

1 Assessing an ecological trap using long-term condition data: case study on yellowfin
2 tuna and Drifting Fish Aggregating Devices (DFADs)

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4 Supplementary Materials

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20 **Supplementary Tables**

21 **Table S1: Number of sampled yellowfin tuna per year.**

Year	Number of samples
1987	659
1988	664
1989	401
1990	805
2003	496
2004	773
2005	1,224
2006	3,781
2007	1,619
2008	962
2009	2,621
2010	1,500

Year	Number of samples
2011	1,824
2012	3,431
2013	1,361
2014	1,103
2015	1,060
2016	294
2017	254
2018	416
2019	666
Total	25,914

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23 **Table S2: Number of sampled yellowfin tuna per school type per year.** Data was filtered to keep

24 only measurements for which the fishing mode information was available.

Year	FOB	FSC	Total
1990	279	119	398

Year	FOB	FSC	Total
2003	78	75	153
2005	235	10	245
2006	105	337	442
2007	61	34	95
2008	9	27	36
2009	513	100	613
2010	433	123	556
2011	629	591	1,220
2012	233	510	743
2013	381	36	417
2014	523	178	701
2015	598	37	635
Total	4,077	2,177	6,254

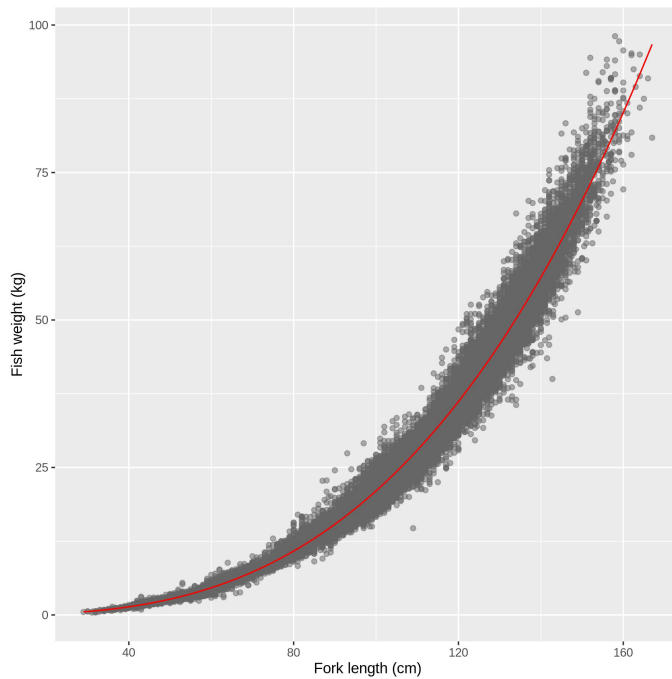
25 **Supplementary Material 1**

26 The power-law function $W_{th} = a FL^b$ was used to fit the fish weight as a function of the fork length data
27 recorded throughout the study period (Figure S1), using a linear regression procedure of the log-
28 transformed data (using the *lm* function of the package *stats* in R). The following parameters were
29 obtained:

	Value	Standard deviation	p-value
$\ln(a)$	-10.66	7.5×10^{-3}	$< 10^{-16}$
a	2.35×10^{-5}		
b	2.976	1.6×10^{-3}	$< 10^{-16}$

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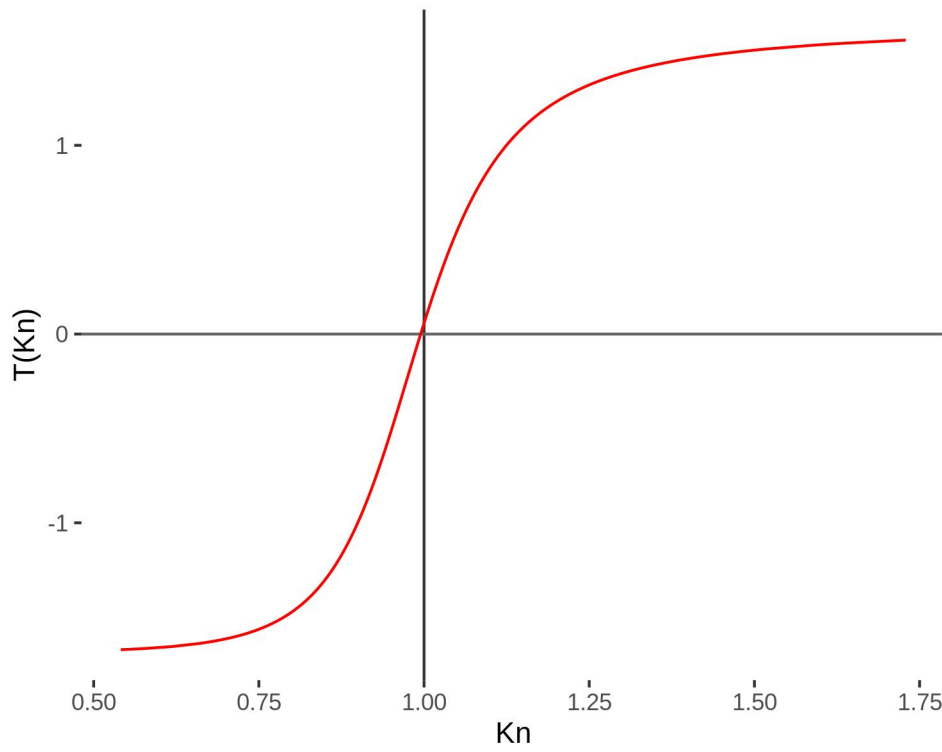
31 Hence, $W_{th} = 2.35 \times 10^{-5} FL^{2.976}$, $R^2 = 0.992$; where W_{th} is the predicted weight, in kilograms, and FL is
32 the fork length, in centimeters.



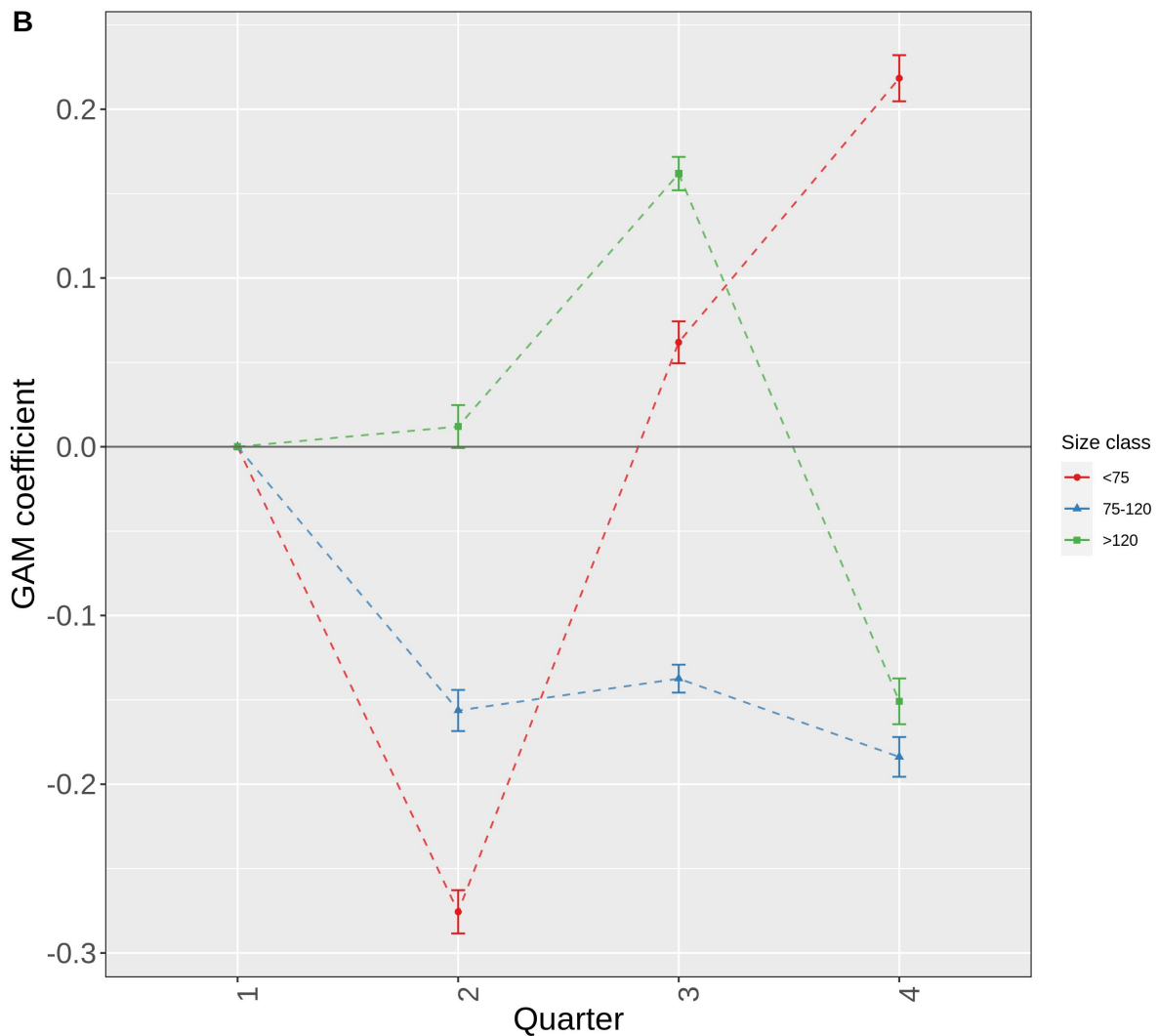
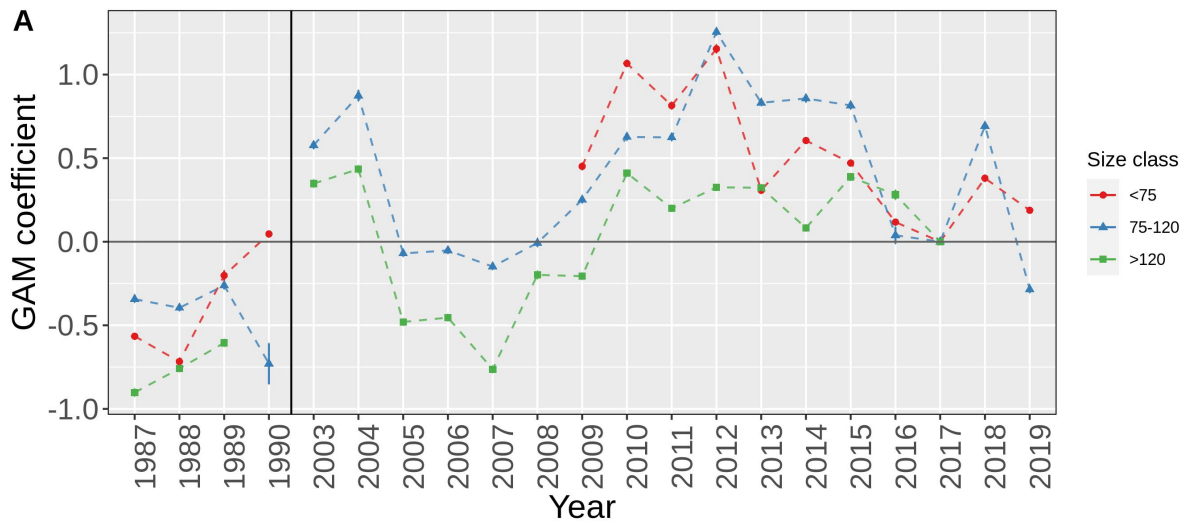
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34 **Figure S1: Relationship between fish weight and fork length.**

35 **Supplementary Figures**

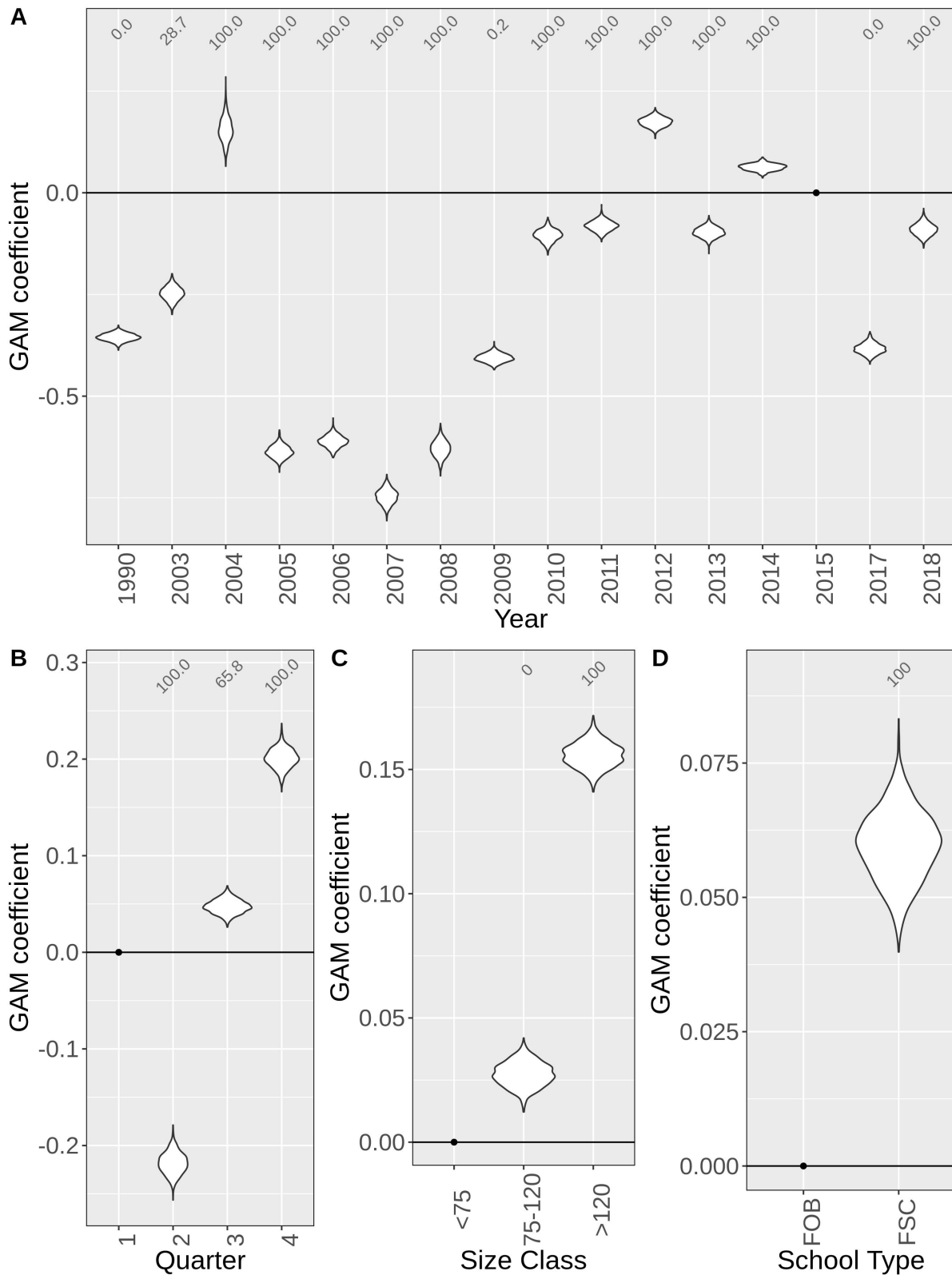


36 **Figure S2: Result of the Geary-Hinkley transformation performed on K_n .**



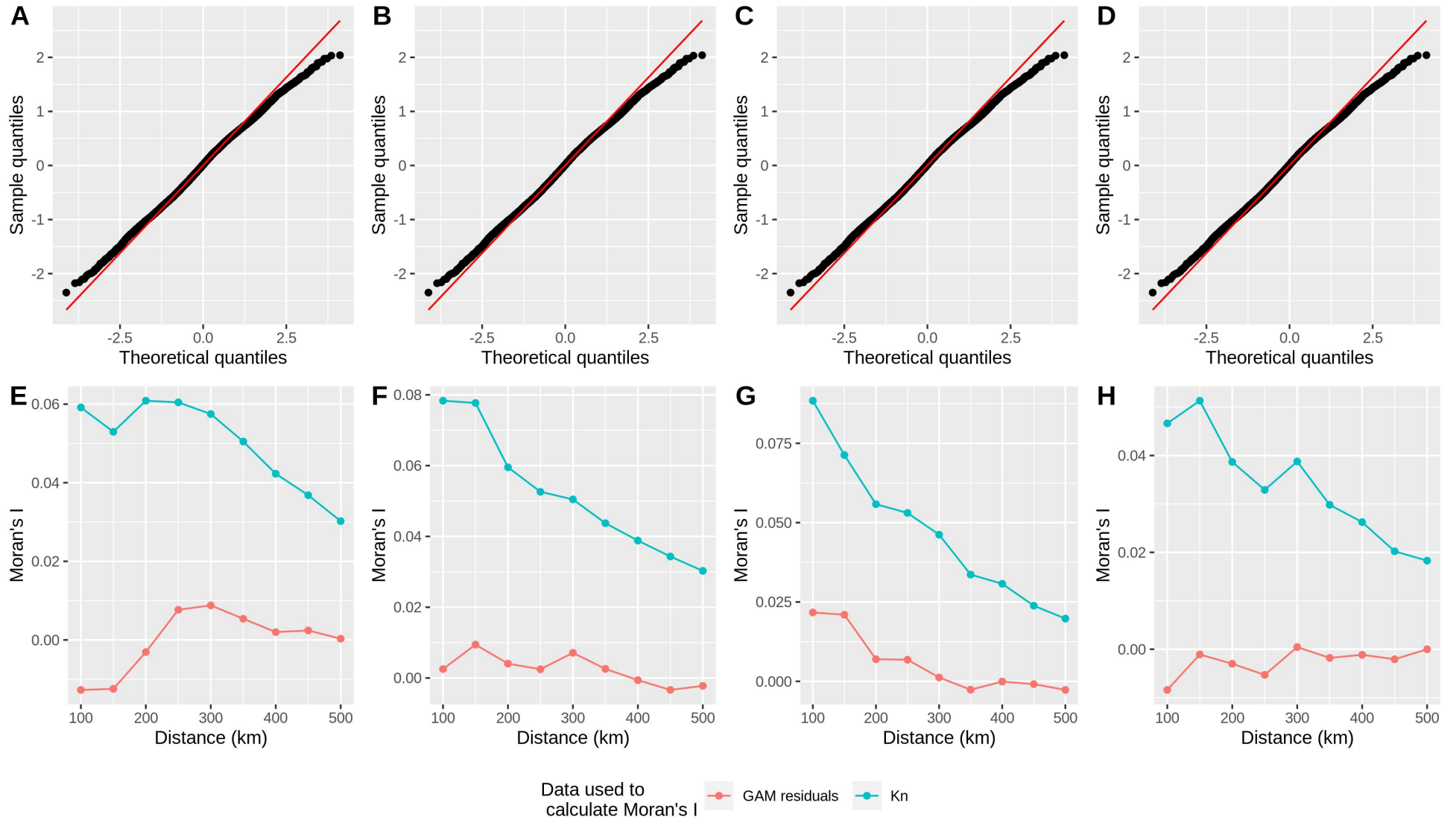
37 **Figure S3: Coefficients of the Generalized Additive Models considering a subset of data.** Only
 38 small fish (<75cm, red circles), only medium fish (75-120cm, blue triangles) or only large fish
 39 (>120cm, green squares). Coefficients of the fishing year (A) and of the quarter (B). Each coefficient

40 represent the mean deviation of $T(K_n)$ from the values at a given level of reference. The error bars
41 represent the standard deviation. Considered categories of reference: Y: 2017; Q: Q1. The year 2017
42 was chosen as the reference year because it is the most recent year with all size classes measured.



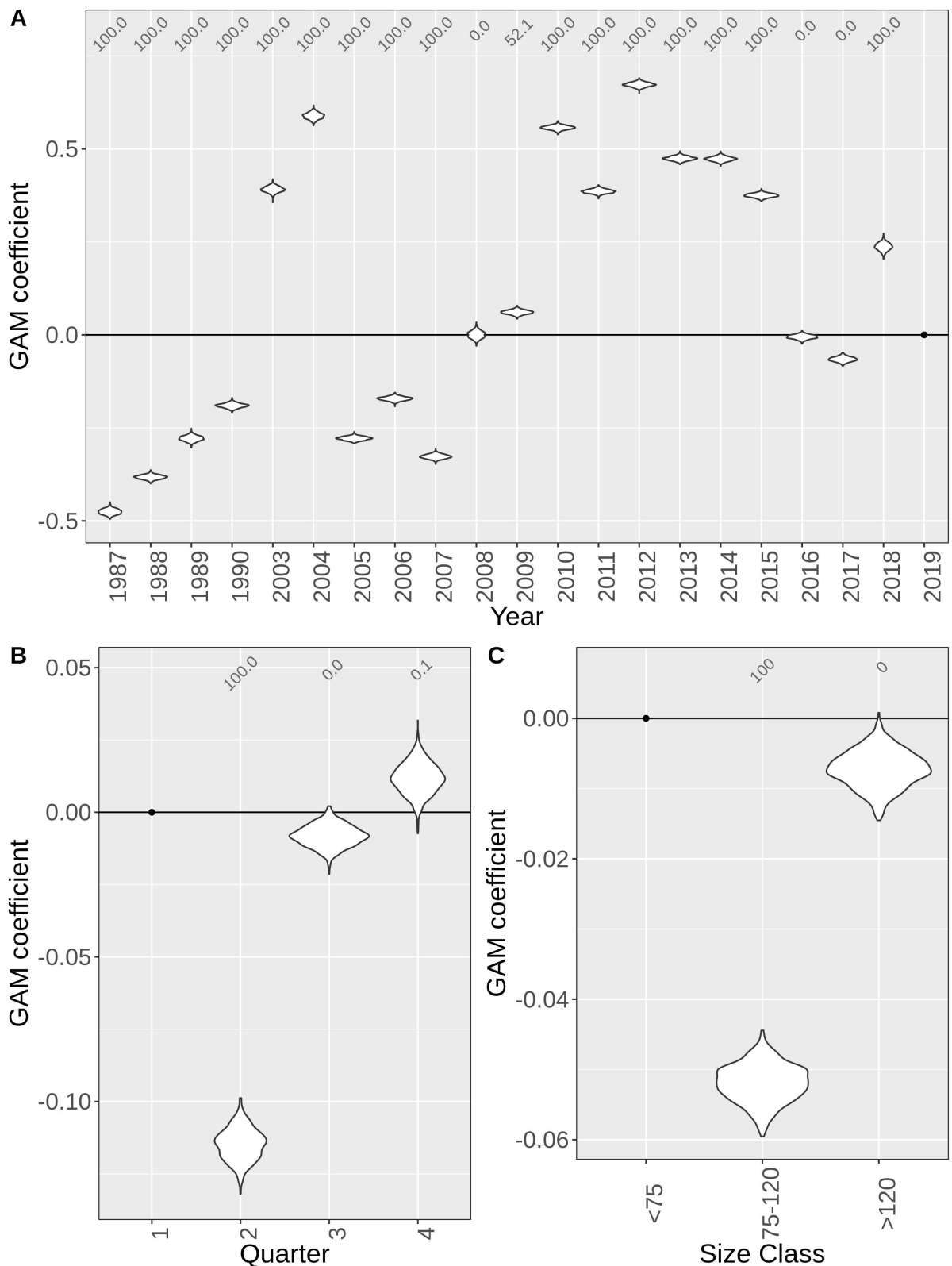
43 **Figure S4: Coefficients of the Generalized Additive Model with fishing mode as an explanatory**
 44 **variable.** Coefficients of the fishing year (A), of the quarter (B), of the size class (C) and of the fishing
 45 mode (D). Please note that each coefficient represents the mean deviation of $T(K_n)$ from the values for

46 a given category of reference. The shape of the point represents the distribution of the obtained values.
47 The numbers in grey in the upper part of the panels represent the percentage of the models generated in
48 the bootstrap for which the given category was significantly different from the category of reference.
49 Considered categories of reference, represented by a black dot: Y: 2015; Q: Q1; SC: <75 cm, FM: FOB.
50 2015 was chosen as the reference year because it is the most recent year with both FOB-associated and
51 FSC tuna, only FOB-associated tuna were sampled in 2016 and 2017. The $T(K_n)$ of FSC was
52 significantly higher than that of FOB-associated tuna in all the models generated in the bootstrap (see
53 panel D).



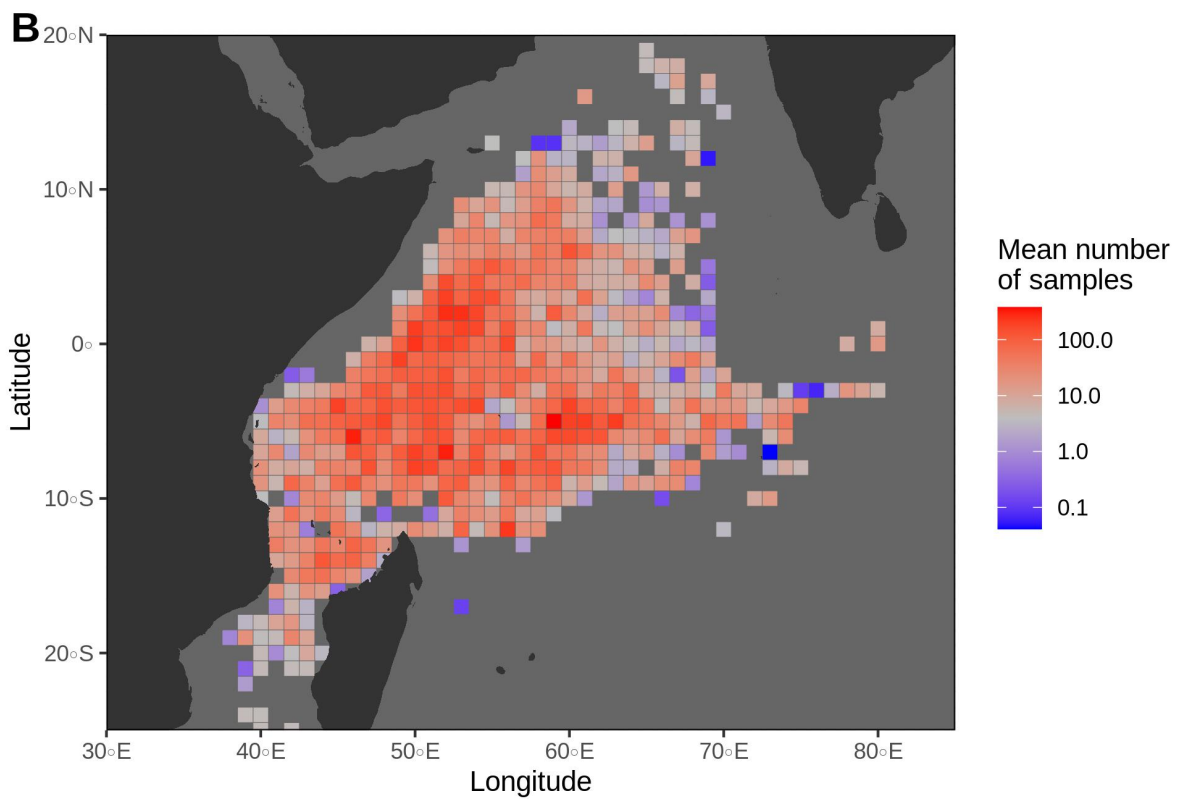
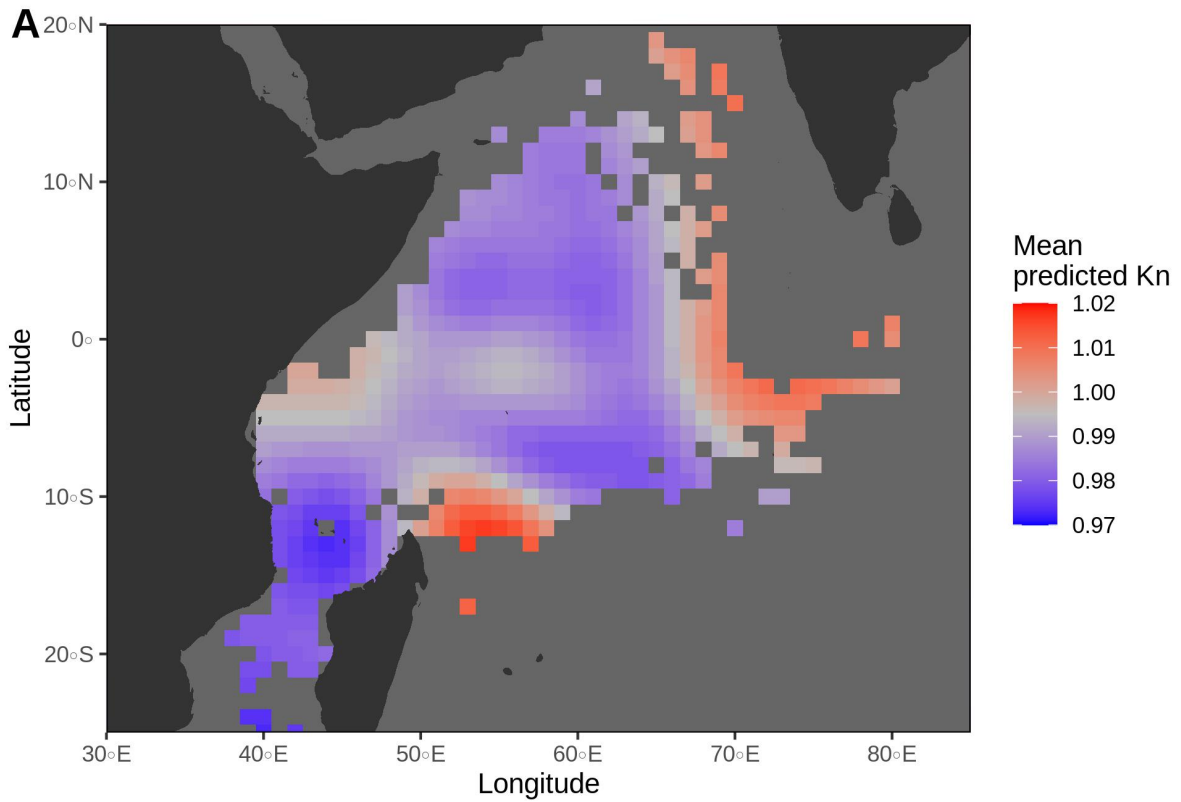
54 **Figure S5: Diagnostic plots of the residuals of 4 randomly picked Generalized Additive Models performed.** (A-D) Quantile-quantile plots of the
 55 residuals. (E-H) Plot of the Moran's I in the data, in blue, and in the model residuals, in red. Distances on x axis is the distance used to define two

56 points as “linked” in the Moran’s I calculation (see details of the *dnearneigh* function in the *spdep* package in R).



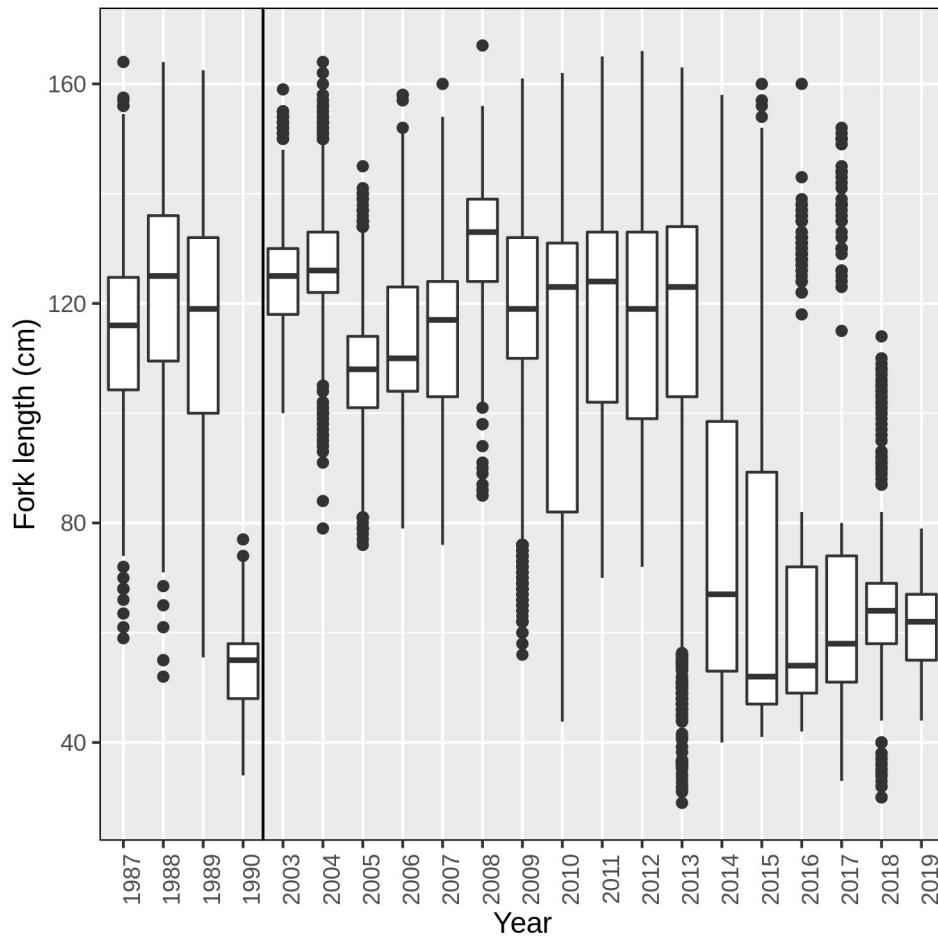
57 **Figure S6: Coefficients of the Generalized Additive Model.** Coefficients of the fishing year
 58 (A), of the quarter (B) and of the size class (C). Each coefficient represents the mean
 59 deviation of $T(K_n)$ from the values for a category of reference. The shape of the points

60 represents the distribution of the values obtained with the bootstrap process. Numbers in grey
61 in the upper part of the panels represent the percentage of the models generated in the
62 bootstrap for which a given category was significantly different from the category of
63 reference. Considered category of reference, represented by a black dot: Y: 2019; Q: Q1; SC:
64 <75 cm.



65 **Figure S7: Spatial prediction of the Generalized Additive Models.** (A) Mean predicted
 66 value of K_n . (B) Mean number of samples in the data used as input in the model. Dark grey

67 cells represent cells in which no tuna was sampled. Considered categories of reference for the
68 prediction: Y: 2019; Q: Q1; size class: <75 cm.



69 **Figure S8: Boxplot of the fork length of sampled tuna per year.** The uneven distribution
 70 of the sampling is mainly due to the fact that data comes from different research projects,
 71 which do not always aim at studying the same size class.