

EU request for ICES to evaluate the recovery plan for herring in divisions 6.a and 7.b–c

Advice summary

ICES advises that the proposed recovery plan is not precautionary when the stock is below B_{lim} .

It is noted that when the combined stocks are forecast to be above B_{lim} , the proposed rebuilding plan is more precautionary than the mechanism used by ICES to provide advice. However, when the stocks are forecast to be below B_{lim} , the proposed rebuilding plan implies that a monitoring TAC could lead to fishing mortality rates above precautionary bounds.

The proposed plan can create a framework for recovery of these combined stocks, but adjustments are required in the region of the harvest rule below B_{lim} . However, it is unlikely that the plan can aid the recovery of the combined stocks by 2020 as recent poor recruitments hamper a speedy recovery.

Request

ICES is requested to assess whether the Pelagic AC proposed recovery plan (Annex 1) is seen as precautionary. ICES is furthermore asked, in analysing the elements of the plan, to assess whether the plan is likely to create a framework for recovery of the stock to precautionary levels by 2020.

Elaboration on ICES advice

Reference points

The reference points, defined in Article 4, are consistent with and based upon the corresponding values defined by ICES. It is also stated (Article 4.3) that the reference points would be revised in line with any future revisions by ICES.

In addition, the Pelagic AC proposed recovery plan defines an $F_{low} = 0.06$, which is defined as the lowest previously observed fishing mortality (from the 2016 assessment; ICES, 2016a) and does not correspond to an ICES reference point.

TAC setting procedures

Article 5.1 and 5.2 refer to spawning-stock biomass (SSB) at January 1. ICES advisory procedures refer to SSB at spawning time for this stock. This should be reflected in the plan. Aside from this difference, Article 5.1 is identical to ICES advisory procedures and as such is in conformity with the precautionary approach and ICES MSY approach (ICES, 2017a).

Article 5.2 is more precautionary than the ICES MSY rule when the combined stocks are forecast to be above B_{lim} . However, the plan specifies a maximum value for fishing mortality (F_{low}) when the stock is below B_{lim} . ICES highlights potential problems with the use of such an F target as it may lead to fishing mortality rates exceeding the ICES MSY rule when SSB is well below B_{lim} . It is therefore recommended to remove F_{low} from the plan. In those cases where the status-quo monitoring TAC of 5800 tonnes would result in an F larger than in the ICES MSY rule, any monitoring TAC should be reduced to match the maximum F following from the ICES MSY rule. Depending on the reduction, a reduced monitoring TAC may imply that samples are insufficient to represent the catches.

Article 5.3 provides for a monitoring TAC when SSB is forecast to be below B_{lim} . Assuming that a TAC would be allocated, the proposed plan is less precautionary than the ICES MSY approach when the stock is below B_{lim} because it may result in F values that are above those implied by the ICES MSY approach. Consequently, ICES points out that the monitoring TAC of 5800 tonnes at biomass levels below B_{lim} may not be precautionary. ICES notes an apparent ambiguity in the wording of this Article, as it is stated that a monitoring TAC “may” be applied, but the accompanying graphic implies that the monitoring TAC will apply at the appropriate forecast biomass. ICES interprets the graphic as having precedence in this case. The proposed plan implies a monitoring TAC of 5800 t. This is the level that the monitoring TAC has been set at by managers in 2016 and 2017. The amount

of the monitoring TAC is higher than the amount advised by ICES that would be required to collect samples for monitoring the stock (4840 t; ICES 2016b).

Article 5.4, which specifies a monitoring TAC when SSB is less than or equal to B_{lim} , is inconsistent with the F_{low} specified in Article 5.2 because at B_{lim} an $F = 0.06$ would result in a higher catch than 5800 tonnes and, conversely, when SSB is much below B_{lim} a TAC of 5800 tonnes would result in an $F > 0.06$. However, at low SSB, Article 5.5 provides for the monitoring TAC to be revised downwards, within the year, subject to ICES advice. ICES notes an apparent inconsistency in this article because it is not stated as a concrete action. ICES notes that the amount of the monitoring TAC has been determined independently of stock size and based on the number of samples required.

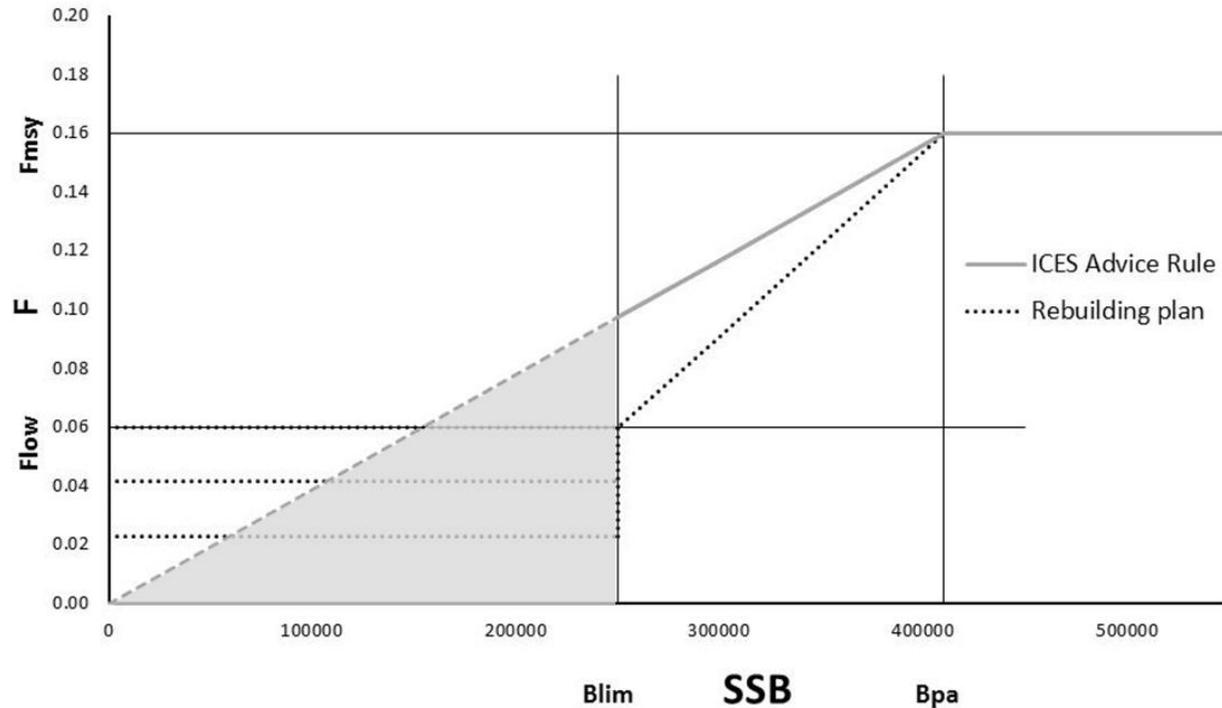


Figure 1 Harvest control rules (HCRs) from the proposed rebuilding plan (dotted lines) in comparison to the generic HCR (advice rule) used by ICES to provide advice (grey line), along with the relevant reference points. The dashed line and grey shading indicate that the fishing mortality implied by the ICES MSY rule does not necessarily apply when $SSB < B_{lim}$, because ICES MSY approach implies that the advised F must be consistent with preventing a further decline of the stock when $SSB < B_{lim}$ (ICES, 2017a). The various dashed lines, in the region when $SSB < B_{lim}$, indicate the inconsistency in implied F within the proposed recovery plan. This diagram is for illustrative purposes and does not represent all possible outcomes of the proposed rebuilding plan.

The monitoring fishery

ICES is concerned that the monitoring fishery should not be conducted in a way as to create a bias in the catch-at-age matrix. The integrity of the data collected from the fishery should be such that it is a continuation of the long-term catch-at-age data. A change in fleet behaviour will result in a break in the time-series of catch data.

Framework for recovery

The ICES framework for fish stock advice includes provisions when the spawning stock is so low that reproduction is at significant risk of being impaired. A precautionary approach implies that fisheries management in such situations should be

more cautious. The proposed rebuilding plan includes such provisions, although further refinements would be required, such as removing the inconsistency of specifying a constant fishing mortality and a specific monitoring TAC for various levels of SSB when below B_{lim} .

Given that the stocks are estimated to be well below B_{lim} at present (ICES, 2017b), and what is known about the stock dynamics of herring, ICES considers it unlikely that the plan can deliver rebuilding to B_{pa} by 2020.

ICES reaffirms that its advice for herring in this area is for two stocks combined because they cannot be separated with sufficient precision at present. Therefore, extra vigilance is required because the overall measurement of F may disguise disparities in the fishing mortality for either stock. In particular, if one stock is much smaller than the other it could have a high but undetectable fishing mortality rate. Therefore, the efforts implied by Article 7 must be maintained in order to achieve data capable of supporting separate assessments for each stock. All available information on the status of the two stocks should be evaluated.

Basis of the advice

Background

The two herring stocks in the ICES divisions 6.a and 7.b–c were combined following an ICES benchmark workshop (WKWEST; ICES, 2015) because there was insufficient information to split the survey and catch information into separate assessments pertaining to stocks for 6.a North and for 6.a South and 7.b–c. There is general agreement that the herring stocks in 6.a North and for 6.a South and 7.b–c constitute separate stocks (ICES, 2015). In its 2016 and 2017 advice, ICES advised for a zero TAC and the development of a recovery plan for the combined stocks. A proposed recovery plan was developed by the Pelagic Advisory Council, and in June 2017 ICES received a request from the EU to assess whether the proposed plan is precautionary. The request was dealt with by ICES Herring Assessment Working Group for the Area South of 62° N (HAWG), which worked by correspondence.

Methods and Results

Given that the stock consists of two units, performing a management strategy evaluation to test the plan was deemed inappropriate due to lack of data on the dynamics of each of these two units. For pragmatic reasons, the proposed plan is therefore compared to the ICES MSY advice rule, which is considered to result in precautionary fisheries catch advice. The ICES MSY advice rule (ICES, 2017a) leads to catch advice corresponding to a fishing mortality of:

- $F = F_{MSY}$ when the spawning–stock biomass is at or above $MSY B_{trigger}$, and
- $F = F_{MSY} \times \text{spawning–stock biomass} / MSY B_{trigger}$ when the stock is below $MSY B_{trigger}$.

In addition, if a catch corresponding to $F_{MSY} \times SSB_{2018} / MSY B_{trigger}$ results in SSB_{2019} being below B_{lim} , additional conservation measures may be recommended to prevent a further decline. This may involve zero catch advice.

The comparison of the proposed recovery plan with the ICES MSY approach indicated that the plan could result in fishing mortality rates that are higher than the ICES MSY advice rule when the stock is below B_{lim} .

To assess whether the proposed plan by the Pelagic AC would lead to recovery of the stock to precautionary levels by 2020, an evaluation of stock development into the near future had to be carried out. For this analysis, the 2017 final stock assessment of the combined herring stocks (ICES, 2017) was used as a starting point. The stock was projected forward ten years in time, assuming recent (poor) recruitment to be expected in the years to come. Three different fishing scenarios were tested: 1) no catch for the entire time period, 2) catching only the proposed monitoring TAC of 5800 tonnes, 3) fishing at a rate of 0.06 (F_{low} in the proposed plan) per year.

Under all scenarios, the stock is assumed to decline further, with average biomass around 130 000, 110 000, and 108 000 tonnes for the three scenarios respectively. The fishing mortalities imposed under each of these three scenarios (0 for scenario 1, variable for scenario 2, and 0.06 for scenario 3) were compared to the maximum F proposed by the ICES advice rule given these average biomasses. Realized fishing mortality under scenario 2 and 3 was considered too high when compared to the ICES advice rule that stipulates an $F \sim 0.043$ per year. F_s from scenario 2 and 3 were in the range of 0.046–0.06.

Sources and references

ICES. 2015. Report of the Benchmark Workshop on West of Scotland Herring (WKWEST), 2-6 February, Dublin, Ireland. ICES CM 2015/ACOM:34. 299 pp.

ICES. 2016a. Report of the Herring Assessment Working Group for the Area South of 62 North (HAWG), 29 March – 7 April 2016, ICES HQ, Copenhagen, Denmark. ICES CM 2016/ACOM:07. 867 pp.

ICES. 2016b. EU request for advice on a scientific monitoring fishery for herring in ICES divisions 6.a, 7.b, and 7.c ICES Advice 2016, Book 5, Section 4.3. 7 pp.

ICES. 2017a (in prep). Advice basis. *In* Report of the ICES Advisory Committee, 2017. ICES Advice 2017, Book 1, Section 1.2.

ICES. 2017b. Herring (*Clupea harengus*) in divisions 6.a and 7.b–c (West of Scotland, West of Ireland). ICES Advice 2017, Book 1, Section 1.2.

Annex I: PELAC proposal for 6a-7bc herring rebuilding

Background

1. The two herring stocks in the ICES areas 6a and 7bc have been combined in the ICES benchmark workshop 2015 (ICES WKWEST Feb 2015) because there was insufficient information to split the survey and catch information into separate assessments pertaining to stocks for 6a North and for 6a South-7bc.
2. There is general agreement that the herring stocks in 6a North and for 6a South-7bc constitute separate stocks (ICES 2016a).
3. The ICES advice for 2016 and for 2017 has been for a zero TAC and the development of a rebuilding plan. "Fishing should not proceed unless accompanied by a stock recovery plan. Such a plan should include rebuilding targets and time lines as well as protections for each stock. This would also imply including a research component to resolve the lack of information on stock mixing and recruitment."
4. According to the most recent scientific assessment, the present low stock size of herring in 6a-7bc is likely to be mostly caused by natural factors with only a limited impact by the very low fishing mortality in the recent 5 years. The influence of the environment on herring productivity means that the biomass will always fluctuate (Dickey-Collas et al. 2010).
5. On 29 April 2016, ICES issued advice for a scientific monitoring fishery for herring in the area (ICES 2016b).
6. On the basis of the ICES advice, the European Union included the scientific monitoring fishery for herring in the regulation 2016/1252 of 28 July 2016, thereby establishing a scientific quota of 4170 tonnes in 5b, 6b and 6a North and 1630 tonnes in 6a South, 7bc. (EU 2016/0203).The same provision was made for 2017 ((EU 2017/127).

Objectives

The primary purpose of the 6a-7bc herring rebuilding plan is to:

1. Recover stock levels to the appropriate minimum biomass reference points as quickly as possible.
 2. To improve the knowledge base for herring in 6a and 7bc, by a. Utilizing any quota that is allocated for the combined 6a, 7bc herring stock, or the two constituting stocks during the rebuilding phase, solely for the purpose of scientific monitoring necessary to determine the status of the stocks and the ability to discriminate between the '6a North stock' and '6a South, 7bc stock'.
 - b. Providing the data and analyses undertaken during scientific monitoring under this rebuilding plan to relevant scientific expert groups for use in benchmarking the assessments methods for herring in 6a and 7bc, and as time series for future update assessments.
 - c. Determining appropriate biological reference points for the different stock components.
 - d. Establish agreed harvest control rules to be used as the basis for future TAC setting.

Criteria and definitions

Article 1 subject matter

This plan pertains to the herring stocks in the following geographical areas:

- a) 6a North (including area 5b and 6b);
- b) 6a South and 7bc

Article 2 geographical definitions of stocks

For the purposes of this plan, the following geographical definitions of stocks shall apply:

- a) '6a North stock' means the autumn-spawning herring stock that spawns in the waters of 6a North.
- b) '6a South, 7bc stock' means the winter-spawning herring stock that spawns in the waters of 6a South and 7cb.
- c) 'Combined 6a, 7bc stock' means the combined stocks of 6a North autumn spawning herring and 6a South and 7bc winter spawning herring stocks.

Article 3 definitions

For the purposes of this Plan, in addition to the definitions laid down in Article 4 of Regulation (EC) No 1380/2013, the following definitions shall apply:

1. 'Monitoring TAC' means the allocated TAC for herring in 6a and 7bc that will fulfil the obligations for appropriate monitoring of stock development and/or stock discrimination.
2. 'Catch sampling' means the collection and analysis of catch samples taken from a commercial fishery, in accordance with the EU Multi-annual programme for data collection (EC 2016_1251)
3. 'Genetic sampling' means the collection and analysis of genetic tissue samples from a commercial fishery or from research surveys with the aim of identification of distinct fish stocks.
4. 'Morphometric sampling' means the collection and analysis of morphometric images of fish body shape from commercial fisheries or from research surveys.
5. 'Monitoring plan' means the detailed approach and methods to be used to collect relevant and credible information on the herring stocks that are part of this rebuilding plan.
6. 'Survey period(s)' means the period(s) during which commercial fishing vessels are being used as research platforms to carry out research activities in the context of this rebuilding plan.
7. 'Survey area(s)' means the areas(s) where commercial fishing vessels are being used as research platforms to carry out research activities in the context of this rebuilding plan.
8. 'Research activities' refers to catch sampling, genetic sampling, morphometric sampling, acoustic surveying or any other activity that contributes to an enhanced understanding of stock status or stock discrimination.
9. 'Flow' refers to the level of fishing mortality on the combined 6a, 7bc stock which when exceeded, triggers discussion on the need for an in-year reduction in the monitoring TAC (see article 5.5). Recognising that it is not possible to determine the risk to stock status of alternative values of Flow, Flow is defined arbitrarily as the lowest previously observed fishing mortality ($F=0.06 = \text{Flow}$) as given in the ICES 2016b advice.
10. 'Spawning ground' refers to locations where there is evidence of herring spawning.
11. 'Spawning habitat' refers to preferred substrate used by herring during spawning.

Article 4 reference points

1. The precautionary and MSY reference points for the two herring stocks in 6a North and 6a South-7bc are currently unknown because it is not possible to separate the stocks in the catch or the surveys. On the basis of the combined assessment (ICES 2016a) relevant reference points are: a. The minimum spawning biomass level and the precautionary spawning biomass level for the combined herring stock shall be as follows: $B_{lim} = 250\ 000$ tonnes, $B_{pa} = 410\ 000$ tonnes. These values are based on the 2016 ICES advice.

- b. B_{pa} is the rebuilding target for herring in 6a and 7bc.

c. The maximum fishing mortality associated with Maximum Sustainable Yield (F_{msy}) for the combined herring stock shall be as follows: F_{msy} = 0.16. This value is based on the 2016 ICES advice.

2. If the stock is perceived to be below B_{lim}, a monitoring TAC may be allocated for commercial vessels that carry out scientific research within the context of the monitoring plan (article 6).

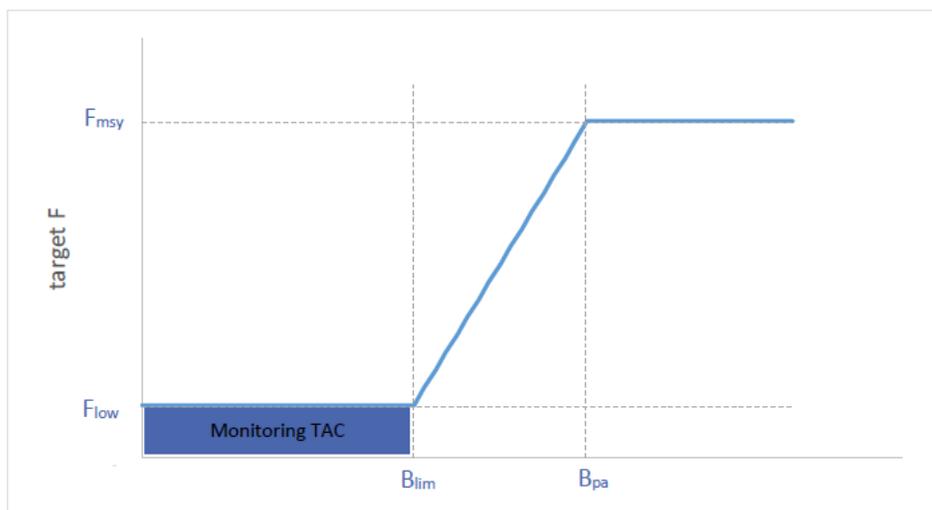
3. The values of reference points can be adapted on the basis of new ICES advice for the combined stock or when separate assessments and advice are available for the two constituting stocks.

Article 5 TAC setting procedures

1. In the case that the spawning stock biomass of the combined stock is forecast to be above or equal to MSY Btrigger (equivalent to B_{pa}) on 1 January of the year for which the TAC is to be set, the TAC shall be fixed to a catch estimated based on a fishing mortality of F_{msy}.

2. In the case that the spawning stock biomass of the combined stock is forecast to be less than MSY Btrigger and larger than B_{lim} on 1 January of the year for which the TAC is to be set, the TAC shall be fixed that is consistent with a fishing mortality given by the harvest control rule:

$$F = \text{Flow} + [(SSB - B_{lim}) * (F_{msy} - \text{Flow}) / (B_{pa} - B_{lim})]$$



3. In the case where SSB is assessed to be below B_{lim} a monitoring TAC may be allocated for the purpose of scientific monitoring.

4. A monitoring TAC will be set at a status quo level (presently 5 800 tonnes).

5. The monitoring TAC, may be adjusted downwards within year, if the report from the Herring Assessment Working Group provides new information on stock status or the impact of the monitoring TAC on herring in 6a and 7bc.

Article 6 Monitoring plan

1. A monitoring plan will be established for the duration of the rebuilding plan or as long as the stock remains below B_{lim}.

2. The monitoring plan will outline the research priorities and activities that will be carried out when utilizing the monitoring TAC.

3. The monitoring plan will be closely coordinated between scientific institutes, management and stakeholder organizations from those countries who have a fishery interest.

4. Research activities will be carried out according to scientific protocols and procedures.

Article 7 Conditions of the monitoring fishery

1. Derogation of the landing obligation will be granted to industry vessels conducting scientific survey work in the survey area(s) during the survey period(s).

2. Vessels participating in the scientific survey work will be permitted to catch herring in specified areas for the purpose of taking scientific samples during the survey period.

3. Collection and use of information for stock status and stock discrimination a. Data collected from the surveys will be stored in existing established data archiving system, the same as other scientific surveys. The data will be held at Marine Scotland Science (Aberdeen) and the Marine Institute (Galway)

b. Access to the data will be granted on the basis of a reasoned request, through permission of the data custodian(s). In principle, no reasonable request for access will be denied in so long as it relates to the scientific analysis and gives due consideration to the data owners.

a) c. The data and outcomes of the analyses of research activities will be submitted to the relevant scientific expert groups in ICES and STECF for consideration in improving the assessments of the herring stocks, through benchmark process and use in update assessments.

b)

Article 8 Biological and Ecosystem considerations

1. Vessels will take measures to avoid vulnerable species likely to encounter pelagic fishing gears. On observation of: Basking shark - *Cetorhinus maximus*¹ or Kemp's ridley turtle – *Lepidochelys kempii*², a vessel will cease fishing operations and move away at least 2 nautical miles.

2. All bycatch of seabirds, seals, elasmobranchs and cetaceans will be counted, measured and included in the survey database.

3. Protection of herring spawning grounds a. Spatial and temporal characteristics of herring spawning grounds should be identified.

b. Activities that have an impact on the spawning habitat of herring should not occur unless the effects have been assessed and shown not to be detrimental.

4. The 4° meridian divides 6a north herring from the North Sea stock. It is not clear if this boundary is appropriate, as it bisects some of the spawning grounds. Given the ongoing work on stock identity, it would be important for ICES to review the basis of the 4° line for herring.

5. There have been many reports on increases in the number of predators in area 6a and 7bc which could affect the natural mortality of herring. Documentation of such effects on natural mortality is an important part of the understanding of stock dynamics.

1 Protected under Schedule 5 of the Wildlife and Countryside Act 1981 (Scotland)

2 Habitats Regulation 1994 (Schedule 2, European Protected Species)

Article 9 End of the rebuilding phase

The rebuilding plan will be superseded by a long term plan for the stock(s) when according to ICES SSB is above Bpa for 3 consecutive years.

References

- Dickey-Collas, M., Nash, R. D. M., Brunel, T., van Damme, C. J. G., Marshall, C. T., Payne, M. R., Corten, A., Geffen, A. J., Peck, M. A., Hatfield, E. M. C., Hintzen, N. T., Enberg, K., Kell, L.T., and Simmonds, E. J. 2010. Lessons learned from stock collapse and recovery of North Sea herring: a review. *ICES Journal of Marine Science*, 67: 1875–1886.
- EU 2016/0203 (NLE). Proposal for a COUNCIL REGULATION amending Regulations (EU) 2016/72 and (EU) 2015/2072 as regards certain fishing opportunities.
- EC 2017/127. COUNCIL REGULATION (EU) 2017/127 of 20 January 2017 fixing for 2017 the fishing opportunities for certain fish stocks and groups of fish stocks, applicable in Union waters and, for Union Page 7 of 7 Pelagic Advisory Council Co-funded by the EU fishing vessels, in certain non-Union waters <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017R0127>
- ICES. 2015. Report of the Benchmark Workshop on West of Scotland Herring (WKWEST), 2-6 February, Dublin, Ireland. ICES CM 2015\ACOM:34. 299 pp.
- ICES 2016a. Herring (*Clupea harengus*) in divisions 6.a and 7.b-c (west of Scotland, west of Ireland). In Report of the ICES Advisory Committee, 2016. Advice book 5. Section 5.3.33: June 30th 2016.
- ICES 2016b. EU request for advice on a scientific monitoring fishery for herring in ICES divisions 6.a, 7.b, and 7.c. Section 5.4.3 in ICES Special Request Advice Celtic Seas Ecoregion. 29 April 2016.