7.3.19 Advice July 2014

## **ECOREGION STOCK**

## Bay of Biscay and Atlantic Iberian waters Sardine in Divisions VIIIc and IXa

#### Advice for 2015

ICES advises on the basis of precautionary considerations, and taking into account the current low biomass that catches in 2015 should be no more than 16 000 tonnes. Discards are considered to be negligible and all catches are assumed to be landed.

#### Stock status

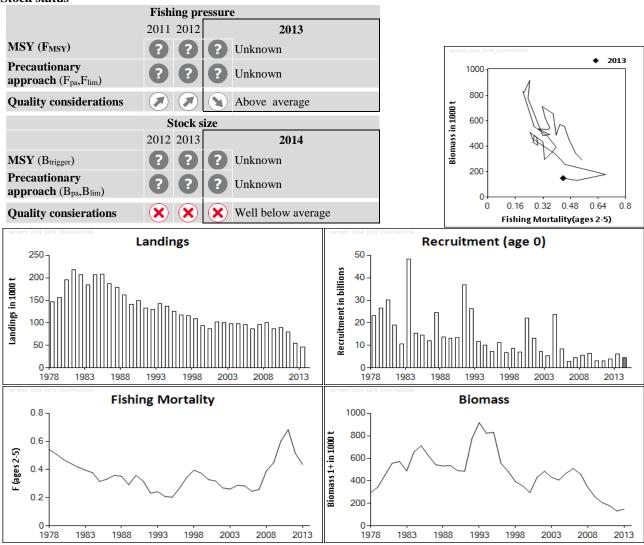


Figure 7.3.19.1 Sardine in Divisions VIIIc and IXa. Summary of stock assessment (weights in thousand tonnes, biomass expressed in weight-at-age 1 and older fish; Biomass 1+). Top right: Biomass 1+ and F over the years. Assumed recruitment values are shaded.

The biomass of age 1 and older fish has decreased since 2006 and is currently around the historic low. Recruitment has been below the long-term average since 2005. Fishing mortality since 2009 has been above the average of the last two decades prior to 2009.

#### Management plans

ICES has evaluated a proposed management plan developed by Portugal and Spain (ICES, 2013a, Annex 7.3.19). ICES concluded that the proposed management plan is provisionally precautionary.

ICES Advice 2014, Book 7

#### **Biology**

Sardine is prey for a range of fish and marine mammal species. Sardine is an omnivorous predator able to feed on both phytoplankton and zooplankton. In addition, sardines have been found to ingest their own eggs (and probably those of other species) and this cannibalism may act as a density control mechanism.

#### **Environmental influence on the stock**

As one of the most abundant pelagic forage fish species in Iberian waters, sardine may exert bottom-up control of their predators or top-down control of their prey, or they may control both prey and predators.

#### The fisheries

Most catch is taken by purse-seiners. Sardine catches are highest in the second half of the year and catches are traditionally concentrated mainly in western part of Portugal, Galicia and Cantabrian Sea. Catches in the Gulf of Cadiz and Algarve areas have increased since 2011. In Spain, vessels target anchovy, mackerel, sardine, and horse mackerel; in summer, part of the fleet switches to tuna fishing. In Portugal, sardine is the main target species, but chub mackerel, horse mackerel, and anchovy are also landed. Most catches are taken off the northern coast. Discards are uncertain but are assumed to be negligible. Slipping estimates are available for the Portuguese fleet, but with a limited coverage in time and extent.

Catch distribution Total catch (2013) = 46 kt, where 46 kt were official landings (99% purse-seine and 1% other gear types). Discards are assumed to be negligible.

#### Effects of the fisheries on the ecosystem

Purse-seines have a low bycatch of non-target species: when targeting sardine, the catches are mostly monospecific. Observer data and interview surveys of fishers also indicate a low impact on megafauna such as cetaceans, seabirds, and turtles. Because purse-seiners operate in open waters, there is little impact on the seabed. The overall effect of the sardine fishery on the pelagic ecosystem of the Atlantic Iberian waters has not been evaluated. The most likely impacts will take place in alterations of prey-predator relationships via modification of sardine abundance, size structure, and behaviour.

#### **Quality considerations**

The main uncertainties in the assessment relate to the discrepant signals about the stock trends provided by the daily egg production method (DEPM) and acoustic surveys. Uncertainty continues regarding the extent of sardine movement across the northern stock boundary, on the comparability of Portuguese and Spanish acoustic surveys, on survey and fishery selection patterns, and on the weighting of the different data sources in the assessment.

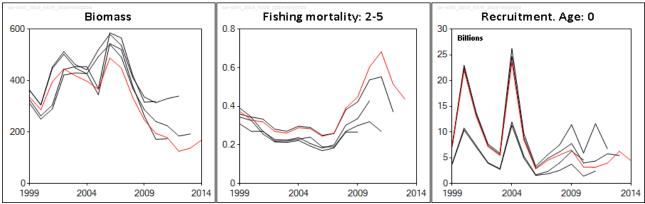


Figure 7.3.19.2 Sardine in Divisions VIIIc and IXa. Historical assessment results (final-year recruitment and biomass estimates included). The stock was benchmarked in 2012.

Scientific basis

2

**Stock Data Category** 1 (ICES, 2014a)

Age-based analytical assessment (SS3). Assessment type

Commercial catches (international landings, ages and length frequencies from catch Input data

sampling), survey indices (PELAGO&PELACUS-Q2, PT-DEPM&SP-DEPM). Annual

maturity data from DEPM survey, and natural mortalities from Gislason formula.

Discards and bycatch Not included and are considered negligible.

**Indicators** 

Other information Benchmarked in February 2012 (WKPELA; ICES, 2012).

Working group Working Group on Anchovy and Sardine (WGHANSA)

# ECOREGION Bay of Biscay and Atlantic Iberian waters STOCK Sardine in Divisions VIIIc and IXa

#### **Reference points**

No reference points are defined for this stock.

#### Outlook for 2015

Basis: F(2014) = average F(2011-2013) scaled to F2013=0.44;  $B_{1+}(2014) = 188$ ;  $B_{1+}(2015) = 169$ ; Catches (2014) = 51; R(2014) and R(2015) = GM(2009-2013) = 4384 million.

Rationale	<b>Catches</b> (2015)	Basis	F (2015)	B <sub>1+</sub> (2016)	%B <sub>1+</sub> change <sup>1)</sup>
Precautionary considerations	16	$F_{2002-2007} \times (B_{1+2014}/B_{1+2002-2007})$	0.11	193	14
Proposed management plan	19.095	Catch 2015 is $(0.36 \times (B_{1+2014} - lower trigger level))$	0.13	191	13
Zero catch	0	F = 0	0	205	21
Other options	12	$F_{2014} \times 0.2$	0.09	196	16
	24	$F_{2014} \times 0.4$	0.17	187	11
	35	$F_{2014} \times 0.6$	0.26	179	6
	36	F = average 2002–2007	0.27	179	6
	45	$F_{2014} \times 0.8$	0.35	172	2
	55	$F_{2014}$	0.44	165	-2

Weights in thousand tonnes.

#### Management plan

ICES has evaluated a management plan as requested by the EC (ICES, 2013a). The management plan description can be found in Annex 7.3.19. ICES concluded that the plan is provisionally precautionary, causing low probabilities of unsustainable fishing mortality, when the biomass used for comparison in the harvest control rule is the  $B_{1+}$  in the beginning of the intermediate year.

Following the proposed EC management plan implies that the TAC is set by the formula  $0.36 \times (B_{1+}(2014) - lower$  trigger level) =  $(0.36 \times (188 - 135))$  because the biomass is currently between the two trigger points in the harvest rule, which implies catches of no more than 19 095 t in 2015. Discards are considered to be negligible and all catches are assumed to be landed.

#### Precautionary considerations

The stock biomass is at a historically low level and fishing mortality peaked in 2010–2011. It has decreased since then but it is still above the long-term average. F should be brought back to where it was before the start of this increase, i.e. the 2002–2007 average (0.27). However, taking into account the low biomass, below previous  $B_{loss}$  and the below-average recruitment, ICES considers fishing mortality F should be reduced further. This reduction is based on the ratio between the current biomass ( $B_{1+(2014)} = 188\ 000\ t$ ) and the average biomass in the period before high fishing mortality occurred (average  $B_{1+(2002-2007)} = 406\ 000\ t$ , ratio of 41%) to F = 0.11. This results in catches of no more than 16 000 t. Discards are considered negligible and all catches are assumed to be landed.

#### **Additional considerations**

#### Management plan evaluations

ICES has evaluated a proposed management plan developed by Portugal and Spain (ICES, 2013a). Given the available data, ICES was unable to define reference points to use for the evaluation. ICES concludes the plan is provisionally precautionary, because it gives low probabilities of exceeding  $F_{loss}$  or driving  $B_{1+}$  below  $B_{loss}$  and a high probability of rapid recovery when  $B_{1+}$  declines to below trigger values. The proposed plan implies a relatively modest exploitation

<sup>&</sup>lt;sup>1)</sup>  $B_{1+}$  2016 relative to  $B_{1+}$  2015.

rate with mean F = 0.22, which is 70% of the natural mortality. As an F slightly lower than the natural mortality is a potential proxy for  $F_{MSY}$  (Deriso, 1982), the plan results in exploitation in the lower range of candidate  $F_{MSY}$  values.

Further exploration of sardine stock dynamics is required; for example it may be possible to draw inferences from studies of other sardine stock dynamics at low biomass. This will provide a better informed basis for determining precautionary criteria which may improve the evaluation of the current proposed plan. Additionally, alternative settings (lower target catch, higher trigger points) and catch stabilizers could be tested to improve the performance of the plan and make it more precautionary.

#### Regulations and their effects

There is no international TAC. Almost all catches are taken by purse-seiners in a directed human consumption fishery. Until 2014, the fisheries are managed by Portugal and Spain through minimum landing size, maximum daily catch, days fishing limitations, and closed areas.

Since 2010, annual catch limits are set for the Portuguese fishery by the Portuguese authorities. In 2013, the catch limit was 36 000 t, following the multiannual management plan.

In Spain, management measures include a maximum allowable catch of 7000 kg per fishing day and a 5-fishing-days week limitation since 1997.

In both countries, fishing for sardine was banned for 45 days during the first quarter of the year, with different regional periods.

#### **Biology**

Sardine is distributed in the Iberian region, to the north in Subareas VII and VIII and in the North Sea, and to the south on the Moroccan shelf. The information presented here assumes that sardine in Divisions VIIIc and IXa is a unit stock, based on biological characteristics. However, some movement of fish between Divisions VIIIb and VIIIc is known to occur. The effect of this movement is uncertain but is presently considered to have little influence on the estimation of the stock in the assessed area (Divisions VIIIc and IXa).

#### The environment

Sardine recruitment is considered to be influenced at both the local and the global scale by environmental variables that may reduce the transportation of eggs and larvae offshore which are critical to ensuring egg and larval survival. Indirect effects, e.g. on growth and condition through variations in food supply or water temperature have been given less attention. Results from such studies show that environmental effects, although present, are often weak and in some cases findings have been contradictory. For example, upwelling intensity has been found to affect recruitment both positively and negatively.

The Iberian sardine is considered a forage fish, i.e. a fish that provides food for predatory fish as well as marine mammals and birds. Sardine is one of the most abundant small pelagic species in western Iberian waters and has been found to be important in the diet of several species of fish and marine mammals. Forage fish such as sardine may exert bottom—up control of their predators or top—down control on their zooplanktonic prey, or they may control both prey and predators (wasp-waist control).

#### Uncertainties in assessment and forecast

The assessment shows a retrospective pattern overestimating SSB and underestimating F is observed in the last 3 years.

The DEPM and the acoustic surveys show discrepant signals in the stock trajectory. The assessment tends to accommodate the signals from the two surveys by providing a broad average perspective but follows the acoustic survey in the years when the DEPM is not available.

Some unresolved technical issues in the software code prevented the inclusion of confidence interval in fishing mortality. Hence confidence intervals are not shown.

#### Comparison of the basis of previous assessment and advice

The basis for the assessment has not changed from last year, but the forecast has been amended to account for changes in F in recent years (the intermediate year F was scaled to 2013). The basis for the advice is the same as last year: precautionary considerations.

#### **Sources**

Deriso, R. B. 1982. Relationship of fishing mortality to natural mortality and growth at the level of maximum sustainable yield. Canadian Journal of Fisheries and Aquatic Sciences, 39: 1054–1058.

ICES. 2012. Report of the Benchmark Workshop on Pelagic Stocks (WKPELA 2012), 13–17 February 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:47. 572 pp.

ICES. 2013a. Management plan evaluation for sardine in Divisions VIIIc and IXa. *In* Report of the ICES Advisory Committee, 2013. ICES Advice, 2013. Book 7, Section 7.3.5.1.

ICES. 2013b. Report of the Working Group on Southern Horse Mackerel, Anchovy, and Sardine (WGHANSA), 21–26 June 2013, Bilbao, Spain. ICES CM 2013/ACOM:16.

ICES. 2014a. Advice basis. In Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 1, Section 1.2.

ICES. 2014b Report of the Working Group on Southern Horse Mackerel, Anchovy, and Sardine (WGHANSA), 20–25 June 2014, ICES HQ, Copemhagen, Denmark. ICES CM 2014/ACOM:16.

Table 7.3.19.1 Sardine in Divisions VIIIc and IXa. Single-stock exploitation boundaries (advice), management, and catch.

Year	ICES	Predicted catch	Agreed	Official	ICES
	Advice	corresp. to advice	TAC	landings VIII & IX	catch <sup>a</sup>
1987	No increase in F; TAC	140	-		178
1988	No increase in F; TAC	150	-	167	162
1989	No increase in F; TAC	212	-	146	141
1990	Room for increased F	227 a	-	150	149
1991	Precautionary TAC	176	-	135	133
1992	No advice	-	-	139	130
1993	Precautionary TAC	135	-	153	142
1994	No advice	118 <sup>b</sup>	-	147	137
1995	No advice; apparently stable stock	-	-	137	125
1996	Lowest possible level	-	-	134	117
1997	Lowest possible level	-	-	n/a	116
1998	Significant reduction	-	-	n/a	109
1999	Reduce F to 0.2	38	-	n/a	94
2000	F below 0.2	< 81	-	n/a	86
2001	F below 0.2	< 88	-	n/a	102
2002	F below 0.25	< 95	-	n/a	100
2003	No increase in F	100	-	n/a	98
2004	No increase in F	128	-	n/a	98
2005	No increase in F	106	-	n/a	97
2006	No increase in F	96	-	n/a	87
2007	No increase in F	114	-	n/a	96
2008	No increase in F	92	-	n/a	101
2009	No increase in F	71	_	n/a	88
2010	No increase in F	75	_	n/a	90
2011	Maintain F at 2002–2007 level	75	-	77	80
2012	Reduce F to the 2002–2007 level	36	-	52	55
2013	Reduce F to the 2002–2007 level	< 55	-	46	46
2014	Reduce F to the 2002–2007 level adjusted to low biomass	< 17	-		
2015	Reduce F to the 2002–2007 level adjusted to low biomass	< 16			

Weights in thousand tonnes.

ICES Advice 2014, Book 7

n/a = not available.

<sup>&</sup>lt;sup>a</sup> Includes only Divisions VIIIc and IXa.

<sup>&</sup>lt;sup>b</sup>Estimated catch at *status quo* F.

 Table 7.3.19.2
 Sardine in Divisions VIIIc and IXa. ICES estimates of catch (tonnes) by subarea.

Yelle		X 7777	TX7 - 371	TV C	TV C	TV C :1	TV C -1	A 11	
1949   1978	Year	VIIIc	IXa North						Div. IXa
1942   47208	1940	66816					Cuaiz		99131
1944   AGM8									
1944   76147									
1946   32280									
1946   32280									
1949   1159   19504   37868   12077   8952   8990   78401     1950   13201   27121   47388   12073   8952   8990   78401     1951   12713   27959   43906   15086   19269   118903   1061909     1952   7765   30485   40938   22687   25331   127266   119441     1953   4969   27559   68145   16969   12081   129738   12474     1954   8836   28816   62467   25736   24084   149939   141103     1955   4969   27559   68145   16969   12081   129793   124743     1954   8836   28816   62467   25736   24084   149939   141103     1955   6851   30804   55518   15191   21150   163931   143807     1956   12074   29614   58128   24069   14475   138860   126268     1957   15624   37170   78596   20231   15010   163931   143807     1958   2743   41143   92790   33937   12554   20107   180424     1959   42005   30055   87845   23754   11680   201339   159334     1961   51212   59570   96105   22872   16528   246287   195075     1962   28891   46381   77701   29643   23528   206144   177235     1963   33796   51979   86859   17595   12397   202626   168830     1966   31732   47036   82354   35003   18797   214922   18190     1966   3196   44154   66929   34153   20855   198287   166919     1966   32196   44154   66929   34153   20855   198287   166919     1967   23480   45595   64210   31576   16635   181496   18816     1970   29344   23230   37608   12989   14257   126049   9716     1971   44691   48637   36728   16917   16534   160907   118816     1977   30449   9782   34764   27578   23333   5619   45090     1977   36149   9782   34764   27578   23333   5619   45090     1977   36149   9782   34764   25974   23333   5619   45090     1978   45090   1588   46215   34869   25788   19570   157533   112765     1979   38254   40325   3489   18007   19200   15171   117371     1973   34746   81828   34688   25788   19570   157533   112765     1978   35737   40244   44062   25774   23333   5619   45090     1979   27500   14383   34684   25778   23333   5619   45090     1979   28586   64645   64688   36389   3603   139970   101716     197									
1949	1947	43459	21855			15667		161391	117932
1951   1210   27121   47388   17025   17963   122698   109497   1952   7765   30485   40938   22687   25331   127266   119441   1953   4969   27556   68145   16969   12051   129793   124743   1954   8836   28816   62467   25736   24084   149939   141103   1955   6851   30804   55618   15191   21150   12074   29614   58128   24069   14475   138360   12026   1957   15624   37170   75896   20231   15010   163931   148307   1958   2743   41143   92790   33937   12554   210167   180424   1959   42005   30055   87845   23754   11680   201339   159334   1961   51212   59570   96105   22872   16528   246287   19907   1962   28891   46381   77701   29643   23528   206144   172253   1963   33796   34784   66629   34153   20855   19827   1966   31732   47036   82354   35003   18797   214922   18190   1966   31732   44032   45595   64210   31576   16635   181496   1960   38254   40732   37782   13852   9350   139970   101716   1969   38254   40732   37782   13852   9350   139970   101716   1969   38254   40732   37782   13852   9350   139970   101716   1969   38254   40732   37782   13852   9350   139970   101716   1970   29834   23236   37608   12989   14257   126049   97160   1971   41691   48637   36728   16991   16534   160507   11816   1977   34140   48637   36728   16991   16534   160507   11816   1977   34140   48637   36728   16991   16534   160507   11816   1977   36149   9782   34153   16548   12538   13456   138340   13776   13836   138374   43782   13890   13776   13836   138374   43782   13890   13776   13836   138374   43782   13830   13776   13836   13834   13837   13837   13836   13837   13836   13837   13836   13837   13836   13837   13836   13837   13836   13837   13836   13836   13836   13837   13836   1									
1951   12713   27959									
1952   7765   30485   40938   22687   25331   127206   119441   1953   4969   27556   68145   16969   12051   129703   124743   1954   8836   28816   62467   25736   24084   149939   141103   1955   6851   30804   55618   15191   21150   12064   122636   12074   29614   58128   24069   14475   138360   126286   1957   13624   37170   75896   20231   15010   163931   148307   1958   27433   41143   92790   33937   12554   210167   180424   1959   42005   36055   87845   23734   11680   201339   159334   1960   38244   60713   83331   24384   24062   230734   192490   1961   51212   59570   96105   22872   16528   246287   195075   1962   28891   46381   77701   29643   23528   206144   177235   1963   33796   51979   86859   17595   12397   202626   168830   1965   31732   47036   82354   35003   18797   214922   183190   1966   32196   44154   66929   34153   20855   198287   166919   1967   23480   45595   64210   31576   16635   181496   158016   1968   24690   51828   46215   36708   12989   14257   126094   19170   28934   46236   37088   12989   14257   126094   19171   46191   48637   36728   16917   16534   16657   118140   11737   1970   28934   45225   34889   18007   19200   151171   11737   1973   44768   18523   46984   27688   19570   157333   11736   1974   34536   13894   36339   18717   14244   117730   11716   1977   34468   18523   46984   27688   19570   157333   11736   1797   34768   18523   46984   27688   19570   15733   11736   11737   11737   1978   34526   13894   35530   61150   37054   17496   20745   12226   85987   1999   37506   12236   54819   19295   16714   153334   103064   1797   34768   18523   46984   27688   18507   19200   151171   11737   1978   43522   12915   34246   25974   23333   5619   145609   1988   24902   12236   54819   19295   16714   153334   103064   17970   1966   32196   3									
1955									
1954   8836   28816   62467   25736   24084   149939   141103   1955   6551   30804   55618   15191   21150   129614   122614   123614   12536   12074   29614   88128   24069   14475   138360   126286   1957   15624   37170   75896   20231   15010   163331   143939   141103   1958   29743   41143   92790   33937   12554   210167   180424   1959   42005   36055   87845   23754   11680   201339   159334   1961   51212   59570   96105   22872   16628   246287   19901   1962   28891   46381   77701   29643   23528   206144   17753   1963   33796   51979   86859   17595   12397   202626   168830   1966   31732   47036   82354   35003   18797   214922   183190   1966   3196   44154   66692   34153   20855   198287   16663   1966   31732   47036   82354   340732   31576   166635   181496   158016   1967   23480   45595   64210   31576   166635   181496   158016   1968   24690   51828   46215   16671   14993   154397   12970   1969   38254   40732   37782   13852   9350   139970   101716   1970   28934   32306   37608   12999   14257   126094   97160   1971   41691   48637   36728   16917   16534   160597   118816   1973   34536   13894   36339   18717   14244   117730   83194   1973   34536   13894   36339   18717   14244   117730   83194   1975   50260   12236   54819   19295   16714   153324   10169   1977   36149   9782   37064   17496   20745   121236   8360   12387   16648   12588   134562   22661   12975   36449   9782   37064   17496   20745   121236   8369   10287   1980   37578   43592   12915   34266   22574   23333   5619   145609   10287   1980   37576   157533   11750   1981   35550   65330   61150   37054   15048   2384   22661   12136   8369   12236   13894   13897   121236   8369   12236   13897   13897   13897   13897   13897   13898   35750   64810   13897   3200   14860   13897   13897   1980   37576   3120   194802   159015   1982   31756   71889   34869   31363   31163   32646   32661   13997   32644   32661   12736   3339   32644   32777   3263   33193   326446   32779   3120   34889   31163									
1956   12074   29614   58128   24069   14475   138360   126286   1297   15024   37170   75896   20231   15010   163931   143931   143931   1959   42005   36055   87845   23754   11680   201339   159334   1961   51212   59570   96105   22872   16528   246287   19507   1961   51212   59570   96105   22872   16528   246287   19507   1962   28891   46381   77701   29643   23528   206144   17975   1963   33796   51979   86859   17595   12397   202626   168830   1965   31732   47036   82354   35003   18797   214922   183190   1966   32196   44154   66929   34153   20855   198287   16699   1967   23480   45595   64210   31576   16635   181496   158016   1968   24690   51828   46215   16671   14993   154397   127077   1970   28934   32306   37608   12989   14257   126094   97160   1971   41691   48637   36728   16917   16534   166697   18173   1973   434768   18523   46984   27688   19570   151171   117371   117371   1973   34476   18523   46984   27688   19570   157533   13156   1976   51901   10140   43435   16548   12538   13456   13324   103664   1977   36149   9782   53064   23754   23782   23782   23782   23783   23869   33794   23783   35619   145609   10376   1978   33774   34356   13894   36339   18717   12444   117730   83194   1975   50260   12236   54819   19295   16714   153324   113669   10376   1978   33774   43876   36353   1375   14638   12538   134562   82619   1978   43552   12915   34246   25974   23333   5619   145609   10376   1988   35787   49593   59290   29433   15193   3200   157741   13890   157241   138907   1978   43576   13894   43686   33063   13737   14354   6575   13894   33374   62843   33163   31163   21607   2488   220646   15790   1983   33734   62843   33163   31163   21607   2488   220646   15790   1983   33734   62843   33163   31163   21607   2488   220646   17970   1988   35790   27506   12236   54390   54364   22795   13100   3064   130250   104090   1983   24866   23905   41681   29968   11666   4166   4166   4166   4166   4166   4166   4166   4166   4166   4166   4166   41	1954	8836	28816	62467	25736	24084		149939	141103
1957   15624   37170   75896   20231   15010   163931   148307   1959   42005   36055   87845   23754   11680   201339   159334   1959   42005   36055   87845   23754   11680   201339   159334   1961   38244   60713   83331   24384   24062   2320734   192075   1962   28891   46381   77701   29643   235288   206144   177253   1963   33796   51979   86859   17595   12397   202626   16889   1964   36390   40897   108065   27636   22035   235023   198633   1964   36390   40897   018065   27636   22035   235023   198633   1966   31732   47036   82354   35003   18797   214992   18190   1966   32196   44154   66929   34153   20855   198287   166901   1966   32196   44154   66929   34153   20855   198287   166901   1966   32196   44154   66929   34153   20855   198287   166901   1966   32196   44154   66929   34153   20855   198287   166901   1966   32196   44154   66929   34153   20855   198287   166901   1966   32195   44154   66929   34153   20855   198287   166901   1966   32195   44154   66929   34153   20855   198287   166901   1966   32195   44154   66929   34153   20855   198287   166901   1969   38254   40732   37782   13852   9350   139970   10171   1970   28934   32306   37608   12989   14257   126094   97160   1971   41691   48637   36728   16917   16534   160507   118816   1977   34768   18523   46984   27688   19570   157533   112765   11973   34768   18523   46984   27688   19570   157533   112765   11974   34536   13894   36339   18717   14244   117730   8319   1975   50260   12236   54819   199295   16714   153324   103064   1977   36149   9782   37064   17496   20745   121236   85087   1979   18271   43876   39651   27532   24111   3800   157241   138970   1978   35520   63530   61150   37054   15048   22384   216517   180967   1988   35787   49593   59290   29433   17579   3120   194802   159015   1988   35787   49593   59290   29433   17579   3120   194802   157901   1918   35550   65330   61150   37054   15048   23844   216517   180967   1988   35790   64691   37558   37690   37790   27500   1925									
1958   29743   41143   92790   33937   12554   210167   180424   1961   38244   60713   83331   24384   24062   230734   192490   1961   51212   59570   96105   22872   16528   246287   193075   1962   28891   46381   77701   29643   23528   206144   177253   1963   33796   51979   86859   17595   12397   202626   168830   1966   31939   40897   108065   27636   22035   235203   1963   1965   31732   47036   82354   35003   18797   214922   183190   1966   32196   44154   66929   34153   20855   198287   16691   1967   23480   45595   64210   31576   16635   181496   158016   1970   28934   32306   37608   12989   14257   126094   97160   1970   28934   32306   37608   12989   14257   126094   97160   1971   41691   48637   36728   16917   16534   160697   181197   1973   44768   18523   46984   27688   19570   151171   117371   117371   1973   434768   18523   46984   27688   19570   151171   117371   117371   36149   9782   37064   17496   20745   23333   5619   145609   15978   36149   9782   37064   17496   20745   314560   10287   1978   33746   53894   12538   134562   82661   1977   36149   9782   37064   17496   20745   23333   5619   145609   10287   1978   43552   12915   34246   25974   23333   5619   145609   10287   1978   33274   62843   33636   3153   3163   31757   3120   194802   15918   33576   63330   61150   37054   15048   2384   22664   13897   13980   37787   42923   44686   38082   16912   2442   206406   15755   1983   33274   62843   33163   31163   21607   24842   206946   15704   1988   25907   66491   61755   31535   18418   4333   208439   18253   1988   20907   57360   31737   14354   6757   18766   14899   18253   24666   23311   23706   24723   23886   6303   149429   24790   1988   25907   66491   61755   31535   18418   4333   208439   18253   1988   25907   66491   61755   31535   18418   4333   208439   18253   1988   25907   66491   61755   31535   18418   4333   208439   18253   1988   20907   66491   61755   31535   18418   4333   208608   177696   14119   1999   27500									
1959   42005   36055   87845   23754   11680   201339   159334   1961   851212   59570   96105   22872   16528   246287   195075   1962   28891   46381   77701   29643   23528   206144   177253   1963   33796   51979   86859   17595   12397   202626   168830   1964   36390   40897   108065   27636   22035   235023   198633   1966   31732   47036   82354   35003   18797   214922   183190   1966   32196   44154   66929   34153   20855   198287   166091   1967   22480   45955   64210   31576   16635   181496   158016   1968   24690   51828   46215   16671   14993   154397   129707   1971   41691   48637   36728   16917   16534   160507   118816   1972   33800   45275   34889   18007   19200   151171   117371   1973   44768   18523   46984   27688   19570   157533   112765   15974   34336   13894   36339   87107   14244   117730   83194   1977   50260   12236   54819   19295   16714   153324   10364   1977   36149   9782   37064   17496   20745   23333   5619   145609   15721   1988   35550   63330   61150   37054   15850   64509   15724   138970   157533   112765   15981   35550   65330   61150   37054   15048   2384   24628   15981   35550   65330   61150   37054   15048   2384   24628   15981   15855   65330   61150   37054   15048   2384   24628   15981   15881   35550   65330   61150   37054   15048   2384   24628   15981   15885   65330   61150   37054   15048   2384   24621   18987   1898   24707   79606   42798   35052   17280   3319   200000   157241   18987   1988   24707   79606   42798   35052   17280   3319   200000   15780   1983   12958   14860   157244   138970   157857   18986   15995   16714   138970   157857   12938   14860   157244   138970   157858   15981   35550   65330   61150   37054   15048   2384   24651   189970   17805   15981   35550   65330   61150   37054   15048   2384   24651   189970   17805   15981   35550   65330   61150   37054   15048   2384   24651   189970   17805   18980   250070   66491   61755   31535   18418   4333   208489   125252   1986   39195   37960   57360   317									
1961   51212   59570   96105   22872   16528   246287   1959075   1962   28891   46381   77701   29643   23528   206144   177253   1963   33796   51979   86859   17595   12397   202626   168830   1964   36390   40897   108005   27636   22035   235023   198633   1965   31732   47036   82354   35003   18797   214922   183190   1966   32196   44154   66929   34153   20855   198287   166091   1967   23480   45595   64210   31576   16635   181496   158016   1968   24690   51828   46215   16671   14993   154397   129707   1969   38254   40732   37782   138852   9350   139970   101716   1970   28934   32306   37608   12989   14257   126094   97160   1971   41691   48637   36728   16917   16534   160507   18816   1972   33800   45275   34889   18007   19200   151171   117371   1973   44768   18523   46984   27688   19570   157533   112765   1974   34536   13894   36339   18717   14244   117730   83194   1975   50260   12236   54819   19295   16714   153324   103064   1976   51901   10140   43435   16548   12538   134562   32661   1979   18271   43876   39651   27532   24111   3800   157241   18907   1980   35787   49593   59290   29433   15787   3120   194802   121236   85087   1988   35787   49593   59290   29433   15789   3120   194802   159015   1980   35787   40593   59290   29433   15789   3120   194802   159015   1988   35756   65330   61150   37054   15048   2384   216517   189067   1982   31756   71889   45865   38082   16912   2442   206944   175190   1983   32374   62843   33163   31163   21607   2688   183837   151463   1988   49984   22665   52779   27420   13393   2990   161531   12087   1998   25907   66491   61755   31535   18418   4333   208439   18253   1998   25907   66491   61755   31535   18418   4333   208439   18253   1998   25907   66491   61755   31535   18418   4333   208439   18253   1998   25907   66491   61755   31535   18418   4333   208439   18253   1996   27500   19253   52212   24723   1938   6503   14949   27070   35856   33585   22966   24619   7175   3399   161531   120857   1999									
1961   51212   59570   96105   22872   16528   246287   196075     1962   28891   46381   77701   29643   23528   206144   177253     1963   33796   51979   86859   17595   12397   202626   168830     1964   36390   40897   108065   27656   22035   235023   198633     1966   31732   47036   82354   35003   18797   214922   183190     1967   23480   45595   64210   31576   16635   181496   158016     1968   24690   51828   46215   16671   14993   154397   129707     1969   38254   40732   37782   13852   9350   139970   101716     1970   28934   32306   37608   12989   14257   126094   97160     1971   41691   48637   36728   16917   16534   160507   118816     1972   33800   45275   34889   18007   19200   151171   117371     1973   44768   18523   46984   27688   19570   157533   112765     1974   34536   13894   36339   18717   14244   117730   11731     1975   50260   12236   54819   19295   16714   153324   103064     1976   51901   10140   43435   16548   12538   134562   82661     1978   43522   12915   34246   25974   23333   5619   146609   157241     1978   43522   12915   34246   25974   23333   5619   146609   157241     1980   35787   49593   59290   29433   17579   3120   194802   159015     1981   35550   65330   61150   37054   15048   2344   216517   189067     1983   32374   62843   33163   31163   21607   2688   18337   151463     1984   27970   79606   42798   33052   17280   3319   200001   178035     1985   25907   66491   61755   31535   18418   4333   208439   182532     1998   29856   16179   52585   26783   11723   3825   149429   121929     1998   24486   23905   47284   29995   13160   3664   142495   180996     1999   27500   19253   52212   24723   1938   5606   101957   8159     1999   27500   19253   52212   24723   1938   5606   101957   8159     1999   27500   19253   52212   24723   1938   5606   101957   8159     1999   27500   19253   52212   24723   1938   5006   101957   8159     1999   1862   2563   31574   24723   19104   3996   125280   10534     1999   1866   39398									
1964   36390   40897   108065   27636   22035   235023   198633   1966   31732   47036   82354   35003   18797   214922   198633   1966   32196   44154   66929   34153   20855   198287   166091   1967   23480   45595   64210   31576   16635   181496   188016   1968   24690   51828   46215   16671   14993   154397   12970   101716   1970   228934   32306   37608   12989   14257   126094   97160   1971   41691   48637   36728   16917   16534   160507   118816   1972   33800   45275   34889   18007   19200   151171   117371   1973   44768   18523   46984   27688   19570   157533   112765   1974   34536   13894   36339   18717   14244   117370   83194   1975   50260   12236   54819   19295   16714   153324   130564   1976   51901   10140   43435   16548   12538   134562   82661   1977   36149   9782   37064   17496   20745   121236   85087   1978   43522   12915   34246   25974   23333   5619   145609   15201   1981   35550   65330   61150   37054   15048   2384   216517   18901   1981   35550   65330   61150   37054   15048   2384   216517   18902   1981   32576   76898   33639   31757   3120   194802   159015   1981   35250   65330   61150   37054   15048   2384   216517   18907   1982   31756   71889   45865   38082   16912   2442   206946   17890   1988   32374   62843   33163   31163   21607   2688   183837   151463   1986   39195   37960   47298   35032   17280   3319   206005   178035   1986   39195   37960   57360   31737   14354   6757   187363   148168   1997   25857   14383   44379   26150   22166   4834   132587   118097   1999   27500   19253   52212   24723   19238   6503   149429   121929   1991   20735   14383   44379   26150   22166   4844   132587   118096   1996   14423   11251   34761   31117   3890   36644   142495   118099   1999   27500   19253   52212   24723   19238   6503   149429   121929   1991   20735   14383   44379   26150   22106   4844   132587   118096   1996   14423   11251   34761   31117   3890   36446   39955   34764   34794   34794   34794   34794   34794   34794   34794   3	1961	51212		96105	22872				
1964   36390   40897   108065   27636   22035   235023   198633   1965   31732   47036   82354   35003   18797   214922   183190   1966   32196   44154   66929   34153   20855   198287   166091   1967   23480   45595   64210   31576   16635   181496   188016   18901   1969   38254   40732   37782   13852   9350   139970   101716   1970   28934   32306   37608   12989   14257   126094   1971   41691   48637   36728   18017   1920   15117   11737   17173   31800   45275   34889   18007   19200   151171   11737   17173   17173   17174   1975   50260   12236   54819   19295   16714   153324   103064   1976   51901   10140   43435   16548   12538   134562   82661   1977   36149   9782   37064   17496   20745   121236   85087   1978   43522   12915   34246   25974   23333   5619   145609   102087   1980   35787   49593   59290   29433   17579   3120   19480   15901   1981   35550   65330   61150   37054   15048   2384   216517   18903   1983   32374   62843   33163   31163   21607   2442   206946   17510   1983   32374   62843   33163   31163   21607   2442   206946   175190   1983   32574   62843   33163   31163   21607   2688   18387   151463   1984   27970   79606   42798   35052   17280   3319   206005   17803   1986   39195   37960   57360   31737   14354   6757   187363   148168   1986   39195   37960   57360   31737   14354   6757   187363   148168   1988   4944   24005   52779   27420   13393   2990   161531   120587   1990   27500   19253   52212   24723   19238   5503   149495   11990   1994   22181   16151   49136   30390   14942   3782   136582   114401   1995   1995   19538   13928   41444   27270   19104   3782   136582   114401   1995   19538   3328   41444   27270   19104   3782   36582   114401   1995   19538   3328   41444   27270   19104   3782   36582   114401   1995   19538   3328   41444   27270   19104   3782   36582   114401   1995   19538   3328   41444   27270   19104   3782   36582   114401   1995   19538   33288   32726   25619   13350   5066   101957   87023   10406   114401   11995   1									
1965   31732   47036   82354   35003   18797   214922   183190   1966   32196   44154   66929   34153   20855   198287   166091   1967   23480   45595   64210   31576   16635   181496   188016   1968   24690   51828   46215   16671   14993   154397   129707   1970   28934   32306   37608   12989   14257   126094   1971   41691   48637   36728   16917   16534   160507   118116   1972   33800   45275   34889   18007   19200   151171   117371   1973   44768   18523   46984   27688   19570   155533   112765   1974   34536   13894   36339   18717   14244   117730   1374   1975   50260   12236   54819   19295   16714   153324   13364   1976   51901   10140   43435   16548   12538   134562   18914   1877   36149   9782   37064   17496   20745   121236   82661   1977   36149   9782   37064   17496   20745   121236   82661   1977   36149   9782   37064   17496   20745   121236   82661   1977   36149   9782   37064   17496   20745   121236   82661   1977   36149   9782   37064   17496   20745   121236   82661   1978   43522   12915   34246   25974   23333   5619   145609   10287   1980   35787   49593   59290   29433   17579   3120   194802   159015   1981   35550   65330   61150   37054   15048   2384   216517   189015   1983   32374   62843   33163   31163   21607   2688   183837   15190   1983   32374   62843   33163   31163   21607   2688   183837   15790   1983   32970   66491   61755   31535   18418   4333   208439   182532   1986   39195   37960   57360   31737   14354   6757   18763   18703   1988   40944   24005   52779   27420   13393   2990   161531   12085   1990   27500   19253   52212   24723   19238   6503   149429   121929   1991   20735   14383   44379   26150   22106   4834   13257   1989   14480   23905   47284   29995   13160   3664   142495   11809   1993   24486   23905   47284   29995   13160   3664   142495   180915   1996   14423   11251   34761   31117   1988   5304   116736   102313   1997   15587   12291   34156   25863   21137   6780   11814   100227   1999   14480   3666   23311   23701									
1966   32196   44154   66929   34153   20855   198287   166091   1967   23480   45595   64210   31576   16635   181496   158016   158016   1968   24690   51828   46215   16671   14993   154397   129707   1969   38254   40732   37782   13852   9350   139970   101716   1970   2894   23306   37608   12989   14257   126094   97160   1971   41691   48637   36728   16917   16534   160507   118816   1972   33800   45275   34889   18007   19200   151171   11731   14768   18523   46984   27688   19570   151171   117730   83194   1975   50260   12236   54819   19295   16714   153324   103064   1975   50260   12236   54819   19295   16714   153324   103064   1977   36149   9782   37064   17496   20745   121236   82661   1977   36149   9782   37064   17496   20745   121236   82661   1977   36149   9782   37064   17496   20745   121236   82661   1977   36149   9782   37064   17496   20745   121236   82661   1977   363522   12915   34246   25974   23333   5619   145609   120887   1979   18271   43876   39651   27532   24111   3800   157241   138970   1980   35787   49593   59290   29433   17579   3120   19402   159015   1981   35550   65330   61150   37054   15048   2384   216517   180967   1982   31756   71889   45865   38082   16912   2442   206946   175190   1983   32374   62843   33163   31163   21607   2688   183837   151463   1987   36377   42234   44806   27795   17613   8870   177696   141319   1988   49044   24005   52779   27420   13393   2999   16153   126587   1989   29856   16179   52585   26783   11723   3835   140961   111105   1990   27500   19253   52212   24723   19238   6503   149429   112929   11999   120735   14383   43379   20160   2446   23905   47284   29995   13160   3664   14245   14401   1995   19538   13928   41444   27270   19104   3996   15530   15381   1996   1993   24486   23905   47284   29995   13160   3664   14245   14401   1995   19538   13928   41444   27270   19104   3996   15582   114401   1995   19538   13928   41444   27270   19104   3996   125280   10631   1996   11577   3063   325									
1967   23480   45595   64210   31576   16635   181496   158016   1968   24690   51828   46215   16671   14993   154397   101716   1970   28934   32306   37608   12989   14257   126094   97160   1971   41691   48637   36728   16917   16534   160507   118816   1972   33800   45275   34889   18007   19200   151171   117371   1973   44768   18523   46984   27688   19570   15533   11573   112761   1973   44768   18523   46984   27688   19570   15533   12394   1975   50260   12236   54819   19295   16714   153324   13384   1976   51901   10140   43455   16548   12538   134562   32661   1977   36149   9782   37064   17496   20745   121236   85087   1978   43522   12915   34246   25974   23333   5619   145609   10287   1980   35787   49593   59290   29433   17579   3120   194802   15911   1983   32374   62843   33163   31163   21607   2688   183837   151463   1984   27970   79606   42798   35032   17280   3394   227970   79606   42798   35032   17280   33199   206060   17803   1988   40944   24005   52779   27420   13393   2990   161531   12087   1999   27500   19253   52212   24723   19238   6503   149429   11299   1991   20735   14838   44379   26150   22106   4834   13255   11108   11108   1999   27500   19253   52212   24723   19238   6503   149429   12199   1991   20735   4486   23905   47284   29995   13160   3664   142495   11809   1999   27500   19253   52212   24723   19238   6503   149429   12199   1991   20735   14838   44379   26150   22106   4834   132587   11809   11800   11800   11800   11800   11800   11800   11800   11800   11800   11800   11800   11800   11800   11800   11800   11800   11800									
1969									
1970	1968	24690	51828	46215	16671	14993		154397	129707
1971   41691   48637   36728   16917   16534   160507   118816   1972   33800   45275   34889   18007   19200   151171   117371   117371   1973   44768   18523   46984   27688   19570   157533   112765   1974   34536   13894   36339   18717   14244   117730   33194   1975   50260   12236   54819   19295   16714   153324   103064   1976   51901   10140   43435   16548   12538   134562   82661   1977   36149   9782   37064   17496   20745   121236   85087   1978   43522   12915   34246   25974   23333   5619   145609   102087   1980   35787   49593   59290   29433   17579   3120   194802   159015   1981   35550   65330   61150   37054   15048   2384   216517   180967   1982   31756   71889   45865   38082   16912   2442   206946   175190   1983   32374   62843   33163   31163   21607   2688   183837   151463   1984   27970   79606   42798   35032   17280   3319   206005   178035   1985   25907   66491   61755   31535   18418   4333   208439   182532   1986   39195   37960   57360   31737   14354   6757   187363   148168   1898   40944   24005   52779   27420   13393   2990   161531   120887   1989   29856   16179   52585   26783   11723   3835   14966   11906   11909   27500   19253   52212   24723   19238   6503   149429   121929   1991   20735   14383   44379   26150   22106   4834   132587   111852   1990   27500   19253   52212   24723   19238   6503   149429   121929   1991   20735   14383   44379   26150   22106   4834   132587   111852   11995   19538   13928   41444   27270   19104   3996   14538   114061   11105   1990   11667   2866   23311   23701   1912   5081   85786   74089   10971   15587   12291   34156   25863   21137   6780   14894   94091   12588   4666   3838   32284   29564   20743   5066   101957   85159   2000   16679   4368   24696   23311   23701   19129   5081   85786   74089   2001   16798   8398   32726   25619   13350   5066   101957   85159   2000   16798   8398   32726   25619   13350   5066   101957   85159   2000   16937   2466   23311   23701   24066   6188   94669   83088   20									
1972   33800   45275   34889   18007   19200   151171   117371   1973   44768   18523   46984   27688   19570   157533   112765   1974   34536   13894   36339   18717   14244   117730   83194   1975   50260   12236   54819   19295   16714   153324   103064   1976   51901   10140   43435   16548   12538   134562   82661   1977   36149   9782   37064   17496   20745   121236   85087   1978   43522   12915   34246   25974   23333   5619   145609   102087   1979   18271   43876   39651   27532   24111   3800   157241   138970   1980   35787   49593   59290   29433   17579   3120   194802   159015   1981   35550   65330   61150   37054   15048   2384   216517   180967   1982   31756   71889   45865   38082   16912   2442   206946   175190   1983   32374   62843   33163   31163   21607   2688   183837   151463   1984   27970   79606   42798   35032   17280   3319   206005   178035   1985   25907   66491   61755   31535   18418   4333   208439   182532   1868   39195   37960   57360   31737   14354   6757   187363   148168   1987   36377   42234   44806   27795   17613   8870   177696   141319   1988   40944   24005   52779   27420   13393   2990   161531   120587   1989   29856   16179   52585   26783   11723   3835   140961   11105   1990   27500   19253   52212   24723   19238   6503   149429   121929   1991   20735   14383   44379   26150   22106   4834   132587   111852   1992   26160   16579   41681   29968   11666   4196   130250   104090   1993   24486   23905   47284   29995   13160   3664   142495   118009   1994   22181   16151   49136   30390   14942   3782   336582   114401   1995   19538   13928   41444   27270   19104   3996   125280   105742   1996   14423   11251   34761   31117   19880   5304   11673   116798   3398   32726   25619   13350   5066   101957   83159   1000   11697   2866   23311   23701   19129   5081   83786   74082   1000   1697   2866   23311   23701   19129   5081   83786   74082   2000   11697   2866   23311   23701   19129   5081   83786   74082   2000   11697   2866   23311   2									
1973									
1974   34536   13894   36339   18717   14244   117730   83194   1975   50260   12236   54819   19295   16714   153324   103064   1976   501901   10140   43435   16548   12538   134562   82661   1977   36149   9782   37064   17496   20745   121236   85087   1978   43522   12915   34246   25974   23333   5619   145609   102087   1979   18271   43876   39651   27532   24111   3800   157241   138970   1980   35787   49593   59290   29433   17579   3120   194802   159015   1981   35550   65330   61150   37054   15048   2384   216517   180967   1982   31756   71889   45865   38082   16912   2442   206946   175190   1983   32374   62843   33163   31163   21607   2688   183837   151463   1984   27970   79606   42798   35032   17280   3319   206005   178035   1985   25907   66491   61755   31535   18418   4333   208439   182532   1986   39195   37960   57360   31737   14354   6757   187363   148168   1987   36377   42234   44806   27795   17613   8870   177696   141319   1988   40944   24005   52779   27420   13393   2990   161531   120887   1989   29856   16179   52585   26783   11723   3835   140961   111105   1990   27500   19253   52212   24723   19238   6503   149429   121929   1991   20735   14383   44379   26150   22106   4834   132587   111852   1992   26160   16579   41681   29968   11666   4196   130250   104090   1993   24486   23905   47284   29995   13160   3664   142495   118009   1994   22181   16151   49136   30390   14942   3782   316582   114401   1995   19538   13928   41444   27270   19104   3996   125280   105742   1996   14423   11251   34761   31117   19880   5304   116736   102313   1997   15587   12291   34156   25863   21137   6780   115814   100227   1998   16177   3263   32584   29564   20743   6594   108924   92747   1999   11862   2563   31574   21747   8499   7846   94091   82229   10982   11689   99673   83787   2000   16978   8398   32726   25619   13350   5066   101957   83159   2000   11697   2866   23311   23701   19129   5081   85786   74089   2000   16936   8398   32726   25619									
1976   51901   10140   43435   16548   12538   134562   82661   1977   36149   9782   37064   17496   20745   121236   85087   1978   43522   12915   34246   25974   23333   5619   145609   102087   1979   18271   43876   39651   27532   24111   3800   157241   138970   1980   35787   49593   59290   29433   17579   3120   194802   159015   1981   35550   65330   61150   37054   15048   2384   216517   189967   1982   31756   71889   45865   38082   16912   2442   206946   175190   1983   32374   62843   33163   31163   21607   2688   183837   151463   1984   27970   79606   42798   35032   17280   3319   206005   178035   1985   25907   66491   61755   31535   18418   4333   208439   182532   1986   39195   37960   57360   31737   14354   6757   187363   148168   1987   36377   42234   44806   27795   17613   8870   177696   141319   1988   40944   24005   52779   27420   13393   2990   161531   120887   1989   29856   16179   52585   26783   11723   3835   140961   111105   1990   27500   19253   52212   24723   19238   6503   149429   121129   1991   20735   14383   44379   26150   22106   4834   132587   111852   11992   26160   16579   41681   29968   11666   4196   130250   104090   1993   24486   23905   47284   29995   13160   3664   142495   118009   1994   22181   16151   49136   30390   14942   3782   136582   114401   1995   19538   13928   41444   27270   19104   3996   125280   105742   1996   14423   11251   34761   31117   19880   5304   116736   102313   1997   15587   12291   34156   25863   21137   6780   115814   100227   1998   16177   3263   32584   29564   20747   6780   115814   100227   1999   11862   2563   31574   21747   18499   7846   94091   82229   2000   16679   2866   23311   23701   19129   5081   85786   74889   2002   15885   4562   33585   22969   10982   11689   99673   83787   2003   16436   6383   33293   24635   8600   8484   97831   13957   15587   2291   34156   25863   21137   6780   115814   100227   13090   11663   25696   24619   7175   8391   97345   77545   200									
1977   36149   9782   37064   17496   20745   121236   85087   1978   43522   12915   34246   25974   23333   5619   145609   102087   1979   18271   43876   39651   27532   24111   3800   157241   138970   1980   35787   49593   59290   29433   17579   3120   194802   159015   1981   35550   65330   61150   37054   15048   2384   216517   180967   1982   31756   71889   45865   38082   16912   2442   206946   175190   1983   32374   62843   33163   31163   21607   2688   183837   151463   1984   27970   79606   42798   35032   17280   3319   206005   178035   1985   25907   66491   61755   31535   18418   4333   208439   182532   1986   39195   37960   57360   31737   14354   6757   187363   148168   1987   36377   42234   44806   27795   17613   8870   177696   141319   1988   40944   24005   52779   27420   13393   2990   161531   120587   1989   29856   16179   52585   26783   11723   3835   140961   111105   1990   27500   19253   52212   24723   19238   6503   149429   121929   1991   20735   14383   44379   26150   22106   4834   132587   111852   1992   26160   16579   41681   29968   11666   4196   130259   104090   1993   24486   23905   47284   29995   13160   3664   142495   118009   1994   22181   16151   49136   30390   14942   3782   136582   114401   1995   19538   13928   41444   27270   19104   3996   125380   105742   1998   16177   3263   32584   29564   20743   6594   108924   92747   1999   1862   2563   31574   21747   18499   7846   94091   82229   2000   1697   2866   23311   23701   19129   5081   85786   74089   2002   15885   4562   33585   22969   10982   11689   99673   83787   2002   15885   4562   33585   22969   10982   11689   99673   83787   2002   15885   4562   33585   22969   10982   11689   99673   83785   2004   18306   8573   29488   24370   8107   9176   8900   11663   25666   24619   7175   8391   97345   77545   2006   15377   10856   30152   19061   5798   5779   87023   71646   2007   13380   12402   41090   19142   4266   6188   99673   83785   2004   18366   246									
1978									
1979							5610		
1980									
1981   35550   65330   61150   37054   15048   2384   216517   180967   1982   31756   71889   45865   38082   16912   2442   206946   175190   1983   32374   62843   33163   31163   21607   2688   183837   151463   1984   27970   79606   42798   35032   17280   3319   206005   178035   1985   25907   66491   61755   31535   18418   4333   208439   182532   1986   39195   37960   57360   31737   14354   6757   187363   148168   1987   36377   42234   44806   27795   17613   8870   177696   141319   1988   40944   24005   52779   27420   13393   2990   161531   120587   1989   29856   16179   52585   26783   11723   3835   140961   111105   1990   27500   19253   52212   24723   19238   6503   149429   121929   1991   20735   14383   44379   26150   22106   4834   132587   111852   1992   26160   16579   41681   29968   11666   4196   130250   104090   1993   24486   23905   47284   29995   13160   3664   142495   118009   1994   22181   16151   49136   30390   14942   3782   136582   114401   1995   19538   13928   41444   27270   19104   3996   125280   105742   1996   14423   11251   34761   31117   19880   5304   116736   102313   1997   15587   12291   34156   25863   21137   6780   115814   100227   1998   16177   3263   32584   29564   20743   6594   108924   92747   1999   11862   2563   31574   21747   18499   7846   94091   82229   2000   11697   2866   23311   23701   19129   5081   85786   74089   2001   16798   8398   32726   25619   13350   5066   101957   85159   2002   15885   4562   33585   22969   10982   11689   99673   83787   2003   16436   6383   33293   24635   8600   8484   97831   81395   2004   18306   8573   29488   24370   8107   9176   98020   79714   2005   19800   11663   25696   24619   7175   8391   97345   77545   2006   15377   10856   30152   19061   5798   5779   87023   71646   2007   13380   12402   41090   19142   4266   6188   94649   83088   2008   13636   9409   45210   20858   4928   7423   101464   87828   2009   11963   7226   36212   20838   4785   6716   87740									
1983   32374   62843   33163   31163   21607   2688   183837   151463   1984   27970   79606   42798   35032   17280   3319   206005   178035   1985   25907   66491   61755   31535   18418   4333   208439   182532   1986   39195   37960   57360   31737   14354   6757   187363   148168   1987   36377   42234   44806   27795   17613   8870   177696   141319   1988   40944   24005   52779   27420   13393   2990   161531   120587   1989   29856   16179   52585   26783   11723   3835   140961   111105   1990   27500   19253   52212   24723   19238   6503   149429   121929   1991   20735   14383   44379   26150   22106   4834   132587   111852   1992   26160   16579   41681   29968   11666   4196   130250   104090   1993   24486   23905   47284   29995   13160   3664   142495   118009   1994   22181   16151   49136   30390   14942   3782   136582   114401   1995   19538   13928   41444   27270   19104   3396   125280   105742   1996   14423   11251   34761   31117   19880   5304   116736   102313   1997   15587   12291   34156   25863   21137   6780   115814   100227   1998   16177   3263   32584   29564   20743   6594   108924   92747   1999   11862   2563   31574   21747   18499   7846   94091   82229   2000   11697   2866   23311   23701   19129   5081   85786   74089   2001   16978   8398   32726   25619   13350   5066   101957   85159   2002   15885   4562   33585   22969   10982   11689   99673   83787   2003   16436   6383   33293   24635   8600   8484   97831   81395   2004   18306   8573   29488   24370   8107   9176   98020   79714   2005   19800   11663   25696   24619   7175   8391   97345   77545   2006   15377   10856   30152   19061   5798   5779   87023   71646   2007   13380   12402   41090   19142   4266   6188   96469   83088   2008   13636   9409   45210   20858   4928   7423   101464   87828   2006   13636   9409   45210   20858   4928   7423   101464   87828   2006   13636   9409   45210   20858   4928   7423   101464   87828   2001   13772   7409   40923   17623   5181   4662   89571   75798						15048			
1984   27970   79606   42798   35032   17280   3319   206005   178035   1985   25907   66491   61755   31535   18418   4333   208439   182532   1986   39195   37960   57360   31737   14354   6757   187363   148168   1987   36377   42234   44806   27795   17613   8870   177696   141319   1988   40944   24005   52779   27420   13393   2990   161531   120587   1989   29856   16179   52585   26783   11723   3835   140961   111105   1990   27500   19253   52212   24723   19238   6503   149429   121929   1991   20735   14383   44379   26150   22106   4834   132587   111852   1992   26160   16579   41681   29968   11666   4196   130250   104090   1993   24486   23905   47284   29995   13160   3664   142495   118009   1994   22181   16151   49136   30390   14942   3782   136582   114401   1995   19538   13928   41444   27270   19104   3996   125280   105742   1996   14423   11251   34761   31117   19880   5304   116736   102313   1997   15587   12291   34156   25863   21137   6780   115814   100227   1998   16177   3263   32584   29564   20743   6594   108924   92747   1999   11862   2563   31574   21747   18499   7846   94091   82229   2000   16679   2866   23311   23701   19129   5081   85786   74089   2001   16798   8398   32726   25619   13350   5066   101957   85159   2002   15885   4562   33585   22969   10982   11689   99673   83787   2003   16436   6383   33293   24635   8600   8484   97831   81395   2004   18306   8573   29488   24370   8107   9176   98020   79714   2005   19800   11663   25696   24619   7175   8391   97345   77545   2006   13380   12402   41090   19142   4266   6188   9469   83088   2008   13636   9409   45210   20858   4928   7423   101464   87828   2009   11963   7226   36212   20838   4785   6716   87740   75777   2010   3772   7409   40923   17623   5181   4662   89571   75798   2011   8336   5621   37152   13685   6387   9023   80403   71867   2011   8336   5621   37152   13685   6387   9023   80403   71867   2011   13090   4154   19647   9045   2891   6031   54857   41768   2011   130									
1985         25907         66491         61755         31535         18418         4333         208439         182532           1986         39195         37960         57360         31737         14354         6757         187363         148168           1987         36377         42234         44806         27795         17613         8870         177696         141319           1988         40944         24005         52779         27420         13393         2990         161531         120587           1989         29856         16179         52585         26783         11723         3835         140961         111105           1990         27500         19253         52212         24723         19238         6503         149429         121929           1991         20735         14383         44379         26150         22106         4834         132587         111852           1992         26160         16579         41681         29968         11666         4196         130250         10490           1993         24486         23905         47284         29995         13160         3664         142495         118009									
1986   39195   37960   57360   31737   14354   6757   187363   148168   1987   36377   42234   44806   27795   17613   8870   177696   141319   1988   40944   24005   52779   27420   13393   2990   161531   120587   1989   29856   16179   52585   26783   11723   3835   140961   111105   1990   27500   19253   52212   24723   19238   6503   149429   121929   1991   20735   14383   44379   26150   22106   4834   132587   111852   1992   26160   16579   41681   29968   11666   4196   130250   104090   1993   24486   23905   47284   29995   13160   3664   142495   18009   1994   22181   16151   49136   30390   14942   3782   136582   114401   1995   19538   13928   41444   27270   19104   3996   125280   105742   1996   14423   11251   34761   31117   19880   5304   116736   102313   1997   15587   12291   34156   25863   21137   6780   115814   100227   1998   16177   3263   32584   29564   20743   6594   108924   92747   1999   11862   2563   31574   21747   18499   7846   94091   82229   2000   116970   2866   23311   23701   19129   5081   85786   74089   2001   16798   8398   32726   25619   13350   5066   101957   85159   2002   15885   4562   33585   22969   10982   11689   99673   83787   2003   16436   6383   33293   24635   8600   8484   97831   81395   2004   18306   8573   29488   24370   8107   9176   98020   79714   2005   18306   8573   29488   24370   8107   9176   98020   79714   2005   18306   8573   29488   24370   8107   9176   98020   79714   2005   18306   8573   29488   24370   8107   9175   8391   97345   77545   2006   15377   10856   30152   19061   5798   5779   87023   71646   2007   13380   12402   41090   19142   4266   6188   96469   83088   2008   13636   9409   45210   20858   4928   7423   101464   87828   2009   11963   7226   36212   20838   4785   6716   87740   75777   2010   13772   7409   40923   17623   5181   4662   89571   75798   2011   8536   5621   37152   13685   6387   9023   80403   71867   2012   13090   4154   19647   9045   2891   6031   54857   41768   2012   1									
1987         36377         42234         44806         27795         17613         8870         177696         141319           1988         40944         24005         52779         27420         13393         2990         161531         120587           1989         29856         16179         52585         26783         11723         3835         14961         111105           1990         27500         19253         52212         24723         19238         6503         149429         121929           1991         20735         14383         44379         26150         22106         4834         132587         111852           1992         26160         16579         41681         29968         11666         4196         130250         104090           1993         24486         23905         47284         29995         13160         3664         142495         118009           1994         22181         16151         49136         30390         14942         3782         136582         114401           1995         19538         13928         41444         27270         19104         396         125280         105742									
1989         29856         16179         52585         26783         11723         3835         140961         111105           1990         27500         19253         52212         24723         19238         6503         149429         121929           1991         20735         14383         44379         26150         22106         4834         132587         111852           1992         26160         16579         41681         29968         11666         4196         130250         104090           1993         24486         23905         47284         29995         13160         3664         142495         118009           1994         22181         16151         49136         30390         14942         3782         136582         114401           1995         19538         13928         41444         27270         19104         3996         125280         105742           1996         14423         11251         34761         31117         19880         5304         116736         102313           1997         15587         12291         34156         25863         21137         6780         115814         100227									
1990	1988	40944	24005	52779	27420	13393	2990	161531	120587
1991         20735         14383         44379         26150         22106         4834         132587         111852           1992         26160         16579         41681         29968         11666         4196         130250         104090           1993         24486         23905         47284         29995         13160         3664         142495         118009           1994         22181         16151         49136         30390         14942         3782         136582         114401           1995         19538         13928         41444         27270         19104         3996         125280         105742           1996         14423         11251         34761         31117         19880         5304         116736         102313           1997         15587         12291         34156         25863         21137         6780         115814         100227           1998         16177         3263         32584         29564         20743         6594         108924         92747           1999         11862         2563         31574         21747         18499         7846         94091         82229									
1992         26160         16579         41681         29968         11666         4196         130250         104090           1993         24486         23905         47284         29995         13160         3664         142495         118009           1994         22181         16151         49136         30390         14942         3782         136582         114401           1995         19538         13928         41444         27270         19104         3996         125280         105742           1996         14423         11251         34761         31117         19880         5304         116736         102313           1997         15587         12291         34156         25863         21137         6780         115814         100227           1998         16177         3263         32584         29564         20743         6594         108924         92747           1999         11862         2563         31574         21747         18499         7846         94091         82229           2000         11697         2866         23311         23701         19129         5081         85786         74089           <									
1993         24486         23905         47284         29995         13160         3664         142495         118009           1994         22181         16151         49136         30390         14942         3782         136582         114401           1995         19538         13928         41444         27270         19104         3996         125280         105742           1996         14423         11251         34761         31117         19880         5304         116736         102313           1997         15587         12291         34156         25863         21137         6780         115814         100227           1998         16177         3263         32584         29564         20743         6594         108924         92747           1999         11862         2563         31574         21747         18499         7846         94091         82229           2001         16797         2866         23311         23701         19129         5081         85786         74089           2002         15885         4562         33585         22969         10982         11689         99673         83787 <th< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th<>									
1994         22181         16151         49136         30390         14942         3782         136582         114401           1995         19538         13928         41444         27270         19104         3996         125280         105742           1996         14423         11251         34761         31117         19880         5304         116736         102313           1997         15587         12291         34156         25863         21137         6780         115814         100227           1998         16177         3263         32584         29564         20743         6594         108924         92747           1999         11862         2563         31574         21747         18499         7846         94091         82229           2001         16797         2866         23311         23701         19129         5081         85786         74089           2001         16798         8398         32726         25619         13350         5066         101957         85159           2002         15885         4562         33585         22969         10982         11689         99673         83787           2									
1995         19538         13928         41444         27270         19104         3996         125280         105742           1996         14423         11251         34761         31117         19880         5304         116736         102313           1997         15587         12291         34156         25863         21137         6780         115814         100227           1998         16177         3263         32584         29564         20743         6594         108924         92747           1999         11862         2563         31574         21747         18499         7846         94091         82229           2000         11697         2866         23311         23701         19129         5081         85786         74089           2001         16798         8398         32726         25619         13350         5066         101957         85159           2002         15885         4562         33585         22969         10982         11689         99673         83787           2003         16436         6383         33293         24635         8600         8484         97831         81395           2004<									
1997         15587         12291         34156         25863         21137         6780         115814         100227           1998         16177         3263         32584         29564         20743         6594         108924         92747           1999         11862         2563         31574         21747         18499         7846         94091         82229           2000         11697         2866         23311         23701         19129         5081         85786         74089           2001         16798         8398         32726         25619         13350         5066         101957         85159           2002         15885         4562         33585         22969         10982         11689         99673         83787           2003         16436         6383         33293         24635         8600         8484         97831         81395           2004         18306         8573         29488         24370         8107         9176         98020         79714           2005         19800         11663         25696         24619         7175         8391         97345         77545           2006									
1998         16177         3263         32584         29564         20743         6594         108924         92747           1999         11862         2563         31574         21747         18499         7846         94091         82229           2000         11697         2866         23311         23701         19129         5081         85786         74089           2001         16798         8398         32726         25619         13350         5066         101957         85159           2002         15885         4562         33585         22969         10982         11689         99673         83787           2003         16436         6383         33293         24635         8600         8484         97831         81395           2004         18306         8573         29488         24370         8107         9176         98020         79714           2005         19800         11663         25696         24619         7175         8391         97345         77545           2006         15377         10856         30152         19061         5798         5779         87023         71646           2007									
1999         11862         2563         31574         21747         18499         7846         94091         82229           2000         11697         2866         23311         23701         19129         5081         85786         74089           2001         16798         8398         32726         25619         13350         5066         101957         85159           2002         15885         4562         33585         22969         10982         11689         99673         83787           2003         16436         6383         33293         24635         8600         8484         97831         81395           2004         18306         8573         29488         24370         8107         9176         98020         79714           2005         19800         11663         25696         24619         7175         8391         97345         77545           2006         15377         10856         30152         19061         5798         5779         87023         71646           2007         13380         12402         41090         19142         4266         6188         96469         83088           2008									
2000         11697         2866         23311         23701         19129         5081         85786         74089           2001         16798         8398         32726         25619         13350         5066         101957         85159           2002         15885         4562         33585         22969         10982         11689         99673         83787           2003         16436         6383         33293         24635         8600         8484         97831         81395           2004         18306         8573         29488         24370         8107         9176         98020         79714           2005         19800         11663         25696         24619         7175         8391         97345         77545           2006         15377         10856         30152         19061         5798         5779         87023         71646           2007         13380         12402         41090         19142         4266         6188         96469         83088           2008         13636         9409         45210         20858         4928         7423         101464         87828           2009									
2001         16798         8398         32726         25619         13350         5066         101957         85159           2002         15885         4562         33585         22969         10982         11689         99673         83787           2003         16436         6383         33293         24635         8600         8484         97831         81395           2004         18306         8573         29488         24370         8107         9176         98020         79714           2005         19800         11663         25696         24619         7175         8391         97345         77545           2006         15377         10856         30152         19061         5798         5779         87023         71646           2007         13380         12402         41090         19142         4266         6188         96469         83088           2008         13636         9409         45210         20858         4928         7423         101464         87828           2009         11963         7226         36212         20838         4785         6716         87740         75777           2010									
2003         16436         6383         33293         24635         8600         8484         97831         81395           2004         18306         8573         29488         24370         8107         9176         98020         79714           2005         19800         11663         25696         24619         7175         8391         97345         77545           2006         15377         10856         30152         19061         5798         5779         87023         71646           2007         13380         12402         41090         19142         4266         6188         96469         83088           2008         13636         9409         45210         20858         4928         7423         101464         87828           2009         11963         7226         36212         20838         4785         6716         87740         75777           2010         13772         7409         40923         17623         5181         4662         89571         75798           2011         8536         5621         37152         13685         6387         9023         80403         71867           2012		16798	8398	32726	25619	13350	5066		85159
2004         18306         8573         29488         24370         8107         9176         98020         79714           2005         19800         11663         25696         24619         7175         8391         97345         77545           2006         15377         10856         30152         19061         5798         5779         87023         71646           2007         13380         12402         41090         19142         4266         6188         96469         83088           2008         13636         9409         45210         20858         4928         7423         101464         87828           2009         11963         7226         36212         20838         4785         6716         87740         75777           2010         13772         7409         40923         17623         5181         4662         89571         75798           2011         8536         5621         37152         13685         6387         9023         80403         71867           2012         13090         4154         19647         9045         2891         6031         54857         41768									
2005         19800         11663         25696         24619         7175         8391         97345         77545           2006         15377         10856         30152         19061         5798         5779         87023         71646           2007         13380         12402         41090         19142         4266         6188         96469         83088           2008         13636         9409         45210         20858         4928         7423         101464         87828           2009         11963         7226         36212         20838         4785         6716         87740         75777           2010         13772         7409         40923         17623         5181         4662         89571         75798           2011         8536         5621         37152         13685         6387         9023         80403         71867           2012         13090         4154         19647         9045         2891         6031         54857         41768									
2006         15377         10856         30152         19061         5798         5779         87023         71646           2007         13380         12402         41090         19142         4266         6188         96469         83088           2008         13636         9409         45210         20858         4928         7423         101464         87828           2009         11963         7226         36212         20838         4785         6716         87740         75777           2010         13772         7409         40923         17623         5181         4662         89571         75798           2011         8536         5621         37152         13685         6387         9023         80403         71867           2012         13090         4154         19647         9045         2891         6031         54857         41768									
2007         13380         12402         41090         19142         4266         6188         96469         83088           2008         13636         9409         45210         20858         4928         7423         101464         87828           2009         11963         7226         36212         20838         4785         6716         87740         75777           2010         13772         7409         40923         17623         5181         4662         89571         75798           2011         8536         5621         37152         13685         6387         9023         80403         71867           2012         13090         4154         19647         9045         2891         6031         54857         41768									
2008         13636         9409         45210         20858         4928         7423         101464         87828           2009         11963         7226         36212         20838         4785         6716         87740         75777           2010         13772         7409         40923         17623         5181         4662         89571         75798           2011         8536         5621         37152         13685         6387         9023         80403         71867           2012         13090         4154         19647         9045         2891         6031         54857         41768									
2010         13772         7409         40923         17623         5181         4662         89571         75798           2011         8536         5621         37152         13685         6387         9023         80403         71867           2012         13090         4154         19647         9045         2891         6031         54857         41768	2008	13636	9409	45210	20858	4928	7423	101464	87828
2011         8536         5621         37152         13685         6387         9023         80403         71867           2012         13090         4154         19647         9045         2891         6031         54857         41768									
<b>2012</b> 13090 4154 19647 9045 2891 6031 <b>54857 41768</b>									

 Table 7.3.19.3
 Sardine in Divisions VIIIc and IXa. Summary of stock assessment.

Year	Recruitment	Biomass 1+	Landings	Mean F
	Age 0	Tonnes	Tonnes	Ages 2-5
	thousands	tonnes	tonnes	
1978	23313500	294134	146000	0.544
1979	26550000	343568	157000	0.51
1980	30285900	450693	195000	0.471
1981	18960200	556295	217000	0.444
1982	10642300	571954	207000	0.417
1983	48373200	487789	184000	0.396
1984	15330800	655710	206000	0.379
1985	14560900	712052	208000	0.315
1986	12031500	622478	187000	0.332
1987	24643900	543282	178000	0.359
1988	13625600	532279	162000	0.353
1989	13067400	536293	141000	0.293
1990	13450900	492039	149000	0.359
1991	36815500	484998	133000	0.318
1992	26263000	774800	130000	0.233
1993	11628100	916842	142000	0.243
1994	9952300	822745	137000	0.209
1995	7193820	830272	125000	0.203
1996	11217800	555005	117000	0.268
1997	6660780	483536	116000	0.343
1998	8735370	392693	109000	0.396
1999	7115880	355411	94000	0.375
2000	22021700	295942	86000	0.329
2001	13111700	433069	102000	0.319
2002	7163760	485050	100000	0.269
2003	5425150	431469	98000	0.261
2004	23600100	407352	98000	0.289
2005	8461540	467955	97000	0.284
2006	2808970	509794	87000	0.245
2007	4500140	458709	96000	0.259
2008	5536170	339881	101000	0.391
2009	6511940	256338	87000	0.449
2010	3186420	205491	90000	0.604
2011	3159520	178372	80001	0.683
2012	3953520	131407	55000	0.515
2013	6247200	149172	46000	0.437
2014	4383901*	188000		
Average	13797037	444107	129528	0.364

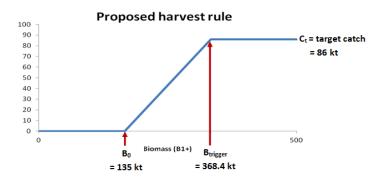
<sup>\*</sup> Geometric mean (2009–2013).

*ICES Advice 2014, Book 7* 7

### Annex 7.3.19 Proposed management plan

In the document referred to in the plan (Plan de gestion sardina), the harvest rule is stated as:

The harvest rule is illustrated in the figure below:



The harvest rule sets a TAC directly according to an estimate of the biomass of fish aged 1 and older  $(B_{1+})$ . The TAC is fixed at Ct when  $B_{1+}$  is above  $B_{trigger}$ , and reduced if it is below.

ICES has not defined a  $B_{lim}$  for this stock, but for the purposes of the formulation of this plan the value is taken as  $B_{loss}$  in 2000 according to the 2012 assessment.

8

ICES Advice 2014, Book 7

<sup>&</sup>lt;sup>1</sup> For the purpose of this evaluation the  $B_{1+}$  in the beginning of the intermediate year is used.