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Data for an estimate of Glass-Eel recruitment

ON THE USE OF AVAILABLE DATA FOR AN ESTIMATE OF GLASS-EEL RECRUITMENT

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This paper is not a "review" of all works about glass-eel abundance. It is a general reflection, following different papers which have been presented during the last Eel Working Group meeting in Perpignan. Its objectve is to propose a planned approach allowing more effective use of all kinds of data on abundance of European glass eels. The proposed sketch is a very simplified one and each worker has to discuss it and improve it as well. So, would it be possible to go a bit further than MORIARTY's statement : "the only definitive conclusion is that more extensive observations are required and that they must be continued for many years" .

I - THE QUESTIONS

* Two linked questions directly concern European studies on eel recruitment, on a biological point of view :

1) The yearly estimate of glass eel runs.
   - 1st level : recruitment in coastal areas,
   - 2d level : recruitment in a river and/or a drainage basin.
   - 3d level : recruitment or total run for a country.

2) Variations of year-class strength.
   These variations can be studied for each of the above levels.

* A third one depends on countries where glass eel fisheries do exist, for fisheries managment :

3) Abundance monitoring through glass eel fisheries, related to a data file for "fisheries indicators" (catches, fishing effort, CPUE) .

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II - THE STATEMENT AND THE GOAL

From the papers by the different teams concerned, three point can be emphasized :

1) There is a multiplicity and a rather high heterogeneity of data.

2) There is a general will for scientists to compare these data :

- each year, on an European basis, from a selection of locations, as suggested by DEKKER ;
- for a longer period, from one or several places (e. g. annual series of data available from the Netherlands, Germany, Ireland, France...)

3) It is essential to make these comparisons :

- to classify acquired data according to their characteristics and with reference to questions to be solved ;
- to define standard methods for the collection of further data .

III - MAIN FACTORS RELEVANT TO THE ABUNDANCE INDEX VALIDITY

We consider estuarine areas, from the marine coastal zone up to the fluvial zone, from the first arrival of glass-eels in autumn to the active settling in the drainage basins during the following summer.

Available data should be separated into two batches :

- Data related to commercial fisheries using active gear (boat towed nets). Some experimental catches may also be joined to this category. Data consist in daily or hourly yields, or in CPUE.
- Data related to experimental or routine observations near dikes (ship locks, sluices, hydro dams ...). Commercial or amateur fisheries data using anchored nets in the upper zones migth belong to this category.

These data must then be considered with the main following factors.

1) Physical outline of estuarine systems :

- situation of data according to physical obstacles (dams, sluices, industrial water uses,...)
- evolution in time, natural or artificial changes of the outline (embanking, Channel digging,...)

2) Hydrodynamics. Data must be located, in time and space, according to water masses that may be defined by :

- dynamic tide : tidal strength and upstream limit of level due to the flood tide ;
- saline tide : salinity variations and upstream limit of the brackish waters.
- Fluvial discharge, and its relation with the above factors.

According to sites, one of these factors may be more significant than others. In the present proposed diagram, we assume that the dynamic tide is the most important one.

3) Characteristics of glass eel fisheries.

- Situation of data sources in time and space in relation to fisheries ;
- Variations in local fishing regulations between sites ;
- Relative evolution of fishing effort and CPUE, on the one hand between months in a year, on the other hand between years ;
- Long term history of fisheries .

4) Statistical validity of the estimates.

This general concern must lead to a possibility of an accurate diagnosis, in terms of an evaluation of relative error.

IV - DATA PATTERNS ON GLASS EEL ABUNDANCE : A DIAGRAM

The attempt to classify available data by different patterns is presented in tables 1 and 2. Data are reviewed in relation with the above factors. Numerous arrangements of these factors are possible. Some of them are more meaningful than others. The present classification is a simplified one and corresponds to the best known cases.

"Data patterns" result in "abundance index patterns" from which a diagnosis on recruitment in successive steps of migration should be established. We particularly look for estimates of so called :

- "coastal recruitment", a measure of the glass eel flow entering the estuary (autumn, winter) ;
- "fluvial recruitment", a measure of the glass eel flow ready to settle in fresh waters.

The recruitment levels should also be illustrated by a general curve of abundance index during the ascent season. As indicated by GASCUEL, three types of curves can be plotted :

1) A "probability curve" (fig 1), that expresses the crossing of a glass eel run through a marine or brackish system (for instance marine fisheries) ;

2) A "plateau-curve" (fig 2), where the abundance becomes steady throughout the migration period and quickly decreases in spring time. This occurs with CPUE in upstream freshwater fisheries. Both level and stability depend upon the fishing effort which can reduce the natural increase ;

3) A "assymétric-curve", with a dominating rising shape when the downstream exploitation is rather weak or nil. This rising curve reflects the upstream accumulation of glass eels. Theoretically, this curve is the cumulative function of the first probability-curve, with deduction of losses (mortalities) that happened during the migration through the estuary.

CONCLUSION

This analysis may appear a little too artificial and probably does not represent all the possible figures. Therefore, it will be useful to try an application of the proposal to previously acquired data or data to come. Thus, each of us could improve his own work and the EIFAC Working Group on Eel could elaborate a better estimate of glass eel recruitment for the European stock.

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