



## PFA self-sampling report for WGDEEP 2021 (WD02)

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## Summary

This report summarizes the self-sampling data collected by the Pelagic Freezer-trawler Association (PFA) with a focus on Argentines or Silversmelts. The self-sampling data consists of two main sources: (1) the historical catch per haul data derived from a limited number private logbooks of skippers, and (2) the self-sampling program that has been initiated from 2015 onwards on an increasing number of freezer-trawlers.

The PFA fishery for argentines takes place in the months April and May, and sometimes into June. The predominant fishing area is ICES division 27.6.a with also some catches being taken in 2.a, 4.a and 5.b. The fishery is combined with the fishery for blue whiting, whereby the catches of blue whiting take place during the day and catch of argentines mostly in the night.

Overall, the self-sampling activities for the argentines fisheries during the years 2000 – 2020 covered 48 fishing trips with 1248 hauls, a total catch of 30253 tonnes and 18635 individual length measurements.

The length compositions of argentines are relatively stable over the years, varying between 34 and 36 cm. A standardized CPUE series of the PFA fisheries is presented based on a GLM on CPUE (catch/rectangle/day) with year, week and depth as explanatory variables. Catch rates in 2019 and 2020 have been estimated higher than the preceding years, in line with reports from the skippers in the fleet.

# 1 Introduction

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The Pelagic Freezer-trawler Association (PFA) is an association that has nine member companies that together operate 17 (in 2019) freezer trawlers in six European countries ([www.pelagicfish.eu](http://www.pelagicfish.eu)).

In 2015, the PFA has initiated a self-sampling programme that expands the ongoing monitoring programmes on board of pelagic freezer-trawlers by the specialized crew of the vessels. The primary objective of that monitoring programme is to assess the quality of fish. The expansion in the self-sampling programme consists of recording of haul information, recording the species compositions by haul and regularly taking random length-samples from the catch. The self-sampling is carried out by the vessel quality managers on board of the vessels, who have a long experience in assessing the quality of fish, and by the skippers/officers with respect to the haul information. The scientific coordination of the self-sampling programme is carried out by Martin Pastoors (PFA chief science officer) with support of Floor Quirijns (contractor).

## 2 Overview of self-sampling methodology

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The PFA self-sampling programme has been implemented incrementally on many vessels that belong to the members of the PFA. The self-sampling programme is designed in such a way that it follows as closely as possible the working practices on board of the different vessels and that it delivers relevant information for documenting the performance of the fishery and to assist stock assessments of the stocks involved. The following main elements can be distinguished in the self-sampling protocol:

- haul information (date, time, position, weather conditions, environmental conditions, gear attributed, estimated catch, optionally: species composition)
- batch information (total catch per batch=production unit, including variables like species, average size, average weight, fat content, gonads y/n and stomach fill)
- linking batch and haul information (essentially a key of how much of a batch is caught in which of the hauls)
- length information (length frequency measurements, either by batch or by haul)

The self-sampling information is collected using standardized Excel worksheets. Each participating vessel will send in the information collected during a trip by the end of the trip. The data will be checked and added to the database by Floor Quirijns and/or Martin Pastoors, who will also generate standardized trip reports (using RMarkdown) which will be sent back to the vessel within one or two days. The compiled data for all vessels is being used for specific purposes, e.g. reporting to expert groups, addressing specific fishery or biological questions and supporting detailed biological studies. The PFA publishes an annual report on the self-sampling programme.

A major feature of the PFA self-sampling programme is that it is tuned to the capacity of the vessel-crew to collect certain kinds of data. Depending on the number of crew and the space available on the vessel, certain types of measurements can or cannot be carried out. That is why the programme is essentially tuned to each vessel separately. And that is also the reason that the totals presented in this report can be somewhat different dependent on which variable is used. For example the estimate of total catch is different from the sum of the catch by species because not all vessels have supplied data on the species composition of the catch.

The historical data retrieval program has been based on skippers' private logbooks that have been kept for fisheries practice recording. This data delivers information on the catch composition by haul and species. As part of a generic effort to retrieve the historical information,

excel based versions of the logbooks have been converted into a standardized database. A major effort has been spent in making the information from the skippers' logbooks consistent and useable, so that the units are consistent between vessels and years. In addition, the species composition has been approximated from the logbooks using automated techniques. For example, skippers may have described the catch of a certain haul as "her 10% hom" which would then be converted to 90% herring and 10% horse mackerel. All conversion have been fully documented in R code. For this report, skippers' logbooks of 4 vessels have been used covering the period 2000-2015.

The freezer-trawler fishery is mostly focussed on the key target species herring, mackerel, horse mackerel and blue whiting. However, during the months april to june there is also a more limited directed fishery for greater argentine (*Argentina silus*) and lesser argentine (*Argentina sphyraena*), mostly in ICES division 27.6.a and 27.4.a.

For this report, the PFA self-sampling data has been filtered using the following criteria:

- hauls in divisions 27.2.a, 27.4.a, 27.5.b, 27.6.a
- catch of arg, aru, ary by trip and week at least 5% of the total catch of that trip and week.
- catch of arg, aru, ary by trip and week at least 50 tonnes.

### 3 Results

#### 3.1 General summary of self-sampling for Silver smelts\*\*

An overview of all the self-sampled trips for arg, aru, ary in 27.2.a, 27.4.a, 27.5.b, 27.6.a

year	nvessels	ntrips	ndays	nhauls	catch	nlength
2001	1	1	10	32	1,635	0
2003	1	1	18	43	2,132	0
2004	1	2	38	96	4,925	0
2005	1	1	7	14	1,340	0
2006	1	1	12	25	1,495	0
2007	1	1	13	29	1,505	0
2008	1	1	7	16	680	0
2012	1	2	27	74	3,044	0
2013	1	1	12	27	1,260	0
2014	1	1	14	30	1,885	0
2015	3	4	51	123	9,712	15,672
2016	3	3	73	158	11,025	10,166
2017	4	4	43	118	10,345	11,178
2018	9	9	103	273	17,215	17,783
2019	6	8	80	197	18,938	8,821
2020	6	8	117	319	22,536	18,781
(all)		48	625	1,574	109,672	82,401

Table 3.1.1: PFA fisheries for argentines (and blue whiting). Self-sampling Summary of number of vessels, trips, days, hauls, catch (tonnes) and number of fish measured.

The majority of hauls have been recorded in division 27.6.a (81%).

division	2001	2003	2004	2005	2006	2007	2008	2012	2013	2014	2015	2016	2017	2018	2019	2020	all	perc
27.6.a	32	4	65	3	2	17	16	70	27	25	116	97	109	239	175	281	1,278	81.2%
27.5.b	0	36	12	11	8	12	0	4	0	2	7	42	9	5	0	4	152	9.7%
27.4.a	0	0	0	0	13	0	0	0	0	3	0	19	0	26	22	34	117	7.4%
27.2.a	0	3	19	0	2	0	0	0	0	0	0	0	0	3	0	0	27	1.7%
(all)	32	43	96	14	25	29	16	74	27	30	123	158	118	273	197	319	1,574	100.0%

Table 3.1.2: PFA fisheries for argentines (and blue whiting). Self-sampling Summary of number of hauls per year and division.

## Catch by species in the selected fisheries

species	english_name	scientific_name	2015	2016	2017	2018	2019	2020	all	perc
whb	blue whiting	Micromesistius poutassou	6,781	7,735	7,688	13,110	13,602	13,115	62,030	69.1%
arg	argentines	Argentina spp	2,841	2,551	2,438	3,682	4,824	7,561	23,897	26.6%
her	herring	Clupea harengus	0	0	0	0	0	1,438	1,438	1.6%
mac	mackerel	Scomber scombrus	29	27	124	264	446	312	1,203	1.3%
hke	hake	Merluccius merluccius	51	642	89	126	59	50	1,017	1.1%
hom	horse mackerel	Trachurus trachurus	0	50	0	1	2	0	52	0.1%
squ	various squids nei	Loliginidae, Ommastrephidae	10	0	3	3	3	14	33	0.0%
mcd	NA	Ceratoscopelus maderensis	0	0	0	0	0	23	23	0.0%
sqr	squid	Loligo vulgaris	0	0	0	4	1	16	21	0.0%
mzz	other fish	Osteichthyes	0	0	0	20	0	0	20	0.0%
oth	NA	NA	1	21	3	6	2	8	41	0.0%
(all)	(all)	(all)	9,713	11,026	10,346	17,215	18,938	22,537	89,774	100.0%

*Table 3.1.3: PFA fisheries for argentines (and blue whiting). Self-sampling Summary of total catch (tonnes) by species.*

## Haul positions

An overview of all self-sampled hauls in the PFA fisheries for argentinines (and blue whiting)..

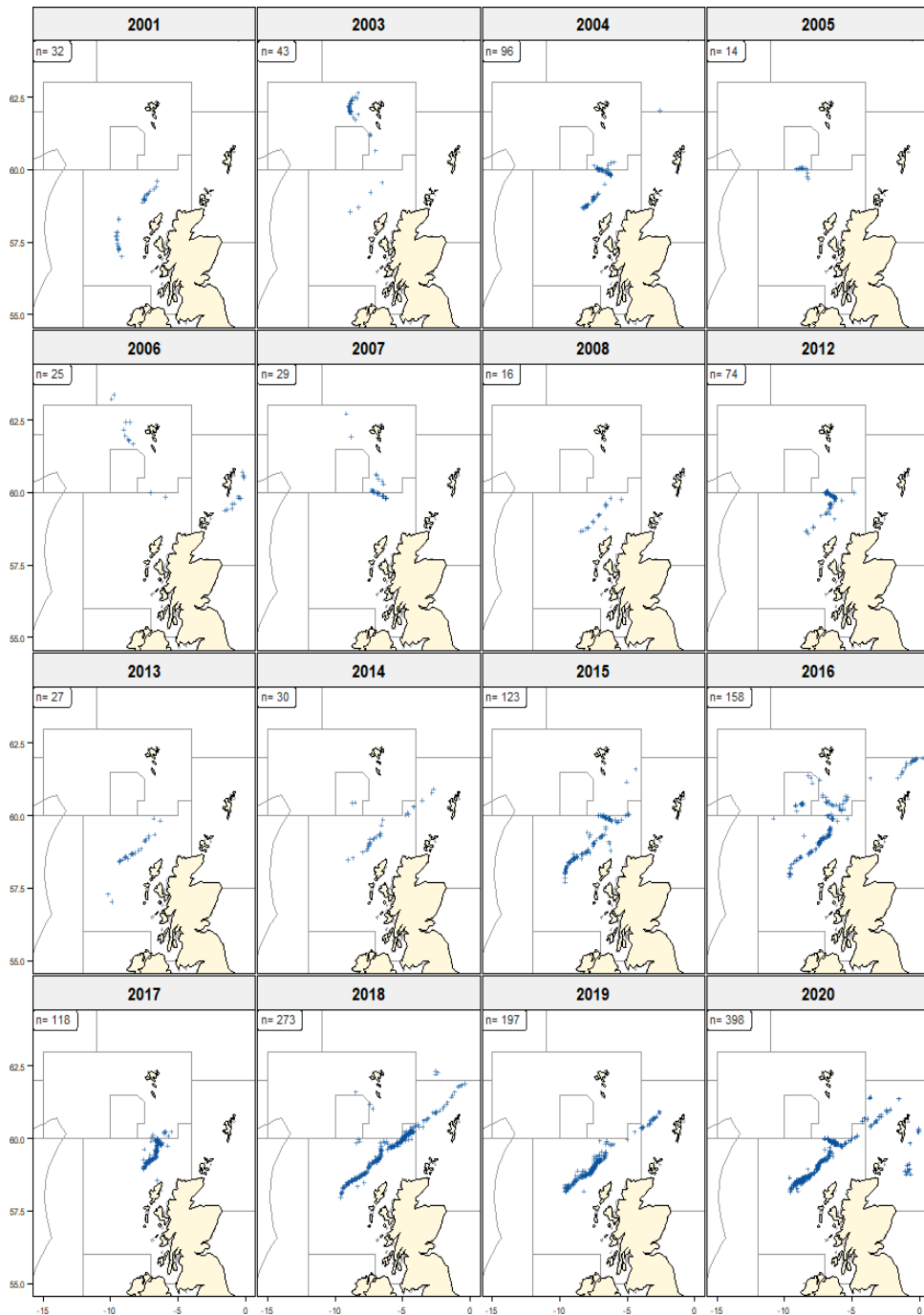


Figure 3.1.1: PFA fisheries for argentinines (and blue whiting). Self-sampling haul positions. *N* indicates the number of hauls.



## Total catch per rectangle for the main target species

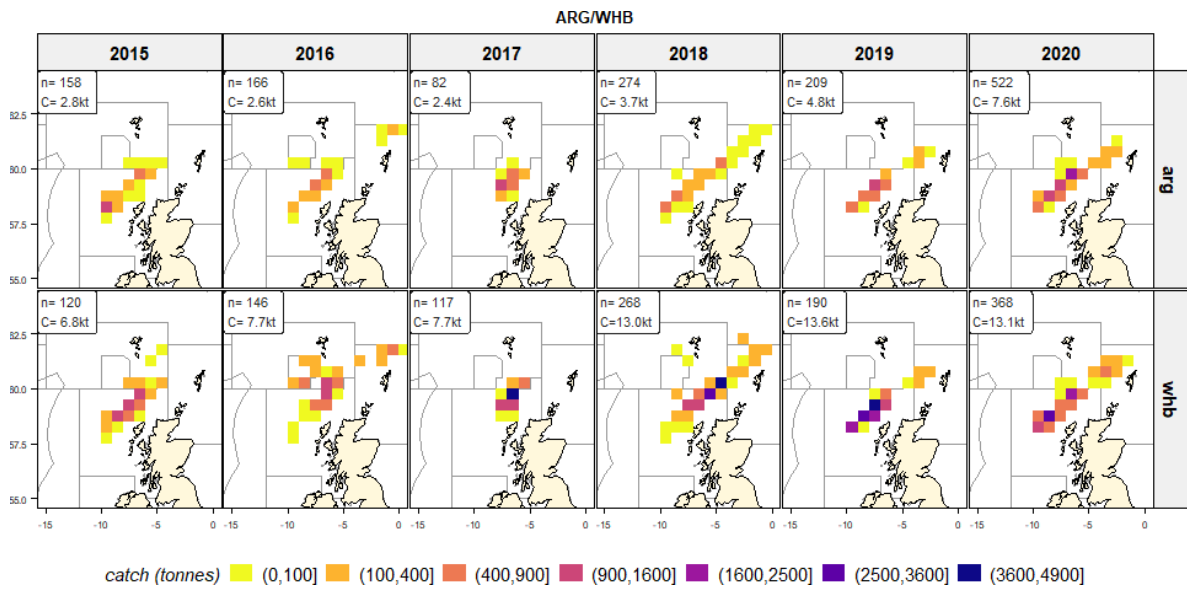


Figure 3.1.2: PFA fisheries for argentinies (and blue whiting). Self-sampling catch per species and per rectangle. N indicates the number of hauls. Catch refers to the total catch per year.

## Average fishing depth by rectangle

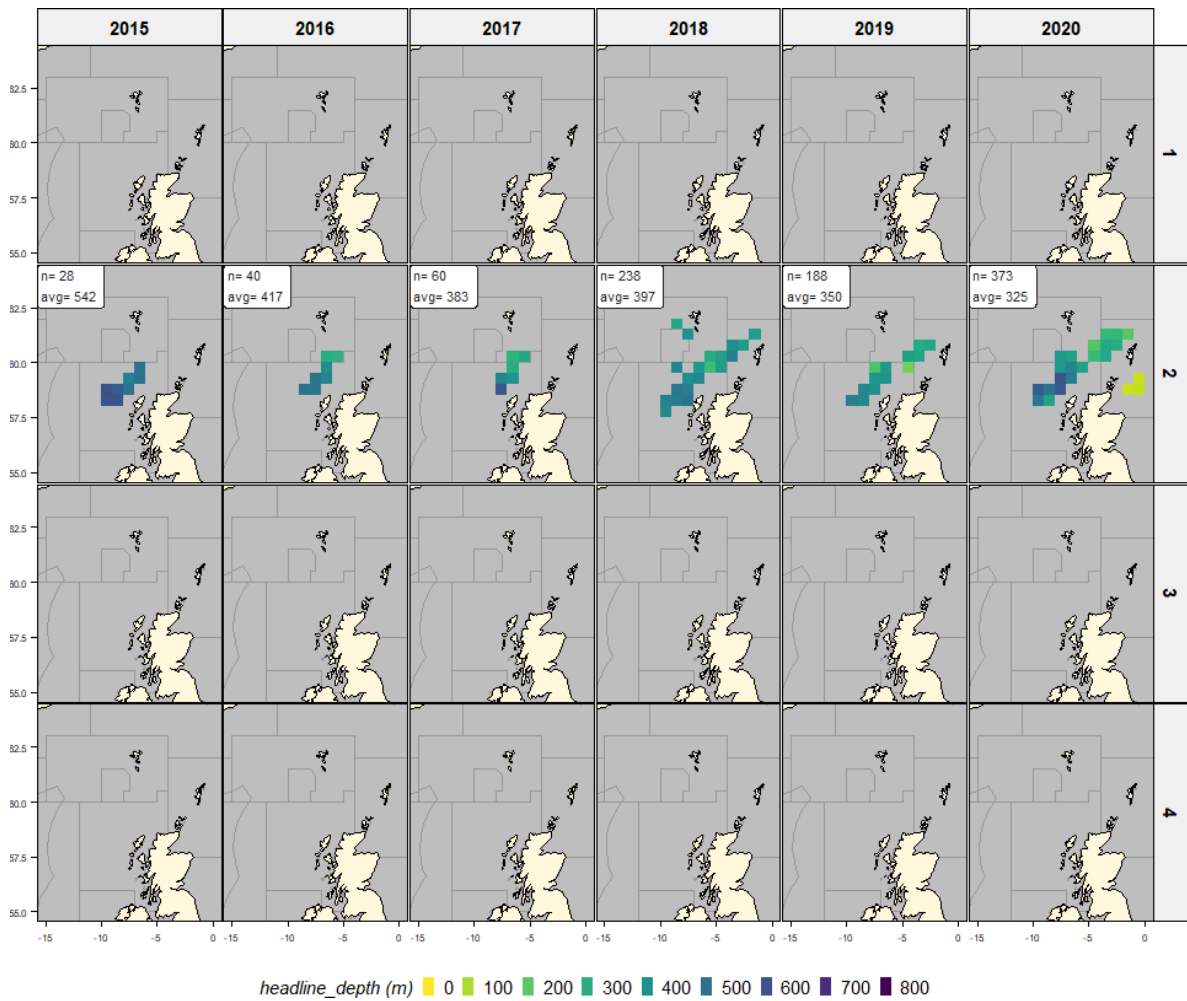


Figure 3.1.3: PFA fisheries for argentinies (and blue whiting). Average fishing depth (m) by year and quarter. N indicates the number of hauls. Avg refers to the average fishing depth.

## Average temperature at fishing depth by rectangle

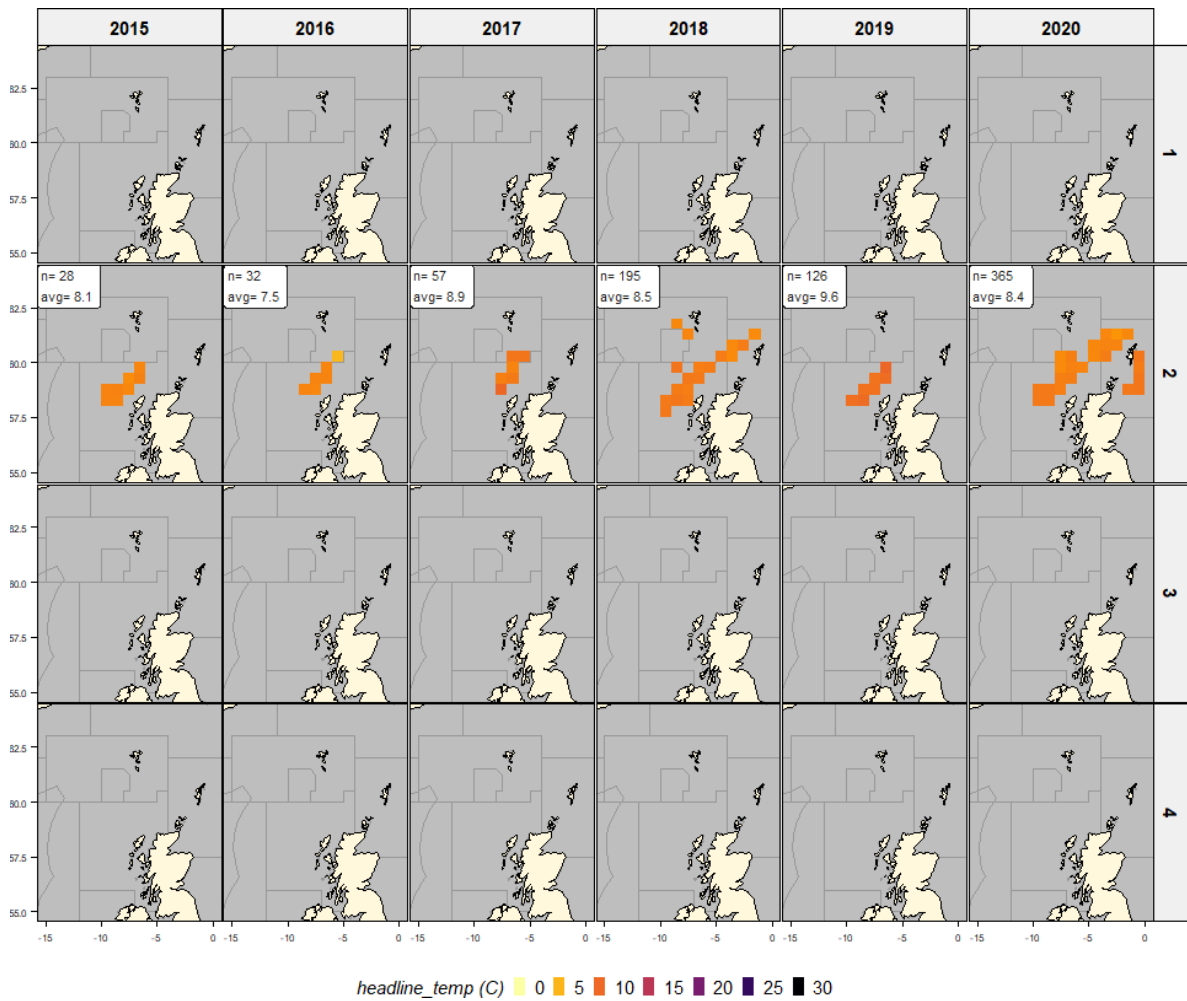


Figure 3.1.4: PFA fisheries for argentinies (and blue whiting). Average temperature at fishing depth (C) by year and quarter. N indicates the number of hauls. Avg refers to the average temperature.

### Average windspeed by rectangle

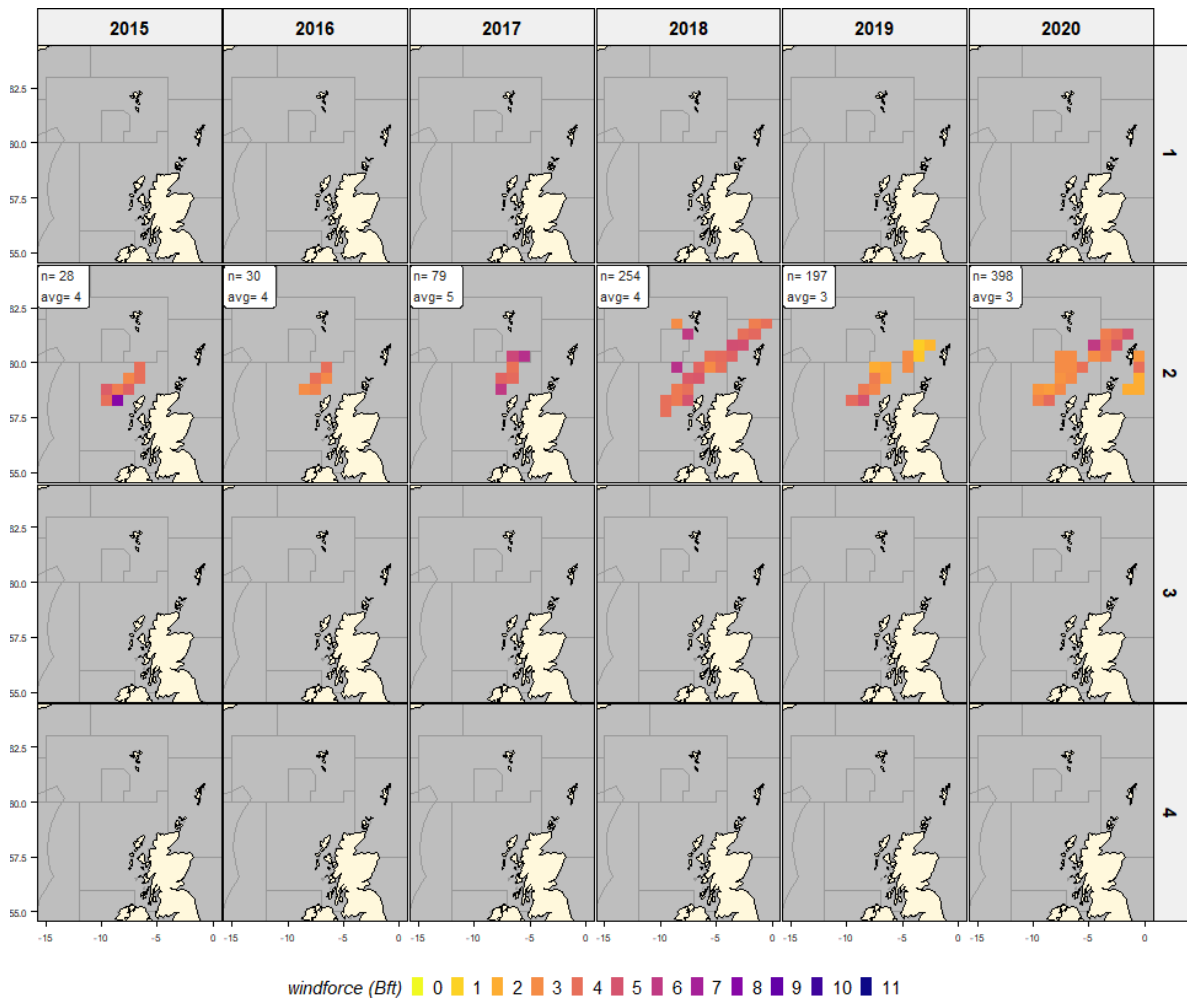


Figure 3.1.5: PFA fisheries for argentinnes (and blue whiting). Average wind speed (Bft) by year and quarter. N indicates the number of hauls. Avg refers to the average wind speed.

### 3.2 Argentines (ARG, Argentina spp.)

The Argentines fishery takes place as a summer fishery from June to September and a winter fishery in December. Overall, the self-sampling activities for the Argentines fisheries during the years 2000 – 2020 covered 48 fishing trips with 1685 hauls, a total catch of 30253 tonnes and 18635 individual length measurements. The main fishing areas are ICES divisions 27.4.a, 27.4.b and 27.7.d.

species	division	year	nvessels	ntrips	ndays	nhauls	catch	catchperc	nlength
arg	27.2.a	2004	1	1	1	1	80	3	0
arg	27.4.a	2014	1	1	1	3	9	5	0
arg	27.4.a	2016	2	2	8	18	150	6	362
arg	27.4.a	2018	5	5	13	25	181	5	239
arg	27.4.a	2019	1	1	9	21	329	7	628
arg	27.4.a	2020	3	3	9	17	490	6	377
arg	27.5.b	2003	1	1	12	28	821	100	0
arg	27.5.b	2004	1	2	6	8	182	7	0
arg	27.5.b	2005	1	1	2	3	108	100	0
arg	27.5.b	2006	1	1	4	6	222	94	0
arg	27.5.b	2007	1	1	4	6	130	18	0
arg	27.5.b	2012	1	1	4	4	25	2	0
arg	27.5.b	2015	2	3	4	5	155	5	637
arg	27.5.b	2016	2	2	8	14	139	5	119
arg	27.5.b	2017	1	1	1	1	6	0	2
arg	27.5.b	2018	1	1	1	1	4	0	6
arg	27.5.b	2020	1	1	2	2	87	1	48
arg	27.6.a	2001	1	1	6	9	121	100	0
arg	27.6.a	2003	1	1	3	4	0	0	0
arg	27.6.a	2004	1	2	23	61	2,272	90	0
arg	27.6.a	2006	1	1	1	2	14	6	0
arg	27.6.a	2007	1	1	8	17	599	82	0
arg	27.6.a	2008	1	1	5	12	216	100	0
arg	27.6.a	2012	1	2	25	67	1,246	98	0
arg	27.6.a	2013	1	1	11	23	127	100	0
arg	27.6.a	2014	1	1	10	19	186	95	0
arg	27.6.a	2015	3	4	47	105	2,686	95	5,178
arg	27.6.a	2016	3	3	45	86	2,262	89	1,063
arg	27.6.a	2017	4	4	38	81	2,432	100	980
arg	27.6.a	2018	9	9	83	204	3,498	95	1,396
arg	27.6.a	2019	6	8	59	129	4,495	93	3,038
arg	27.6.a	2020	6	8	97	266	6,984	92	4,557
arg	(all)	2001		1	6	9	121	100	0
arg	(all)	2003		2	15	32	821	100	0
arg	(all)	2004		5	30	70	2,534	100	0
arg	(all)	2005		1	2	3	108	100	0
arg	(all)	2006		2	5	8	236	100	0
arg	(all)	2007		2	12	23	729	100	0
arg	(all)	2008		1	5	12	216	100	0
arg	(all)	2012		3	29	71	1,271	100	0
arg	(all)	2013		1	11	23	127	100	0
arg	(all)	2014		2	11	22	195	100	0
arg	(all)	2015		7	51	110	2,841	100	5,815
arg	(all)	2016		7	61	118	2,551	100	1,544

arg	(all)	2017		5	39	82	2,438	100	982
arg	(all)	2018		15	97	230	3,683	100	1,641
arg	(all)	2019		9	68	150	4,824	100	3,666
arg	(all)	2020		12	108	285	7,561	99	4,982
arg	(all)	(all)		75	550	1,248	30,256		18,630

*Table 3.2.1: Argentines. Self-sampling summary with the number of days, hauls, trips, vessels, catch (tonnes), number of fish measured, catch rates (ton/effort).*

### Argentines (ARG). Catch by month

species	month	2001	2003	2004	2005	2006	2007	2008	2012	2013	2014	2015	2016	2017	2018	2019	2020	all	perc
arg	Apr	63	0	485	107	0	0	0	675	127	20	569	433	43	921	981	3,397	7,821	25.9%
arg	May	57	821	1,969	0	235	728	216	521	0	174	1,928	1,869	2,394	2,760	3,842	3,128	20,642	68.3%
arg	Jun	0	0	80	0	0	0	0	75	0	0	0	247	0	0	0	1,034	1,436	4.7%
arg	Jul	0	0	0	0	0	0	0	0	0	0	343	0	0	0	0	0	343	1.1%
arg	(all)	120	821	2,534	107	235	728	216	1,271	127	194	2,840	2,549	2,437	3,681	4,823	7,559	30,242	100.0%

*Table 3.2.2: Argentines. Self-sampling summary with the catch (tonnes) by year and month.*

## Argentines (ARG). Catch by rectangle

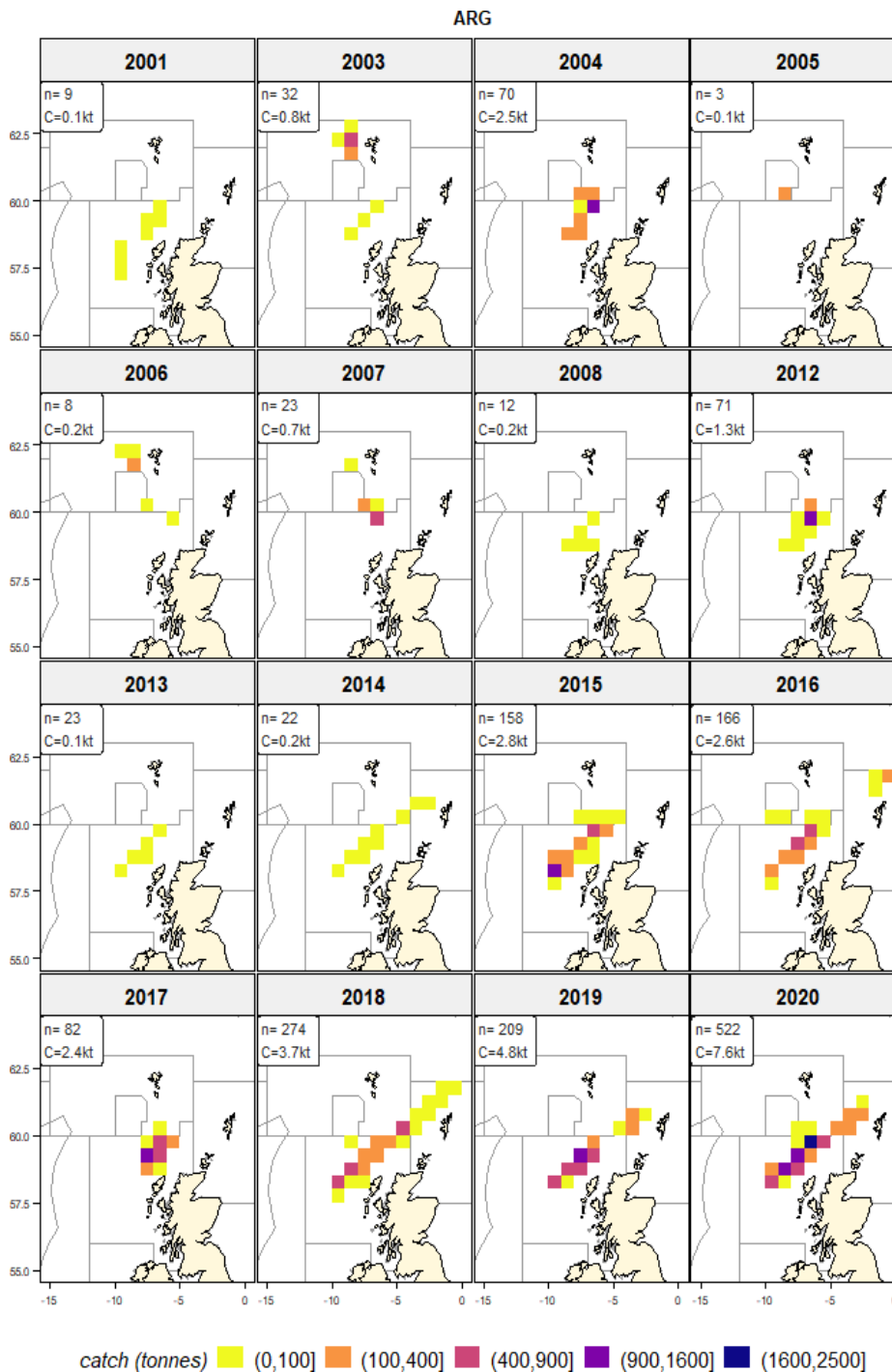


Figure 3.2.1: Argentines. Catch per per rectangle. N indicates the number of hauls; Catch refers to the total catch per year.





## Argentines (ARG). Spatial-temporal evolution of the fishery

Spatial-temporal evolution of the fishery by year and month from the haul-by-haul catch information. The fishing season is from June until September and a winter fishery in December. The midpoint of the distribution is indicated by the blue triangle. The catch has been used as weighting factor in the calculation of the midpoint.

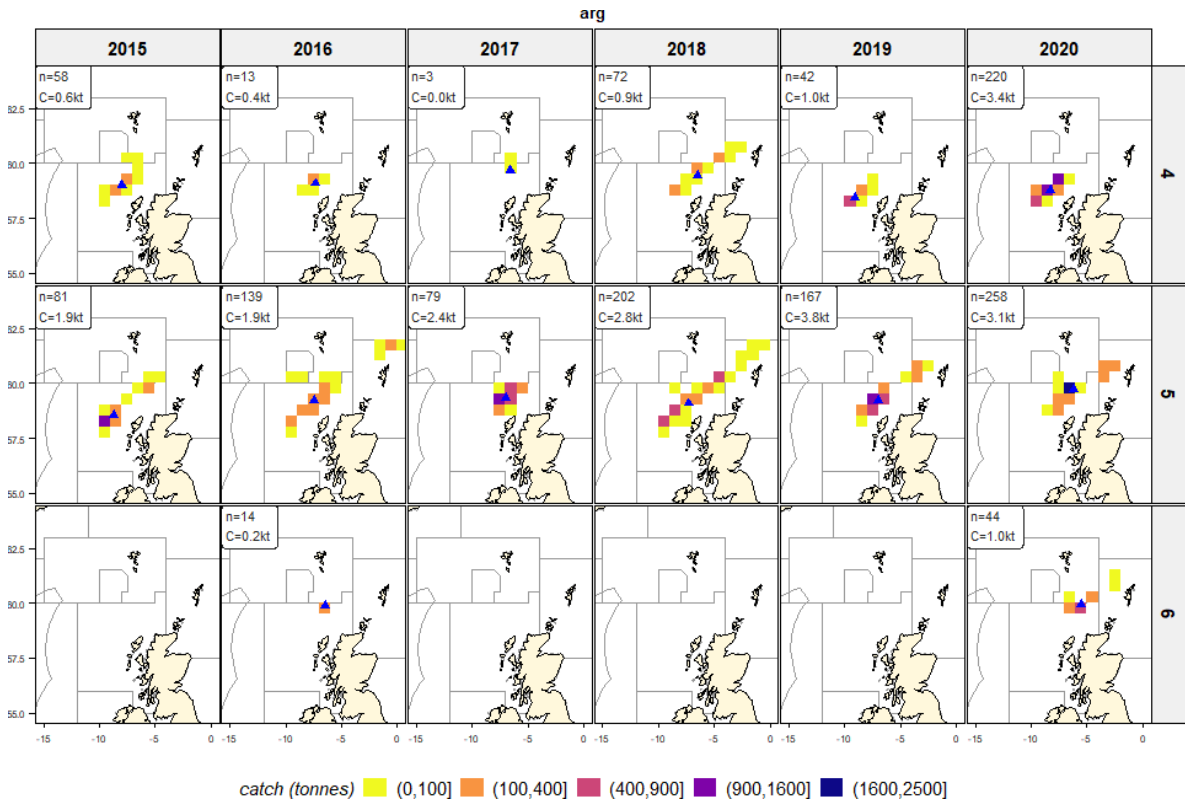


Figure 3.2.2: Argentines. Average catch per day per rectangle. *N* indicates the number of hauls; *avg* refers to the overall average catch per day.

## Argentines (ARG). Length distributions of the catch

The length distribution of argentines in the catches is relatively stable between 34 and 36 cm.

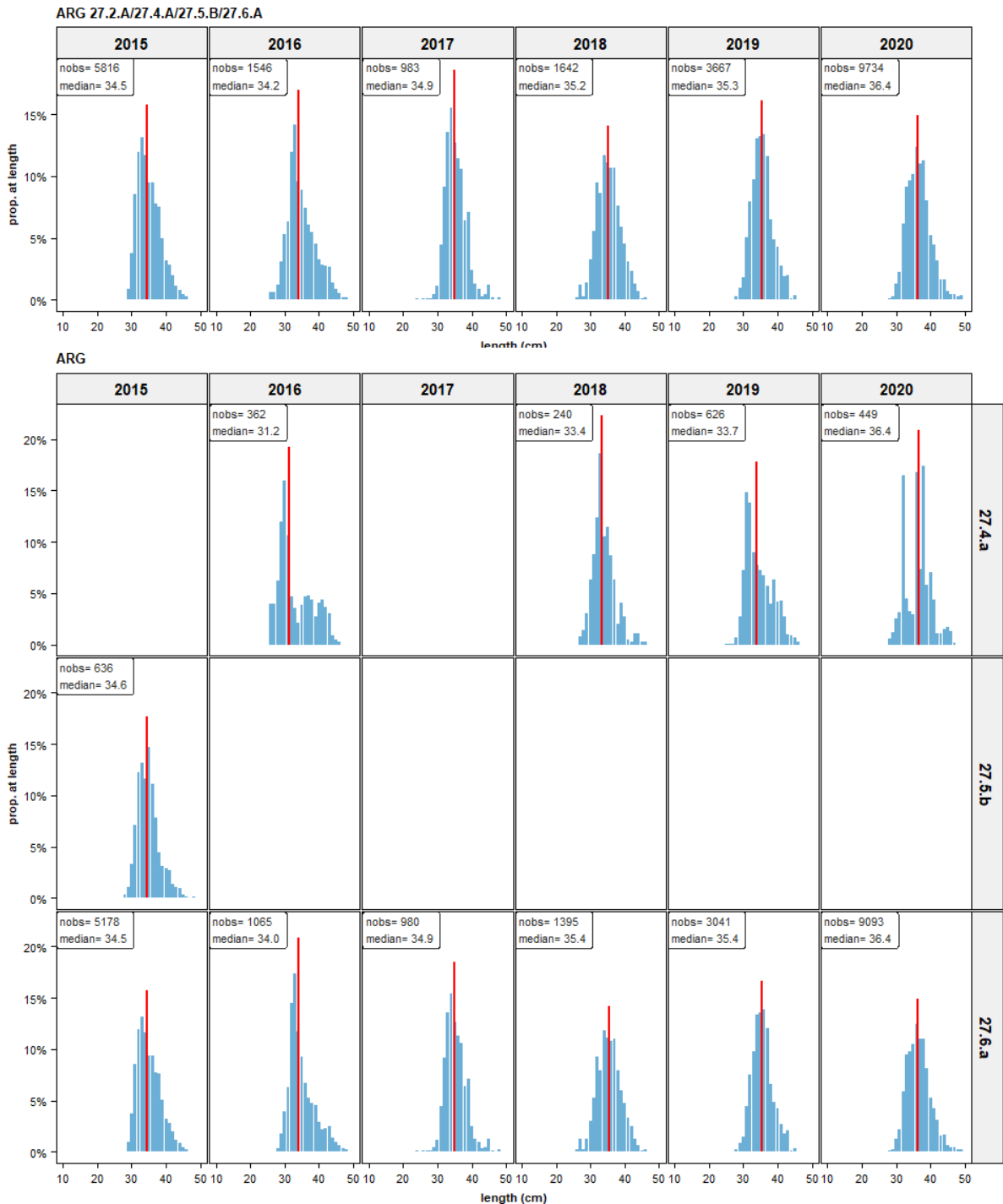


Figure 3.2.3: Argentines. Length distributions by year (top) and by year and division (bottom). Nobs refers to the number of observations; median denotes the median length.

### Catch at depth

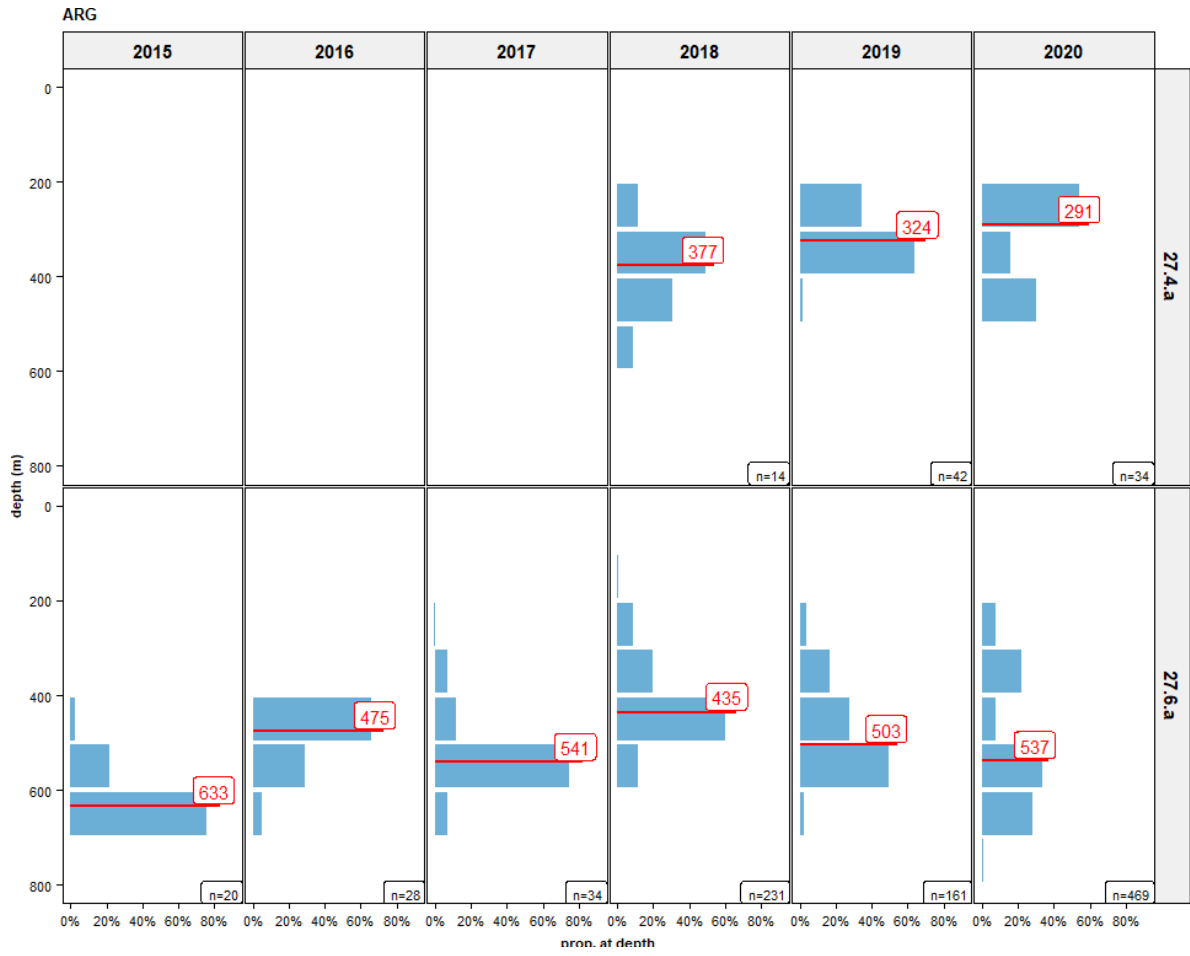


Figure 3.2.4: Argentinian. Depth distributions by year and division. Nobs refers to the number of observations; median denotes the median length.

### CPUE index

The catch rate in the fishery for argentines can be highly fluctuating between hauls. Catch rate has been defined as catch (tons) per ICES rectangle and per day on a nominal scale. Catches have first been summed by vessel, year, week and rectangle and the number of hauls and fishing days have been calculated. Then the catches and effort (fishing days) have been summed over all vessels by year and week and the average depth has been calculated. CPUE was then calculated as the average catch per rectangle and per day. This follows the procedure explained in Quirijns and Pastoors (2020), although here only applied to the PFA fleet.

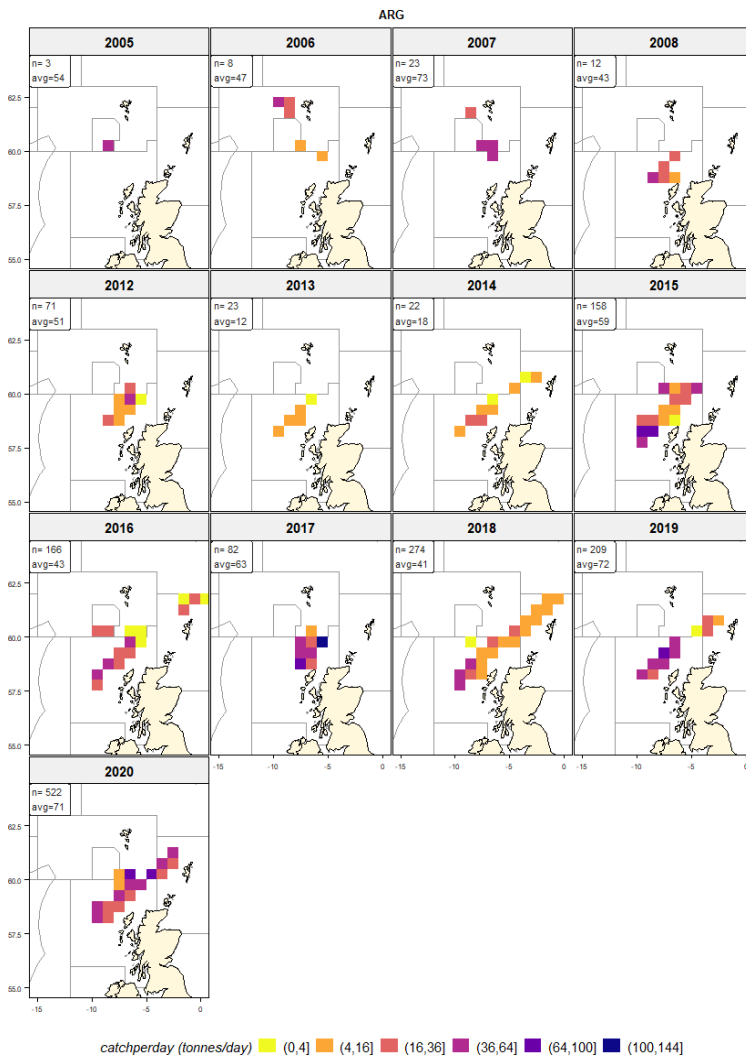
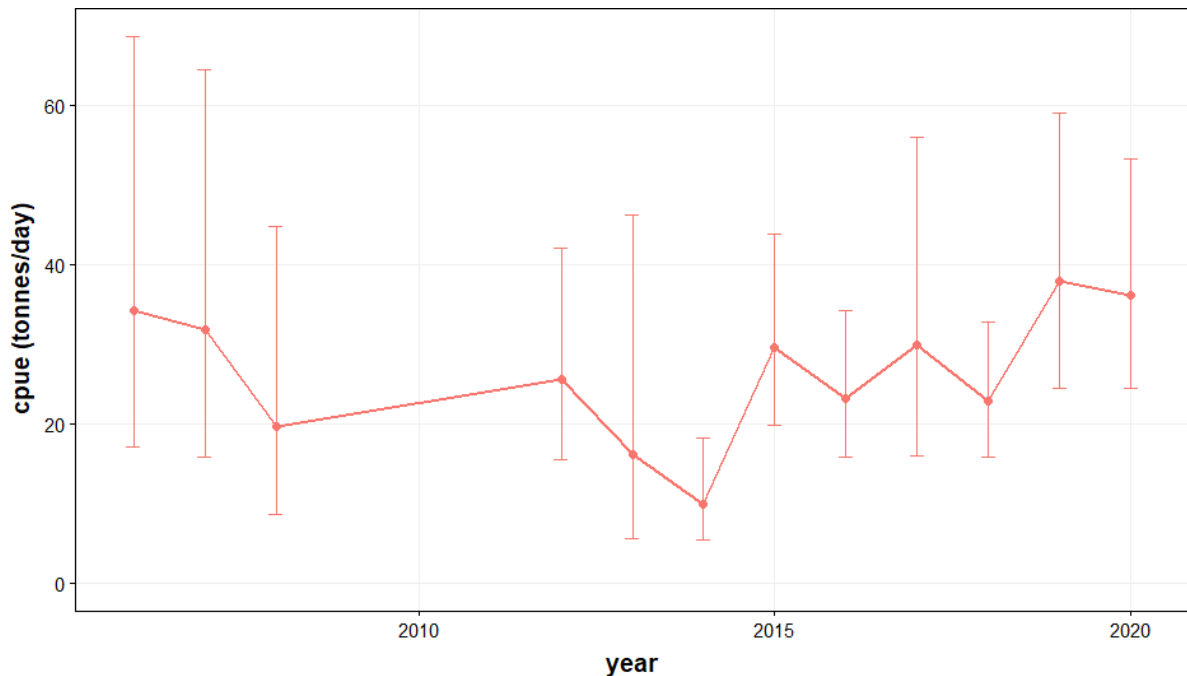


Figure 3.2.5: Argentines. Average catch per day per rectangle. N indicates the number of hauls; avg refers to the overall average catch per day.

The model used for standardization is:  $CPUE \sim year + week + depth$ , where CPUE is expressed as catch per day per rectangle. Catch rates in 2019 have been estimated higher than the preceding years, in line with reports from the skippers in the fleet.



## 4 Discussion and conclusions

By the end of 2019, all vessels were participating in the PFA self-sampling programme. Although the programme does not consist of a random selection of vessels – because the instructions to the vessel benefit from a continued application of data collection on the participating vessels – the overall fishing pattern does appear to represent the fisheries of the PFA vessels.

The definition of what constitutes ‘a fishery’ for a certain species is not well specified. In this report we selected all trips within divisions 27.2.a, 27.4.a, 27.5.b, 27.6.a and where the weekly catches had more than 50 tonnes of argentinies and where the proportion of species in the catch of that week was at least 5%.

The standardized CPUE for the PFA fleet has now been included in the annual report. The standardized CPUE follows the approach documented in Quirijns and Pastoors 2020.

## 5 Acknowledgements

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The skippers, officers and the quality managers of many of the PFA vessels have put in a lot of effort to make the PFA the self-sampling work. Without their efforts, there would be no self-sampling.

## 6 References

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Quirijns, F. J. and M. A. Pastoors (2020). CPUE standardization for greater silversmelt in 5b6a. WKGSS 2020, WD03.

## 7 More information

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Please contact Martin Pastoors ([mpastoors@pelagicfish.eu](mailto:mpastoors@pelagicfish.eu)) if you would have any questions on the PFA self-sampling program or the specific results presented here.