Data-filtering-based or model-based methods: comparison for a data-limitedstock abundance indicator. Case study on a striped red mullet stock.

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Development of abundance indicators is important for the sustainable monitoring of exploited resource stocks. International Council for the Exploitation of the Sea (ICES) classifies the western stock of north Atlantic striped red mullet (Mullus surmuletus) as a Data Limited Stock-category 5. Only Landings Per Unit Effort (LPUE) data are currently available. One of the most used method to study LPUE data relies on Generalized Additive Mixed Models (GAMMs). We decided to study LPUE as an abundance indicator of red mullet stock using GAMM with three different data preprocessing. Spatio-temporal scale of the study is ICES Subarea 8 (including Bay of Biscay) and 2000-2023 period.

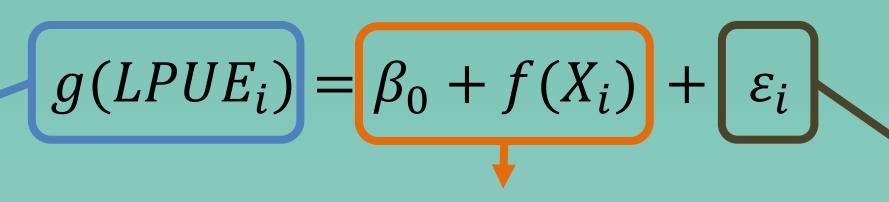


How much performance of GAMM modeling and abundance indicator prevision vary according to the data pre-processing?

GAMM model reminder (1 explanatory variable X):

Link function

of LPUE



Model the variability of the mean (or level) of LPUE due to explanatory variables





SACROIS data

Fishing sequences of all otter bottom trawls (OTB) which have ever caught red mullet in ICES Subarea 8

First method: without data pre-processing

Second method: light data pre-processing

Third method: hard data pre-processing

Data cleaning: Focus on the meaningful information

Activit

Fishing

Anormal

data

Fishing time is maximum 1

hour*

LPUE is more than 0.4 kg* (1 fish)

At least 1 sequence of red mullet by vessel × year

Fishing time is maximum 1 hour* Vessel must be present more than 4 years*

Vessel must land more than 500 kg by year*

Mesh size between 20 and 320 mm*

At least 24 fishing sequences by year*

Mesh size between 20 and 320 mm*

Research and discussions with professionals to keep or remove suspicious data

Spatio-temporal aggregation (year × 15 days duration period × ICES rectangle × vessel): Selection of the useful statistical unit

Other filters

Not considered

Not considered

More than 2 sequences in a new statistical unit

analysis Data pre-

Not considered

Cut into 2 periods following a change in LPUE declarations*

Creation of vessels typologies according to selected technical characteristics: Regression tree and

Hierarchical Ascendant Classification

Best GAMM model selection (based on AIC) for each method Analysis of goodness-of-fit and GAMMs residuals



Best pre-processing method to create a red-mullet abundance indicator

*Discussed with and approved by professional fishermen during working groups "Reference fleets".

This is an ongoing work, please feel free to ask us for more information or to share ideas of improvement!



