1.6.2.3 EU request to provide guidance on the most appropriate method to aggregate species within species groups for the assessment of good environmental status for MSFD Descriptor 1

Advice summary

ICES advises the use of two frameworks for aggregating indicators to species group level:

i) First, combining indicators within each Marine Strategy Framework Directive (MSFD) criterion across all species; second, combining the criteria within each species group (criteria approach).

ii) First, combining indicators within each species across all MSFD criteria; second, combining across species within each species group (species approach).

ICES advises using a criteria approach to aggregation of indicators for the species-rich ecosystem components fish, birds, and cephalopods, and a species approach for the species-poor ecosystem components mammals and reptiles.

ICES advises on appropriate methods (proportional, averaging, conditional) to combine information at each stage of aggregation.

ICES has not been requested to advise on methods to aggregate species groups to assess ecosystem components.
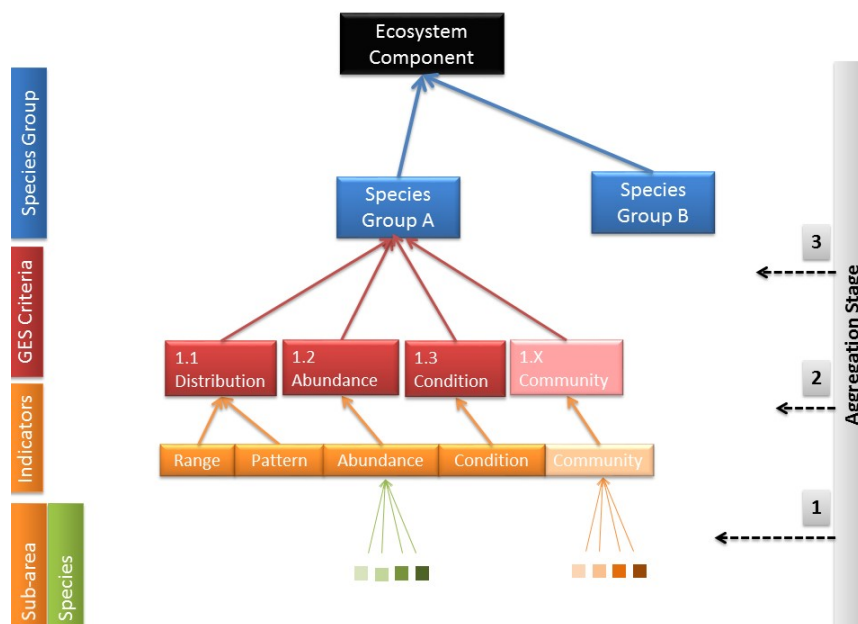
Request

Guidance on the most appropriate method to aggregate species within species groups for the assessment of GES for [MSFD] Descriptor 1. This guidance can allow for a limited set of differing methods for different species groups, if required.
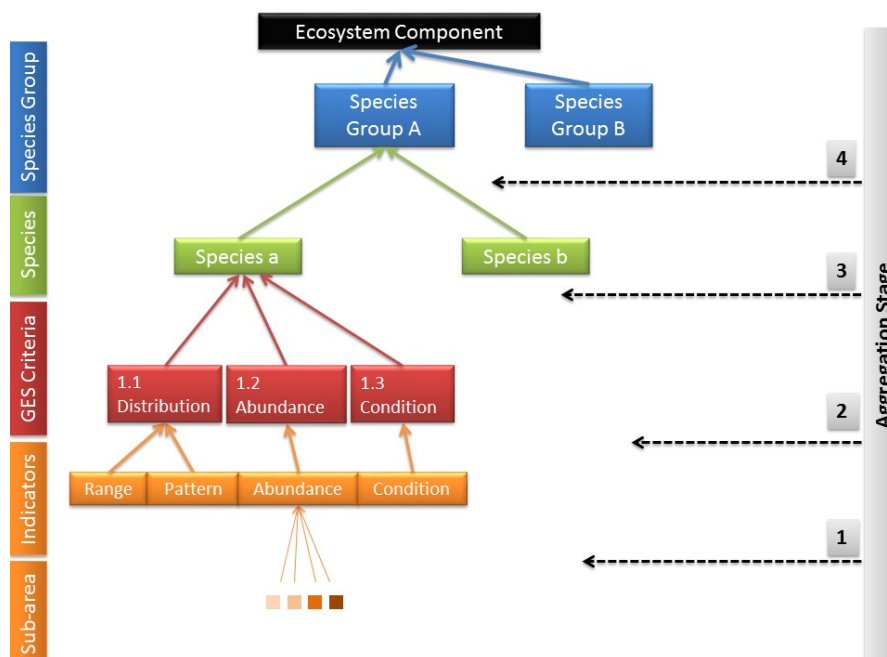
Elaboration on the advice

The choice of type of approach is driven largely by the amount of information that is available (and that can be available). The criteria approach (Figure 1.6.2.3.1) retains the equal importance of all criteria, emphasizing that no one criterion is considered more important than another. Retention of all criteria is important as each criterion may respond at different time scales and to different drivers; for example, a pressure acting on an indicator of breeding success (condition criterion) may not manifest itself on a criterion of adult abundance until several years later. The species approach (Figure 1.6.2.3.2) can be applied to all taxonomic groups, but has the disadvantage of emphasizing the criterion that is measured most often (usually abundance) over criteria measured less often. The inclusion of community indicators, while straightforward under the criteria approach, is complicated under the species approach.

Under the criteria approach, criteria across species are aggregated within species groups. The criteria approach is recommended for birds, fish, and cephalopods as the monitoring and assessment practices in many regional seas are providing suitable information for a number of criteria. These components generally consist of many commonly observed species, and the amount of information that can be collected across species is relatively high. Aggregation by criteria carries the advantage of a transparent weighting of all criteria including, potentially, community aspects. This approach is consistent with the species groups within these ecosystem components being functional rather than taxonomic.

Under the species approach, species across criteria are aggregated within species groups. The species approach is recommended for mammals and reptiles as these components generally consist of few commonly observed species and a larger number of less frequently observed species. The amount of information which can be collected on criteria across species is generally relatively low. The species groups in mammals and reptiles are predominantly taxonomic rather than functional groups.

Figure 1.6.2.3.1   The criteria approach. Under this approach, criteria across species are aggregated within species groups. Aggregation at stages 1 and 2 should use proportions or averages, while at stage 3 it should be conditional. Community indicators (1.x, lighter shades) can be included if required. Subareas are used when indicators are measured at smaller areas than the total regional sea. Methods to aggregate species group to ecosystem component may be required, but ICES has not been asked to advise on them at this time.

Figure 1.6.2.3.2   The species approach. Under this approach, species across criteria are aggregated within species groups. Aggregation at stages 1 and 2 should use proportions or averages, while at stages 3 and 4 it should be conditional. Subareas are used when indicators are measured at smaller areas than the total regional sea. Methods to aggregate species group to ecosystem component may be required but ICES has not been asked to advise on them at this time.

Aggregation methods

ICES advises that the aggregation method should differ between aggregation stages under the two approaches. For aggregation at the early stages of each approach (e.g. across species for the criteria approach), averaging (weighted if necessary) or proportional methods should be used depending on the specific situation. At the later stages of aggregating criteria and species groups (stage 3 for criteria approach, stages 3 and 4 for species approach), a conditional method should be used. ICES advises the use of a one-out all-out method only as part of a conditional rule (e.g. only if another condition is met) and only at later aggregation stages. This allows, for instance, assessment of whether the condition is part of natural variation or is caused by a human activity.

Proportional

This method specifies a combined indicator as the proportion of assessments (i.e. at species or indicator level) that are within agreed limits. The combined indicator is evaluated against an agreed percentage or percentages or an agreed proportion or proportions. The setting of percentages or proportions can be informed by examining the properties (e.g. uncertainty) of the data. Ranges of percentages or proportions could be chosen; all choices are a matter for policy decision.

Averages

This method uses the average of indicator values to derive an aggregated indicator. Indicators should be normalized prior to averaging (e.g. be in the range of 0–1 relative to a reference level, or ordered into categories). Weighted averages are calculated by applying weights to the various indicators in the aggregation. Weighting may be based on, for example, their perceived importance (e.g. critically endangered species, key species, etc.), the area covered by the indicator, or differences in population abundance. Weighting is also appropriate for indicators that are correlated with each other due to common drivers or processes. The choice of weighting approach is a policy decision.

Conditional

This method uses decisions based on preset rules. These rules may be simple (e.g. one-out all-out) or sequential, where if one criterion is met, a further criterion is considered. Conditional methods allow for the inclusion of reviews within decision-making, i.e. if conditions outside the agreed limits are encountered, the causes are then taken into consideration. For example, if a poor condition in one criterion is encountered, the subsequent aggregation stage might still be regarded as being within acceptable limits.

Basis of the advice

Rationale

The EC is requesting guidance on the most suitable and defendable approach to aggregate species within species groups (birds, mammals, reptiles, fish and cephalopods), for the state assessments of the MSFD. The request is driven by the need to consider how to aggregate species within the appropriate species groups for Descriptor 1. This should focus on assessments of state (species groups).
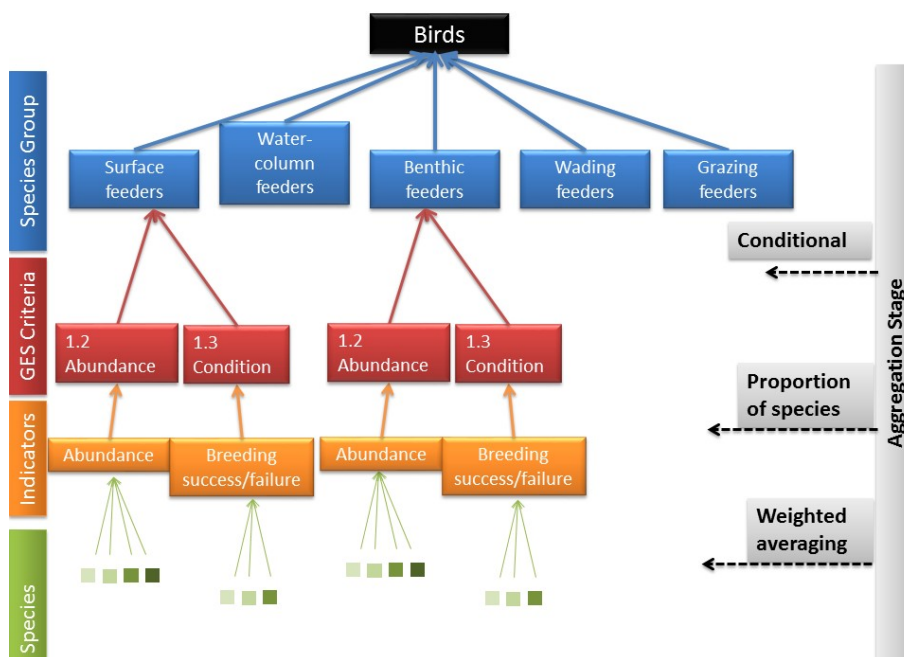
Background

The European Commission is presently revising its Decision on criteria and methodological standards on good environmental status of marine waters (EU, 2010). For Descriptor 1 (D1), experts coordinated by the EC Joint Research Centre (JRC) prepared a technical and scientific review that resulted in recommendations for revision of the relevant part of the Decision. Some outstanding issues identified for D1 were discussed in a workshop held in September 2015. This workshop noted that additional work on aggregation rules was needed to provide guidance for a coherent and concrete framework for integrating assessments towards the overall assessment of species under D1. The present ICES advice is provided to meet this need. It is based on the agreed list of ecosystem components/species groups included in the current draft of the proposed Commission Decision (Table 1.6.2.3.1).
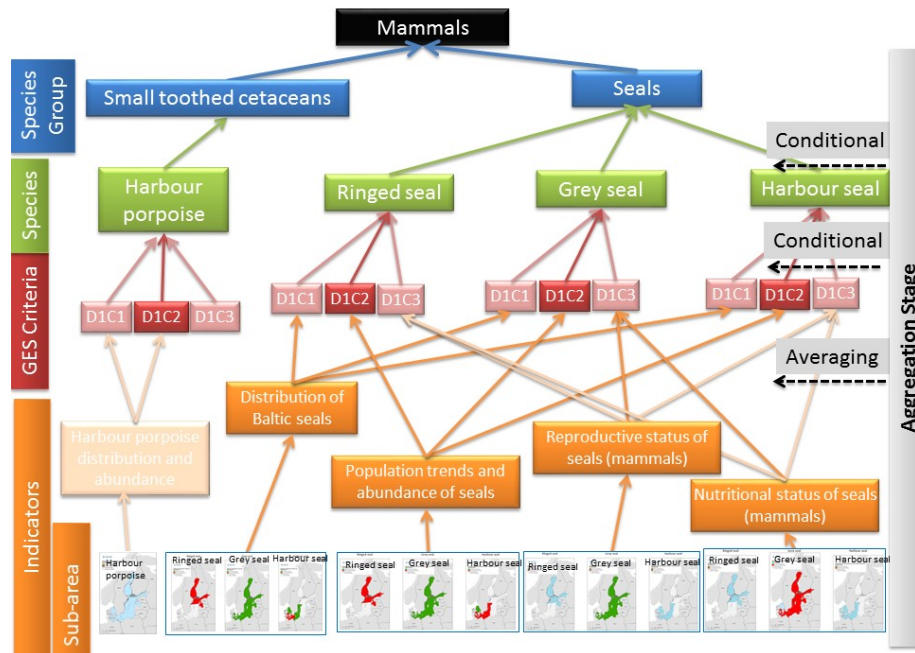
Table 1.6.2.3.1   Categories of ecosystem components and species groups proposed by Palialexis *et al.* (2015).

Ecosystem component	Species group
Birds	Grazing birds
	Wading birds
	Surface-feeding birds
	Pelagic-feeding birds
	Benthic-feeding birds
Mammals	Small toothed cetaceans
	Deep-diving toothed cetaceans
	Baleen whales
	seals
Reptiles	Turtles
Fish	Coastal fish
	Pelagic shelf fish
	Demersal shelf fish
	Deep-sea fish
Cephalopods	Coastal/shelf cephalopods
	Deep-sea cephalopods

Examples

The following regional examples (Figures 1.6.2.3.3 and 1.6.2.3.4) are provided to improve understanding of the aggregation approaches and methods.

Figure 1.6.2.3.3   Example of use of the criteria approach to aggregate to the species group level for birds in the OSPAR area.

Figure 1.6.2.3.4 Example of use of the species approach to aggregate to the species group level for mammals in the HELCOM area. Lighter shades indicate that the indicator is not adopted or that data for the species is not available.

Sources and references

EU. 2010. COMMISSION DECISION of 1 September 2010 on criteria and methodological standards on good environmental status of marine waters (notified under document C(2010) 5956). GES Decision 2010/477/EU. Official Journal of the European Union, L 232/14. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:232:0014:0024:EN:PDF

ICES. 2016. Report of the Workshop on providing a method to aggregate species within species groups for the assessment of GES for MSFD D1 (WKD1Agg), 29 February–2 March 2016, ICES HQ, Copenhagen, Denmark. ICES CM 2016/ACOM:43. 45 pp.

Palialexis, A., Cardoso, A. C., Avellan, L., Batsleer, J., Campos, B., Connor, D., Greenstreet, S., *et al.* 2015. Report of the JRC's Descriptor 1 workshop to support the review of the Commission Decision 2010/477/EU concerning MSFD criteria for assessing Good Environmental Status. EUR 27715. doi:10.2788/444834.