

7.3.22 Horse mackerel (*Trachurus trachurus*) in Division 9.a (Atlantic Iberian waters)

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2017 should be no more than 73 349 tonnes. All catches are assumed to be landed.

Stock development over time

Fishing mortality (F) has been below F_{MSY} over the whole time-series, and the spawning-stock biomass (SSB) has been relatively stable over the time-series and above $MSY B_{trigger}$. SSB has increased in the last two years resulting from the strong recruitments in 2011 and 2012.

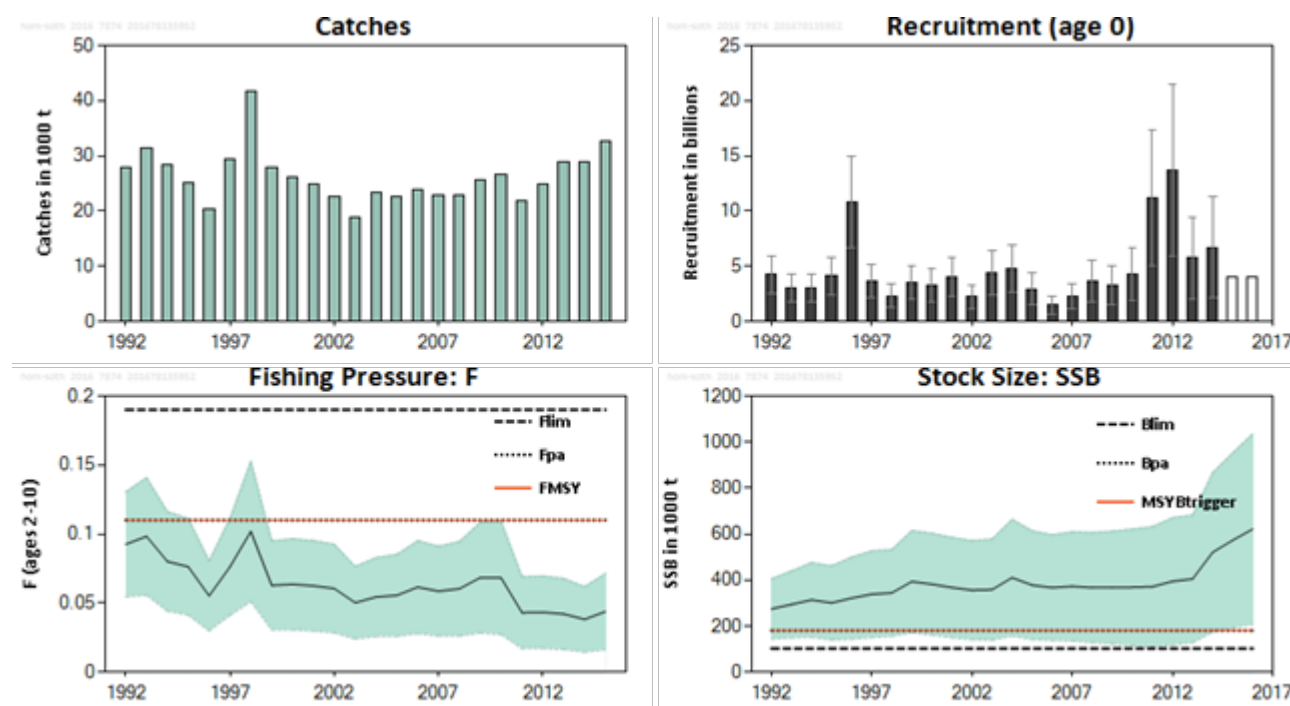


Figure 7.3.22.1 Horse mackerel in Division 9.a. Summary of stock assessment (weights in thousand tonnes) with 95% confidence intervals included for recruitment, fishing mortality (F), and spawning-stock biomass (SSB). Predicted values are not shaded.

Stock and exploitation status

Table 7.3.22.1 Horse mackerel in Division 9.a. State of the stock and fishery relative to reference points.

| | | Fishing pressure | | | | Stock size | | | |
|---------------------------|----------------------|------------------|------|------|-----------------------|----------------------|------|------|------------------------------|
| | | 2013 | 2014 | 2015 | | 2014 | 2015 | 2016 | |
| Maximum sustainable yield | F_{MSY} | ✓ | ✓ | ✓ | Below | MSY | ✓ | ✓ | ✓ Above trigger |
| Precautionary approach | F_{pa} , F_{lim} | ✓ | ✓ | ✓ | Harvested sustainably | B_{pa} , B_{lim} | ✓ | ✓ | ✓ Full reproductive capacity |
| Management plan | F_{MGT} | - | - | - | Not applicable | SSB_{MGT} | - | - | - Not applicable |

Catch options

Table 7.3.22.2 Horse mackerel in Division 9.a. The basis for the catch options.

| Variable | Value | Source | Notes |
|--------------------------|--------------|-------------|---|
| F ages 2-10 (2016) | 0.044 | ICES, 2016a | F ₂₀₁₅ |
| SSB (2016) | 621563 t | ICES, 2016a | Deterministic short-term forecast |
| R _{age0} (2016) | 4060 million | ICES, 2016a | Geometric mean (1992–2014) |
| R _{age0} (2017) | 4060 million | ICES, 2016a | Geometric mean (1992–2014) |
| Total catch (2016) | 31595 t | ICES, 2016a | Catch corresponding to the assumed F for 2016 |
| Landings (2016) | 31595 t | ICES, 2016a | |
| Discards (2016) | 0 t | ICES, 2016a | Negligible |

Table 7.3.22.3 Horse mackerel in Division 9.a. The catch options. Weights in tonnes.

| Rationale | Catches <i>T. trachurus</i> (2017) | Basis | F (2017) | SSB (2017)* | SSB (2018) | %SSB change** | % Catch change*** |
|---------------|------------------------------------|---|----------|-------------|------------|---------------|-------------------|
| MSY approach | 73349 | F _{MSY} | 0.11 | 640862 | 605274 | -6 | 124 |
| Zero catch | 0 | F ₂₀₁₇ = 0 | 0 | 646156 | 678351 | 5 | -100 |
| Other options | 30237 | F ₂₀₁₆ | 0.044 | 644033 | 648084 | 1 | -8 |
| | 36139 | F ₂₀₁₆ × 1.2 | 0.053 | 643609 | 642199 | 0 | 10 |
| | 47798 | F ₂₀₁₆ × 1.6 | 0.070 | 642763 | 630596 | -2 | 46 |
| | 59269 | F ₂₀₁₆ × 2.0 | 0.088 | 641917 | 619209 | -4 | 81 |
| | 73349 | F _{pa} | 0.11 | 640862 | 605274 | -6 | 124 |
| | 121743 | F _{lim} | 0.19 | 637078 | 557731 | -12 | 272 |
| | 535901 | SSB ₂₀₁₈ =MSY B _{trigger} | 1.29 | 586638 | 181000 | -69 | 1538 |
| | 535901 | SSB ₂₀₁₈ =B _{pa} | 1.29 | 586638 | 181000 | -69 | 1538 |
| | 638528 | SSB ₂₀₁₈ =B _{lim} | 1.86 | 562146 | 103000 | -82 | 1851 |

*For this stock, the SSB is determined at spawning time (assumed to be at the end of January) and is influenced by fisheries before spawning.

**SSB 2018 relative to SSB 2017.

***Catches 2017 relative to ICES estimates of catches in 2015 (32 723 t).

Basis of the advice

Table 7.3.22.4 Horse mackerel in Division 9.a. The basis of the advice.

| | |
|-----------------|--|
| Advice basis | MSY approach |
| Management plan | There is no management plan for horse mackerel in this area. A management plan is being developed by initiative of the Pelagic Advisory Council (PELAC). |

Quality of the assessment

There is a retrospective pattern. This is most likely due to a change in the selection pattern to increased selectivity of young ages and decreased selectivity of older ages in recent years, as a result of the relative increase of the contribution of purse seiners catches to the total catches. Confidence intervals for SSB estimates (mean coefficient of variation of 30%) are wide, indicating high uncertainty. The retrospective pattern shows historic SSB has been relatively stable but has been consistently underestimated. Although confidence intervals on F are also wide, they show F is below F_{MSY} . This stock continues to show a relatively stable recruitment with occasional large peaks. There are indications of good recruitment in 2015, but given the uncertainty of the last year's estimate (coefficient of variation of 40%), the geometric mean is used for short-term forecasts.

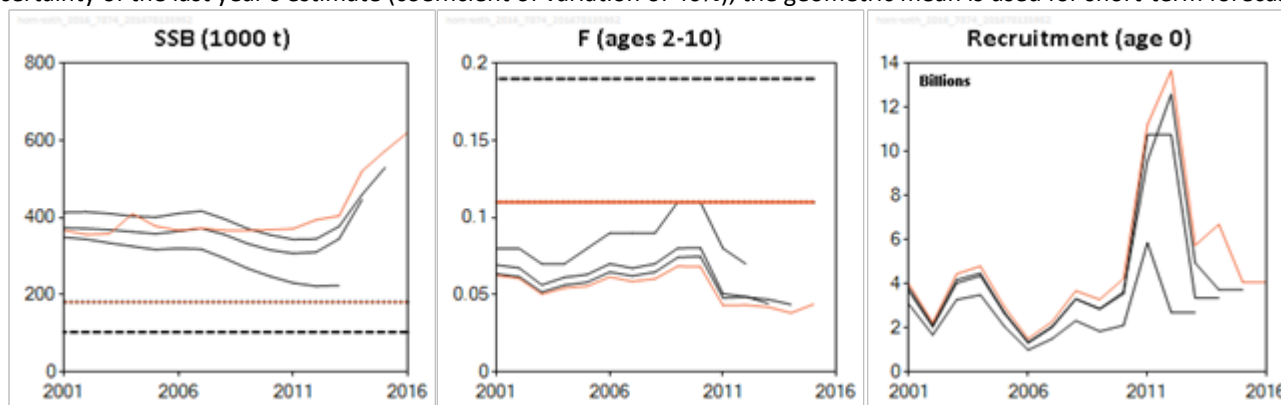


Figure 7.3.22.2 Horse mackerel in Division 9.a. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

The advice pertains to *T. trachurus*, while the total allowable catch (TAC) is set for all *Trachurus* species, including *T. picturatus* (blue jack mackerel) and *T. mediterraneus* (Mediterranean horse mackerel). Part of the catches consist of other horse mackerel species than *T. trachurus*, and this percentage can vary from year to year. Preliminary estimates indicate that in 2012-2014 less than 10% of the catch consisted of the other species.

Currently, fishing mortality is well below F_{MSY} . The basis for the advice is the MSY approach, and this implies increasing current fishing mortality by a factor of 2.5 and gives estimated catches in 2017 amounting to 73 349 tonnes. Sporadic events of strong recruitment have been observed in this species, such as in 1996 and 2011/2012 for this stock, and can result in rapid periodic increases in SSB. If managers wish to maximize catch stability following such recruitment events, it may be preferable not to increase F to F_{MSY} immediately, spreading the yield from the two recent large year classes over a longer period than would be the case when fishing at F_{MSY} , given the long lifespan and the low natural mortality for this species. The analysis carried out with stochastic long-term simulations estimated an equilibrium catch at F_{MSY} of 44 000 tonnes.

ICES information on current discarding indicates it is negligible.

The traditional fishery across several fleets has for a long time targeted juvenile age classes. This exploitation pattern combined with a low exploitation rate does not seem to have been detrimental to the dynamics of the stock.

Reference points

Table 7.3.22.5 Horse mackerel in Division 9.a. Reference points, values, and their technical basis. Weights in thousand tonnes.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|---------------------------|--------------|--|-------------|
| MSY approach | MSY B_{trigger} | 181 | Lower bound (average) of 90% confidence intervals of the SSB time-series in a stock being exploited well below F_{MSY} . | ICES, 2016a |
| | F_{MSY} | 0.11 | Constrained by F_{pa} ($F_{\text{MSY}}=F_{\text{pa}}$). Stochastic long-term simulations using a segmented regression with breakpoint at MSY B_{trigger} . | ICES, 2016a |
| Precautionary approach | B_{lim} | 103 | Derived from B_{pa} and assessment uncertainty ($B_{\text{lim}}=B_{\text{pa}} \times e^{-1.645\sigma}$; $\sigma = 0.34$) | ICES, 2016a |
| | B_{pa} | 181 | MSY B_{trigger} | ICES, 2016a |
| | F_{lim} | 0.19 | Equilibrium scenarios with stochastic recruitment: F value corresponding to 50% probability of ($\text{SSB} < B_{\text{lim}}$). | ICES, 2016a |
| | F_{pa} | 0.11 | Derived from F_{lim} and assessment uncertainty ($F_{\text{pa}}=F_{\text{lim}} \times e^{-1.645\sigma}$; $\sigma = 0.32$) | ICES, 2016a |
| Management plan | SSB_{MGT} | Not defined. | | |
| | F_{MGT} | Not defined. | | |

Basis of the assessment

Table 7.3.22.6 Horse mackerel in Division 9.a. The basis of the assessment.

| | |
|--------------------------|--|
| ICES stock data category | 1 (ICES, 2016b) |
| Assessment type | Analytical assessment (AMISH model) that uses catches in the model and in the forecast |
| Input data | Commercial catches (international landings, ages, and length frequencies from catch sampling). One survey index (combined PT and SP-IBTS-Q4), annual maturity data from commercial catch and surveys |
| Discards and bycatch | Not included and are considered negligible |
| Indicators | None |
| Other information | This stock was benchmarked in 2011 (WKBENCH ; ICES, 2011) and is planned to be benchmarked in 2017. |
| Working group | Working Group Southern Horse Mackerel, Anchovy and Sardine (WGHANSA) |

Information from stakeholders

There is no available information.

History of advice, catch and management

Table 7.3.22.7 Horse mackerel in Division 9.a. History of ICES advice, the agreed TAC, and ICES estimates of landings. Weights in thousand tonnes.

| Year | ICES advice | Predicted catch corresp. to advice* | Agreed TAC** <i>Trachurus spp.</i> | ICES catches <i>T.</i> <i>trachurus</i> * |
|------|--|--|---------------------------------------|--|
| 1987 | Not assessed | - | 72.5*** | 55^ |
| 1988 | Mesh size increase | - | 82.0*** | 56^ |
| 1989 | No increase in F; TAC | 72.5 | 73.0*** | 56^ |
| 1990 | F at $F_{0.1}$; TAC | 38 | 55.0^ | 49^ |
| 1991 | Precautionary TAC | 61 | 73.0^ | 22 |
| 1992 | If required, precautionary TAC | 61 | 73.0^ | 26 |
| 1993 | No advice | - | 73.0^ | 32 |
| 1994 | <i>Status quo</i> prediction | 55^^^ | 73.0^ | 26 |
| 1995 | No long-term gains in increasing F | 63^^^ | 73.0^ | 25 |
| 1996 | No long-term gains in increasing F | 60^^^ | 73.0^ | 23 |
| 1997 | No advice | - | 73.0^ | 28 |
| 1998 | F should not exceed the F(94–96) | 59 | 73.0^ | 42 |
| 1999 | No increase in F | 58 | 73.0^ | 28 |
| 2000 | $F < F_{pa}$ | < 59 | 68.0^ | 27 |
| 2001 | $F < F_{pa}$ | < 54 | 68.0^ | 25 |
| 2002 | $F < 0.113$ | < 34 | 57.5^ | 24 |
| 2003 | Average of last 3 years | < 49 | 55.2^ | 20 |
| 2004 | Should not exceed the recent average (2000–2002) | < 47 | 55.0^ | 24 |
| 2005 | Should not exceed the recent average (2000–2002) | < 25 | 55.0^ | 23 |
| 2006 | Should not exceed the recent average (2000–2004, excluding 2003) | < 25 | 55.0^ | 24 |
| 2007 | Same advice as last year | < 25 | 55.0^ | 23 |
| 2008 | Same advice as last year | < 25 | 57.8^ | 22 |
| 2009 | Same advice as last year | < 25 | 57.8^ | 26 |
| 2010 | Same advice as last year | < 25 | 31.1^^ | 27 |
| 2011 | Same advice as last year | < 25 | 29.585^^ | 22 |
| 2012 | No increase in F | < 30.8 | 30.800^^ | 25 |
| 2013 | No increase in F | < 26 | 30.000^^ | 29 |
| 2014 | MSY approach | < 35.000 | 35.000^^ | 29.205 |
| 2015 | MSY approach | < 71.824 | 59.500^^ | 32.723 |
| 2016 | MSY approach | ≤ 68.583 | 68.583^^ | |
| 2017 | MSY approach | ≤ 73.349 | | |

* Only *T. trachurus* L.** All *Trachurus* spp.

*** Division 8.c, subareas 9 and 10 and CECF Division 34.1.1 (EU waters only).

^ Division 8.c and Subarea 9.

^^ Subarea 9.

^^^ Catch at *status quo* F.

History of catch and landings

Table 7.3.22.8 Horse mackerel in Division 9.a. Catch distribution by fleet in 2015 as estimated by ICES.

| Total catch (2015) | | Landings | | | Discards |
|--------------------|-----------|-----------------|----------------|--|------------|
| 32.723 kt | 40% trawl | 51% purse-seine | 9% other gears | | Negligible |
| | 32.723 kt | | | | |

Table 7.3.22.9 Horse mackerel in Division 9.a. History of ICES estimated catch (thousand tonnes).

| Year | Catch <i>T. trachurus</i> | Total catch <i>T. trachurus</i> including Spanish catches in ICES Subdivision 9.a South* |
|------|---------------------------|--|
| 1992 | 27.858 | |
| 1993 | 31.521 | |
| 1994 | 28.441 | |
| 1995 | 25.147 | |
| 1996 | 20.400 | |
| 1997 | 29.491 | |
| 1998 | 41.564 | |
| 1999 | 27.733 | |
| 2000 | 26.160 | |
| 2001 | 24.910 | |
| 2002 | 22.506 | 23.663 |
| 2003 | 18.887 | 19.566 |
| 2004 | 23.252 | 23.577 |
| 2005 | 22.695 | 23.111 |
| 2006 | 23.902 | 24.558 |
| 2007 | 22.790 | 23.424 |
| 2008 | 22.993 | 23.593 |
| 2009 | 25.737 | 26.497 |
| 2010 | 26.556 | 27.216 |
| 2011 | 21.875 | 22.575 |
| 2012 | 24.868 | 25.316 |
| 2013 | 28.993 | 29.382 |
| 2014 | 29.017 | 29.205 |
| 2015 | 32.723 | 33.178 |

* Spanish catches from Subdivision 9.a South are included from 2002 onwards. These catches will not be included in the assessment until the rest of the time-series is completed.

Summary of the assessment

Table 7.3.22.10 Horse mackerel in Division 9.a. Assessment summary with weights (in tonnes). Recruitment in thousands. High and low refer to 95% confidence intervals.

| Year | Recruitment (Age 0) | High | Low | SSB** | High | Low | Catches | Mean F (Ages 2–10) | High | Low |
|---------|------------------------|----------|---------|--------|---------|--------|---------|-----------------------|--------|--------|
| 1992 | 4242400 | 5937312 | 2547488 | 274236 | 405128 | 143344 | 27858 | 0.0925 | 0.1305 | 0.0545 |
| 1993 | 3046190 | 4329978 | 1762402 | 293962 | 439044 | 148880 | 31521 | 0.0983 | 0.1409 | 0.0557 |
| 1994 | 3032940 | 4329988 | 1735892 | 313515 | 475397 | 151632 | 28441 | 0.0801 | 0.1161 | 0.0441 |
| 1995 | 4096250 | 5816372 | 2376128 | 300437 | 461575 | 139299 | 25147 | 0.0763 | 0.1112 | 0.0414 |
| 1996 | 10849900 | 15012220 | 6687580 | 321255 | 499176 | 143334 | 20400 | 0.0552 | 0.0805 | 0.0299 |
| 1997 | 3662040 | 5194312 | 2129768 | 338410 | 526317 | 150503 | 29491 | 0.0763 | 0.1113 | 0.0412 |
| 1998 | 2322380 | 3359566 | 1285194 | 343720 | 532144 | 155297 | 41564 | 0.1018 | 0.1526 | 0.0511 |
| 1999 | 3563350 | 5096596 | 2030104 | 393136 | 614725 | 171548 | 27733 | 0.0628 | 0.0949 | 0.0306 |
| 2000 | 3280070 | 4735608 | 1824532 | 382014 | 603113 | 160915 | 26160 | 0.0636 | 0.0965 | 0.0307 |
| 2001 | 3984280 | 5754548 | 2214012 | 367265 | 585028 | 149503 | 24910 | 0.0624 | 0.0951 | 0.0297 |
| 2002 | 2237320 | 3317560 | 1157080 | 356018 | 570774 | 141262 | 22506 | 0.0605 | 0.0925 | 0.0285 |
| 2003 | 4442450 | 6452850 | 2432050 | 358238 | 577711 | 138764 | 18887 | 0.0502 | 0.0765 | 0.0240 |
| 2004 | 4795750 | 6973530 | 2617970 | 410088 | 663478 | 156698 | 23252 | 0.0543 | 0.0829 | 0.0258 |
| 2005 | 2953570 | 4370902 | 1536238 | 377794 | 613507 | 142080 | 22695 | 0.0555 | 0.0852 | 0.0259 |
| 2006 | 1498030 | 2295772 | 700288 | 366936 | 596357 | 137514 | 23902 | 0.0615 | 0.0952 | 0.0279 |
| 2007 | 2271200 | 3443918 | 1098482 | 372443 | 609310 | 135576 | 22790 | 0.0586 | 0.0911 | 0.0261 |
| 2008 | 3678580 | 5566932 | 1790228 | 367049 | 606129 | 127969 | 22993 | 0.0603 | 0.0945 | 0.0262 |
| 2009 | 3279450 | 5063326 | 1495574 | 366739 | 611996 | 121483 | 25737 | 0.0684 | 0.1085 | 0.0284 |
| 2010 | 4230450 | 6613070 | 1847830 | 368264 | 620969 | 115559 | 26556 | 0.0682 | 0.1092 | 0.0272 |
| 2011 | 11210800 | 17383840 | 5037760 | 371066 | 631605 | 110527 | 21875 | 0.0430 | 0.0690 | 0.0170 |
| 2012 | 13683100 | 21442480 | 5923720 | 394300 | 670908 | 117692 | 24868 | 0.0433 | 0.0695 | 0.0171 |
| 2013 | 5741180 | 9399300 | 2083060 | 404559 | 681854 | 127265 | 28993 | 0.0420 | 0.0677 | 0.0164 |
| 2014 | 6690770 | 11284450 | 2097090 | 520590 | 866917 | 174263 | 29017 | 0.0382 | 0.0618 | 0.0145 |
| 2015 | 4060480* | | | 572955 | 953048 | 192863 | 32723 | 0.0438 | 0.0714 | 0.0162 |
| 2016 | 4060480* | | | 621563 | 1035773 | 207353 | | | | |
| Average | 4730107 | 7094540 | 2365673 | 382262 | 618079 | 146445 | 26251 | 0.0632 | 0.0960 | 0.0304 |

*Geometric mean (1992–2014)

** SSB is determined at spawning time

Sources and references

ICES. 2011. Report of the Benchmark Workshop on Roundfish and Pelagic Stocks (WKBENCH 2011), 24–31 January 2011, Lisbon, Portugal. ICES CM 2011/ACOM:38. 418 pp.

ICES. 2016a. Working Group on Southern Horse Mackerel, Anchovy and Sardine (WGHANSA), 24–29 June 2016, Lorient, France. ICES CM 2016/ACOM:17.

ICES. 2016b. General context of ICES advice. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, Section 1.2.