## Horse mackerel (*Trachurus trachurus*) in divisions 3.a, 4.b–c, and 7.d (Skagerrak and Kattegat, southern and central North Sea, eastern English Channel)

### ICES stock advice

ICES advises that when the precautionary approach is applied, catches should be no more than 17 517 tonnes in each of the years 2018 and 2019.

### Stock development over time

The combined CGFS–IBTS (Channel Groundfish Survey–North Sea International Bottom Trawl Survey) survey index indicates that the stock continues to be at a low level, although some signs of recovery are observed.
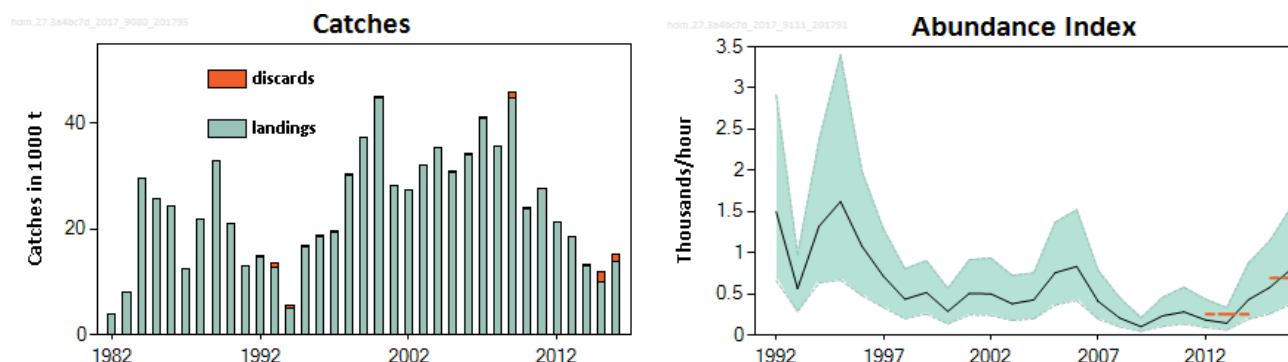


**Figure 1**    Horse mackerel in divisions 3.a, 4.b–c, and 7.d. Left: Catches in quarters 1 and 2 from divisions 3.a and 4.a, and in all quarters from divisions 4.b–c and 7.d. Discard estimates are only available for some years. Right: Index of abundance of fish > 20 cm length in the stock; data obtained from a combination of the IBTS and CGFS surveys in the North Sea (divisions 4.b–c, Q3) and eastern English Channel (Division 7.d, Q4), respectively. Confidence intervals (95%) are included.

### Stock and exploitation status

**Table 1**    Horse mackerel in divisions 3.a, 4.b–c, and 7.d. State of the stock and fishery relative to reference points. The status evaluation is based on reference point proxies (ICES, 2017a).

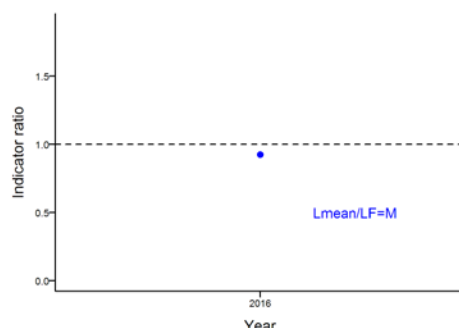| | | Fishing pressure | | | | | Stock size | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2014 | 2015 | 2016 | | | 2014 | 2015 | 2016 | |
| Maximum Sustainable Yield | $F_{MSY\ proxy}$ | ? | ? | ❌ | Above | MSY $B_{Trigger}$ | ? | ? | ? | Undefined |
| Precautionary Approach | $F_{pa}$, $F_{lim}$ | ? | ? | ? | Undefined | $B_{pa}$, $B_{lim}$ | ? | ? | ? | Undefined |
| Management plan | $F_{MGT}$ | — | — | — | Not applicable | $B_{MGT}$ | — | — | — | Not applicable |
| Qualitative evaluation | - | | ? | ? | ? | Unknown | - | ↗ | ↗ | ↗ | Increasing |

**Figure 2**    Horse mackerel in divisions 3.a, 4.b–c, and 7.d. The index ratio $L_{mean}/L_{F=M}$ from the length-based indicator (LBI; ICES, 2017b) method is used for the evaluation of the exploitation status. The exploitation status is above the $F_{MSY}$ proxy when the index ratio value is less than 1.

## Catch options

The ICES framework for category 3 stocks was applied (ICES, 2012). The index of stock abundance is derived from the combination of two surveys: the Channel Groundfish Survey (CGFS) in September–October and the North Sea International Bottom Trawl Survey (NS-IBTS) in July–September, and it is used as the index of stock development over time. The advice is based on a comparison of the two latest index values (index A) with the three preceding values (index B), multiplied by the recent advised catch.

The index is estimated to have increased by more than 20% and thus the uncertainty cap was applied.

The precautionary buffer was last applied in 2014. Fishing mortality is above the $F_{MSY}$ proxy (as indicated by a length-based analysis), and stock size relative to reference points is unknown. Therefore, the precautionary buffer was applied to the advice.

**Table 2**    Horse mackerel in divisions 3.a, 4.b–c, and 7.d. The basis for the catch options.

| Index A (2015, 2016) | | 692 ind. h⁻¹ |
|---|---|---|
| Index B (2012, 2013, 2014) | | 254 ind. h⁻¹ |
| Ratio (A/B) | | 2.7 |
| Uncertainty cap | Applied | 1.2 |
| Precautionary buffer | Applied | 0.8 |
| Advised catch for 2017 | | 18247 tonnes |
| Catch advice* | | 17517 tonnes |
| Discard rate (average 2015–2016) | | 13.35% |
| Landings corresponding to the catch advice** | | 15179 tonnes |

The values in the table are rounded. Calculations were done with unrounded inputs and computed values may not match exactly when calculated using the rounded values in the table.
\* [Advised catch for 2017] × [uncertainty cap] × [precautionary buffer].
\*\* [Catch advice] × [1 − discard rate].

## Basis of the advice

**Table 3**    Horse mackerel in divisions 3.a, 4.b–c, and 7.d. The basis of the advice.

| | |
|---|---|
| Advice basis | Precautionary approach. |
| Management plan | There is no management plan for horse mackerel in this area. ICES evaluated a proposed harvest control rule for a multi-annual plan for horse mackerel in the North Sea (ICES, 2014). None of the options were considered as being in accordance with the precautionary approach. |

**Quality of the assessment**

In 2017 this stock was benchmarked (ICES, 2017c), and the information of the NS-IBTS Q3 and the CGFS Q4 surveys was combined with a statistical model, producing a joint abundance index. As a consequence the stock is now in category 3, and the index is therefore used to provide catch advice (ICES, 2012).

In 2015, the RV "Gwen Drez" was replaced by the RV "Thalassa" to carry out the CGFS survey. In 2014 an intercalibration process was conducted to quantify the differences in catchability for a large number of species. ICES reviewed this intercalibration exercise and considered the results to be acceptable for this stock.

**Issues relevant for the advice**

Discarding in the target pelagic fisheries is considered negligible. New information in 2015 from bottom-trawl fisheries not directed at horse mackerel indicated a discard rate of 16.7% for the stock as a whole. This has continued in 2016, with a discard rate close to 10%. Still, discard information is considered to be incomplete, and discard numbers from earlier years have not been submitted to ICES. However, information from national discard reports for the non-directed bottom-trawl fisheries indicates a similar level of discarding occurring in earlier years.

Since 2013, signals of better recruitment have been observed in survey indices and fishery catch-at-age data, especially in Division 7.d. The main focus of the fisheries in this area in 2015 and 2016 has been on the smaller fish (ages 1 and 2); this is expected to continue in 2017. With this pattern of exploitation, mostly immature individuals are caught, which might hinder the recovery of the stock by removing an important portion of the recent year classes before they can enter the spawning stock.

**Reference points**

Table 4    North Sea horse mackerel in divisions 3.a, 4.b–c, and 7.d. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|---|---|---|---|---|
| MSY approach | MSY $B_{trigger}$ | Not defined | | |
| | $F_{MSY_{proxy}}$ | 24.7 cm (2016) | Length-based indicator (LBI; ICES 2015). Expected mean length of catch above $L_c$ when F = M, assuming M/K = 1.5. | ICES (2017a) |
| Precautionary approach | $B_{lim}$ | Not defined | | |
| | $B_{pa}$ | Not defined | | |
| | $F_{lim}$ | Not defined | | |
| | $F_{pa}$ | Not defined | | |
| Management plan | $SSB_{mgt}$ | Not defined | | |
| | $F_{mgt}$ | Not defined | | |

**Basis of the assessment**

Table 5    Horse mackerel in divisions 3.a, 4.b–c, and 7.d. Basis of assessment and advice.

| | |
|---|---|
| ICES stock data category | 3 (ICES, 2016). |
| Assessment type | Survey trends based assessment. |
| Input data | Commercial catch, NS-IBTS and CGFS data. |
| Discards and bycatch | Included in the advice (9.95% of the total catch in 2016, 16.7% in 2015). |
| Indicators | Length-based indicators. |
| Other information | This stock has been benchmarked in 2017 (ICES, 2017c). |
| Working group | Working Group on Widely Distributed Stocks (WGWIDE) |

## Information from stakeholders

On behalf of the Pelagic Advisory Council and the EAPO Northern Pelagic Working Group, a research project on genetic composition of horse mackerel stocks was initiated in 2015 with University College Dublin (Ireland). Genetic samples have been taken over the whole distribution area of horse mackerel during the years 2015, 2016, and 2017, with a specific focus on the separation between horse mackerel in the western waters and horse mackerel in the North Sea. It is anticipated that results of the genetic analysis will be available in the first half year of 2018.

Historical catch rates of pelagic freezer-trawlers, based on skippers' diaries, have been compiled. The results were presented to the benchmark in 2017, but further work is necessary to develop an index of stock biomass from these data.

## History of the advice, catch, and management

**Table 6**          Horse mackerel in divisions 3.a, 4.b–c, and 7.d. ICES advice and catch. All weights are in tonnes.

| Year | ICES advice | Predicted catch corresp. to advice | Agreed TAC * | ICES catch ** |
|---|---|---|---|---|
| 1987 | Not assessed | - | 30000 | 12336 |
| 1988 | No advice | - | 50000 | 21806 |
| 1989 | No advice | - | 45000 | 32788 |
| 1990 | No advice | - | 40000 | 21023 |
| 1991 | No advice | - | 45000 | 12913 |
| 1992 | No advice | - | 55000 | 15043 |
| 1993 | No advice | - | 60000 | 13617 |
| 1994 | No advice | - | 60000 | 5629 |
| 1995 | No advice | - | 60000 | 16756 |
| 1996 | No advice | - | 60000 | 18843 |
| 1997 | No advice | - | 60000 | 19540 |
| 1998 | Develop and implement management plan | - | 60000 | 30500 |
| 1999 | Develop and implement management plan | - | 60000 | 37224 |
| 2000 | Develop and implement management plan | - | 51000 | 45133 |
| 2001 | No increase in catch | - | 51000 | 28331 |
| 2002 | No increase in catch from 1982–1997 average | < 18000 | 58000 | 27264 |
| 2003 | No increase in catch from 1982–1997 average | < 18000 | 50000 | 32028 |
| 2004 | No increase in catch from 1982–1997 | < 18000 | 42000 | 35435 |
| 2005 | No increase in catch from 1982–1997 | < 18000 | 43000 | 30911 |
| 2006 | No increase in catch from 1982–1997 | < 18000 | 43000 | 34318 |
| 2007 | No increase in catch from 1982–1997 | < 18000 | 43000 | 41242 |
| 2008 | No increase in catch from 1982–1997 | < 18000 | 39000 | 35704 |
| 2009 | Same advice as last year | < 18000 | 39000 | 46919 |
| 2010 | Same advice as last year | < 18000 | 47000 | 24151 |
| 2011 | No advice | - | 40000 | 27619 |
| 2012 | Reduce catches | - | 44000 | 21378 |
| 2013 | Reduce catches by 20% | < 25500 | 38000 | 18645 |
| 2014 | Same advice as last year | < 25500 | 32000 | 13388 |
| 2015 | Significant reduction in catches | < 15200 | 15200 | 12002 |
| 2016 | Same advice value as in 2015 | ≤ 15200 | 15200 | 15341 |
| 2017 | Precautionary approach | ≤ 18247*** | 18247*** | |
| 2018 | Precautionary approach | ≤ 17517*** | | |
| 2019 | Precautionary approach (same advice as for 2018) | ≤ 17517*** | | |

\* Until 2010 the TAC is for Division 2.a and Subarea 4 (EU waters only). From 2010 onwards the TAC is for divisions 3.a , 4.b–c, and 7.d (EU waters only).
\** ICES Catch includes catches from divisions 4.a and 3.a (quarters 1–2 only).
\*** Total catch advice takes into account information on discarding from non-directed bottom-trawl fisheries, which first became available in 2016.

**History of the catch and landings**

**Table 7**      Horse mackerel in divisions 3.a, 4.b–c, and 7.d. Catch distribution by fleet in 2016 as estimated by ICES.

| Catch (2016) | Landings | | | | Discards |
|---|---|---|---|---|---|
| | Bottom trawl 2.5% | Pelagic trawl 50% | Seine 0.5% | Undefined gears 47% | |
| 15 341 tonnes | | | | | 1 527 tonnes |
| | 13 814 tonnes | | | | |

**Table 8**      Horse mackerel in divisions 3.a, 4.b–c, and 7.d. History of commercial catch and landings; ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes.

| Year | Division 3.a | Division 4.a | Divisions 4.b–c | Division 7.d | Discards | Total |
|---|---|---|---|---|---|---|
| 1982 | 2788* | | - | 1247 | | 4035 |
| 1983 | 4420* | | - | 3600 | | 8020 |
| 1984 | 25893* | | - | 3585 | | 29478 |
| 1985 | - | | 22897 | 2715 | | 26750 |
| 1986 | - | | 19496 | 4756 | | 24648 |
| 1987 | 1138 | | 9477 | 1721 | | 11634 |
| 1988 | 396 | | 18290 | 3120 | | 23671 |
| 1989 | 436 | | 25830 | 6522 | | 33265 |
| 1990 | 2261 | | 17437 | 1325 | | 18762 |
| 1991 | 913 | | 11400 | 600 | | 12000 |
| 1992 | | | 13955 | 688 | 400 | 15043 |
| 1993 | | | 3895 | 8792 | 930 | 13617 |
| 1994 | | | 2496 | 2503 | 630 | 5689 |
| 1995 | 112 | | 7948 | 8666 | 30 | 16756 |
| 1996 | 1657 | | 7558 | 9416 | 212 | 18843 |
| 1997 | | | 14078 | 5452 | 10 | 19540 |
| 1998 | 3693 | | 10530 | 16194 | 83 | 30500 |
| 1999 | | | 9335 | 27889 | | 37224 |
| 2000 | - | 176 | 25934 | 19019 | 4 | 45133 |
| 2001 | 43 | 212 | 6686 | 21390 | 0 | 28331 |
| 2002 | 0 | 639 | 15303 | 11323 | 0 | 27264 |
| 2003 | 49 | 622 | 10309 | 21049 | 0 | 32028 |
| 2004 | 303 | 133 | 18544 | 16455 | 0 | 35435 |
| 2005 | 0 | 1331 | 13995 | 15522 | 62 | 30911 |
| 2006 | 185 | 2192 | 7996 | 23867 | 78 | 34318 |
| 2007 | 11 | 2051 | 9234 | 29808 | 139 | 41242 |
| 2008 | 27 | 910 | 2582 | 32185 | 0 | 35704 |
| 2009 | 21 | 314 | 20010 | 25537 | 1036 | 46919 |
| 2010 | 0 | 100 | 1969 | 22079 | 2 | 24151 |
| 2011 | 0 | 0 | 10435 | 17184 | 0 | 27619 |
| 2012 | 0 | 355 | 1559 | 19464 | 0 | 21378 |
| 2013 | 0 | 17 | 1453 | 17175 | 0 | 18645 |
| 2014 | 2 | 2 | 2604 | 10772 | 7 | 13388 |
| 2015 | 4 | 644 | 782 | 8568 | 2004 | 12002 |
| 2016 | 4 | 1629 | 1071 | 11110 | 1527 | 15341 |

*Divisions 3.a and 4.b–c combined.

## Summary of the assessment

Table 9          Horse mackerel in divisions 3.a, 4.b–c, and 7.d. Abundance index of North Sea horse mackerel (in thousands/hour) obtained from the combination of the NS-IBTS in divisions 4.b–c in Q3 and the CGFS in Division 7.d in Q4. The High and Low columns represent the confidence intervals (95%) of the indices.

| Year | Abundance index | High | Low | Landings tonnes | Discards tonnes |
|---|---|---|---|---|---|
| 1982 | | | | 4035 | |
| 1983 | | | | 8020 | |
| 1984 | | | | 29478 | |
| 1985 | | | | 25612 | |
| 1986 | | | | 24252 | |
| 1987 | | | | 12336 | |
| 1988 | | | | 21806 | |
| 1989 | | | | 32788 | |
| 1990 | | | | 21023 | |
| 1991 | | | | 12913 | |
| 1992 | 1.498 | 2.915 | 0.663 | 14643 | 400 |
| 1993 | 0.565 | 0.974 | 0.291 | 12687 | 930 |
| 1994 | 1.322 | 2.368 | 0.635 | 5059 | 630 |
| 1995 | 1.621 | 3.401 | 0.669 | 16726 | 30 |
| 1996 | 1.08 | 1.987 | 0.482 | 18631 | 212 |
| 1997 | 0.714 | 1.286 | 0.336 | 19530 | 10 |
| 1998 | 0.436 | 0.806 | 0.201 | 30417 | 83 |
| 1999 | 0.517 | 0.905 | 0.257 | 37224 | 0 |
| 2000 | 0.289 | 0.57 | 0.137 | 45126 | 4 |
| 2001 | 0.508 | 0.916 | 0.245 | 28331 | 0 |
| 2002 | 0.501 | 0.937 | 0.24 | 27264 | 0 |
| 2003 | 0.381 | 0.726 | 0.179 | 32028 | 0 |
| 2004 | 0.428 | 0.754 | 0.199 | 35435 | 0 |
| 2005 | 0.759 | 1.37 | 0.366 | 30786 | 62 |
| 2006 | 0.834 | 1.523 | 0.422 | 34162 | 78 |
| 2007 | 0.411 | 0.787 | 0.197 | 40964 | 139 |
| 2008 | 0.209 | 0.458 | 0.101 | 35704 | 0 |
| 2009 | 0.104 | 0.212 | 0.047 | 44847 | 1036 |
| 2010 | 0.234 | 0.459 | 0.106 | 24146 | 2 |
| 2011 | 0.282 | 0.583 | 0.136 | 27619 | 0 |
| 2012 | 0.185 | 0.437 | 0.093 | 21378 | 0 |
| 2013 | 0.146 | 0.335 | 0.064 | 18645 | 0 |
| 2014 | 0.43 | 0.876 | 0.193 | 13373 | 7 |
| 2015 | 0.58 | 1.146 | 0.261 | 9993 | 2004 |
| 2016 | 0.803 | 1.557 | 0.376 | 13813 | 1527 |
| **Average** | **0.594** | **1.131** | **0.276** | **23737** | **286** |

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