

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

Nathalie Caill-Milly<sup>1</sup>, Muriel Lissardy<sup>1</sup>, Noëlle Bru<sup>2</sup>

<sup>1</sup> Ifremer, LITTORAL, 1, allée du Parc Montaury, F-64600 Anglet, France

<sup>2</sup> Université de Pau et des Pays de l'Adour, E2S UPPA, CNRS, LMAP, Anglet, France

### 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<sup>1</sup>). 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 **whiting**, 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 whiting abundance indices from professional fishing data (2016-2018).**

<sup>1</sup> <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 whiting, the retained gear and cluster are « Bottom otter trawls » (OTB) and cluster 1. Cluster 1 corresponds to small vessels (8.1 to 15.8 m) with small tonnage (2.8 to 43.9 grt) and a engine power comprised between 44 and 258 kW. Quarter 3 was selected to avoid period of concentrations during breeding season in particular. A North/South separation within the Bay, latitude 46, was applied due to very different LPUE levels between both areas.

Table 2: Characteristics of the selected fleets regarding whiting.

Retained gear	Cluster	Gear mesh class	Period	Specific spatial delimitation
Bottom otter trawls (1 vessel) « OTB »	Cluster 1	70 to 79 mm	Quarter 3	Northern Bay of Biscay
				Southern Bay of Biscay

For the selected mesh class (70 - 79 mm), evolutions of the LPUE mean level and of its use were considered for quarter 3 and for the north and the south of the Bay of Biscay.

For the north, no significant trend was detected either for LPUE or for the use (Figure 1).

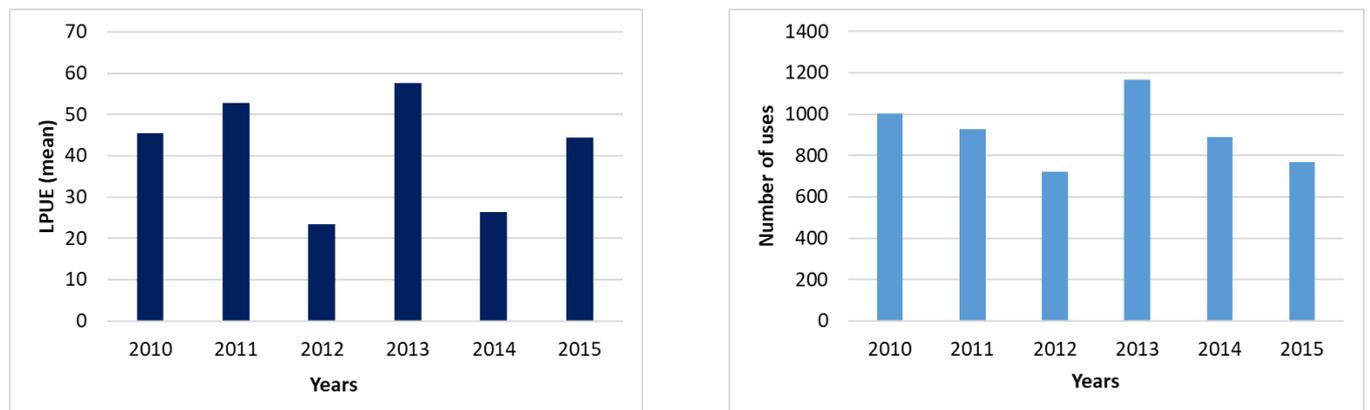


Figure 1: Levels of LPUE and number of uses - Bottom otter trawls - Cluster 1 - Mesh class 70 - 79 mm - Quarter 3 – Northern Bay of Biscay

For the south, a decrease of the LPUE mean is observed in 2013 and 2014. Then in 2015, an increase was observed. Nevertheless its overall evolution showed no significant trend between 2010 and 2015 (Figure 2). In the same time, the number of uses displayed globally an increase and then a decrease.

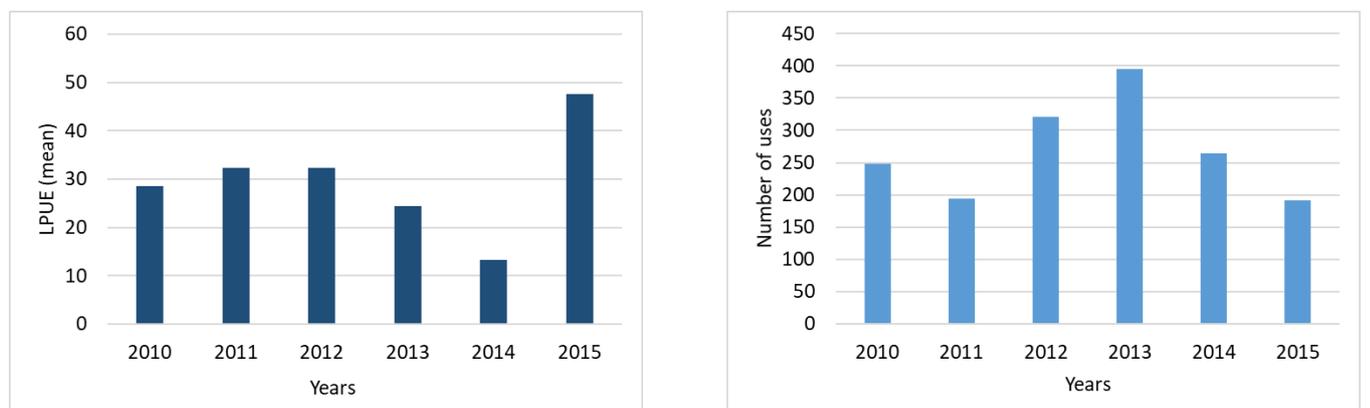


Figure 2: Levels of LPUE and number of uses - Bottom otter trawls - Cluster 1 - Mesh class 70 - 79 mm - Quarter 3 – Southern Bay of Biscay

## 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.* OTB for whiting).

Clusters are the result of a hierarchical classification of vessels based on their technical characteristics (length, tonnage and engine 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 whiting and for OTB, the retained tree (Fig. 3) is the one which setting minimizes the prediction error for cluster 1 and for all the data (cluster prediction error 1: 2.4%; total prediction error 2.2%).

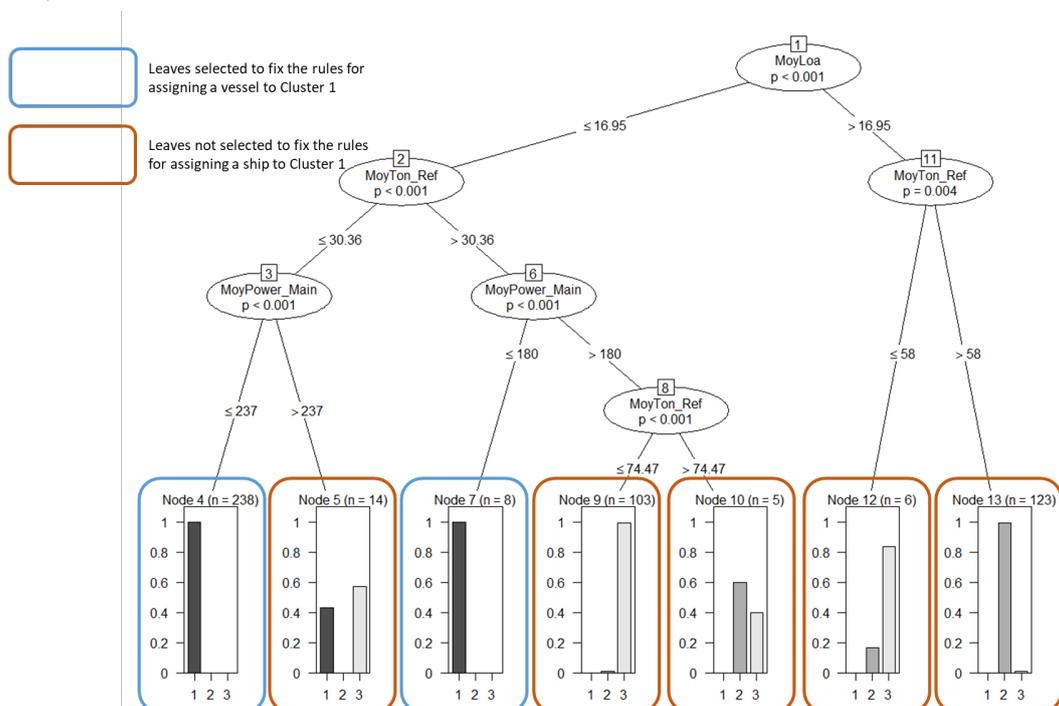


Figure 3: Conditional regression tree on cluster 1 variable (for whiting / OTB) with technical characteristics [Loa : Length (m); Ton\_Ref : tonnage (grt); Power\_Main : power(kW)].

Consequently, a vessel falls into the cluster 1 if its length is less than 16.95 m and:

- If its power is less than or equal to 237 kW and its gauge less than or equal to 30.36 grt;
- Or if its power is less than or equal to 180 kW and its gauge strictly greater than 30.36 grt.

### Update of data and evolution of the indices

The evolution of the number of uses and of the mean level of LPUE are shown for quarter 3 and for the north and the south of the Bay of Biscay (Figures 4 and 5).

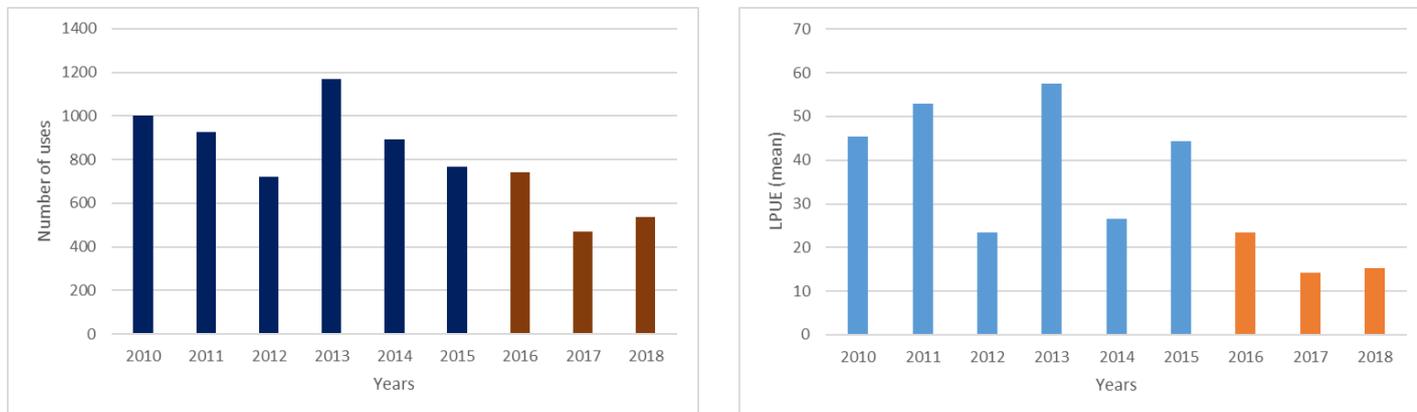


Figure 4: Numbers of uses and levels of LPUE - Bottom otter trawls - Cluster 1- Mesh class 70 - 79 mm – Quarter 3 – Northern Bay of Biscay

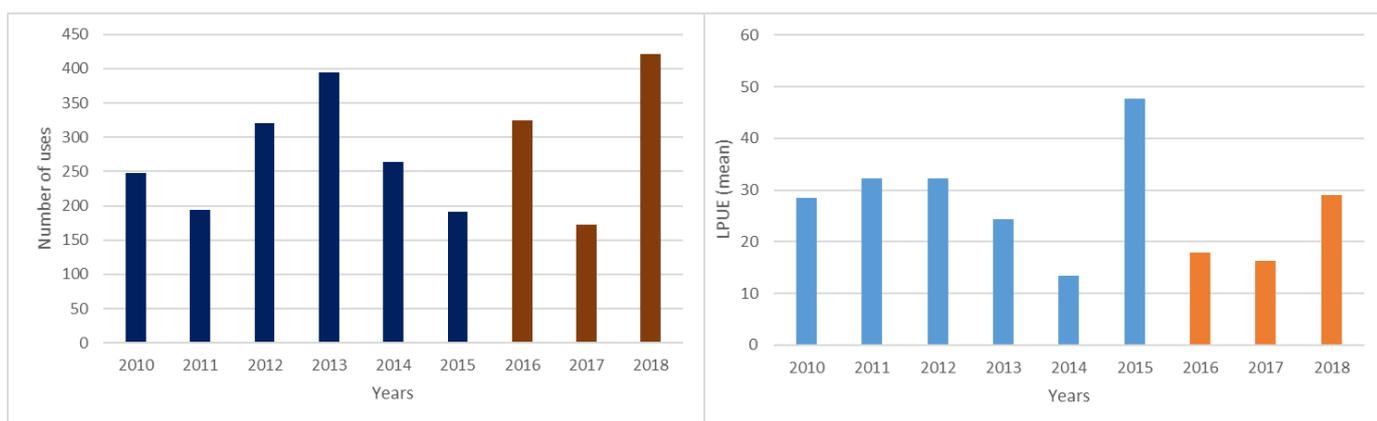


Figure 5: Numbers of uses and levels of LPUE - Bottom otter trawls - Cluster 1- Mesh class 70 - 79 mm – Quarter 3 – Southern Bay of Biscay

In recent years, the LPUEs calculated for the northern Bay of Biscay show low levels, but the decrease is not significant over the whole period (Pearson test).

For the south, no trend emerges.

### Information from the consultation of professional structures

The consultation identified two regulatory elements that could potentially have disturbed the LPUE indices built for 2016, 2017 and 2018:

- The whiting management plan implemented by the "OP Vendée" from January 2017 for trawlers;
- The decree concerning trawlers over 12m which have a European Fishing Authorization (EFA) to fish common sole in the Bay of Biscay<sup>2</sup>.

<sup>2</sup> Since January 1<sup>st</sup>, 2016, this decree imposes a mandatory minimum mesh size of 80 mm for the vessels concerned (having this authorization), out of derogation period from June 1<sup>st</sup> to September 30<sup>th</sup> each year. This latter period makes it possible to practice specific métiers (for example bottom trawls targeting wedge sole). This decree was modified at the end of 2018, with the possibility of shifting the derogation period of 4 consecutive months.

In the case of the whiting management plan, the organization "OP Vendée" transmitted to Ifremer the registration numbers of the vessels belonging to this organisation and concerned by the measure. The analyzes showed that only the indicator for the northern Bay of Biscay is concerned.

⇒ Considering all the available data and assuming that all things are equal, it is estimated that the levels of LPUE (north of the Bay of Biscay) for 2017 and 2018 could have been impacted by the management measure but without changing the trend of the indicator.

In the case of the measures applied to vessels having a EFA for common sole, the list of these vessels was not recovered. We only looked at the evolution of the number of fishing sequences by vessels over 12 m and their associated LPUE. For the northern part of the Bay, the sequence number began to decline in 2014; it increased from 2015 and the level remained very low in 2018. This came together with a very large decrease in the average LPUE for these vessels. For the southern part of the Bay, the sequence number also recorded a sharp decline concomitantly with the implementation of the measure, but there was a strong change in 2018 since the level observed is the highest in the series (2010-2018). The associated LPUEs for the north increased again in 2018 without however reaching the levels prior to the implementation of the measure.

⇒ Considering all the available data and assuming that all things are equal, it is estimated that the levels of LPUE (north and south of the Bay of Biscay) between 2016 and 2018 could have been impacted by the measurement management, but without changing the trend of the indicator.

## **Conclusion**

Currently two fleets are selected for the Bay of Biscay: OTB - Cluster 1 - Mesh size 70 - 79 mm - Quarter 3 - Northern Bay of Biscay and OTB - Cluster 1 - Class mesh 70 - 79 mm - Quarter 3- Southern Bay of Biscay. For the south, the number of uses varies significantly from year to year. The confidence interval of the LPUE is wider for the south than the north, the levels of LPUE are less stable within the quarter in the south than in the north. It could therefore be proposed to retain only the northern indicator in future years.

## References

Caill-Milly N., Lissardy M., Bru N., Dutertre M.-A., Saguet C., 2019. A methodology based on data filtering to identify reference fleets to account for the abundance of fish species: Application to the Striped red mullet (*Mullus surmulletus*) in the Bay of Biscay. *Continental Shelf Research*, 183, 51-72. <https://doi.org/10.1016/j.csr.2019.06.004>

Léauté J.-P., Caill-Milly N., Lissardy M., 2017. ROMELIGO : Improvement of the fishery knowledge of striped red mullet, whiting and pollack of the Bay of Biscay. The whiting part. Working Document for the Working Group for the Bay of Biscay and Iberian Waters Ecoregion (WGBIE). 4-11 May 2017, Cadiz (Spain). <https://archimer.ifremer.fr/doc/00413/52452/>

Léauté J.-P., Caill-Milly N., Lissardy M., Bru N., Dutertre M.-A., Saguet C., 2018a. ROMELIGO. Amélioration des connaissances halieutiques du ROuget-barbet, du MERlan et du LLeu jaune du GOLfe de Gascogne. RBE/HGS/LRHLLR et ODE/UL/LERAR/18-001. <https://archimer.ifremer.fr/doc/00440/55126/>

Léauté J.-P., Caill-Milly N., Lissardy M., 2018b. ROMELIGO: Improvement of the fishery knowledge of striped red mullet, whiting and pollack of the Bay of Biscay. Whiting part. Working Document for the Working Group for the Bay of Biscay and Iberian Waters Ecoregion (WGBIE). 3-10 May 2018, Copenhagen (Denmark).

Sacris 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)