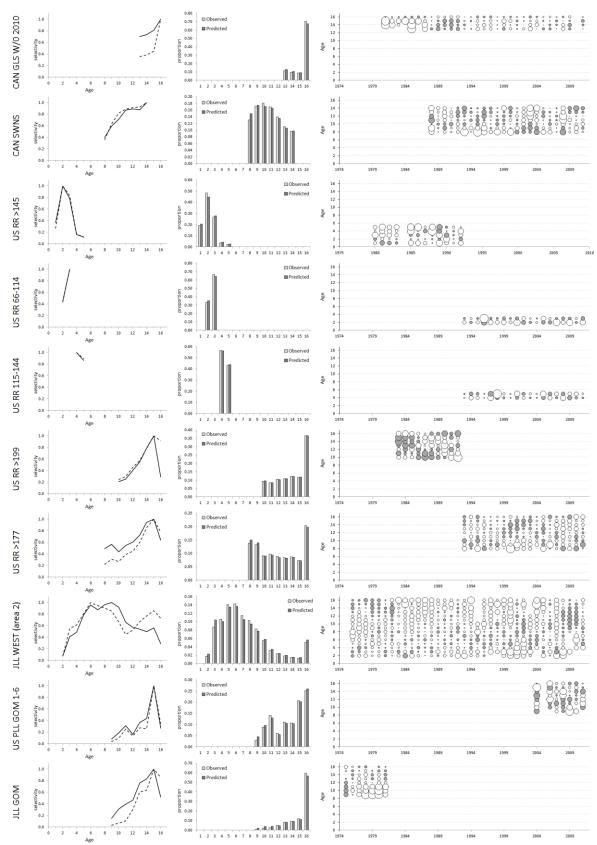


Figure 9. Estimated selectivities-at-age, fit to the CAA data (as average over all the years with data available), and bubble plots of the CAA standardised residuals for the catches associated with indices of abundance for the **SCAA_EstS assessment**. The VPA selectivities-at-age are shown as dashed lines.

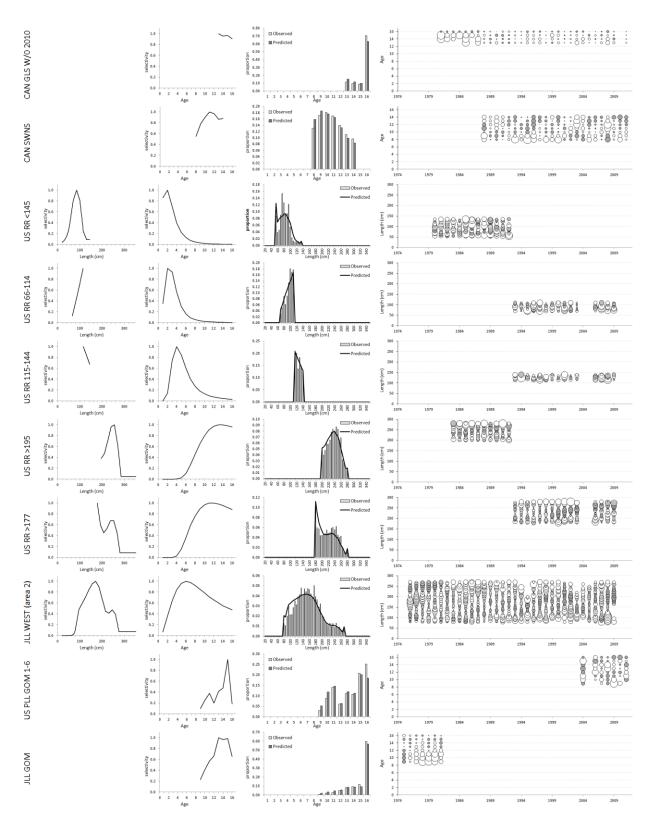


Figure 10. Estimated selectivities-at-length (where applicable), the effective equivalent selectivities-at-age, fit to the CAA/CAL data (as average over all the years with data available), and bubble plots of the CAA/CAL standardised residuals for the catches associated with indices of abundance for the **SCAL assessment**. Note that for CAN GLS W/O 2010, CAN SWNS, US PLL GOM 1-6 and JLL GOM, the model is fit to CAA data rather than CAL data.

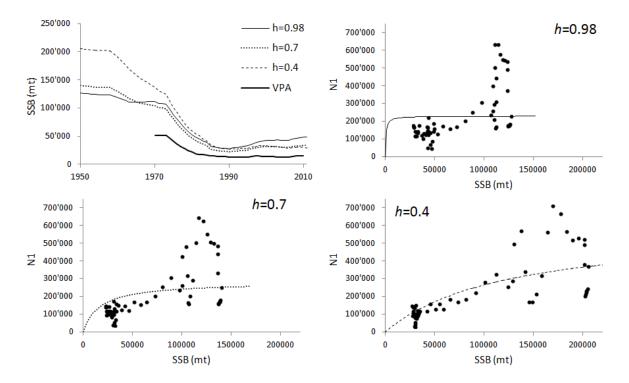


Figure 11. Spawning biomass trajectories and stock–recruit relationships for SCAA_EstS with different fixed values for steepness *h*.

Appendix A.

Data

The data listed below are from ICCAT (2012) for Continuity Run, or as kindly provided by Laurie Kell of the ICCAT Secretariat.

m 11	4 4	A 1	•		
Table	AL	Catches	1n	metric	tons
Lable		Cutones	111	meure	tomo.

	Longline	Other	Purse seine	Sport	Traps
950	0.0	468.0	1.0	192.0	346.0
1951	0.0	270.0	100.0	235.0	491.0
1952	7.0	334.0	0.0	153.0	135.0
1953	1.0	198.0	0.0	119.0	766.0
1954	0.0	130.0	55.0	107.0	531.0
1955	5.0	135.0	0.0	27.0	377.0
1956	0.0	47.0	0.0	19.0	181.0
1957	46.0	58.0	0.0	38.0	404.0
1958	72.0	61.0	138.0	67.0	869.0
1959	283.0	125.0	781.0	79.0	302.0
1960	340.0	119.0	277.0	60.0	236.0
1961	373.0	78.0	903.0	108.0	158.0
1962	1351.0	44.0	3768.0	412.0	224.0
1963	6558.0	22.0	5770.0	1185.0	303.0
1964	12410.0	24.0	5150.0	608.0	479.0
1965	9469.0	58.0	3331.0	1066.0	247.0
1966	3085.0	47.0	1006.0	3731.0	221.0
1967	3126.0	58.0	2082.0	361.0	313.0
1968	1665.0	63.0	687.0	635.0	126.0
		32.0			
1969 1970	593.0 268.0	83.0	1118.0 4288.0	1038.0 644.0	231.0 183.0
	1390.0	182.0	3769.0		
1971				1144.0	106.0
1972	339.0 1127.0	186.0	2011.0	1354.0 816.0	58.0
1973		115.0	1656.0		157.0
1974	946.0	256.0	960.0	2955.0	276.0
1975	1562.4	24.0	2320.0	1022.0	144.0
1976	3066.0	311.0	1582.0	752.0	172.0
1977	3753.4	194.0	1502.0	874.0	372.0
1978	3219.1	191.0	1230.0	904.0	221.0
1979	3691.0	196.0	1381.0	956.0	31.0
1980	3972.5	131.0	758.0	893.0	47.0
1981	3879.0	133.0	910.0	808.0	41.0
1982	363.0	323.0	232.0	459.0	68.0
1983	829.0	514.0	384.0	808.0	7.0
1984	832.0	377.0	401.0	676.0	3.0
1985	1245.0	293.0	377.0	750.0	20.0
1986	1278.0	166.2	360.0	518.0	0.0
1987	1237.0	156.3	367.0	726.0	17.0
1988	1475.3	425.0	383.0	601.0	14.0
1989	817.6	769.0	385.0	786.0	1.0
1990	854.1	536.0	384.0	1004.0	2.0
1991	1023.3	578.0	237.0	1083.0	0.0
1992	885.2	509.3	300.0	586.3	1.0
1993	784.0	406.0	295.0	854.0	29.0
1994	622.0	307.2	301.0	804.0	79.0
1995	604.1	384.0	249.0	1114.0	72.0
1996	713.6	436.0	245.0	1029.0	90.0
1997	537.0	293.0	250.0	1195.3	59.0
1998	887.0	342.0	249.0	1111.0	68.0
1999	1074.5	281.0	248.0	1123.8	44.5
2000	1079.5	284.4	275.2	1119.7	16.1
2001	714.7	202.3	195.9	1655.7	15.8
2002	940.5	107.6	207.7	2035.1	28.1
2003	418.3	139.6	265.4	1398.3	84.0
2004	824.8	97.1	31.8	1138.8	32.0
2005	556.2	89.1	178.3	924.5	8.4
2006	714.4	85.3	3.6	1005.1	3.0
2007	520.3	63.1	27.9	1022.9	3.6
2008	764.7	81.9	0.0	1129.9	23.0
2009	573.5	120.7	11.4	1250.6	23.5
2010	703.1	106.7	0.0	1008.9	38.8
2011	924.4	147.8	0.0	887.3	26.3

 Table A2. Commercial catches-at-age used in the SCAA.

				4		6	-	0	0	10	11	10	12	1.4	1.4	1.5	10
Longline 1970	1 0	2	3	4	5	6	7	8	9 12	10 182	11 274	12 182	13 261	14 199		15 170	16
1970	13	246	31	133	90	275	844	1551	1133	710	690	546	399	232		114	24
1972	29	54	58	17	143	55	44	103	358	206	51	72	74	66		26	11
1973	88	443	564	476	691	260	227	594	1117	696	177	287	313	271		90	24
1974	109	2668	2794	1629	518	102	471	628	542	517	460	439	407	259		270	34
1975	2	37	54	76	190	21	17	166	347	633	1180	937	881	844		864	189
1976	184	1236	5772	2497	2630	1032	183	110	649	599	364	711	1538	1910	910	1750	437
1977	59	423	5315	9521	2292	1826	1748	405	157	245	213	339	480	954	954	1387	606
1978	81	192	1427	2785	2513	2673	991	394	316	174	176	324	464	471	471	928	634
1979	47	340	1441	1237	685	1572	2568	1750	521	305	302	399	664	930	930	1129	508
1980	135	480	1763	2676	1229	1329	2270	4609	3088	774	491	460	517	602		990	694
1981	357	1462	8455	3354	4371	3051	2529	2055	1690	1016	456	688	604	573		480	540
1982	82	129	178	244	160	380	399	302	155	216	150	130	146	109		58	18
1983	6	120	2151	577	569	823	602	994	595	428	257	154	161	83		65	16
1984	56	1523	602	1189	1808	1487	781	358	327	305	204	142	117	189		85	27
1985	35	128	6680	2044	3469	3697	1742	590	363	253	173	195	262	155		341	49
1986	4	133	1228	2236	1390	1119	1062	560	363	302	177	132	272	219	219	286	147
1987	29	350	1547	2310	3131	3641	1171	1170	786	677	217	152	135	109	109	103	41
1988	85	283	3580	3747	3165	2881	2824	1351	827	431	228	127	191	144	144	144	45
1989	32	203	272	1062	887	1133	1022	1112	668	334	194	189	186	141	141	83	31
1990	36	103	834	783	1322	1410	838	735	670	502	301	186	191	111		99	37
1991	37	155	593	1334	1478	1412	1477	1079	475	371	276	294	200	153		146	43
1992	54	43	451	931	911	1273	782	1116	942	339	254	177	236	187		120	31
1993	19	50	666	1300	1165	1428	1294	650	609	545	251	122	130	71		45	21
1994	25	75	322	1566	1863	1685	601	592	530	310	157	115	80	48		37	15
1995	106	59	286	1093	689	2680	1086	250	304	188	70	58	81	46	46	35	12
1996	54	182	565	1356	1108	767	997	866	297	192	237	196	177	124	124	106	22
1997	33	8	186	601	739	755	967	670	646	230	120	62	94	69	69	45	11
1998	24	8	236	1059	532	1065	686	828	980	1253	391	199	108	150		35	20
1999	29	32	129	799	1138	752	670	935	652	544	494	517	538	297		199	41
2000	22	29	404	783	3293	2630	1358	1141	534	282	163	152	176	103		82	20
2001	34	33	57	120	155	344	963	1021	360	399	276	338	215	126		125	20
2002	12	34	31	90	79	237	466	1509	1201	1028	562	321	277	83		153	22
2003	2	24	17	325	262	461	185	332	185	217	222	131	189	89	89	163	17
2004	0	11	7	349	1445	2507	1203	768	344	367	226	183	211	140	140	123	20
2005	1	51	592	622	711	548	569	791	452	258	378	237	188	113	113	158	16
2006	4	186	355	690	468	1420	755	743	1054	840	478	350	235	150	150	331	37
2007	0	22	2527	2124	851	899	507	379	230	133	246	176	123	92		105	15
2008	0	32	150		782	457	923	997	714	573	512	298	261			201	23
				518										110			
2009	2	0	12	33	28	260	45	338	390	383	391	188	135	120	120	184	26
41 f		2	2	4			7			10	11	10	12	14	1.4	1.5	10
ther surf	1	2	3	4	5	6	7	8	9	10	11	12	13	14		15	16
1970	0	0	0	0	0	0	0	0	0	1	7	62	20	19		9	16
1971	0	0	0	0	0	0	8	9	6	8	8	41	99	127	127	161	22
1972	4	8	6	4	18	15	9	11	43	34	30	66	100	183	183	109	18
1973	3	14	11	34	26	17	6	20	45	44	14	15	28	33	33	39	20
1974	33	214	39	64	33	4	20	36	25	36	28	40	88	139	139	185	35
1975	0	1	1	1	4	0	0	2	5	9	17	13	13	11		12	28
1976	4	34						6	23	42	48	56	97				38
			Q /	62	42					44			91			124	20
1977			84	62	43	12	10			-			-		102	134	
1978	27	17	37	36	10	8	5	2	1	2	3	4	7	18	102 18	31	
1979	5	17 8	37 16	36 27	10 24	8 18	5 10	2 5	1 2	6	5	15	48	18 85	102 18 85	31 118	27
		17	37	36	10	8	5	2	1					18	102 18 85	31	27
1980	5	17 8	37 16	36 27	10 24	8 18	5 10	2 5	1 2	6	5	15	48	18 85	102 18 85 45	31 118	27 42
1980	5 0	17 8 2	37 16 6	36 27 13	10 24 7	8 18 14	5 10 14	2 5 12	1 2 6	6 11	5 4	15 14	48 31	18 85 45	102 18 85 45 12	31 118 78	27 42 30
1980 1981	5 0 0 1	17 8 2 1 11	37 16 6 6 40	36 27 13 5 20	10 24 7 3 19	8 18 14 4 16	5 10 14 6 13	2 5 12 13 11	1 2 6 13 8	6 11 11 15	5 4 7 11	15 14 9 10	48 31 12 10	18 85 45 12 22	102 18 85 45 12 22	31 118 78 19 13	27 42 30 28
1980 1981 1982	5 0 0 1 0	17 8 2 1 11 0	37 16 6 40 0	36 27 13 5 20 0	10 24 7 3 19 0	8 18 14 4 16 0	5 10 14 6 13 2	2 5 12 13 11 4	1 2 6 13 8 13	6 11 11 15 17	5 4 7 11 32	15 14 9 10 53	48 31 12 10 30	18 85 45 12 22 27	102 18 85 45 12 22 27	31 118 78 19 13 41	27 42 30 28 69
1980 1981 1982 1983	5 0 1 0 0	17 8 2 1 11 0 0	37 16 6 40 0 0	36 27 13 5 20 0 0	10 24 7 3 19 0 0	8 18 14 4 16 0 2	5 10 14 6 13 2 8	2 5 12 13 11 4 9	1 2 6 13 8 13 54	6 11 11 15 17 52	5 4 7 11 32 48	15 14 9 10 53 48	48 31 12 10 30 43	18 85 45 12 22 27 120	102 18 85 45 12 22 27 120	31 118 78 19 13 41 62	27 42 30 28 69 105
1980 1981 1982 1983 1984	5 0 1 0 0 0	17 8 2 1 11 0 0 0	37 16 6 40 0 0	36 27 13 5 20 0 0 0	10 24 7 3 19 0 0	8 18 14 4 16 0 2 0	5 10 14 6 13 2 8 3	2 5 12 13 11 4 9 15	1 2 6 13 8 13 54 9	6 11 15 17 52 18	5 4 7 11 32 48 55	15 14 9 10 53 48 40	48 31 12 10 30 43 41	18 85 45 12 22 27 120 71	102 18 85 45 12 22 27 120 71	31 118 78 19 13 41 62 52	27 42 30 28 69 105 70
1980 1981 1982 1983 1984 1985	5 0 1 0 0 0 0	17 8 2 1 11 0 0 0 0	37 16 6 40 0 0 0 0	36 27 13 5 20 0 0 0 0	10 24 7 3 19 0 0 0 0	8 18 14 4 16 0 2 0 3	5 10 14 6 13 2 8 3 3	2 5 12 13 11 4 9 15 17	1 2 6 13 8 13 54 9 14	6 11 15 17 52 18 33	5 4 7 11 32 48 55 29	15 14 9 10 53 48 40 63	48 31 12 10 30 43 41 71	18 85 45 12 22 27 120 71 105	102 18 85 45 12 22 27 120 71 105	31 118 78 19 13 41 62 52 113	27 42 30 28 69 105 70 51
1980 1981 1982 1983 1984 1985 1986	5 0 1 0 0 0 0 0	17 8 2 1 11 0 0 0 0 0	37 16 6 40 0 0 0 0 0	36 27 13 5 20 0 0 0 0 0	10 24 7 3 19 0 0 0 0 0	8 18 14 4 16 0 2 0 3 0	5 10 14 6 13 2 8 3 3 3 3	2 5 12 13 11 4 9 15 17 3	1 2 6 13 8 13 54 9 14 6	6 11 15 17 52 18 33 7	5 4 7 11 32 48 55 29 20	15 14 9 10 53 48 40 63 40	48 31 12 10 30 43 41 71 62	18 85 45 12 22 27 120 71 105 100	102 18 85 45 12 22 27 120 71 105 100	31 118 78 19 13 41 62 52 113 92	27 42 30 28 69 10 <u>5</u> 70 51 27
1980 1981 1982 1983 1984 1985 1986 1987	5 0 1 0 0 0 0 0 0	17 8 2 1 11 0 0 0 0 0 0 1	37 16 6 40 0 0 0 0 0 5	36 27 13 5 20 0 0 0 0 0 0 13	10 24 7 3 19 0 0 0 0 0 0 27	8 18 14 4 16 0 2 0 3 0 32	5 10 14 6 13 2 8 3 3 3 3 27	2 5 12 13 11 4 9 15 17 3 41	1 2 6 13 8 13 54 9 14 6 33	6 11 15 17 52 18 33 7 42	5 4 7 11 32 48 55 29 20 28	15 14 9 10 53 48 40 63 40 33	48 31 12 10 30 43 41 71 62 48	18 85 45 12 22 27 120 71 105 100 57	102 18 85 45 12 22 27 120 71 105 100 57	31 118 78 19 13 41 62 52 113 92 74	27 42 30 28 69 105 70 51 27 23
1980 1981 1982 1983 1984 1985 1986	5 0 1 0 0 0 0 0	17 8 2 1 11 0 0 0 0 0	37 16 6 40 0 0 0 0 0	36 27 13 5 20 0 0 0 0 0	10 24 7 3 19 0 0 0 0 0	8 18 14 4 16 0 2 0 3 0	5 10 14 6 13 2 8 3 3 3 3	2 5 12 13 11 4 9 15 17 3	1 2 6 13 8 13 54 9 14 6	6 11 15 17 52 18 33 7	5 4 7 11 32 48 55 29 20	15 14 9 10 53 48 40 63 40	48 31 12 10 30 43 41 71 62	18 85 45 12 22 27 120 71 105 100	102 18 85 45 12 22 27 120 71 105 100 57	31 118 78 19 13 41 62 52 113 92	27 42 30 28 69 105 70 51 27 23
1980 1981 1982 1983 1984 1985 1986 1987	5 0 1 0 0 0 0 0 0	17 8 2 1 11 0 0 0 0 0 0 1	37 16 6 40 0 0 0 0 0 5	36 27 13 5 20 0 0 0 0 0 0 13	10 24 7 3 19 0 0 0 0 0 0 27	8 18 14 4 16 0 2 0 3 0 32	5 10 14 6 13 2 8 3 3 3 3 27	2 5 12 13 11 4 9 15 17 3 41	1 2 6 13 8 13 54 9 14 6 33	6 11 15 17 52 18 33 7 42	5 4 7 11 32 48 55 29 20 28	15 14 9 10 53 48 40 63 40 33	48 31 12 10 30 43 41 71 62 48	18 85 45 12 22 27 120 71 105 100 57	102 18 85 45 12 22 27 120 71 105 100 57 113	31 118 78 19 13 41 62 52 113 92 74	27 42 30 28 69 105 70 51 27 23 44
1980 1981 1982 1983 1984 1985 1986 1987 1988	5 0 1 0 0 0 0 0 0 0 0 66	17 8 2 1 11 0 0 0 0 0 1 1117	37 16 6 40 0 0 0 0 0 5 185	36 27 13 5 20 0 0 0 0 0 0 0 13 0	10 24 7 3 19 0 0 0 0 0 0 0 27 9	8 18 14 4 16 0 2 0 3 0 32 33	5 10 14 6 13 2 8 3 3 3 3 27 73	2 5 12 13 11 4 9 15 17 3 41 113	1 2 6 13 8 13 54 9 14 6 33 91	6 11 15 17 52 18 33 7 42 192	5 4 7 11 32 48 55 29 20 28 397	15 14 9 10 53 48 40 63 40 33 217	48 31 12 10 30 43 41 71 62 48 95	18 85 45 12 22 27 120 71 105 100 57 113	102 18 85 45 12 22 27 120 71 105 100 57 113 169	31 118 78 19 13 41 62 52 113 92 74 86	27 42 30 28 69 105 70 51 27 23 44 81
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990	5 0 1 0 0 0 0 0 0 66 22 3	17 8 2 1 11 0 0 0 0 0 1 117 39 5	37 16 6 40 0 0 0 0 0 5 185 62 9	36 27 13 5 20 0 0 0 0 0 0 0 13 0 0 0	10 24 7 3 19 0 0 0 0 0 0 27 9 4 6	8 18 14 4 16 0 2 0 3 0 32 33 16 24	5 10 14 6 13 2 8 3 3 3 27 73 69 62	2 5 12 13 11 4 9 15 17 3 41 113 511 341	1 2 6 13 8 13 54 9 14 6 33 91 600 641	6 11 15 17 52 18 33 7 42 192 436 477	5 4 7 11 32 48 55 29 20 28 397 301 172	15 14 9 10 53 48 40 63 40 33 217 267 124	48 31 12 10 30 43 41 71 62 48 95 227 122	18 85 45 12 22 27 120 71 105 100 57 113 169 112	102 18 85 45 12 22 27 120 71 105 100 57 113 169 112	31 118 78 19 13 41 62 52 113 92 74 86 174 115	27. 42 30 28 69 105 70 51 27. 23 44 81 50
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991	5 0 1 0 0 0 0 0 0 66 22 3 0	17 8 2 1 11 0 0 0 0 0 1 117 39 5 0	37 16 6 40 0 0 0 0 0 5 185 62 9 0	36 27 13 5 20 0 0 0 0 0 0 0 13 0 0 0 3	10 24 7 3 19 0 0 0 0 0 0 27 9 4 6 4	8 18 14 4 16 0 2 0 3 0 32 33 16 24 26	5 10 14 6 13 2 8 3 3 3 27 73 69 62 156	2 5 12 13 11 4 9 15 17 3 41 113 511 341 343	1 2 6 13 8 13 54 9 14 6 33 91 600 641 436	6 11 15 17 52 18 33 7 42 192 436 477 551	5 4 7 11 32 48 55 29 20 28 397 301 172 364	15 14 9 10 53 48 40 63 40 33 217 267 124 194	48 31 12 10 30 43 41 71 62 48 95 227 122 110	18 85 45 12 22 27 120 71 105 100 57 113 169 112 135	102 18 85 45 12 22 27 120 71 105 100 57 113 169 112 135	31 118 78 19 13 41 62 52 113 92 74 86 174 115 130	27 42 30 28 69 10 51 27 23 44 81 50 45
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992	5 0 1 0 0 0 0 0 0 0 0 66 22 3 0 0	17 8 2 1 11 0 0 0 0 1 117 39 5 0 0 0	37 16 6 40 0 0 0 0 0 5 185 62 9 0 0	36 27 13 5 20 0 0 0 0 0 0 13 0 0 0 3 1	10 24 7 3 19 0 0 0 0 0 0 27 9 4 6 4 5	8 18 14 4 16 0 2 0 3 0 32 33 16 24 26 3	5 10 14 6 13 2 8 3 3 3 27 73 69 62 156 54	2 5 12 13 11 4 9 15 17 3 41 113 511 341 343 197	1 2 6 13 8 13 54 9 14 6 33 91 600 641 436 299	6 11 15 17 52 18 33 7 42 192 436 477 551 265	5 4 7 11 32 48 55 29 20 28 397 301 172 364 279	15 14 9 10 53 48 40 63 40 33 217 267 124 194 285	48 31 12 10 30 43 41 71 62 48 95 227 122 110 190	18 85 45 12 22 27 120 71 105 100 57 113 169 112 135 122	102 18 85 45 12 22 27 120 71 105 100 57 113 169 112 135 122	31 118 78 19 13 41 62 52 113 92 74 86 174 115 130 107	27 42 30 28 69 10 51 27 23 44 81 50 45 48
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993	5 0 1 0 0 0 0 0 0 0 0 66 22 3 0 0 0 0	17 8 2 1 11 0 0 0 0 0 1 117 39 5 0 0 0 0 0 0 0 0 0 0 0 0 0	37 16 6 40 0 0 0 0 0 5 185 62 9 0 0 0 0	36 27 13 5 20 0 0 0 0 0 0 13 0 0 0 3 1 0	$ \begin{array}{c} 10\\ 24\\ 7\\ 3\\ 19\\ 0\\ 0\\ 0\\ 0\\ 0\\ 27\\ 9\\ 4\\ 6\\ 4\\ 5\\ 0\\ \end{array} $	8 18 14 4 16 0 2 0 3 0 32 33 16 24 26 3 0	5 10 14 6 13 2 8 3 3 3 27 73 69 62 156 54 73	2 5 12 13 11 4 9 15 17 3 41 113 511 341 343 197 71	1 2 6 13 8 13 54 9 14 6 33 91 600 641 436 299 153	6 11 15 17 52 18 33 7 42 192 436 477 551 265 239	5 4 7 11 32 48 55 29 20 28 397 301 172 364 279 208	15 14 9 10 53 48 40 63 40 33 217 267 124 194 285 160	48 31 12 10 30 43 41 71 62 48 95 227 122 110 190 156	18 85 45 12 22 27 120 71 105 100 57 113 169 112 135 122 137	102 18 85 45 12 22 71 120 71 105 57 113 169 112 135 122 137	31 118 78 19 13 41 62 52 113 92 74 86 174 115 130 107 101	27 42 30 28 69 10 51 27 23 44 81 50 45 48 43
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994	5 0 1 0 0 0 0 0 0 0 66 22 3 0 0 0 0 0	17 8 2 1 11 0 0 0 0 0 1 117 39 5 0	37 16 6 40 0 0 0 0 0 5 185 62 9 0 0 0 0 0	36 27 13 5 20 0 0 0 0 0 0 13 0 0 0 3 1 0 0 0 3 1 0 0	10 24 7 3 19 0 0 0 0 0 0 27 9 4 6 4 5 0 0	8 18 14 4 16 0 2 0 3 0 32 33 16 24 26 3 0 4	5 10 14 6 13 2 8 3 3 3 27 73 69 62 156 54 73 24	2 5 12 13 11 4 9 15 17 3 41 113 511 341 343 197 71 196	1 2 6 13 8 13 54 9 14 6 33 91 600 641 436 299 153 243	6 11 15 17 52 18 33 7 42 192 436 477 551 265 239 195	5 4 7 11 32 48 55 29 20 28 397 301 172 364 279 208 214	15 14 9 10 53 48 40 63 40 33 217 267 124 194 285 160 181	48 31 12 10 30 43 41 71 62 48 95 227 122 110 190 156 133	18 85 45 12 22 27 120 71 100 57 113 169 112 135 122 137 90	102 18 85 45 12 22 27 120 71 105 100 57 113 169 112 135 122 137 90	31 118 78 19 13 41 62 52 113 92 74 86 174 115 130 107 101 56	444 277. 422 300 288 699 1059 700 511 277. 233 444 811 500 455 488 433 199
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1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1991 1992 1993 1994 1995 1996 1997 1998	5 0 0 1 0 0 0 0 0	17 8 2 1 11 0 0 0 0 0 1 117 39 5 0 0 0 0 1 10 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0	37 16 6 40 0 0 0 0 0 0 5 185 62 9 0 0 0 0 0 0 0 0	36 27 13 5 20 0 0 0 0 0 0 0 13 0 0 0 1 1 0 0 0 1 1 0 0	$ \begin{array}{c} 10\\ 24\\ 7\\ 3\\ 19\\ 0\\ 0\\ 0\\ 0\\ 0\\ 27\\ 9\\ 4\\ 6\\ 4\\ 5\\ 0\\ 0\\ 1\\ 1\\ 2\\ 0\\ \end{array} $	8 18 14 16 0 2 0 3 0 32 33 16 24 26 3 0 4 12 7 7 3	5 10 14 6 13 2 8 3 3 27 73 69 62 156 54 73 24 13 16 20 8	2 5 12 13 11 4 9 15 17 3 41 113 511 341 197 71 196 104 203 142 93	1 2 6 13 8 13 54 9 14 6 33 91 600 641 436 299 153 243 145 105 251 213	6 11 15 17 52 18 33 7 42 192 436 477 551 265 239 195 343 106 198 369	5 4 7 11 32 48 55 29 20 28 397 301 172 364 279 208 214 315 168 58 269	15 14 9 10 53 48 40 63 40 33 217 267 124 194 285 160 181 240 235 88 133	48 31 12 10 30 43 41 71 62 48 95 227 122 110 190 156 133 140 153 104 118	18 85 45 12 27 120 71 105 100 57 113 169 112 135 122 137 90 112 133 90 103	102 18 85 45 12 22 120 71 100 57 113 169 112 133 90 103 103 103 103 103 103 103 10	$\begin{array}{c} 31 \\ 1118 \\ 78 \\ 19 \\ 13 \\ 41 \\ 62 \\ 52 \\ 1113 \\ 92 \\ 74 \\ 86 \\ 174 \\ 115 \\ 130 \\ 107 \\ 101 \\ 56 \\ 81 \\ 115 \\ 82 \\ 75 \end{array}$	277 422 300 288 699 1055 700 511 277 233 444 811 500 455 488 433 199 277 522 322 300
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1995 1997 1998 1999	5 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	17 8 2 1 11 0 0 0 0 0 1 117 39 5 0 0 0 0 1 10 0 0 0 1 0	37 16 6 40 0 0 0 0 0 0 5 185 62 9 0 0 0 0 0 0 0 0	36 27 13 5 20 0 0 0 0 0 0 0 13 0 0 0 3 1 0 0 0 1 1 0 0 0 0	10 24 7 3 19 0 0 0 0 0 0 0 27 9 4 6 4 5 0 0 1 1 2 0 3	8 18 14 4 16 0 2 0 3 0 32 33 16 24 26 3 0 4 12 7 7 3 3	5 10 14 6 13 2 8 3 3 27 73 69 62 156 54 73 24 13 16 20 8 21	2 5 12 13 11 4 9 15 17 3 41 113 511 341 343 197 71 196 104 203 142 93 205	1 2 6 13 8 13 54 9 14 6 33 91 600 641 436 6 91 53 243 145 105 251 213 188	6 11 11 15 17 52 18 33 7 42 192 436 437 551 265 239 195 343 106 198 369 274	5 4 7 111 32 48 55 29 20 28 397 301 172 208 214 315 168 58 269 254	15 14 9 10 53 48 40 63 40 63 40 33 217 267 124 194 285 160 181 240 0 181 235 88 133 232	48 31 12 10 30 43 41 71 62 895 227 122 110 995 122 110 156 133 140 153 140 154 72	18 85 45 12 27 120 71 105 57 113 169 112 135 122 133 90 112 133 90 103 54	102 18 85 45 12 22 120 71 105 100 57 113 169 112 137 90 112 133 90 103 54	31 118 78 19 13 41 62 52 113 92 74 86 174 115 130 107 101 56 81 115 82 75 43	277 422 300 288 699 1055 700 511 277 233 444 811 500 455 488 433 199 277 522 322 300 16
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000	5 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	17 8 2 1 11 0 0 0 0 1 117 39 5 0 0 0 1 10 0 0 0 1 0	37 16 6 40 0 0 0 0 0 0 5 185 62 9 0 0 0 0 0 0 0 0	36 27 13 5 20 0 0 0 0 0 13 0 0 0 3 1 0 0 0 3 1 1 0 0 0 1 1 1 0 0 0 0	$ \begin{array}{c} 10\\ 24\\ 7\\ 3\\ 19\\ 0\\ 0\\ 0\\ 0\\ 27\\ 9\\ 4\\ 6\\ 4\\ 5\\ 0\\ 1\\ 1\\ 2\\ 0\\ 3\\ 0\\ \end{array} $	8 18 14 4 16 0 2 0 30 32 33 16 24 26 3 0 4 12 7 7 3 3 3 3	5 10 14 6 13 2 8 3 3 27 73 69 62 156 54 73 24 13 16 20 8 21 3	2 5 12 13 11 4 9 15 17 3 41 113 511 341 343 197 71 196 104 203 142 93 205 39	1 2 6 13 8 13 54 9 14 6 33 91 14 6 600 641 436 299 153 243 145 105 251 188 157	6 11 11 15 52 18 33 7 42 192 436 477 551 192 436 477 551 299 195 343 106 198 369 274 188	5 4 7 11 32 48 55 29 20 28 397 301 172 2364 279 208 214 315 168 58 208 208 214 315 168 58 58 209 204 139	15 14 9 10 53 48 40 63 40 33 217 267 124 194 285 160 181 240 235 88 133 232 207	48 31 12 10 30 43 41 71 62 48 95 227 122 110 190 156 133 140 153 104 118 72 245	$\begin{array}{c} 18\\ 85\\ 45\\ 12\\ 22\\ 27\\ 120\\ 71\\ 105\\ 100\\ 57\\ 113\\ 169\\ 112\\ 135\\ 122\\ 133\\ 90\\ 112\\ 133\\ 90\\ 103\\ 54\\ 153\\ \end{array}$	102 18 85 45 12 22 27 122 122 105 100 57 113 1659 112 133 90 113 133 90 103 54 153	31 1118 78 19 13 41 62 52 113 92 74 86 174 115 130 107 101 56 81 115 82 75 43 95	277 422 300 288 699 1055 11 277 233 444 811 500 455 488 433 199 277 522 320 300 166 169
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1995 1996 1997 1999 2000 2001	5 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	17 8 2 1 11 0 0 0 0 1 117 399 5 0 0 0 0 1 10 0	37 16 6 40 0 0 0 0 0 0 5 185 62 9 0 0 0 0 0 0 0 0	36 27 13 5 20 0 0 0 0 0 0 0 0 13 0 0 0 3 1 0 0 0 3 1 1 0 0 0 0	$10 \\ 24 \\ 7 \\ 3 \\ 19 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 27 \\ 9 \\ 4 \\ 6 \\ 4 \\ 5 \\ 0 \\ 1 \\ 1 \\ 2 \\ 0 \\ 3 \\ 0 \\ 1 \\ 1 \\ 2 \\ 0 \\ 3 \\ 0 \\ 1 \\ 1 \\ 2 \\ 0 \\ 1 \\ 1 \\ 2 \\ 0 \\ 1 \\ 1 \\ 1 \\ 2 \\ 0 \\ 1 \\ 1 \\ 1 \\ 2 \\ 0 \\ 1 \\ 1 \\ 1 \\ 2 \\ 0 \\ 1 \\ 1 \\ 1 \\ 1 \\ 2 \\ 0 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1$	8 18 14 4 16 0 2 0 32 33 16 24 26 3 0 4 12 7 7 3 3 3 14	5 10 14 6 13 2 8 3 3 27 73 69 22 156 54 73 24 13 16 20 8 21 3 191	2 5 12 13 11 4 9 15 17 3 41 113 511 341 343 197 71 196 203 142 93 205 39 305	1 2 6 13 8 13 54 9 14 6 33 91 600 641 436 299 153 243 145 105 251 213 188 185 7 60	6 11 11 52 17 52 18 33 7 42 192 436 477 551 239 195 343 106 198 369 274 188 103	5 4 7 11 32 48 55 29 20 28 307 301 172 208 214 315 168 58 269 254 139 99	15 14 9 10 53 48 40 63 40 63 33 217 267 124 194 285 160 181 240 235 88 133 232 2207 95	48 31 12 10 30 43 41 71 62 48 95 227 110 190 156 133 140 153 104 1153 104 1153 99	18 85 45 12 22 27 120 71 105 100 57 113 169 112 135 122 137 90 102 133 90 103 54 153 94	102 18 85 45 12 22 27 122 122 105 105 105 105 105 105 113 1659 113 135 122 137 90 113 133 54 153 94	$\begin{array}{c} 31\\ 1118\\ 78\\ 19\\ 13\\ 41\\ 62\\ 52\\ 1113\\ 92\\ 74\\ 86\\ 174\\ 115\\ 130\\ 107\\ 101\\ 56\\ 81\\ 115\\ 82\\ 75\\ 43\\ 95\\ 61 \end{array}$	277 422 300 288 699 1055 11 277 233 444 811 500 455 488 433 199 277 522 320 300 166 166 859
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002	5 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	$ \begin{array}{r} 17 \\ 8 \\ 2 \\ 1 \\ 11 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \\ 117 \\ 39 \\ 5 \\ 0 \\$	37 16 6 40 0 0 0 0 0 5 185 62 9 0 0 0 0 0 0 0 0	36 27 13 5 20 0 0 0 0 0 0 0 13 0 0 0 3 1 0 0 0 1 1 1 0 0 0 0	$ \begin{array}{c} 10\\ 24\\ 7\\ 3\\ 19\\ 0\\ 0\\ 0\\ 0\\ 0\\ 27\\ 9\\ 4\\ 5\\ 0\\ 0\\ 1\\ 2\\ 0\\ 3\\ 0\\ 1\\ 0\\ \end{array} $	8 18 14 4 16 0 2 0 32 33 16 24 26 3 0 4 12 7 7 3 3 14 1	5 10 14 6 13 2 8 3 3 27 73 69 62 156 54 73 24 13 16 20 8 21 3 191 7	2 5 12 13 11 4 9 15 17 3 41 113 511 341 343 197 71 196 104 203 142 93 205 39 305 142	1 2 6 13 8 13 54 9 14 6 33 91 600 641 436 299 153 243 145 251 213 188 157 60 219	6 11 11 15 17 52 18 33 7 42 192 436 477 551 2399 195 343 343 69 274 188 369 274 188 309 274	5 4 7 11 32 48 55 29 20 28 397 301 172 208 214 315 58 269 254 139 99 28	15 14 9 10 53 48 40 63 33 217 267 124 94 194 285 160 181 240 88 133 232 207 95 39	48 31 12 10 30 43 41 71 62 48 95 227 102 106 133 140 153 104 118 72 59 99 51	$\begin{array}{c} 18\\ 85\\ 45\\ 12\\ 22\\ 27\\ 120\\ 71\\ 105\\ 57\\ 113\\ 169\\ 112\\ 135\\ 122\\ 137\\ 90\\ 112\\ 133\\ 90\\ 103\\ 54\\ 153\\ 94\\ 30\\ \end{array}$	102 118 118 118 122 120 112 122 120 111 105 100 57 1113 169 112 133 169 112 133 90 103 54 153 94 30	$\begin{array}{c} 31\\ 118\\ 78\\ 19\\ 13\\ 41\\ 62\\ 52\\ 113\\ 92\\ 74\\ 86\\ 174\\ 86\\ 174\\ 115\\ 130\\ 107\\ 101\\ 56\\ 81\\ 115\\ 82\\ 75\\ 43\\ 95\\ 61\\ 33 \end{array}$	27 42 30 28 69 105 70 51 27 23 44 81 50 45 48 43 19 27 52 32 30 16 16 85 25
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1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1995 1995 1997 1998 1999 2000 2001 2002 2003	5 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	$ \begin{array}{r} 17 \\ 8 \\ 2 \\ 1 \\ 11 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \\ 117 \\ 39 \\ 5 \\ 0 \\$	37 16 6 40 0 0 0 0 0 0 5 185 62 9 0 0 0 0 0 0 0 0	36 27 13 5 20 0 0 0 0 0 0 0 13 0 0 0 3 1 0 0 0 1 1 1 0 0 0 0	$ \begin{array}{c} 10\\ 24\\ 7\\ 3\\ 19\\ 0\\ 0\\ 0\\ 0\\ 0\\ 27\\ 9\\ 4\\ 5\\ 0\\ 0\\ 1\\ 2\\ 0\\ 3\\ 0\\ 1\\ 0\\ \end{array} $	$\begin{array}{c} 8\\ 18\\ 14\\ 4\\ 16\\ 0\\ 2\\ 0\\ 3\\ 0\\ 32\\ 33\\ 16\\ 24\\ 26\\ 3\\ 0\\ 4\\ 12\\ 7\\ 7\\ 3\\ 3\\ 14\\ 1\\ 0\\ \end{array}$	5 10 14 6 13 2 8 3 3 27 73 69 62 156 54 73 24 13 16 20 8 21 3 191 7 3	2 5 12 13 11 4 9 15 17 3 41 113 511 341 1343 197 71 196 104 203 142 93 205 39 305 142 82	1 2 6 13 8 13 54 9 14 6 33 91 600 641 153 243 145 105 251 213 188 157 60 219 177	6 11 11 15 17 52 18 33 7 42 192 436 477 551 239 195 343 106 198 369 274 188 369 274 188 369 274	5 4 7 11 32 48 55 29 20 28 397 301 172 208 214 315 168 58 269 254 139 99 928 65	15 14 9 10 53 48 40 63 33 217 267 124 194 285 160 181 240 235 88 133 232 207 95 39 43	48 31 12 10 30 43 41 71 62 48 95 2277 122 110 156 133 140 153 104 118 72 245 99 51 23	18 85 45 12 22 27 120 71 105 57 113 169 112 135 122 137 90 103 54 153 94 30 16	102 18 85 45 12 22 27 120 71 105 100 57 113 169 90 103 54 153 99 103 54 153 99 103 163 104 105 105 105 105 105 105 105 105	$\begin{array}{c} 31\\ 1118\\ 78\\ 19\\ 13\\ 41\\ 62\\ 52\\ 113\\ 92\\ 74\\ 86\\ 174\\ 115\\ 130\\ 107\\ 101\\ 56\\ 81\\ 115\\ 82\\ 75\\ 43\\ 95\\ 61\\ 33\\ 29 \end{array}$	27 42 30 28 69 105 70 51 27 23 44 81 50 45 48 43 19 27 52 30 16 16 85 25 16
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004	5 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	$ \begin{array}{r} 17 \\ 8 \\ 2 \\ 1 \\ 11 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \\ 117 \\ 39 \\ 5 \\ 0 \\$	37 16 6 40 0 0 0 0 0 0 5 185 62 9 0 0 0 0 0 0 0 0	$36 \\ 27 \\ 13 \\ 5 \\ 20 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 13 \\ 0 \\ 0 \\ 0 \\ 3 \\ 1 \\ 0 \\ 0 \\ 0 \\ 1 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0$	$ \begin{array}{c} 10\\ 24\\ 7\\ 3\\ 19\\ 0\\ 0\\ 0\\ 0\\ 0\\ 27\\ 9\\ 4\\ 6\\ 4\\ 5\\ 0\\ 0\\ 1\\ 2\\ 0\\ 3\\ 0\\ 1\\ 0\\ 7\\ \end{array} $	8 18 14 4 16 0 2 0 32 33 16 24 26 3 0 4 12 7 7 3 3 14 1 0 12	5 10 14 6 13 2 8 3 3 27 73 69 62 156 54 73 24 13 16 20 8 21 3 191 7 3 58	2 5 12 13 11 4 9 15 17 3 41 113 511 341 197 71 196 104 203 142 93 205 39 305 142 82 233	1 2 6 13 8 13 54 9 14 6 33 91 600 641 436 600 641 436 229 153 243 145 105 251 251 251 251 251 13 13 13 13 13 13 13 13 13 1	6 11 11 15 52 18 33 7 42 192 436 477 551 192 436 477 551 265 265 265 265 265 265 265 265 265 265	5 4 7 11 32 48 55 29 20 28 397 301 172 208 214 315 168 8 269 254 139 99 28 65 36	15 14 9 10 53 48 40 63 33 217 267 124 194 285 160 181 240 235 88 133 232 207 95 39 43 28	48 31 12 10 30 43 41 71 62 95 227 122 110 990 156 133 140 156 133 140 153 104 118 72 245 99 51 23 10	18 85 45 12 27 120 71 105 57 113 169 112 135 122 137 90 112 133 54 153 94 30 16 10	102 18 85 45 12 22 27 120 71 105 100 57 113 169 90 103 54 153 99 103 54 153 99 103 54 153 99 103 154 153 154 153 154 155 157 157 157 157 157 157 157	31 1118 78 19 13 41 62 52 113 92 74 86 174 115 82 75 43 95 61 33 29 16	277 422 300 288 699 105 511 277 233 444 811 500 455 488 433 199 277 522 320 300 166 166 889 255 166 588
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005	5 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	17 8 2 1 11 0 0 0 0 1 117 39 5 0 0 0 0 1 0	37 16 6 40 0 0 0 0 0 5 185 62 9 0 0 0 0 0 0 0 0	36 27 13 5 20 0 0 0 0 0 0 13 0 0 0 3 1 0 0 0 3 1 1 0 0 0 1 1 1 0 0 0 0	$10 \\ 24 \\ 7 \\ 3 \\ 19 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 27 \\ 9 \\ 4 \\ 6 \\ 4 \\ 5 \\ 0 \\ 1 \\ 1 \\ 2 \\ 0 \\ 3 \\ 0 \\ 1 \\ 0 \\ 7 \\ 0 \\ 0 \\ 7 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	$\begin{array}{c} 8\\ 18\\ 14\\ 4\\ 16\\ 0\\ 2\\ 0\\ 3\\ 0\\ 32\\ 33\\ 16\\ 24\\ 26\\ 3\\ 0\\ 4\\ 12\\ 7\\ 7\\ 3\\ 3\\ 14\\ 1\\ 0\\ 12\\ 0\\ \end{array}$	5 10 14 6 13 2 8 3 27 73 69 62 156 54 73 24 13 16 20 8 21 3 191 7 3 58 1	2 5 12 13 11 4 9 15 17 3 41 113 511 341 343 197 71 196 104 203 142 93 205 39 305 142 82 233 16	1 2 6 13 8 13 54 9 14 6 33 91 436 299 153 243 145 105 251 213 188 187 60 219 177 138 33 33	6 11 11 15 52 18 33 7 42 192 436 477 551 192 436 477 551 195 343 106 198 274 188 103 105 151 162 9	5 4 7 11 32 48 55 29 20 28 397 301 172 2364 214 315 168 58 224 139 99 28 269 254 139 99 28 36 5 36 53	15 14 9 10 53 48 40 63 30 217 267 124 194 285 160 181 240 235 88 8 133 232 207 95 39 43 28 39	48 31 12 10 30 43 41 71 62 48 95 227 122 110 190 156 133 140 153 104 153 104 153 104 153 104 124 10 10 10 10 10 10 10 10 10 10	18 85 45 12 22 27 120 71 105 100 57 113 169 102 135 122 137 90 103 54 153 94 30 16 10 153 94 30 16 10 16 153 19 19 103 103 103 104 105 122 135 123 125 125 125 125 125 125 125 125	102 18 85 45 12 22 27 100 57 113 169 112 133 90 112 133 90 103 54 153 94 16 10 10 10 10 10 10 10 10 10 10	$\begin{array}{c} 31\\ 118\\ 78\\ 19\\ 13\\ 41\\ 62\\ 52\\ 113\\ 92\\ 74\\ 86\\ 174\\ 115\\ 130\\ 107\\ 101\\ 107\\ 101\\ 105\\ 82\\ 75\\ 81\\ 115\\ 82\\ 75\\ 61\\ 33\\ 29\\ 16\\ 34 \end{array}$	27 42 30 28 69 105 51 27 70 51 27 23 44 81 50 45 48 43 19 27 52 30 16 16 16 88 9 25 16 58 14
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006	$\begin{array}{c} 5 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	$ \begin{array}{r} 17 \\ 8 \\ 2 \\ 1 \\ 11 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \\ 117 \\ 399 \\ 5 \\ 0 $	37 16 6 40 0 0 0 0 0 5 185 62 9 0 0 0 0 0 0 0 0	36 27 13 5 20 0 0 0 0 0 0 0	$\begin{array}{c} 10\\ 24\\ 7\\ 3\\ 19\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 27\\ 9\\ 4\\ 6\\ 4\\ 5\\ 0\\ 0\\ 1\\ 1\\ 2\\ 0\\ 3\\ 0\\ 1\\ 0\\ 0\\ 7\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$	8 18 14 16 0 2 0 32 33 16 24 26 3 0 4 12 7 7 3 3 3 14 1 0 12 0 0	5 10 14 6 13 2 8 3 3 27 73 69 62 156 54 73 24 13 16 20 8 21 3 191 7 3 58 1 11	2 5 12 13 11 4 9 15 17 3 41 113 511 341 343 197 71 196 104 203 142 93 205 39 305 142 82 233 16 18	1 2 6 13 8 13 54 9 14 6 33 91 600 641 436 299 153 243 145 105 251 213 188 187 60 219 177 187 209 197 201 213 243 243 243 243 244 245 251 251 251 251 251 251 251 25	6 11 11 15 17 52 18 33 7 42 192 436 477 551 239 195 343 106 198 369 274 188 103 105 151 62 9 30	5 4 7 11 32 48 55 29 20 28 397 301 172 208 214 305 168 58 269 254 139 99 28 65 36 31 40	15 14 9 10 53 48 40 33 217 267 124 40 33 217 267 124 194 285 160 181 240 235 88 133 232 207 95 39 43 28 28	48 31 12 10 30 43 41 71 162 48 95 227 122 110 190 156 133 104 118 72 245 99 51 23 10 24 24 24 24 24 24 24 24 24 24	18 85 45 12 22 27 120 71 105 100 57 113 169 112 135 122 137 90 103 54 133 90 103 54 133 90 103 54 122 137 137 137 137 137 137 137 137	102 18 85 45 12 22 17 105 100 57 113 169 112 133 90 103 54 153 94 30 16 10 103 33	$\begin{array}{c} 31\\ 118\\ 78\\ 19\\ 13\\ 41\\ 62\\ 52\\ 113\\ 92\\ 74\\ 86\\ 174\\ 86\\ 174\\ 86\\ 174\\ 86\\ 174\\ 86\\ 174\\ 86\\ 115\\ 107\\ 101\\ 56\\ 81\\ 115\\ 82\\ 75\\ 43\\ 95\\ 61\\ 33\\ 29\\ 16\\ 33\\ 29\\ 16\\ 34\\ 28\\ \end{array}$	27 42 30 28 69 10 51 27 23 44 81 50 45 48 43 30 27 52 32 30 16 16 8 58 29 21 6 18 14 11
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007	$\begin{array}{c} 5 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	17 8 2 1 11 0 0 0 0 1 117 39 5 0	37 16 6 40 0 0 0 0 0 5 185 62 9 0 0 0 0 0 0 0 0	$\begin{array}{c} 36\\ 27\\ 13\\ 5\\ 20\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 13\\ 0\\ 0\\ 0\\ 3\\ 1\\ 0\\ 0\\ 0\\ 1\\ 1\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$	$\begin{array}{c} 10\\ 24\\ 7\\ 3\\ 19\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 27\\ 9\\ 4\\ 6\\ 4\\ 5\\ 0\\ 0\\ 1\\ 1\\ 2\\ 0\\ 3\\ 0\\ 1\\ 0\\ 0\\ 7\\ 0\\ 0\\ 1\\ \end{array}$	$\begin{array}{c} 8\\ 18\\ 14\\ 4\\ 16\\ 0\\ 2\\ 0\\ 32\\ 33\\ 16\\ 24\\ 26\\ 3\\ 0\\ 4\\ 12\\ 7\\ 7\\ 3\\ 3\\ 3\\ 14\\ 1\\ 0\\ 12\\ 0\\ 0\\ 4\\ \end{array}$	5 10 14 6 13 2 8 3 3 27 73 69 62 156 54 73 24 13 16 20 8 21 3 191 7 3 58 1 11 5	2 5 12 13 11 4 9 15 17 3 41 113 511 1341 343 197 71 196 104 203 142 93 205 39 305 142 82 233 16 18 52	1 2 6 13 8 13 54 9 14 6 33 91 600 641 436 299 153 243 145 251 213 188 157 60 219 177 138 33 20 34	6 11 11 15 17 52 18 33 7 42 192 436 477 551 2399 195 343 106 198 369 274 188 309 274 188 107 551 107 551 107 551 107 551 107 551 107 551 107 551 107 551 107 551 107 551 107 551 107 551 107 551 107 551 107 551 107 551 107 551 106 107 551 106 107 105 105 105 105 105 105 105 105	5 4 7 11 32 48 55 29 20 28 397 301 172 208 214 315 58 269 254 139 228 65 36 65 31 40 27	15 14 9 10 53 48 40 63 33 217 267 124 94 194 285 160 181 240 88 133 232 207 95 39 43 28 28 28	48 31 12 10 30 43 41 71 62 48 95 227 102 156 133 140 153 104 118 72 245 99 51 23 10 24 26 27	18 85 45 12 22 27 120 71 105 57 113 169 112 135 122 137 90 103 54 153 94 30 16 103 54 103 54 103 54 12 120 133 103 163 164 165 165 165 165 165 165 165 165	102 18 85 45 12 22 12 12 105 100 57 113 169 112 133 90 103 54 153 94 30 16 10 10 119 33 26	$\begin{array}{c} 31\\ 118\\ 78\\ 19\\ 13\\ 41\\ 62\\ 52\\ 113\\ 92\\ 74\\ 86\\ 174\\ 86\\ 174\\ 86\\ 174\\ 86\\ 174\\ 86\\ 174\\ 86\\ 107\\ 101\\ 56\\ 81\\ 115\\ 82\\ 75\\ 43\\ 95\\ 61\\ 33\\ 29\\ 16\\ 34\\ 28\\ 14\\ \end{array}$	27 42 30 28 69 10 51 27 23 44 81 50 45 48 43 19 27 52 30 16 16 8 58 25 16 58 14 11 68
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006	$\begin{array}{c} 5 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	$ \begin{array}{r} 17 \\ 8 \\ 2 \\ 1 \\ 11 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \\ 117 \\ 399 \\ 5 \\ 0 $	37 16 6 40 0 0 0 0 0 5 185 62 9 0 0 0 0 0 0 0 0	36 27 13 5 20 0 0 0 0 0 0 0	$\begin{array}{c} 10\\ 24\\ 7\\ 3\\ 19\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 27\\ 9\\ 4\\ 6\\ 4\\ 5\\ 0\\ 0\\ 1\\ 1\\ 2\\ 0\\ 3\\ 0\\ 1\\ 0\\ 0\\ 7\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$	8 18 14 16 0 2 0 32 33 16 24 26 3 0 4 12 7 7 3 3 3 14 1 0 12 0 0	5 10 14 6 13 2 8 3 3 27 73 69 62 156 54 73 24 13 16 20 8 21 3 191 7 3 58 1 11	2 5 12 13 11 4 9 15 17 3 41 113 511 341 343 197 71 196 104 203 142 93 205 39 305 142 82 233 16 18	1 2 6 13 8 13 54 9 14 6 33 91 600 641 436 299 153 243 145 105 251 213 188 187 60 219 177 187 209 197 201 213 243 243 243 243 244 245 251 251 251 251 251 251 251 25	6 11 11 15 17 52 18 33 7 42 192 436 477 551 239 195 343 106 198 369 274 188 103 105 151 62 9 30	5 4 7 11 32 48 55 29 20 28 397 301 172 208 214 305 168 58 269 254 139 99 28 65 36 31 40	15 14 9 10 53 48 40 33 217 267 124 40 33 217 267 124 194 285 160 181 240 235 88 133 232 207 95 39 43 28 28	48 31 12 10 30 43 41 71 162 48 95 227 122 110 190 156 133 104 118 72 245 99 51 23 10 24 24 24 24 24 24 24 24 24 24	18 85 45 12 22 27 120 71 105 100 57 113 169 112 135 122 137 90 103 54 133 90 103 54 133 90 103 54 122 137 137 137 137 137 137 137 137	102 18 85 12 22 120 71 105 100 57 113 165 102 133 90 112 133 90 113 154 153 94 30 16 10 10 10 10 10 10 10 10 10 10	$\begin{array}{c} 31\\ 118\\ 78\\ 19\\ 13\\ 41\\ 62\\ 52\\ 113\\ 92\\ 74\\ 86\\ 174\\ 86\\ 174\\ 86\\ 174\\ 86\\ 174\\ 86\\ 174\\ 86\\ 115\\ 107\\ 101\\ 56\\ 81\\ 115\\ 82\\ 75\\ 43\\ 95\\ 61\\ 33\\ 29\\ 16\\ 33\\ 29\\ 16\\ 34\\ 28\\ \end{array}$	27 42 30 28 69 10 51 27 23 44 81 50 45 48 43 30 27 52 32 30 16 16 8 58 29 21 6 18 14 11

Table A2 continued.

rse seine		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1970		100076		17480	6528	1423	442	116	24	0	0	0	0	0	0	0
1971	48997		37912	46091	354	460	424	0	0	0	0	0	0	0	0	0
1972	40900	89956	30577	2247	3412	1007	0	278	0	0	0	0	0	0	0	0
1973	4747	70245	28261	5132	1469	2018	131	17	22	0	0	0	0	0	0	0
1974	20773	15489	16422	3946	2421	1339	148	74	20	7	8	10	19	30	38	50
1975	29671	145069	6412	12799	675	677	230	70	55	100	68	47	82	91	149	37
1976	4016	17240	65387	4	0	0	0	0	13	17	29	32	69	61	92	25
1977	759	18036	3215	18850	5605	861	830	115	4	15	10	26	55	95	101	25
													7			
1978	3915	6883	17300	2048	5725	4642	383	47	77	30	17	5		8	14	64
1979	44	6309	13548	7292	9041	262	214	38	0	9	21	6	0	44	150	89
1980	2094	10476	7861	5247	2817	192	23	12	264	126	63	60	26	9	8	80
1981	2931	6858	7602	296	1283	364	72	125	520	1271	719	255	134	73	45	31
1982	817	514	670	145	9	5	24	66	70	152	273	257	126	49	30	14
1983	1828	0	82	9	0	0	25	22	159	199	255	269	349	242	103	13
1984	129	147	0	0	0	9	6	14	74	206	288	356	247	278	113	13
1985	0	0	Ō	1	0	0	2	13	37	81	162	237	258	242	233	31
1986	0	0	0	0	0	0	0	11	16	36	63	115	179	222	305	42
1987	0	0	0	0	0	0	5	21	100	233	182	157	161	186	176	38
1988	0	0	0	0	0	0	3	7	62	217	212	208	168	159	179	39
1989	0	0	0	0	0	0	1	9	72	193	216	281	174	187	160	29
1990	0	0	0	0	0	0	1	10	131	353	306	247	197	157	155	22
1991	5	1	0	0	1	1	24	166	491	323	150	52	35	22	12	18
1992	õ	0	ŏ	õ	0	0	0	39	220	205	227	231	150	103	66	10
1992	0	0	0	0	0	0	5	68	794	533	129	231 96	44	27	11	7
1994	0	0	0	0	0	0	2	72	694	324	341	144	54	36	13	23
1995	0	0	0	0	0	0	0	5	164	588	323	129	79	47	28	2
1996	0	0	0	0	0	0	2	29	80	167	384	218	127	76	51	51
1997	0	0	0	0	0	0	0	5	175	209	154	189	191	166	100	82
1998	0	0	0	0	0	0	0	13	216	498	254	131	129	135	56	36
1999	0	0	0	0	0	0	0	14	148	485	417	240	74	42	29	20
2000	õ	õ	õ	0	õ	0	õ	7	218	289	271	308	203	99	43	31
2001	õ	õ	õ	õ	õ	õ	õ	12	36	110	168	288	178	133	51	30
2002	0	0	0	0	0	0	0	73	132	71	91	146	224	185	114	7
2003	0	0	0	0	0	0	0	311	625	434	177	88	82	82	36	44
2004	0	0	0	0	0	0	0	64	64	72	33	17	1	0	0	0
2005	0	0	0	0	0	0	0	11	32	86	163	324	136	74	34	86
2006	0	0	0	0	0	0	0	15	4	4	2	0	3	0	0	0
2007	0	0	0	0	0	0	0	0	11	5	6	8	5	16	8	50
2009	0	0	0	0	0	0	0	0	41	34	10	2	0	0	0	0
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1971	13023	5442	0	0	7	114	74	98	41	39	100	186	491	659	634	14
1971 1972	13023 4419	5442 8293	0 2963	0 243	7 384	114 114	74 16	98 75	41 58	39 29	100 67	186 239	491 537	659 785	634 779	144 199
1971 1972 1973	13023 4419 227	5442 8293 2889	0 2963 1122	0 243 235	7 384 67	114 114 148	74 16 23	98 75 21	41 58 86	39 29 77	100 67 47	186 239 80	491 537 175	659 785 277	634 779 355	144 199 154
1971 1972 1973	13023 4419	5442 8293	0 2963	0 243	7 384	114 114	74 16 23 0	98 75	41 58	39 29	100 67 47 368	186 239	491 537	659 785	634 779	144 199 154
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1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86	7 384 67 0 37 70 25 18 20 81 20 76 46 197 54	114 114 148 3 10 18 4 4 13 26 33 76 34 82 182	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107	41 58 86 7 11 16 5 6 26 77 54 61 146 113 66	39 29 77 46 33 21 2 42 23 55 169 118 94 114 71	100 67 47 368 24 39 5 10 32 37 207 210 123 156 93	186 239 80 16 56 43 10 4 39 52 148 163 114 207 119	491 537 175 40 90 99 24 17 76 61 84 156 186 274 247	659 785 277 1474 226 100 59 21 118 58 69 53 260 325 297	634 779 355 788 330 178 100 113 167 67 72 47 233 307 383	144 199 154 650 217 155 198 216 194 186 156 566 135 65 85
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1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267 5764 12228	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194	7 384 67 0 37 70 25 18 20 81 20 76 46 197 54 48 672	114 114 148 3 10 18 4 4 13 26 33 76 34 82 182 58 68	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81	41 58 86 7 11 16 5 6 26 77 54 61 146 113 66 51 67	39 29 77 46 33 21 2 42 23 55 169 118 94 114 71 37 83	100 67 47 368 24 39 5 10 32 37 207 210 123 156 93 44 76	186 239 80 16 56 43 10 4 39 52 148 163 114 207 119 81 73	491 537 175 40 90 99 24 17 76 61 84 156 186 274 247 94 95	 659 785 277 1474 226 100 59 21 118 58 69 53 260 325 297 131 140 	634 779 355 788 330 178 100 113 167 67 72 47 233 307 383 184 144	144 199 154 650 211 155 198 216 194 186 156 56 135 65 855 53 50
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1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1981 1982 1983 1984 1985 1986 1985 1986 1987 1988 1989 1990	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2954 4069 535	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 13897	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 1471	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 1744	7 384 67 0 37 70 25 18 20 81 20 76 46 197 54 48 672 189 1628 879 462 271	114 114 148 3 10 18 4 4 13 26 33 76 34 82 182 58 68 386 331 702 45 56	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 240 179 35	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 221 139 287	41 58 86 7 11 16 5 6 26 77 54 61 146 113 66 51 67 84 275 204 134 262	39 29 77 46 33 21 2 42 23 55 169 94 118 94 114 71 37 83 86 127 203 213 127	100 67 47 368 24 39 5 10 32 37 207 210 123 156 93 44 76 62 124 106 322 173	186 239 80 16 56 43 10 4 39 52 148 163 114 207 119 81 73 68 164 124 364 287	491 537 175 40 90 99 24 17 76 61 84 156 186 274 94 95 91 129 90 100 285 273	659 785 2777 1474 226 100 59 21 118 58 69 53 260 325 297 131 140 108 144 143 274 252	634 779 355 788 330 178 100 113 167 67 72 233 307 233 307 383 184 144 114 159 160 255 188	144 199 154 650 211 155 216 194 156 135 65 56 135 65 53 50 45 50 68 60 66
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2954 4069 535 397	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 1016	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182	7 384 67 0 37 70 25 18 20 81 20 76 46 197 54 48 672 189 1628 879 462 271 1111	$114 \\ 114 \\ 148 \\ 3 \\ 10 \\ 18 \\ 4 \\ 13 \\ 26 \\ 33 \\ 76 \\ 34 \\ 82 \\ 182 \\ 58 \\ 68 \\ 331 \\ 702 \\ 45 \\ 56 \\ 1$	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273	98 75 21 0 11 0 3 0 146 19 1 19 1 19 77 64 107 83 81 101 528 221 139 287 442	$\begin{array}{c} 41\\ 58\\ 86\\ 7\\ 11\\ 16\\ 5\\ 6\\ 26\\ 6\\ 77\\ 77\\ 54\\ 61\\ 146\\ 113\\ 66\\ 51\\ 67\\ 84\\ 275\\ 204\\ 134\\ 134\\ 262\\ 193\\ \end{array}$	39 29 77 46 33 21 2 42 23 55 169 118 94 114 114 71 37 83 86 127 203 213 213 213 223	100 67 47 368 24 39 5 10 32 207 210 123 156 62 124 106 62 124 106 3222 173 245	186 239 80 16 56 43 10 4 39 52 148 163 114 207 119 81 73 68 164 124 364 287 191	491 537 175 40 90 99 24 17 76 61 84 156 61 84 156 186 274 247 94 95 91 129 100 285 273 139	659 785 277 1474 226 100 59 21 118 58 69 53 260 325 297 131 140 108 144 143 274 252 123	634 779 355 788 330 178 100 113 167 67 72 47 72 333 307 383 184 144 114 159 160 255 188 122	144 199 154 650 211 155 198 216 194 186 194 186 56 135 56 53 50 45 50 68 60 68 60 66 59
1971 1972 1973 1974 1975 1976 1977 1978 1980 1981 1982 1983 1984 1985 1984 1985 1984 1989 1990 1990	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4788 2954 4069 535 397 2027	5442 8293 2889 1568 2547 916 3707 3437 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 13897 6045 1016 645	0 2963 1122 1176 87 607 447 226 541 361 436 659 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719 913	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574	7 384 67 0 37 70 25 18 20 81 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653	$114 \\ 114 \\ 148 \\ 3 \\ 10 \\ 18 \\ 4 \\ 4 \\ 13 \\ 26 \\ 33 \\ 76 \\ 34 \\ 82 \\ 182 \\ 58 \\ 68 \\ 331 \\ 702 \\ 45 \\ 56 \\ 1 \\ 139 \\ 139 \\ 114 \\ $	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273 528	98 75 21 0 11 0 3 0 146 19 1 19 1 19 77 64 107 83 81 101 528 221 139 287 242 658	$\begin{array}{c} 41\\ 58\\ 86\\ 7\\ 11\\ 16\\ 5\\ 6\\ 26\\ 77\\ 54\\ 61\\ 146\\ 651\\ 13\\ 66\\ 51\\ 67\\ 84\\ 275\\ 204\\ 134\\ 262\\ 204\\ 104\\ 104\\ 104\\ 104\\ 104\\ 104\\ 104\\ 1$	39 29 77 46 33 21 2 42 23 55 169 118 94 71 37 83 86 127 203 213 127 203 212 324 253	100 67 47 368 24 39 5 10 32 37 207 210 123 156 93 44 76 62 124 106 322 245 222	186 239 80 16 56 43 10 4 39 52 148 163 114 81 73 81 73 81 73 8 164 124 364 287 191 352	491 537 175 40 99 924 17 76 61 84 156 61 84 156 61 84 274 247 94 95 91 129 100 285 273 139 198	659 785 277 1474 226 100 59 21 118 58 69 53 260 325 297 131 140 108 144 143 274 252 213 213	634 779 355 788 330 113 167 67 72 47 233 307 383 184 414 114 159 160 255 188 122 139	144 199 154 650 217 155 198 216 194 186 194 186 56 135 56 53 50 45 50 68 60 68 60 66 59 51
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1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2954 4069 535 397 2027 827 472	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 1016 645 1288 9166	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719 913 2957 1110	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574 138 3301	7 384 67 0 37 70 25 18 20 81 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653 2171 2232	$114 \\ 114 \\ 148 \\ 3 \\ 10 \\ 18 \\ 4 \\ 4 \\ 13 \\ 26 \\ 33 \\ 76 \\ 34 \\ 82 \\ 182 \\ 58 \\ 68 \\ 386 \\ 331 \\ 702 \\ 45 \\ 56 \\ 1 \\ 139 \\ 1562 \\ 348 \\ \end{cases}$	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 240 35 273 5273 529 371	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 221 139 287 442 658 251 1218	$\begin{array}{c} 41\\ 58\\ 86\\ 7\\ 11\\ 16\\ 5\\ 6\\ 26\\ 77\\ 54\\ 61\\ 113\\ 66\\ 51\\ 146\\ 113\\ 66\\ 51\\ 146\\ 275\\ 204\\ 4275\\ 204\\ 134\\ 262\\ 193\\ 764\\ 271\\ 320\\ \end{array}$	39 29 77 46 33 21 2 23 55 169 94 114 71 37 83 86 127 203 213 127 324 253 127 324 466 168	100 67 47 368 24 39 5 10 32 37 207 210 123 156 93 44 76 62 124 106 62 124 103 245 222 308 215	186 239 80 16 55 43 10 4 39 52 148 163 114 207 119 81 14 207 119 81 14 207 119 81 368 164 124 287 191 352 208 248	491 537 175 40 90 99 24 17 76 61 84 156 61 84 274 247 94 129 100 285 273 139 198 194 187	659 785 277 1474 226 100 59 21 118 58 69 221 118 53 260 325 260 325 267 131 140 108 144 252 213 214 140 143	634 779 355 788 300 178 100 113 167 72 47 233 307 72 47 233 307 72 47 233 184 144 114 159 160 255 188 122 213 136	143 199 154 650 212 155 198 216 198 216 198 216 198 216 198 216 198 56 56 55 50 65 85 50 68 66 66 66 66 66 59 51 96 54
1971 1972 1973 1974 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2954 4069 535 397 2027 827 827 472 215	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 1016 645 1288 9166 1095	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719 913 2957 11110 6206	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574 1825 3301 326	7 384 67 0 37 70 25 18 20 81 20 81 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653 2171 2232 596	$114 \\ 114 \\ 148 \\ 3 \\ 10 \\ 18 \\ 4 \\ 4 \\ 13 \\ 26 \\ 33 \\ 76 \\ 34 \\ 82 \\ 182 \\ 58 \\ 68 \\ 386 \\ 331 \\ 702 \\ 45 \\ 56 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ $	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273 528 209 371 371	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 221 139 287 442 658 251 1218 999	$\begin{array}{c} 41\\ 58\\ 86\\ 7\\ 11\\ 16\\ 5\\ 6\\ 26\\ 77\\ 54\\ 113\\ 66\\ 113\\ 66\\ 113\\ 66\\ 113\\ 66\\ 113\\ 262\\ 193\\ 764\\ 271\\ 1262\\ 193\\ 764\\ 271\\ 320\\ 779 \end{array}$	39 29 77 46 33 21 2 42 23 55 169 94 114 71 37 203 213 213 213 1127 324 253 466 168 501	100 67 47 368 24 39 5 10 32 37 207 210 32 123 156 93 44 76 62 124 106 322 173 245 222 308 215 222	186 239 80 16 56 43 10 4 39 52 148 163 10 4 207 119 81 14 207 119 81 14 207 119 81 124 352 208 269	491 537 175 40 90 99 24 17 76 61 84 156 61 84 274 247 95 91 129 100 285 273 139 198 194 187 347	659 785 277 1474 226 100 59 21 118 58 69 53 260 325 260 325 260 325 267 131 140 108 144 143 274 252 123 218 193 324	634 779 355 788 330 178 100 113 167 67 72 47 72 3307 383 184 144 159 160 255 188 122 139 213 301	143 199 154 650 212 155 198 216 199 216 199 199 199 156 556 533 500 688 600 668 600 668 659 51 96 548
1971 1972 1973 1974 1975 1976 1977 1978 1980 1981 1982 1984 1985 1984 1985 1984 1985 1984 1989 1990 1991 1992 1993 1994	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2954 4069 535 397 2027 827 472 215 317	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 1288 9166 645 1288 9166 645 1288 9165 881	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719 913 2957 1110 6206 3250	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574 1886 3301 2182 574	7 384 67 0 37 70 25 18 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653 2171 22596 121	$114 \\ 114 \\ 148 \\ 3 \\ 10 \\ 18 \\ 4 \\ 4 \\ 13 \\ 26 \\ 33 \\ 76 \\ 34 \\ 82 \\ 182 \\ 58 \\ 68 \\ 331 \\ 702 \\ 45 \\ 56 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ $	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273 528 209 371 62	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 221 139 287 442 658 251 8 999 502	41 58 86 7 11 16 5 6 26 77 54 61 146 51 6 6 77 54 61 113 66 51 67 72 204 134 262 204 134 262 204 133 764 262 77 912	39 29 77 46 33 21 2 42 23 55 169 94 114 71 37 83 86 127 203 213 213 213 214 71 37 83 66 127 203 213 24 253 466 168 127 24 253 466 31 21 24 23 25 25 26 26 26 27 27 26 27 26 27 26 27 27 27 27 27 27 27 27 27 27 27 27 27	100 67 47 368 24 39 5 10 32 37 207 210 123 156 93 44 76 62 124 106 322 217 308 215 222 308 215 220 436	186 239 80 16 56 43 10 4 39 52 148 163 114 207 119 81 73 68 164 124 364 124 364 287 191 352 208 248 269 250	491 537 175 40 90 99 24 17 76 61 84 156 61 84 274 247 94 95 273 129 100 285 273 139 198 194 187 347 308	659 785 277 1474 226 100 59 21 118 58 69 53 325 297 131 140 08 144 143 274 212 3218 193 143 218 193 143	634 779 355 788 300 178 100 113 167 67 72 47 72 383 184 144 159 160 255 188 122 139 213 136 301 225	143 199 154 650 211 155 199 210 194 180 65 65 56 65 65 65 65 65 65 60 66 66 65 95 1 96 54 88 76
1971 1972 1973 1974 1975 1976 1977 1978 1980 1981 1982 1984 1985 1984 1985 1984 1985 1984 1989 1990 1991 1992 1993 1994	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2954 4069 535 397 2027 827 827 472 215	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 1016 645 1288 9166 1095	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719 913 2957 11110 6206	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574 1825 3301 326	7 384 67 0 37 70 25 18 20 81 20 81 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653 2171 2232 596	$114 \\ 114 \\ 148 \\ 3 \\ 10 \\ 18 \\ 4 \\ 4 \\ 13 \\ 26 \\ 33 \\ 76 \\ 34 \\ 82 \\ 182 \\ 58 \\ 68 \\ 386 \\ 331 \\ 702 \\ 45 \\ 56 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ $	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273 528 209 371 371	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 221 139 287 442 658 251 1218 999	$\begin{array}{c} 41\\ 58\\ 86\\ 7\\ 11\\ 16\\ 5\\ 6\\ 26\\ 77\\ 54\\ 113\\ 66\\ 113\\ 66\\ 113\\ 66\\ 113\\ 66\\ 113\\ 262\\ 193\\ 764\\ 271\\ 262\\ 193\\ 764\\ 271\\ 320\\ 779\\ \end{array}$	39 29 77 46 33 21 2 42 23 55 169 94 114 71 37 203 213 213 213 1127 324 253 466 168 501	100 67 47 368 24 39 5 10 32 37 207 210 32 123 156 93 44 76 62 124 106 322 173 245 222 308 215 222	186 239 80 16 56 43 10 4 39 52 148 163 10 4 207 119 81 14 207 119 81 14 207 119 81 124 352 208 269	491 537 175 40 90 99 24 17 76 61 84 156 61 84 274 247 95 91 129 100 285 273 139 198 194 187 347	659 785 277 1474 226 100 59 21 118 58 69 53 260 325 260 325 260 325 267 131 140 108 144 143 274 252 123 218 193 324	634 779 355 788 330 178 100 113 167 67 72 47 72 3307 383 184 144 159 160 255 188 122 139 213 301	143 199 154 650 211 155 199 210 194 186 65 65 65 65 65 65 65 65 65 65 65 65 65
1971 1972 1973 1974 1975 1976 1977 1978 1980 1981 1982 1983 1984 1985 1986 1987 1989 1999 1999 1999 1999 1993	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2954 4069 535 397 2027 827 472 215 317	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 1288 9166 645 1288 9166 645 1288 9165 881	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719 913 2957 1110 6206 3250	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574 1886 3301 2182 574	7 384 67 0 37 70 25 18 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653 2171 22596 121	$114 \\ 114 \\ 148 \\ 3 \\ 10 \\ 18 \\ 4 \\ 4 \\ 13 \\ 26 \\ 33 \\ 76 \\ 34 \\ 82 \\ 182 \\ 58 \\ 68 \\ 331 \\ 702 \\ 45 \\ 56 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ $	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273 528 209 371 62	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 221 139 287 442 658 251 8 999 502	41 58 86 7 11 16 5 6 26 77 54 61 146 51 6 6 77 54 61 113 66 51 67 72 204 134 262 204 134 262 204 133 764 262 77 912	39 29 77 46 33 21 2 42 23 55 169 94 114 71 37 83 86 127 203 213 213 213 214 71 37 83 66 127 203 213 24 253 466 168 127 24 253 466 31 21 24 23 25 25 26 26 26 27 27 26 27 26 27 26 27 27 27 27 27 27 27 27 27 27 27 27 27	100 67 47 368 24 39 5 10 32 37 207 210 123 156 93 44 76 62 124 106 322 217 308 215 222 308 215 220 436	186 239 80 16 56 43 10 4 39 52 148 163 114 207 119 81 73 68 164 124 364 124 364 287 191 352 208 248 269 250	491 537 175 40 90 99 24 17 76 61 84 156 61 84 274 247 94 95 273 129 100 285 273 139 198 194 187 347 308	659 785 277 1474 226 100 59 21 118 58 69 53 325 297 131 140 08 144 143 274 212 3218 193 143 218 193 143	634 779 355 788 300 178 100 113 167 67 72 47 72 383 184 144 159 160 255 188 122 139 213 136 301 225	14: 199 15- 655 211 155 193 214 199 186 566 566 566 565 533 500 688 600 666 666 599 511 966 548 888 549 540 540 540 540 540 540 540 540
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1995 1995 1995	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2954 4069 535 397 2027 827 472 215 317 73 76	5442 8293 2889 1568 2547 916 3707 3437 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 1016 645 1288 9166 1095 1881 528	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719 913 2957 1110 6206 3250 1817 648	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574 134 185 301 326 2455 1050 391	7 384 67 0 37 70 25 18 20 81 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653 2171 2232 596 121 619 305	$114 \\ 114 \\ 148 \\ 3 \\ 10 \\ 18 \\ 4 \\ 4 \\ 13 \\ 26 \\ 33 \\ 76 \\ 34 \\ 82 \\ 182 \\ 58 \\ 68 \\ 331 \\ 702 \\ 45 \\ 56 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 44 \\ 494 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 44 \\ 494 \\ 130 \\ 10$	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273 528 209 371 371 62 299	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 221 139 287 442 658 251 1218 999 502 662 135	41 58 86 7 11 16 5 6 26 77 54 61 113 66 51 67 84 205 204 42 55 204 262 193 764 271 320 779 912 313 367	39 29 77 46 33 21 2 42 23 55 169 118 94 71 37 83 86 114 71 37 83 81 27 203 213 127 203 213 127 203 213 127 55 55 169 118 94 55 109 118 94 55 118 94 118 94 112 20 20 20 20 20 20 20 20 20 20 20 20 20	100 67 47 368 24 39 5 10 32 37 207 210 123 156 93 44 76 62 124 106 62 124 106 222 173 245 222 308 215 270 436 827 710 477	186 239 80 16 56 43 10 4 39 52 148 163 114 207 119 81 14 207 119 81 163 114 207 81 124 208 268 248 208 248 269 250 686 647 3	491 537 175 40 90 99 24 17 76 61 84 156 61 84 274 247 94 129 100 285 273 139 198 194 187 347 347 347 347 346 244 247	659 785 277 1474 226 100 59 21 118 58 69 227 131 140 108 144 143 274 252 123 218 140 108 144 324 133 143 344 324 331 467	634 779 355 788 330 178 100 113 167 67 223 307 383 184 144 114 159 160 255 188 122 255 188 122 139 301 24 225 24	143 199 15- 655 211 155 193 210 199 180 150 566 133 165 566 133 500 668 659 511 966 548 888 600 668 669 591 511 966 548 888 888 888 103
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2954 4069 535 397 2027 827 827 472 215 317 73 76 1397	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 1016 645 1288 9166 1095 881 528 327	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 913 2957 91471 3719 913 2957 11110 6206 3250 1817 648 2345	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574 1885 3301 326 2425 1050 391 4232	7 384 67 0 37 70 25 18 20 81 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653 2171 1111 2556 121 619 355 121 1232 125 125 125 125 125 125 125 12	$114 \\ 114 \\ 148 \\ 3 \\ 10 \\ 18 \\ 4 \\ 4 \\ 13 \\ 26 \\ 33 \\ 76 \\ 34 \\ 82 \\ 182 \\ 58 \\ 68 \\ 386 \\ 331 \\ 702 \\ 45 \\ 56 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 44 \\ 945 \\ 945 \\ 111 \\ 120 \\ 1$	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273 528 209 371 371 62 52 299 594	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 221 139 287 442 658 251 1218 999 502 662 135 889	41 58 86 7 11 16 5 6 26 77 54 146 113 66 51 146 147 147 146 51 146 51 146 51 146 51 146 51 146 147 51 146 51 146 147 147 147 147 147 147 147 147	39 29 77 46 33 21 2 42 23 55 169 94 114 71 37 83 86 127 203 466 127 324 253 466 501 462 501 465 501 465 501 465 349	100 67 47 368 24 39 5 10 32 37 207 210 32 123 156 93 44 76 62 124 106 62 124 123 245 222 308 215 270 436 710 436	186 239 80 16 56 43 10 4 39 52 148 163 114 207 119 81 144 207 119 81 144 207 119 81 208 81 248 269 250 686 686 685 248 245 259 250	491 537 175 40 90 99 24 17 76 61 84 156 61 84 274 247 94 247 95 91 129 100 285 2273 139 198 194 187 347 308 407 744	659 785 277 1474 226 100 59 21 118 58 69 53 220 325 260 325 260 325 260 325 260 325 261 140 108 144 143 144 274 252 123 218 193 344 324 331	634 779 355 788 330 178 100 113 167 67 233 307 383 167 233 307 383 184 114 114 159 160 255 188 122 139 213 301 286 287 301 286 204 506	143 199 152 650 211 155 198 216 194 186 155 56 135 655 655 50 688 600 668 659 511 966 544 888 766 888 109
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1984 1985 1984 1985 1986 1987 1993 1994 1992 1993 1994 1995 1996 1997 1998	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2954 4069 535 397 2027 827 472 215 317 73 76 1397 835	5442 8293 2889 1568 2547 916 3707 3437 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 1016 645 1288 9166 645 1095 881 528 258 228 227 5525	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719 913 2957 1110 6206 3250 1817 648 2345 4050	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574 1886 3301 326 2425 1050 391 4232 4438	7 384 67 0 37 70 25 18 20 81 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653 2171 2251 1212 596 121 619 305 831 4501	$114 \\ 114 \\ 148 \\ 3 \\ 10 \\ 18 \\ 4 \\ 4 \\ 13 \\ 26 \\ 33 \\ 76 \\ 34 \\ 82 \\ 182 \\ 58 \\ 68 \\ 331 \\ 702 \\ 45 \\ 56 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 44 \\ 945 \\ 1067 \\ 1$	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273 528 209 371 371 62 52 299 371 371 62 52 299 351 273 528 209 371 371 528 209 351 273 528 209 371 371 528 209 371 371 528 209 371 371 528 209 371 371 529 240 137 2529 240 1377 2529 240 1377 2529 240 1377 2529 240 1377 2529 240 1377 2528 209 35 273 528 209 371 371 371 528 209 371 371 371 372 2529 240 355 273 528 209 371 371 371 2528 209 351 2529 269 371 371 371 372 2529 240 371 371 371 371 371 371 371 371	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 221 139 287 442 658 251 1218 999 502 662 135 889 1196	41 58 86 7 11 16 5 6 26 77 54 61 146 51 146 51 146 51 146 51 146 51 146 51 204 133 66 51 204 133 76 204 205 204 205 204 205 204 205 205 205 205 205 205 205 205	39 29 77 46 33 21 2 42 23 55 169 114 71 37 83 86 127 203 213 324 253 466 501 445 501 445 349 361	100 67 47 368 24 39 5 10 32 37 207 210 123 156 93 44 76 62 124 124 126 322 173 245 222 308 215 2215 2270 436 710 436 432	186 239 80 16 56 43 10 4 39 52 148 163 114 207 119 81 144 207 119 81 144 207 119 81 68 164 124 364 227 208 229 250 686 643 259 686 431	491 537 175 40 90 99 24 17 76 61 84 156 61 84 274 247 94 95 91 129 100 285 273 139 198 194 187 308 405 467 784 559	659 785 277 1474 226 100 59 21 118 58 69 53 325 260 325 297 131 140 108 144 143 274 262 2123 218 193 218 143 344 324 331 467 712 746	634 779 355 788 330 178 100 113 167 67 72 47 72 3307 383 184 144 159 160 255 8 122 139 136 122 139 213 301 286 287 264 650	143 199 152 650 211 152 198 210 199 210 199 180 199 180 150 65 65 855 53 500 688 600 666 599 51 966 548 888 766 888 809 111 130 130 142 143 199 152 199 152 199 152 199 152 199 199 199 199 199 199 199 199 199 19
1971 1972 1973 1974 1975 1976 1977 1978 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1995 1995 1997 1997 1997 1997 1998	13023 4419 227 34891 13629 1328 663 1563 2737 3001 2708 1640 941 741 963 2297 4783 788 2954 4069 535 397 2027 827 472 215 317 73 76 1397 835 281	5442 8293 2889 1568 2547 916 3707 3437 3933 5125 1484 3009 2344 3009 2344 5570 5267 5764 12228 8903 3475 1288 9166 645 1288 9166 645 1288 9166 1095 881 528 258 327 5525 2680	0 2963 1122 1176 87 607 447 226 541 361 436 659 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719 913 2957 1110 6206 3250 1817 648 2345 4050 4504	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574 1886 3301 326 2425 1050 391 4232 4438 3336	7 384 67 0 37 70 25 18 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653 2171 2232 596 121 619 305 831 450 121 121 122 123 123 123 123 123	$114 \\ 114 \\ 148 \\ 3 \\ 10 \\ 18 \\ 4 \\ 4 \\ 13 \\ 26 \\ 33 \\ 76 \\ 34 \\ 82 \\ 182 \\ 58 \\ 68 \\ 331 \\ 702 \\ 45 \\ 56 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 44 \\ 494 \\ 945 \\ 1067 \\ 1005 \\ 10$	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273 528 209 371 371 372 229 240 179 35 273 528 209 371 371 212 212 212 212 212 212 212 2	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 221 139 287 442 658 251 1218 999 502 662 135 889 1196 544	41 58 86 7 11 16 5 6 26 77 54 61 146 51 66 51 133 66 51 133 66 51 134 262 204 133 764 275 204 134 262 204 133 77 204 133 77 204 204 204 205 204 204 205 204 205 204 205 204 205 204 205 204 205 204 205 204 205 205 205 205 205 205 205 205	39 29 77 46 33 21 2 42 35 169 118 94 71 37 83 86 127 203 2137 324 253 466 168 501 442 501 445 349 361 724	100 67 47 368 24 39 5 10 32 37 207 210 123 156 93 44 76 62 124 106 322 245 222 308 215 245 222 308 215 436 710 432 436 24 323 436 710 723 723 73 737 737 737 737 737 737 737	186 239 80 16 56 43 10 4 39 52 148 163 114 207 119 81 73 81 64 124 364 124 364 124 364 2208 248 248 250 686 473 596 686 431 177	491 537 175 40 90 99 24 17 76 61 84 156 61 84 156 274 247 94 95 91 129 100 285 273 139 198 194 187 405 467 784 959 264	659 785 277 1474 226 100 59 21 118 58 69 53 260 325 297 131 140 108 144 143 274 252 218 108 144 143 274 212 31 443 213 218 93 344 324 331	634 779 355 788 300 178 100 113 167 67 72 47 72 333 184 144 114 159 160 255 188 122 139 213 313 60 225 139 213 213 213 216 26 287 264 506 287 264 506 287 264 506 287 264 506 287 264 506 287 264 506 287 264 200 200 200 200 200 200 200 200 200 20	143 199 155 650 211 155 199 210 199 210 199 199 199 199 199 188 566 567 568 655 658 668 660 666 666 669 599 514 888 766 888 109 111 130 999
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1971	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2957 4783 788 2057 4783 788 2057 4783 788 2057 472 215 317 73 76 1397 835 281 814	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 1016 645 1288 9166 1095 881 528 8258 327 5525 2680 2663	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719 913 2957 1110 6206 3250 1817 648 2345 4050 4504 6937	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574 1886 3301 326 2423 1050 391 4232 4438 2233	7 384 67 0 37 70 25 18 20 81 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653 2171 2232 596 1211 2035 831 450 1619 305 831 450 1619 16	$\begin{array}{c} 114\\ 114\\ 148\\ 3\\ 10\\ 18\\ 4\\ 4\\ 13\\ 26\\ 33\\ 76\\ 34\\ 82\\ 182\\ 58\\ 68\\ 386\\ 331\\ 702\\ 45\\ 56\\ 1\\ 139\\ 1562\\ 348\\ 740\\ 67\\ 44\\ 494\\ 945\\ 1067\\ 1005\\ 386\\ \end{array}$	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273 528 209 371 371 272 299 594 512 219 512 219 529 529 529 529 529 529 529 52	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 83 81 101 528 221 139 287 442 658 251 1218 999 502 662 135 889 1196 6544 455	41 58 86 7 11 16 5 6 26 77 54 61 113 66 51 146 51 67 84 275 204 262 193 764 275 204 275 204 77 241 275 204 77 241 275 204 77 241 275 204 271 320 779 912 241 3367 204 271 320 779 912 241 3367 204 241 3367 204 271 3367 204 271 3367 204 271 3367 204 271 3367 204 271 3367 204 271 3367 204 271 3367 204 271 3367 204 205 204 205 204 205 204 205 205 205 205 205 205 205 205	39 29 77 46 33 21 2 23 55 169 94 114 71 37 83 86 127 213 127 324 253 466 168 501 445 349 361 427 724 497	100 67 47 368 24 39 5 10 32 37 207 210 123 156 93 44 76 62 124 106 62 124 106 62 124 103 245 222 308 215 270 436 82 215 270 436 832 435 82 44 73 82 44 76 82 74 82 82 83 82 83 83 83 83 83 83 83 83 83 83 83 83 83	186 239 80 16 56 43 10 4 39 52 148 163 114 207 119 81 14 207 119 81 163 114 207 81 124 364 208 208 248 208 248 269 250 686 473 596 431 177 314	491 537 175 40 90 99 24 17 76 61 84 156 61 84 274 247 95 91 100 285 273 139 198 194 187 347 347 347 559 274 285 273 285 273 285 273 285 273 285 273 285 273 285 273 285 285 285 285 285 285 285 285 285 285	659 785 277 1474 226 100 59 21 118 58 69 53 260 53 225 227 131 140 108 144 143 274 252 218 193 144 143 274 252 218 193 144 143 274 254 213 244 255 217 1474	634 779 355 788 330 178 100 113 167 67 223 307 383 184 144 114 159 160 255 188 122 213 136 301 225 213 136 301 286 201 287 264 506 650 640 183	144 199 155 650 210 155 198 216 199 216 199 488 156 566 194 555 500 688 600 666 544 554 888 600 666 544 888 766 544 888 766 544 888 767 112 112 112 115 55 50 109 115 55 50 109 115 55 109 109 115 55 109 115 55 109 115 55 109 109 109 105 55 50 109 109 109 109 109 109 109 109 109 10
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1996 1997 1996 1997 2000 2001 2001 2003	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2954 4783 788 2957 472 2027 827 472 215 317 73 76 1397 835 2814 720	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 1016 645 1288 9166 1095 881 528 9166 1095 881 528 327 5525 2680 2663 4839	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719 913 2957 1471 3719 913 2957 1110 6206 3250 1817 648 2345 4050 4504 46937 1879	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574 1886 3301 326 2425 1056 2425 1056 2425 1057 403 29 403 20 20 20 20 20 20 20 20 20 20	7 384 67 0 37 70 25 18 20 81 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653 2171 1111 653 2171 2196 305 831 4501 1629 305 831 4501 1629 371 1299 371 1299 371 1299 371 1299 371 1299 371 1299 371 1299 371 1299 1297 1299 1299 1297 1299 1299 1297 1299 1297 1299 1299 1297 1299 1297 1299 1297 1299 1297 1299 1297 1297 1299 1297 1299 1297 1297 1299 1297 1299 1297 1299 1297 1297 1297 1299 1297 1297 1297 1297 1299 1297 1297 1297 1297 1297 1299 1297 129	$114 \\ 114 \\ 148 \\ 3 \\ 10 \\ 18 \\ 4 \\ 4 \\ 13 \\ 26 \\ 33 \\ 76 \\ 34 \\ 82 \\ 182 \\ 58 \\ 68 \\ 386 \\ 331 \\ 702 \\ 45 \\ 56 \\ 1 \\ 139 \\ 1562 \\ 348 \\ 740 \\ 67 \\ 44 \\ 494 \\ 945 \\ 1067 \\ 1005 \\ 386 \\ 291 \\ 1067 $	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273 528 209 371 371 62 52 9 54 52 9 594 512 190 119	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 221 139 287 442 658 251 1218 999 502 662 135 889 1196 544 455 159	41 58 86 7 11 16 5 6 26 77 54 113 66 51 146 113 66 51 146 113 66 51 146 113 202 193 764 205 204 205 205 205 205 205 205 205 205	39 29 77 46 33 21 2 42 23 55 169 94 114 71 37 83 86 127 203 466 127 324 253 466 501 462 501 462 501 462 501 462 349 361 724 348	100 67 47 368 24 39 5 10 32 37 207 210 32 37 210 212 31 56 62 124 123 156 62 124 106 62 124 106 322 173 245 222 2308 245 270 436 67 477 648 432 473 245 245 245 244 245 245 245 245 245 245	186 239 80 16 56 43 10 4 39 52 148 163 114 207 119 81 14 207 119 81 14 207 119 81 14 207 207 81 124 207 208 269 250 686 643 248 269 250 682 643 105 52 148 105 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 109 52 52 100 52 109 52 52 109 52 109 52 207 52 109 52 207 52 109 52 52 52 52 52 52 52 52 52 52 52 52 52	491 537 175 40 90 99 24 17 76 61 84 156 61 84 177 76 61 84 274 247 94 247 95 91 129 100 285 273 139 198 194 157 347 308 405 742 253 263 263 273 265 273 265 273 265 273 265 273 265 273 265 273 265 273 265 273 265 273 265 273 273 273 273 273 273 273 273 273 273	659 785 277 1474 226 100 59 21 118 58 69 53 220 325 260 325 260 325 260 325 260 325 261 108 140 108 144 143 314 274 252 123 218 344 324 331 447 274 275 217 1474 1474 276 100 59 53 277 207 131 1474 266 277 211 118 266 277 211 118 266 277 211 118 266 277 211 118 266 277 211 118 266 277 277 131 100 275 277 131 100 275 277 131 140 266 277 277 131 266 277 277 131 276 277 131 140 274 277 131 276 277 131 277 277 131 274 277 131 276 277 131 140 140 274 277 131 140 140 274 277 277 131 140 140 140 274 277 277 173 140 140 140 274 274 274 277 277 173 173 174 274 274 277 173 174 274 277 173 174 274 277 173 173 174 274 274 274 274 274 274 274 274 274 2	634 779 355 788 330 178 100 113 167 67 72 233 307 383 167 383 184 114 114 159 160 255 188 122 213 139 213 301 286 287 204 506 650 406 651 284 506 650 406 6183 178	143 199 155 650 212 155 198 216 199 216 199 216 199 85 55 35 50 56 55 50 68 56 55 50 68 56 59 51 88 55 50 68 56 66 66 66 66 66 66 59 96 54 88 88 55 74 88 88 55 74 88 88 55 74 88 88 55 74 88 55 74 74 74 74 74 74 74 74 74 74 74 74 74
1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1984 1985 1984 1985 1986 1987 1993 1991 1992 1993 1994 1995 1995 1996 1997 1998 1995 1996 1997 1998 1995 1996 2000 2000 2000 2000 2004 2005 2006	13023 4419 227 34891 13629 1328 663 1563 2737 1017 3001 2708 1640 941 741 963 2297 4783 788 2954 4069 535 397 2027 827 472 215 317 73 6 1397 835 281 814 720 207	5442 8293 2889 1568 2547 916 3707 3447 3933 5125 1484 3009 2344 5570 5267 5764 12228 8903 12683 3475 13897 6045 1016 645 1288 9166 645 1095 881 528 827 5525 2680 2663 3439 444	0 2963 1122 1176 87 607 447 226 541 361 436 669 858 1089 5482 5250 7213 7322 1207 16956 9479 1471 3719 913 2957 1110 6206 3250 1817 6456 2345 4050 4504 6937 1879 890	0 243 235 0 278 13 89 29 40 196 59 134 185 304 86 678 2194 74 2042 1014 1744 122 2182 574 1886 3301 326 2425 1050 391 4232 4438 3336 2232 4438 3336 2233 1939 1056	7 384 67 0 37 70 25 18 20 81 20 76 46 197 54 48 672 189 1628 879 462 271 1111 653 2171 12232 596 121 619 305 831 4501 1612 12932 185 185 120 121 121 121 1225 121 121 121 12	$\begin{array}{c} 114\\ 114\\ 148\\ 3\\ 10\\ 18\\ 4\\ 4\\ 13\\ 26\\ 33\\ 76\\ 34\\ 82\\ 182\\ 58\\ 68\\ 331\\ 702\\ 45\\ 56\\ 1\\ 139\\ 1562\\ 348\\ 740\\ 67\\ 44\\ 494\\ 945\\ 1067\\ 1005\\ 386\\ 291\\ 583\\ \end{array}$	74 16 23 0 34 7 7 8 46 24 0 65 71 137 212 71 37 232 529 240 179 35 273 528 209 371 371 62 299 371 371 62 529 240 137 212 273 528 209 371 371 212 212 212 212 212 212 213 212 212	98 75 21 0 11 0 3 0 146 19 1 19 77 64 107 83 81 101 528 221 139 287 442 658 251 889 1196 544 455 295	41 58 86 7 11 16 5 6 26 77 54 61 146 113 66 51 146 113 66 51 146 143 262 193 764 275 204 134 262 193 764 262 263 779 912 244 134 262 263 264 133 264 262 264 133 264 275 264 134 262 262 262 262 263 264 262 264 193 262 264 193 262 264 275 264 262 264 275 264 262 262 264 262 262 264 262 262	39 29 77 46 33 21 2 42 23 55 169 114 71 37 203 213 203 213 203 213 203 213 242 233 466 127 324 2501 462 501 462 501 462 501 349 361 724 497 348 376	100 67 47 368 24 39 5 10 22 37 207 210 123 123 123 126 93 44 76 62 124 126 322 173 245 222 308 215 227 436 710 436 447 7391	186 239 80 16 56 43 10 4 39 52 148 163 10 4 207 119 81 14 207 119 81 14 207 119 81 14 207 119 81 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 119 82 207 207 81 114 207 207 207 207 207 208 207 207 207 207 207 207 207 207 207 207	491 537 175 40 90 99 24 17 76 61 84 156 61 84 274 247 95 91 129 100 285 91 129 100 285 3139 198 194 187 347 308 405 95 91 253 3139 198 264 202 301 308	659 785 277 1474 226 100 59 21 118 58 69 53 260 325 260 325 260 325 260 325 267 131 140 108 144 143 274 252 213 218 193 344 324 334 712 746 343 155	634 779 355 788 330 178 100 113 167 67 72 47 72 3307 383 184 144 159 160 255 188 122 139 213 301 286 287 264 506 650 406 183 178	77 143 199 154 650 217 155 56 198 216 199 210 199 210 200 200 200 200 200 200 200 200 200

Table A2 continued.

Traps	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1970	0	0	0	0	0	3	1	2	3	7	20	41	85	99	119	271
1971	0	0	5	17	5	17	7	4	1	2	8	25	40	72	59	159
1972	0	1	1	4	6	32	23	3	6	23	38	26	19	20	15	73
1973	0	0	0	0	0	0	0	0	0	13	28	124	128	115	104	100
1974	0	0	0	0	0	0	0	1	1	3	5	12	46	126	145	608
1975	0	0	0	0	1	1	2	3	0	0	1	5	14	31	40	341
1976	0	0	0	0	0	0	0	0	0	0	0	2	0	7	23	431
1977	0	0	0	0	0	0	3	20	142	343	716	591	264	31	0	0
1978	0	0	0	0	0	5	0	0	3	0	1	0	0	2	7	485
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	71
1980	0	0	0	0	0	1	4	5	4	7	2	3	4	3	4	92
1981	0	0	0	0	0	0	0	0	0	0	0	1	2	0	2	88
1982	0	0	0	0	0	0	0	0	0	0	0	1	2	3	1	149
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	17
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	45
1987	0	0	0	0	0	0	0	3	0	2	5	0	2	0	3	33
1988	0	0	0	0	0	0	0	3	0	2	4	0	2	0	3	27
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
1993	0	0	0	0	0	0	0	0	0	0	0	0	3	3	7	65
1994	0	0	0	0	0	0	0	0	1	0	3	1	3	7	12	185
1995	0	0	0	0	0	3	2	0	1	0	1	2	11	4	9	163
1996	0	0	0	0	1	0	0	1	3	2	12	12	26	26	22	170
1997	0	0	0	0	0	0	0	0	0	0	3	2	0	2	9	145
1998	0	0	0	0	0	0	0	0	0	4	2	12	18	18	34	129
1999	0	0	0	0	0	0	0	0	0	0	3	3	8	10	19	96
2000	0	0	0	0	0	0	0	0	0	0	0	1	3	2	4	37
2001	0	0	0	0	0	0	0	0	0	0	1	2	6	5	10	27
2002	0	0	0	0	0	0	6	43	43	10	12	13	13	12	7	5
2003	0	0	0	0	0	0	16	46	157	107	27	4	28	40	14	52
2004	0	0	0	5	1	2	4	0	11	15	11	33	46	16	6	5
2005	0	0	0	0	1	1	0	1	0	1	3	8	4	7	1	7
2006	0	0	0	0	0	1	0	2	1	2	2	0	0	0	1	5
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	9
2008	0	0	0	0	0	8	20	75	39	38	5	0	0	0	0	0
2009	0	0	0	0	5	22	1	10	8	3	11	7	8	5	6	30

Table A3. Commercial fleet catch-at-length used in the SCAL.

In the interests of keeping this document shorter, these data have not been listed below, but can be provided by the authors if required.

Table A4. CPUE	(relative abundance)	series used.
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	CAN GLS W/O 2010	CAN SWNS	US RR<145	US RR 66- 114	US RR 115-144	US RR>195	US RR>177	JLL WEST (area 2)	Larval zero inflated	US PLL GOM 1-6	JLL GOM	Tagging
Units	Numbers	Numbers	Numbers	Numbers	Numbers	Numbers	Numbers	Numbers	Biomass	Numbers	Numbers	Numbers
1970	-	-	-	-	-	-	-	-	-	-	-	1065132
1971	-	-	-	-	-	-	-	-	-	-	-	1001624
1972	-	-	-	-	-	-	-	-	-	-	-	431955
1973	-	-	-	-	-	-	-	-	-	-	-	183616
1974	-	-	-	-	-	-	-	-	-	-	0.968	341589
1975	-	-	-	-	-	-	-	-	-	-	0.534	554596
1976	-	-	-	-	-	-	-	0.657	-	-	0.666	253265
1977	-	-	-	-	-	-	-	2.424	2.724	-	0.913	257385
1978	-	-	-	-	-	-	-	1.200	4.733	-	0.876	121110
1979	-	-	-	-	-	-	-	0.822	-	-	1.287	98815
1980	-	-	0.799	-	-	-	-	1.508	-	-	1.158	192541
1981	1.556	-	0.399	-	-	-	-	1.912	0.770	-	0.553	337995
1982	0.796	-	2.102	-	-	-	-	0.715	1.417	-	-	-
1983	2.472	-	1.114	-	-	2.805	-	0.313	1.073	-	-	-
1984	1.112	-	-	-	-	1.246	-	0.958	0.393	-	-	-
1985	0.214	-	0.630	-	-	0.857	-	1.089	-	-	-	-
1986	0.273	-	0.778	-	-	0.503	-	0.081	0.435	-	-	-
1987	0.366	-	1.219	-	-	0.529	-	0.717	0.386	3.255	-	-
1988	0.610	1.969	0.988	-	-	0.941	-	1.089	1.063	1.533	-	-
1989	0.704	2.639	0.988	-	-	0.763	-	0.910	0.762	2.440	-	-
1990	0.188	2.459	0.904	-	-	0.626	-	0.752	0.318	1.889	-	-
1991	0.935	1.337	1.261	-	-	0.820	-	0.752	0.387	3.256	-	-
1992	1.735	1.239	0.820	-	-	0.910	-	1.148	0.530	0.797	-	-
1993	1.229	0.619	-	1.304	1.291	-	0.668	1.138	0.486	0.452	-	-
1994	0.253	1.167	-	0.265	0.237	-	0.831	1.050	0.528	0.335	-	-
1995	0.909	0.963	-	1.008	0.263	-	1.250	0.788	0.327	0.310	-	-
1996	0.090	0.344	-	1.637	0.695	-	3.489	2.317	1.019	0.183	-	-
1997	0.139	0.240	-	2.541	0.267	-	1.324	1.453	0.416	0.332	-	-
1998	0.271	0.508	-	1.448	0.886	-	1.652	0.684	0.124	0.357	-	-
1999	0.527	0.909	-	1.188	1.049	-	1.932	0.744	0.528	0.612	-	-
2000	0.359	0.230	-	0.946	1.456	-	0.602	0.934	0.352	0.884	-	-
2001	0.340	0.633	-	0.471	1.678	-	1.388	0.597	0.413	0.503	-	-
2002	0.445	0.665	-	1.079	2.490	-	1.806	0.697	0.318	0.471	-	-
2003	0.881	1.440	-	0.474	0.534	-	0.387	0.679	0.784	0.862	-	-
2004	1.048	0.499	-	1.836	0.598	-	0.600	0.608	0.581	0.783	-	-
2005	1.686	0.592	-	1.638	0.784	-	0.501	0.732	0.236	0.590	-	-
2006	0.816	0.902	-	0.657	1.377	-	0.350	1.268	0.585	0.414	-	-
2007	1.520	0.725	-	0.584	1.410	-	0.270	1.950	0.265	0.559	-	-
2008	1.083	1.050	-	0.278	1.036	-	0.369	0.768	0.411	1.283	-	-
2009	2.574	1.026	-	0.320	0.521	-	0.244	1.864	0.650	1.018	-	-
2010	-	0.869	-	0.622	1.226	-	0.792	0.696	0.459	0.881	-	-
2011	4.870	0.973	-	0.704	1.203	-	0.544	2.967	0.844	-	-	-

Table A5. Catches-at-age associated with the CPUE series used in the SCAA.

In the interests of keeping this document shorter, these data have not been listed below, but can be provided by the authors if required.

Table A6. Catches-at-length associated with the CPUE series used in the SCAL.

In the interests of keeping this document shorter, these data have not been listed below, but can be provided by the authors if required.

Appendix B.

The statistical catch-at-age model

The text following sets out the equations and other general specifications of the SCAA followed by details of the contributions to the (penalised) log-likelihood function from the different sources of data available and assumptions concerning the stock–recruitment relationship. Quasi-Newton minimization is then applied to minimize the total negative log-likelihood function to estimate parameter values (the package AD Model BuilderTM (Fournier *et al.* 2012) is used for this purpose). The description below includes more options than used in this paper, but they have been included here for completeness as they may be used in later extensions.

B.1. Population dynamics

B.1.1 Numbers-at-age

The resource dynamics are modelled by the following set of population dynamics equations:

$$N_{y+1,1} = R_{y+1}$$
 (B1)

$$N_{y+1,a+1} = \left(N_{y,a} e^{-M_a/2} - \sum_f C_{y,a}^f\right) e^{-M_a/2} \qquad \text{for } 1 \le a \le m-2$$
(B2)

$$N_{y+1,m} = \left(N_{y,m-1} e^{-M_{m-1}/2} - \sum_{f} C_{y,m-1}^{f}\right) e^{-M_{m-1}/2} + \left(N_{y,m} e^{-M_{m}/2} - \sum_{f} C_{y,m}^{f}\right) e^{-M_{m}/2}$$
(B3)

where

 $N_{y,a}$ is the number of fish of age *a* at the start of year *y* (which refers to a calendar year),

 R_{y} is the recruitment (number of 1-year-old fish) at the start of year y,

 M_a denotes the natural mortality rate for fish of age a,

 $C_{y,a}^{f}$ is the predicted number of fish of age *a* caught in year *y* by fleet *f*, and

m is the maximum age considered (taken to be a plus-group).

B.1.2. Recruitment

The number of recruits (*i.e.* new 1-year-olds) at the start of year *y* is assumed to be related to the spawning stock size (*i.e.* the biomass of mature fish) at the mid-point of the preceding year by either a modified Ricker or a Beverton-Holt stock–recruitment relationship, allowing for annual fluctuation about the deterministic relationship:

for the modified Ricker:

$$R_{y} = \alpha B_{y-1}^{\text{sp}} \exp\left[-\beta \left(B_{y-1}^{\text{sp}}\right)^{\gamma}\right] e^{(\varsigma_{y} - (\sigma_{R})^{2}/2)}$$
(B4)

and for Beverton-Holt:

$$R_{y} = \frac{\alpha B_{y-1}^{\rm sp}}{\beta + B_{y-1}^{\rm sp}} e^{(\varsigma_{y} - (\sigma_{\rm R})^{2}/2)}$$
(B5)

where

 \Box , \Box and \Box are spawning biomass–recruitment relationship parameters,

 ζ_y reflects fluctuation about the expected recruitment for year y, which is assumed to be normally distributed with standard deviation \Box_R (which is input in the applications considered here); these residuals are treated as estimable parameters in the model fitting process.

 B_{y}^{sp} is the spawning biomass in year y, computed as:

$$B_{y}^{\rm sp} = \sum_{a=0}^{m} f_{y,a} W_{y,a}^{\rm sp} N_{y,a} e^{-M_{a} \frac{T_{s}}{12}}$$
(B6)

where spawning for the stocks under consideration is taken to occur T_S months after the start of the year (here $T_S = 6$) and some natural mortality has therefore occurred,

 $w_{y,a}^{sp}$ is the mass of fish of age *a* during spawning, and

 $f_{y,a}$ is the proportion of fish of age *a* that are mature.

B.1.3. Total catch and catches-at-age

The total catch by mass in year *y* is given by:

$$C_{y} = \sum_{f} \sum_{a=0}^{m} w_{y,a}^{f} C_{y,a}^{f} = \sum_{f} \sum_{a=0}^{m} w_{y,a}^{f} N_{y,a} e^{-M_{a}/2} S_{y,a}^{f} F_{y}^{f}$$
(B7)

where

 $W_{y,a}^f$ denotes the mass of fish of age *a* landed in year *y* by fleet *f*,

 $C_{y,a}^{f}$ is the catch-at-age, *i.e.* the number of fish of age *a*, caught in year *y* by fleet *f*,

 $S_{y,a}^{f}$ is the commercial selectivity of fleet f(i.e. combination of availability and vulnerability to fishing gear)

at age a for year y; when $S_{y,a} = 1$, the age class a is said to be fully selected, and

 F_{v}^{f} is the proportion of a fully selected age class that is fished by fleet f.

The model estimate of the mid-year exploitable ("available") component of biomass for fleet f is calculated by converting the numbers-at-age into mid-year mass-at-age (using the individual weights of the landed fish) and applying natural and fishing mortality for half the year:

$$B_{y}^{f} = \sum_{a=0}^{m} w_{y,a}^{f} S_{y,a}^{f} N_{y,a} e^{-M_{a}/2} (1 - S_{y,a}^{f} F_{y}^{f}/2)$$
(B8)

B.1.4. Initial conditions

For the first year (y_0) considered in the model, the numbers-at-age are estimated directly for ages 1 to a^{est} , with a parameter \Box that mimics recent average fishing mortality for ages above a^{est} , *i.e.*

$$N_{v_0,a} = N_{\text{start},a} \qquad \qquad \text{for } 1 \le a \le a^{est} \tag{B9}$$

and

$$N_{\text{start},a} = N_{\text{start},a-1} e^{-M_{a-1}} (1 - \phi S_{a-1}) \qquad \text{for } a^{est} < a \le m - 1$$
(B10)

$$N_{\text{start},m} = N_{\text{start},m-1} e^{-M_{m-1}} (1 - \phi S_{m-1}) / (1 - e^{-M_m} (1 - \phi S_m))$$
(B11)

For the applications considered here however, the population starts at its pre-exploitation equilibrium level (K) with an equilibrium age-structure, with:

$$N_{\text{start},1} = K^{\text{sp}} \left(\left| \sum_{a=1}^{m-1} f_{\text{start},a} w_{\text{start},y}^{\text{sp}} e^{-\frac{T_{\text{s}}}{12} \sum_{a'=1}^{a-1} M_{a'}} + f_{\text{start},m} w_{\text{start},m}^{\text{sp}} \frac{e^{-\frac{T_{\text{s}}}{12} \sum_{a'=1}^{m-1} M_{a'}}}{1 - e^{-\frac{T_{\text{s}}}{12} M_{m}}} \right|$$
(B12)

B.2. The (penalized) likelihood function

The model can be fit to (a subset of) CPUE, and commercial catch-at-age or catch-at-length data to estimate model parameters (which may include residuals about the stock-recruitment function, facilitated through the incorporation of a penalty function described below). Contributions by each of these to the negative of the (penalized) log-likelihood ($- \ln L$) are as follows.

B.2.1 CPUE relative abundance data

The likelihood is calculated assuming that an observed CPUE index for a particular fishing fleet is lognormally distributed about its expected value:

$$I_{y}^{i} = \hat{I}_{y}^{i} \exp\left(\varepsilon_{y}^{i}\right) \quad \text{or} \quad \varepsilon_{y}^{i} = \ln\left(I_{y}^{i}\right) - \ln\left(\hat{I}_{y}^{i}\right) \tag{B13}$$
where

where

 I_y^i is the CPUE biomass or abundance index for year y for gear/flag combination i,

$$\hat{I}_{y}^{i} = \hat{q}^{i} \sum_{y,a}^{m} w_{y,a}^{i} S_{y,a}^{i} N_{y,a} e^{-M_{a}/2} (1 - S_{y,a}^{i} F_{y}^{i}/2)$$
 is the corresponding model estimate of biomass or

 $\hat{I}_{y}^{f} = \hat{q}^{f} \sum_{y,a}^{m} S_{y,a}^{f} N_{y,a} e^{-M_{a}/2} (1 - S_{y,a}^{f} F_{y}^{f}/2)$ is the corresponding model estimate of abundance,

 \hat{q}^i is the constant of proportionality (catchability) for the CPUE series, and

$$\varepsilon_{y}^{i}$$
 from $N(0, (\sigma^{\text{CPUE}})^{2})$.

The contribution of the CPUE data to the negative of the log-likelihood function (after removal of constants) is then given by:

$$-\ln L^{\text{CPUE}} = \sum_{y} \left\{ \ln \left(\sqrt{\left(\sigma^{\text{CPUE}}\right)^2 + \left(\sigma^i_{\text{Add}}\right)^2} \right) + \frac{\left(\varepsilon^i_{y}\right)^2}{2\left[\left(\sigma^{\text{CPUE}}\right)^2 + \left(\sigma^i_{\text{Add}}\right)^2\right]} \right\}$$
(B14)

where

 $\sigma^{ ext{CPUE}}$ is the standard deviation of the residuals for the logarithm of the indices,

 $\sigma^{\prime}_{
m Add}$ is the square root of the additional variance for the CPUE series, which can be estimated in the model fitting procedure but has been set to zero in the applications considered here.

 $\sigma^{ ext{CPUE}}$ is estimated in the fitting procedure by its maximum likelihood value:

$$\sigma^{\text{CPUE}} = \sqrt{\sum_{i} \sum_{y} \left(\ln\left(I_{y}^{i}\right) - \ln\left(\hat{I}_{y}^{i}\right) \right)^{2} / \sum_{i} \sum_{y} 1}$$

The catchability coefficient q^{i} for CPUE index *i* is estimated by its maximum likelihood value:

$$\ell n \, \hat{q}^i = 1/n_i \sum_{y} \left(\ln I^i_y - \ln \hat{B}^{\text{ex}}_y \right) \tag{B15}$$

B.2.2. Commercial catches-at-age

The contribution of the catch-at-age data to the negative of the log-likelihood function under the assumption of an "adjusted" lognormal error distribution is given by:

$$- \ln L^{\text{CAA}} = w_{\text{CAA}} \sum_{f} \sum_{y} \sum_{a} \left[\ln \left(\sigma_{\text{com}}^{f} / \sqrt{p_{y,a}^{f}} \right) + p_{y,a}^{f} \left(\ln p_{y,a}^{f} - \ln \hat{p}_{y,a}^{f} \right)^{2} / 2 \left(\sigma_{\text{com}}^{f} \right)^{2} \right]$$
(B16)

 $p_{y,a}^{f} = C_{y,a}^{f} / \sum_{a'} C_{y,a'}^{f}$ is the observed proportion of fish caught in year y by fleet f that are of age a, $\hat{p}_{y,a}^{f} = \hat{C}_{y,a}^{f} / \sum_{a'} \hat{C}_{y,a'}^{f}$ is the model-predicted proportion of fish caught in year y by fleet f that are of age a,

where

$$\hat{C}_{y,a}^{f} = N_{y,a} S_{y,a}^{f} F_{y}^{f} e^{-M_{a}/2}$$
(B17)
and

is the standard deviation associated with the catch-at-age data, which is estimated in the fitting $\sigma^{\scriptscriptstyle f}_{\scriptscriptstyle
m com}$ procedure by:

$$\hat{\sigma}_{\rm com}^{f} = \sqrt{\sum_{y} \sum_{a} p_{y,a}^{f} \left(\ln p_{y,a}^{f} - \ln \hat{p}_{y,a}^{f} \right)^{2} / \sum_{y} \sum_{a} 1}$$
(B18)

The lognormal error distribution underlying equation (B16) is chosen on the grounds that (assuming no ageing error) variability is likely dominated by a combination of interannual variation in the distribution of fishing effort, and fluctuations (partly as a consequence of such variations) in selectivity-at-age, which suggests that the assumption of a constant coefficient of variation is appropriate. However, for ages poorly represented in the sample, sampling variability considerations must at some stage start to dominate the variance. To take this into account in a simple manner, motivated by binomial distribution properties, the observed proportions are used for weighting so that undue importance is not attached to data based upon a few samples only.

Commercial catches-at-age are incorporated in the likelihood function using equation (B16), for which the summation over age a is taken from age a_{minus} (considered as a minus group) to a_{plus} (a plus group).

The W_{CAA} weighting factor may be set to a value less than 1 to downweight the contribution of the catch-at-age data (which tend to be positively correlated between adjacent ages) to the overall negative log-likelihood compared to that of the CPUE data. Here, $W_{CAA} = 0.1$.

In instances where catch-at-age data corresponding to a particular CPUE index are available, the data are treated in exactly the same manner as described above, with a specific selectivity S_a^i estimated for that index.

B.2.3. Commercial catches-at-length

Commercial catches-at-length are incorporated in the likelihood function in the same manner as the catches-atage. When the model is fit to catches-at-length, selectivity is estimated as a function of length and then converted to selectivity-at-age:

$$S_{y,a}^f = \sum_l S_{y,l}^f A_{a,l} \tag{B19}$$

where $A_{a,l}$ is the proportion of fish of age *a* that fall in the length group *l* (*i.e.*, $\sum_{l} A_{a,l} = 1$ for all ages).

The matrix $A_{a,l}$ is calculated under the assumption that length-at-age is normally distributed about a mean given by the von Bertalanffy equation, *i.e.*:

$$L_a \sim N\left(L_{\infty}\left(1 - e^{-\kappa(a-t_0)}\right), \theta_a^2\right)$$
(B20)
where

 θ_a is the standard deviation of length-at-age a, which is modelled to be proportional to the expected length-

at-age *a*, *i.e.*:

$$\theta_a = \beta L_{\infty} \left(1 - e^{-\kappa(a-t_0)} \right)$$
(B21)
with \Box fixed here to 0.2

with \Box fixed here to 0.2.

Furthermore, in the model fitting to CAL, the weights-at-age used to compute the CPUE indices are weighted by the selectivity for the corresponding fleet:

$$\widetilde{w}_{y,a}^{i} = \sum_{l} S_{y,l}^{f} w_{l} A_{a,l} / S_{a,l}^{i}$$
(B22)

 $\widetilde{W}_{y,a}^{i}$ is the selectivity-weighted mid-year weight-at-age *a* for fleet *f* and year *y*; and

 W_l is the weight of fish of length *l*.

The following term (replacing equation (B15)) is then added to the negative log-likelihood:

$$-\ln L^{\text{CAL}} = w_{\text{len}} \sum_{f} \sum_{y} \sum_{l} \left[\ln \left(\sigma_{\text{len}}^{f} / \sqrt{p_{y,l}^{f}} \right) + p_{y,l}^{f} \left(\ln p_{y,l}^{f} - \ln \hat{p}_{y,l}^{f} \right)^{2} / 2 \left(\sigma_{\text{len}}^{f} \right)^{2} \right]$$
(B23)

The W_{len} weighting factor may be set to a value less than 1 to downweight the contribution of the catch-atlength data (which tend to be positively correlated between adjacent length groups) to the overall negative loglikelihood compared to that of the CPUE data. Here, $W_{len} = 0.05$.

B.2.4. Stock–recruitment function residuals

The stock-recruitment residuals are assumed to be lognormally distributed. Thus, the contribution of the recruitment residuals to the negative of the (now penalized) log-likelihood function is given by:

$$-\ell n L^{\text{pen}} = \sum_{y=y_1+1}^{y_2} \left[\frac{\varsigma_y^2}{2\sigma_{\text{R}}^2} \right]$$
(B24)

where

 G_y is the recruitment residual for year y, which is estimated for year y_1 to y_2 (see equation (B4)),

 $\sigma_{\rm R}$ is the standard deviation of the log-residuals, which is input (here $\Box_{\rm R}=0.4$).

B.3. Model parameters

The model input parameters are given in Table B1.

Table B1. Input parameters (Length–weight, von Bertalanffy growth, maturity and natural mortality at age 1 to age 15 from ICCAT 2012). Length, weight and time units are centimeters, grams and years respectively.

Model plus group	16
Length-weight	a=0.00002861, b=2.929
Von Bertalanffy growth	$K = 0.089, L_{\infty} = 315, t_0 = -1.13$
Maturity-at-age	100% maturity at age 9
Natural mortality	0.14 yr^{-1}
Stock-recruitment	Beverton-Holt, $h=0.98$, $\square_R=0.6$

B.4.2. Fishing selectivity

For SCAA, the commercial fishing selectivities-at-age, $S_{y,a}^{f}$, are estimated separately for ages a_{minus} to a_{plus} . The selectivity is assumed to stay flat after a_{plus} if not otherwise specified. The selectivity is unchanged over a period, but can differ for each of specified different periods.

For SCAL, fishing selectivities-at-length are estimated rather than the selectivities-at-age. These are estimated separately for specified lengths from l_{minus} to l_{plus} , assuming linear changes from the lowest to the highest length for each length group. The selectivity is assumed to stay flat after l_{plus} if not otherwise specified. The selectivity can differ over fixed periods. Details of the fishing selectivities used for both SCAA and SCAL are shown in **Table B2**.

		SCAA-	-fixedS		SCAA	-estS			SC.	AL		
	a _{minus} (yr)	a _{plus} (yr)	Number of parameters estimated	a _{minus} (yr)	a _{plus} (yr)	Number of parameters estimated	a _{minus} (yr)	a _{plus} (yr)	l _{minus} (cm)	l _{plus} (cm)	Number of parameters estimated	Comments
Commercial fleet:												
Longline	1	16	14	1	16	15			50	260	14	
Other	7	16	8	7	16	9			150	285	9	
Purse seine	1	6	5	1	6	5			40	115	5	First selectivity period: 1950-1983
	8	16	7	8	16	8			160	250	6	Second selectivity period: 1984-preser
Sport	1	16	14	1	16	15			35	260	15	
Traps	5	16	10	5	16	11			150	285	9	
CPUE indices:												
CAN GLS W/O 2010	13*	16	-	13*	16	3	13*	16			3	
CAN SWNS	8*	14*	-	8*	14*	6	8*	14*			6	
US RR<145	1*	5*	-	1*	5*	4			55	135	5	
US RR 66-114	2*	3*	-	2*	3*	1			67	114	3	
US RR 115-144	4*	5*	-	4*	5*	1			115	144	2	
US RR>195	10*	16	-	10*	16	6			196	280	6	
US RR>177	8*	16	-	8*	16	8			178	280	7	
JLL WEST (area 2)	2*	16	-	2*	16	14			80	270	13	
Larval zero inflated	9*	16	-	9*	16	-	9*	16			-	Assume spawning biomass, i.e. age 9+
US PLL GOM 1-6	9*	16	-	9*	16	7	9*	16			7	
JLL GOM	9*	16	-	9*	16	7	9*	16			7	
Tagging	1*	3*	-	1*	3*	-	1*	3*			-	Flat selectivity for ages 1 to 3

Table B2. Details of the selectivities estimated.