Update of pollack abundance indices from professional fishing data (2016-2018)

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Context

The ROMELIGO project (2015-2018) aimed to contribute to the improvement of the knowledge on three stocks (mur-west, whg-89a and pol-89a – see Table 1) on the basis of the available data (landings data, sampling data for the French fleet, data from scientific campaigns…) or specific data collected during the project.

Table 1: Stocks considered by the ROMELIGO project for red mullet, whiting and pollack.

Species	Stock name	Stock code
Striped red mullet	Striped red mullet areas VI, VIII et sub-areas VIIa-c, e-k et IXa (West area)	mur-west
Whiting	Whiting area VIII et sub-area IXa	whg-89a
Pollack	Pollack area zone VIII et sub-area IXa	pol-89a

The project was organized in the same way in three parts and applied for each of the three stocks:

- Part 1 - Analyzes of catches and activity of the French professional fishery (composition and evolution of catches, seasonality, spatial distribution, gear used and discards);
- Part 2 - Analyzes of the size composition of the catches on professional and scientific vessels, analyzes of the discards, proposition of abundance indicators using professional fishing data and analyzes of CPUE from available scientific surveys;
- Part 3 - Collection of basic biological data relying on various samplings and calculation of biological parameters (length / weight relationships, growth curves, length at first maturity (L50) or maturity ogive…).

The contract report is available online (Léauté et al., 2018a[1]). A paper on the methodology used to select the reference fleets for the calculation of red mullet LPUE was also published (Caill-Milly et al., 2019).

In relation to this work and regarding **pollack**, two WDs were already sent and presented to the WGBIE respectively in 2017 and 2018:

- One dedicated to part 1 integrating as a preamble a bibliographic review on the biology of the species (Léauté et al., 2017);
- One dedicated to parts 2 and 3 (Léauté et al., 2018b).

This WD provides the update of pollack abundance indices from professional fishing data (2016-2018).

[1] https://archimer.ifremer.fr/doc/00440/55126/

A reminder of the previous results (Léauté et al., 2018b)

For this species and for the Bay of Biscay, Table 2 describes the characteristics of the fleets selected to build abundance indices from professional fishing data. The selection was based on gear, technical characteristics of the vessels (defined by clusters), characteristics of the gear (mesh class), time and space specifications. For pollack, the retained gear and cluster are « Set gillnets (anchored) » (GNS) and cluster 3. This third cluster corresponds to medium vessels (10.5 to 18.2 m) with medium tonnage (6.7 to 91.2 grt) and a power comprised between 87 to 331 kW. Second half-year was selected to avoid period of concentrations during breeding season in particular. Only the northern Bay of Biscay was selected (the southern part, under latitude 46, displayed too wide confidence intervals regarding LPUE).

Table 2: Characteristics of the selected fleets regarding pollack.

Retained gear	Cluster	Mesh class of gear	Period	Specific spatial delimitation
Set gillnets (anchored) « GNS »	Cluster 3	Higher than 90 mm	2nd half-year	Northern Bay of Biscay

For the selected mesh class (higher than 90 mm), evolutions of the LPUE mean level and of its use were considered for the second half-year for the north of the Bay of Biscay.
The evolution of the LPUE was marked by a significant increase (Pearson test) in the level of the indices over the period 2005-2015 (Figure 1). A warning on the use of this indicator based on the practice of gillnets was however given in particular due to possible various uses of the gear related to the length of the nets, the exposure time, the influence of the swell…).

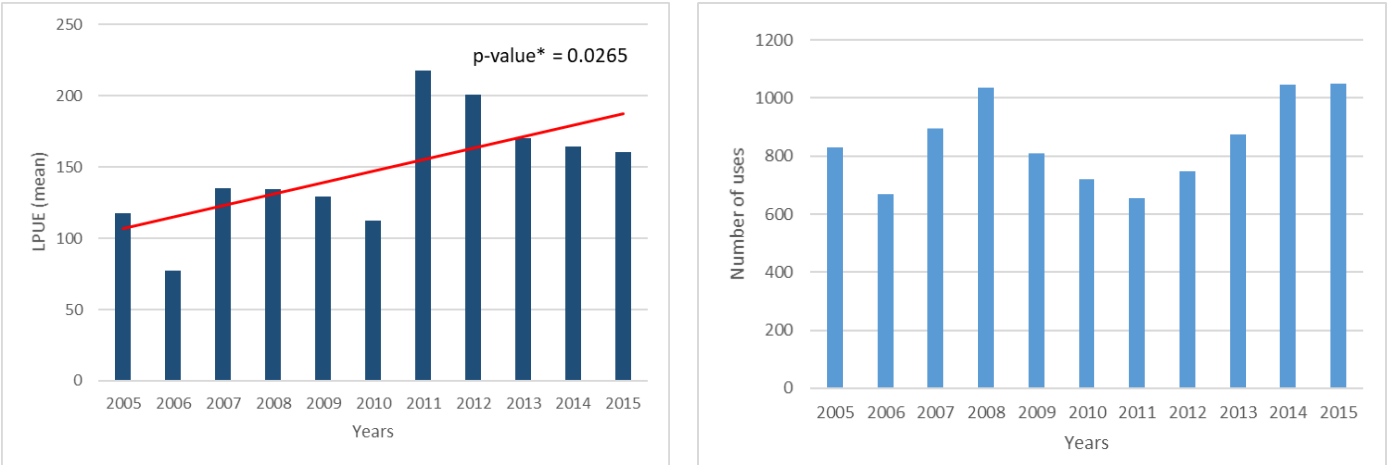

Figure 1: Levels of LPUE and number of uses – Set gillnets (anchored) - Cluster 3 - Mesh class higher than 90 mm – 2nd half-year – Northern Bay of Biscay

Method used to update the abundance indices from professional fishing data

The proposed method allows an update of the LPUEs of the selected fleet after 2015. It requires the assignment of new vessels in one of the clusters defined in the project beforehand. This is to be done at the level of the selected gear for the species (*i.e.* GNS for pollack).

Clusters are the result of a hierarchical classification of vessels based on their technical characteristics (length, tonnage and power). The vessels were grouped according to their degree of similarity for these three variables using Hierarchical Aggregation Clustering (HAC) with Ward aggregation criterion and Euclidean distance.

When grouping with a clustering method such as the above one, it is difficult to identify clearly the bounds allowing to affect one vessel in a specified cluster (because of possible overlaps of some of the characteristics from one cluster to another). A method of assigning vessels was therefore developed for the selected gear.

To do this, a conditional decision tree was built. The targeted variable was the variable “cluster”. Based on the existing classification, the decision tree provides the rules fixing the values that must take the different technical variables for a vessel to belong to a given cluster. The leaves (of the tree) not selected are either because they do not concern the targeted cluster or because the risk of classification error is considered too high.

Once this step has been completed, updating of the data (number of uses of the gear and average levels of LPUE) was carried out. It concerned the years 2016, 2017 and 2018. This update was sent to the professional structures involved in the former "CPUE Working Group" of the Romeligo project. The objective was to identify regulatory or other elements that could potentially disturb the LPUE index constructed for 2016, 2017 and 2018.

Results

Decision criteria for the assignment of new vessels appearing in 2016, 2017 or 2018

Regarding pollack and for GNS, the retained tree (Fig. 2) is the one which setting minimizes the prediction error for cluster 3 and for all the data (cluster prediction error 3: 1.0%; total prediction error 1.0%).

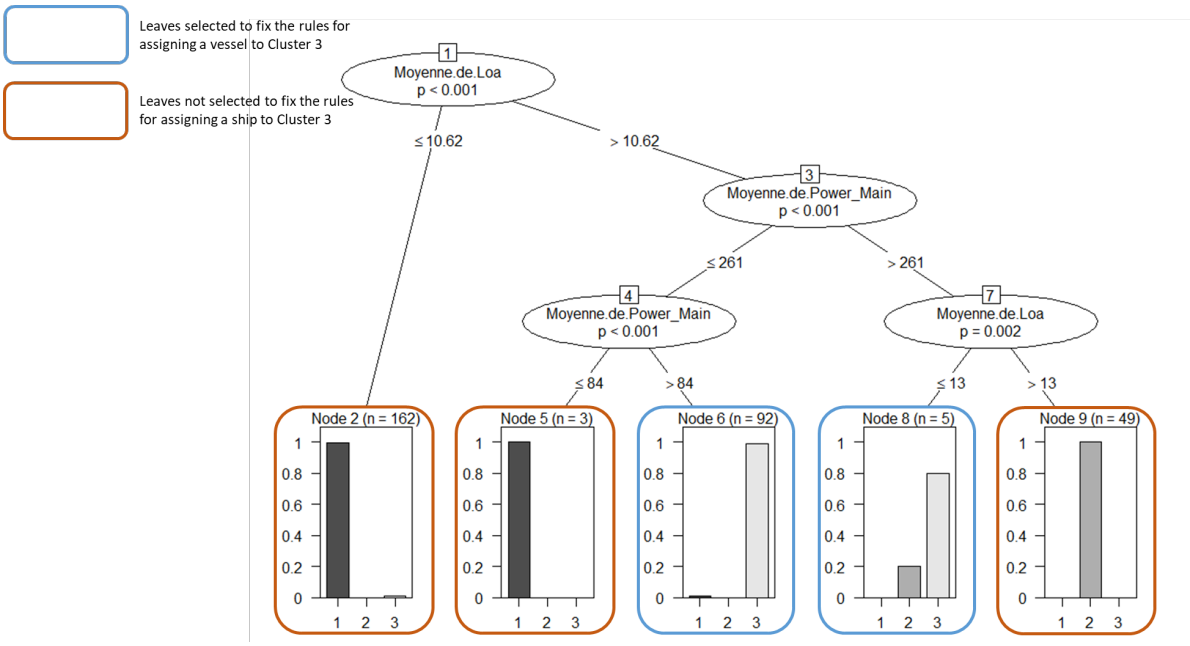

Figure 2: Conditional regression tree on cluster 3 variable (for pollack / GNS) with technical characteristics [Loa : Length (m); Power_Main : power(kW)].

Consequently, a vessel falls into the cluster 3 if its length is greater than 10.62 m and:

- If its power is higher than 84 kW and less than or equal to 261 kW;
- Or if its power is higher than 261 kW and its length less than or equal to 13 m.

Update of data and evolution of the indices

The evolution of the number of uses and of the average level of LPUE are shown for the 2nd half-year and for the north of the Bay of Biscay (Figure 3).

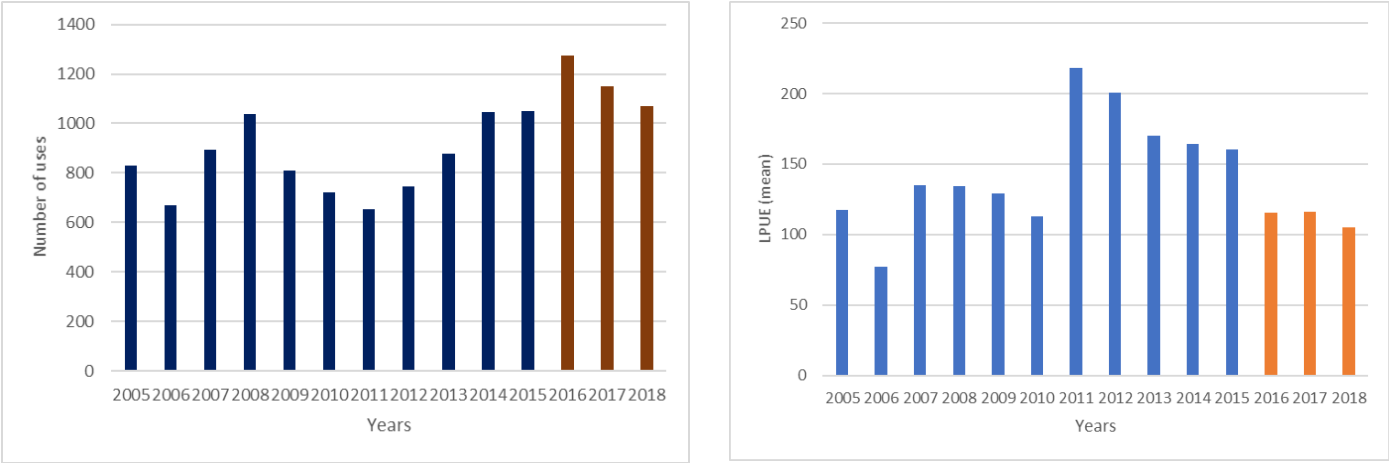

Figure 3: Numbers of uses and levels of LPUE - Set gillnets (anchored) - Cluster 3 - Mesh class higher than 90 mm – 2nd half-year – Northern Bay of Biscay

Over the entire period, the number of fishing sequences ranges from 650 to 1 275; the second part of the series being characterized by higher sequence numbers than at the start of the period.

For the past three years, the LPUEs display low levels compared to the whole series. The highest levels were observed between 2011 and 2015.

Information from the consultation of professional structures

The consultation did not identify regulatory element that could potentially have disturbed the LPUE / GNS indices built for 2016, 2017 and 2018.

Conclusion

Currently one fleet is selected for the Bay of Biscay: GNS - Cluster 3 - Mesh size class greater than 90 mm - 2nd semester - North of the Bay of Biscay. At this time no new element leads to discuss the relevance of this fleet but we must remain cautious about the use of this indicator alone (linked to the possible various uses of the gear).

References

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Sacrois versions used for the update: V.3.3.7 for the 2016 to 2017 data and V.3.3.8 for the 2018 data (extraction November 2019)