

Fig S1. Classification of seven islands from southwestern Atlantic through hierarchical cluster analysis using the Bray-Curtis similarity index as a distance measure and Ward group method for cluster formation. The rectangles represent the northernmost (blue) and southernmost (yellow) islands that correspond to north and south regions.

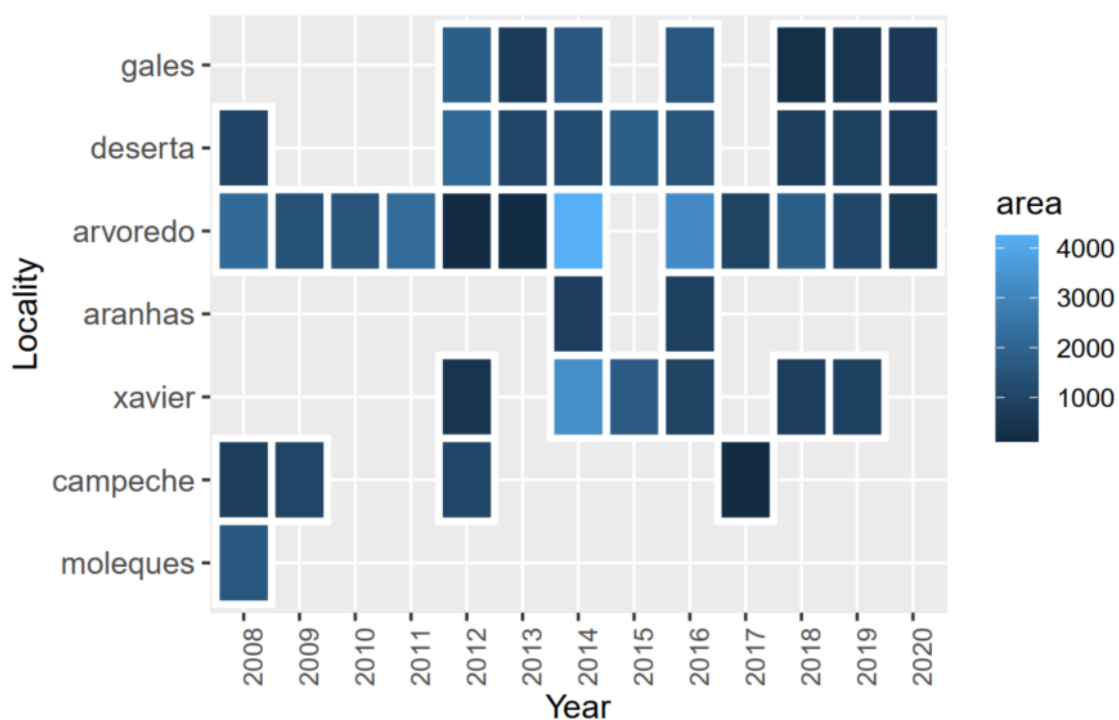


Fig S2. Community data available for each year and island sampled. The color gradient represents sampling effort in square meters. The absence of data is due to the absence of sampling.

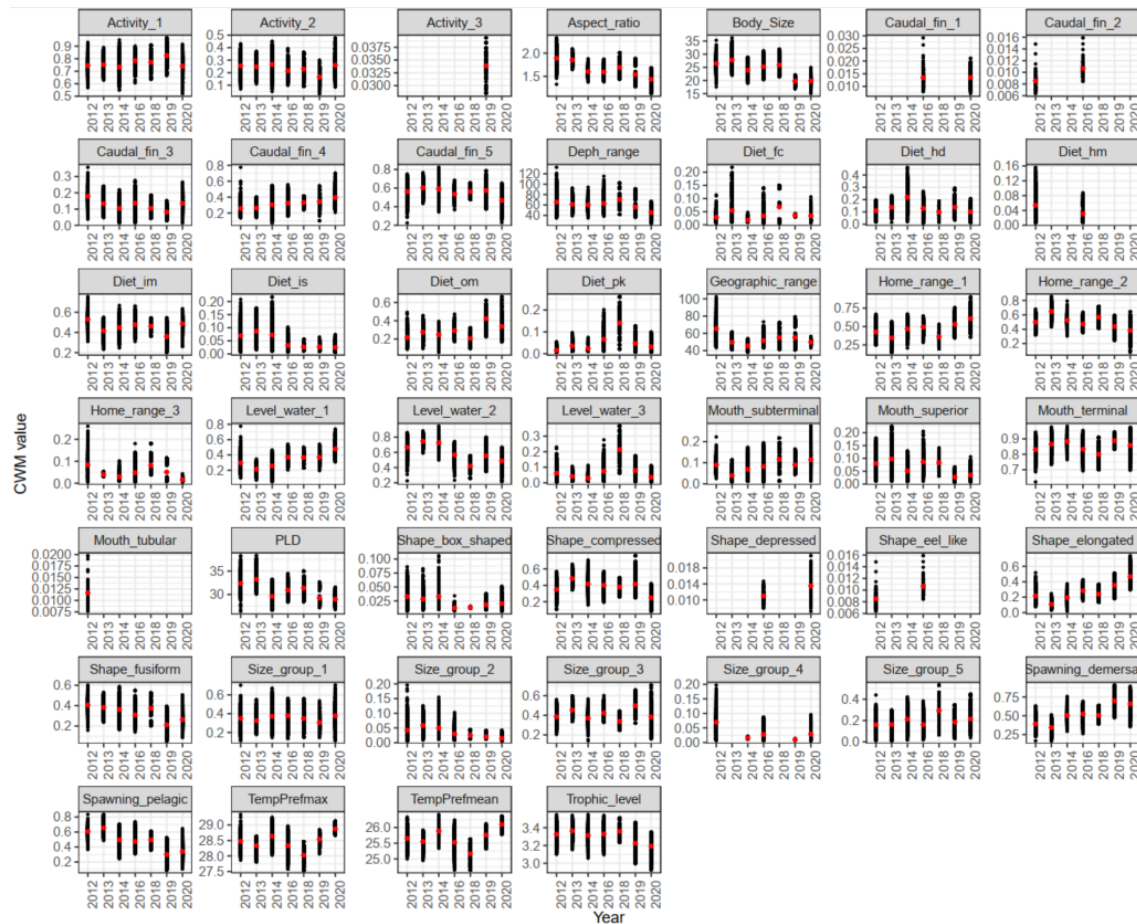


Fig S3. Time-series of the community weighted mean (CWM) traits of fish in **Galé Island**. Note that for some years there is no data available. The black dots represent the range of 1000 CWM traits values calculated from the computed random communities. The red dots represent the mean CWM trait value for each year, and are the value used as input in the multiple factor analysis (MFA).

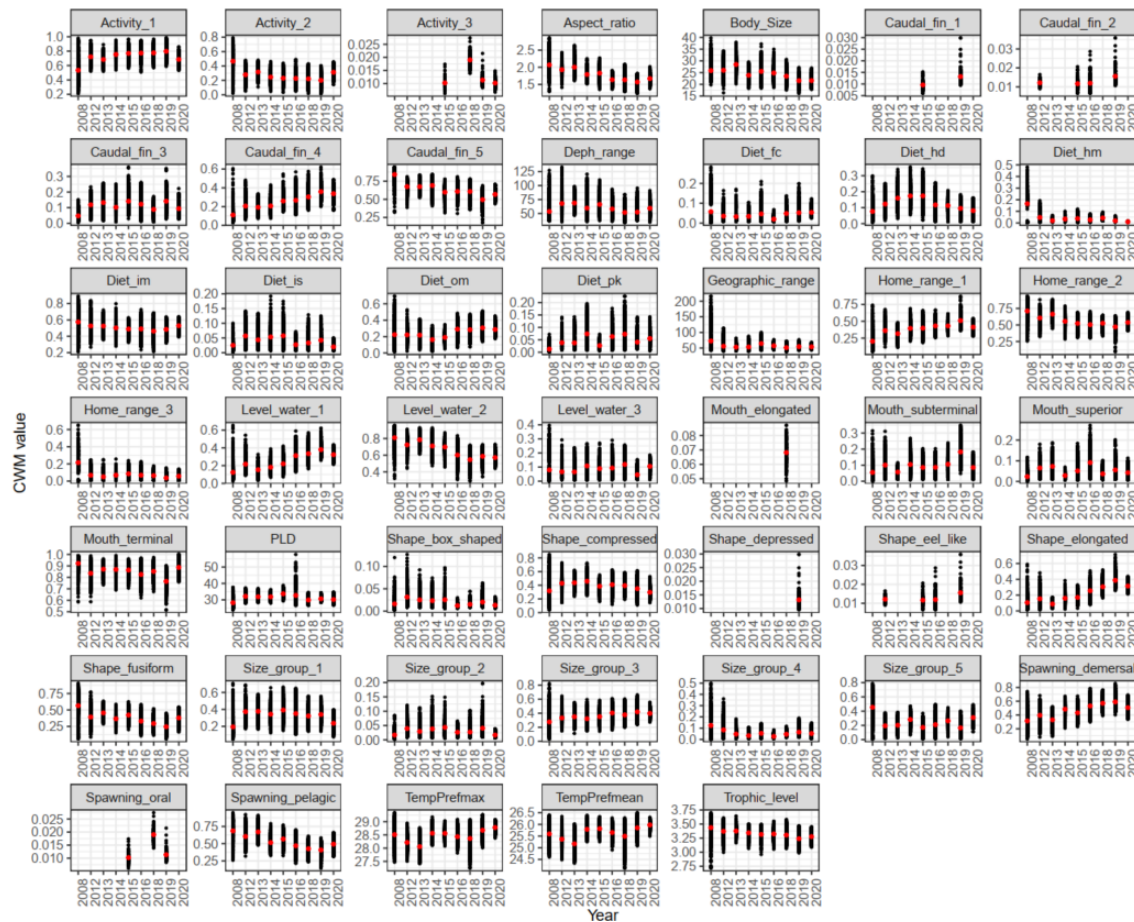


Fig S4. Time-series of the community weighted mean (CWM) traits of fish in **Deserta Island**. Note that for some years there is no data available. The black dots represent the range of 1000 CWM traits values calculated from the computed random communities. The red dots represent the mean CWM trait value for each year, and are the value used as input in the multiple factor analysis (MFA).

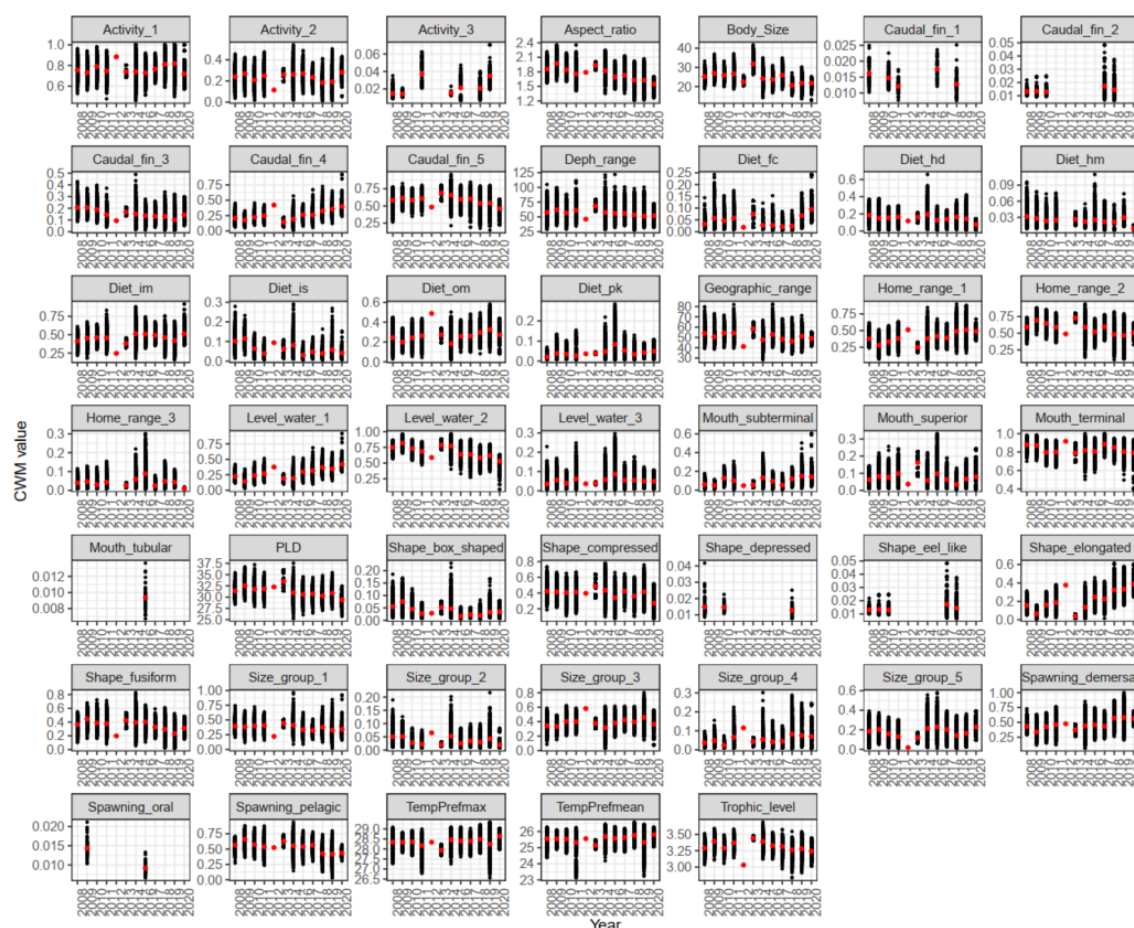


Fig S5. Time-series of the community weighted mean (CWM) traits of fish in **Arvoredo Island**. Note that for some years there is no data available. The black dots represent the range of 1000 CWM traits values calculated from the computed random communities. The red dots represent the mean CWM trait value for each year, and are the value used as input in the multiple factor analysis (MFA).

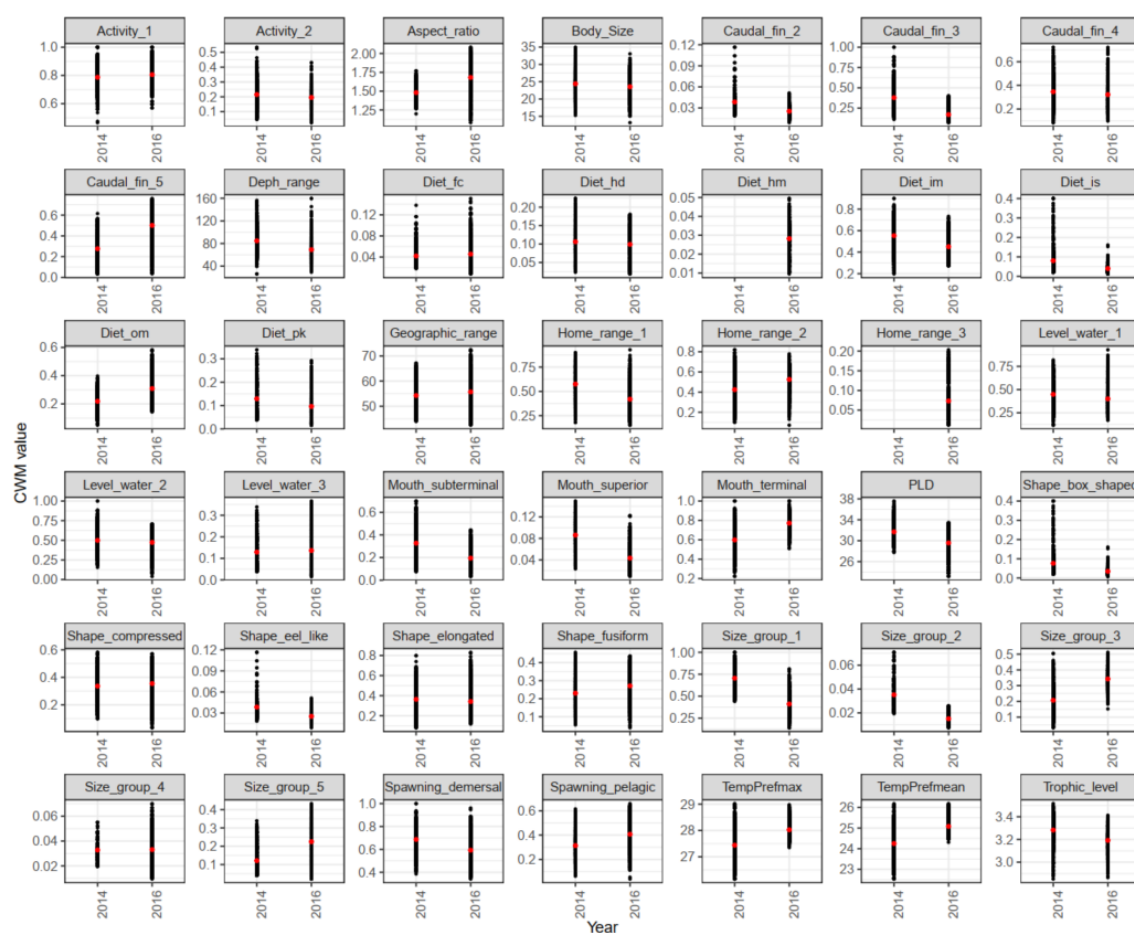


Fig S6. Time-series of the community weighted mean (CWM) traits of fish in **Aranhas Island**. Note that for some years there is no data available. The black dots represent the range of 1000 CWM traits values calculated from the computed random communities. The red dots represent the mean CWM trait value for each year, and are the value used as input in the multiple factor analysis (MFA).

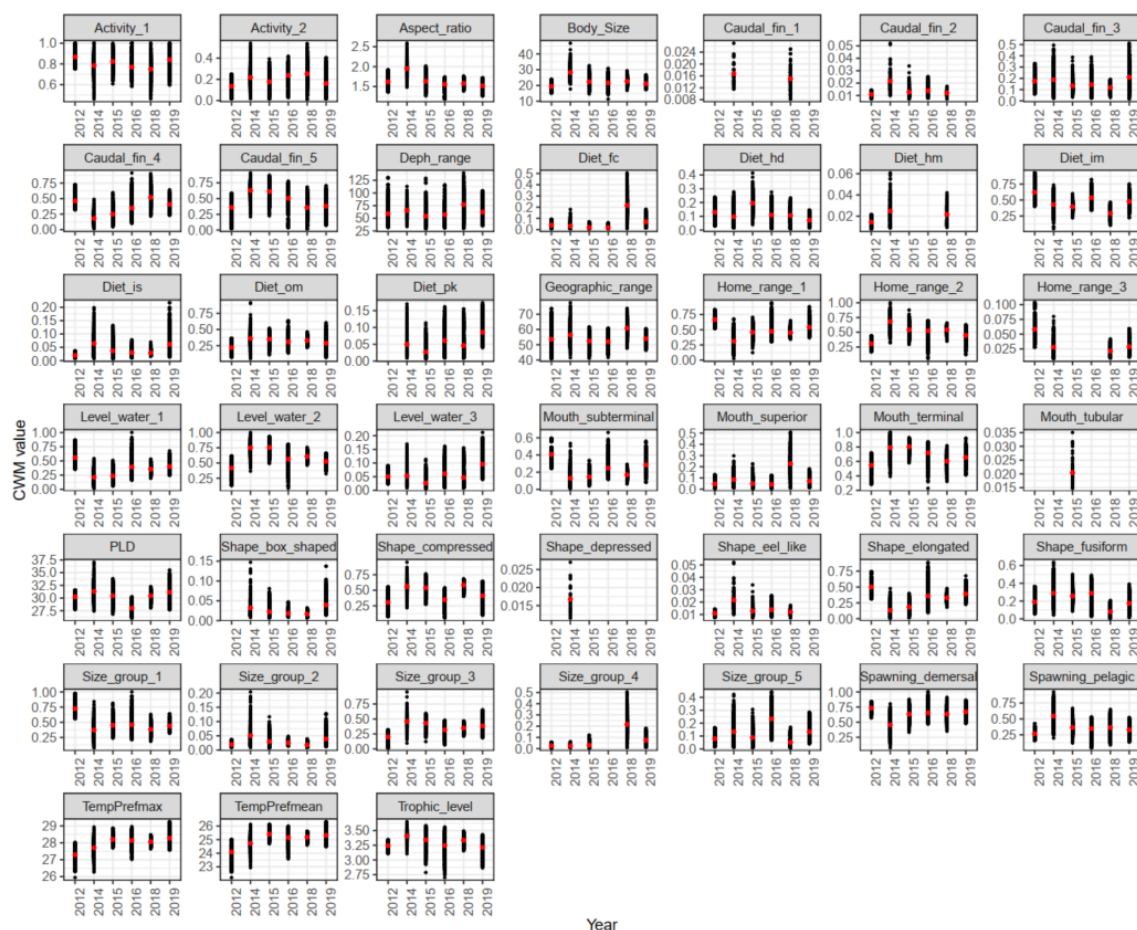


Fig S7. Time-series of the community weighted mean (CWM) traits of fish in **Xavier Island**. Note that for some years there is no data available. The black dots represent the range of 1000 CWM traits values calculated from the computed random communities. The red dots represent the mean CWM trait value for each year, and are the value used as input in the multiple factor analysis (MFA).

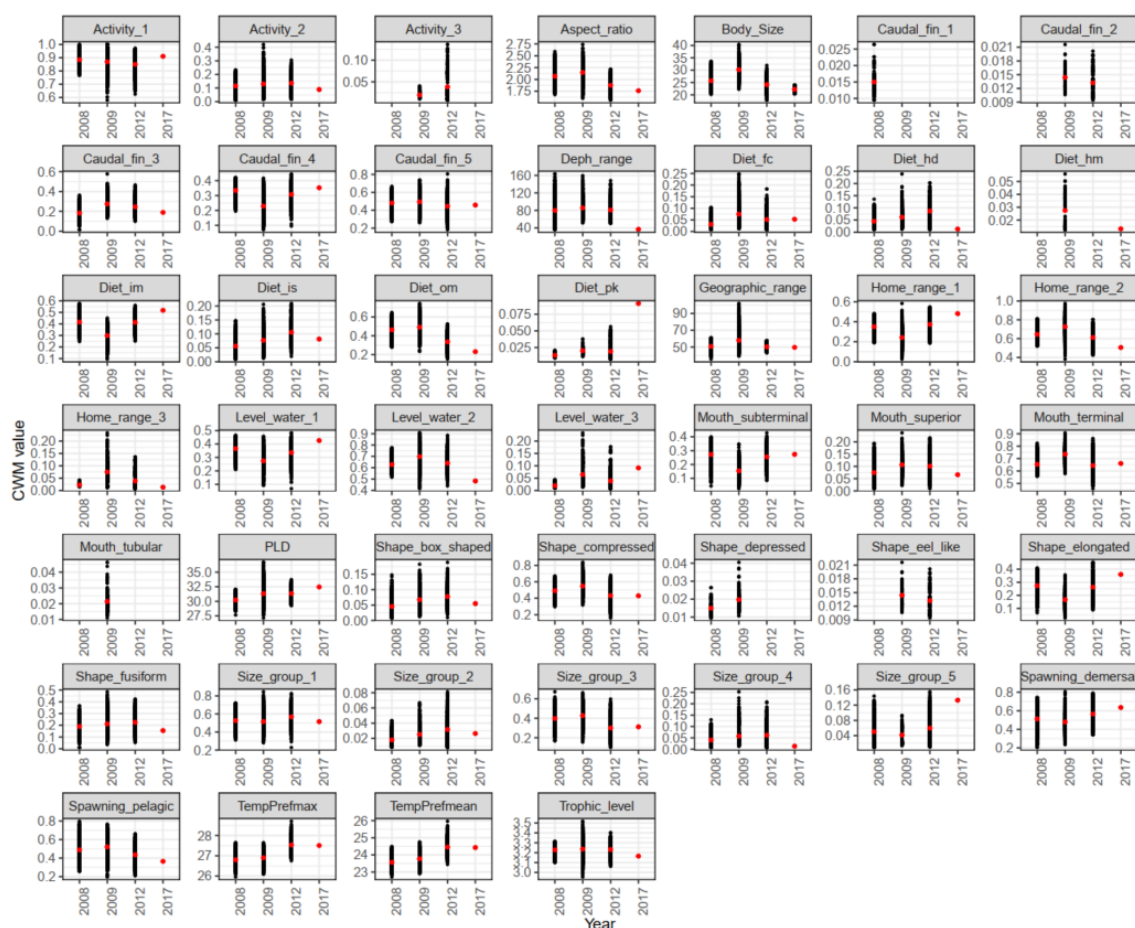


Fig S8. Time-series of the community weighted mean (CWM) traits of fish in **Campeche Island**. Note that for some years there is no data available. The black dots represent the range of 1000 CWM traits values calculated from the computed random communities. The red dots represent the mean CWM trait value for each year, and are the value used as input in the multiple factor analysis (MFA).

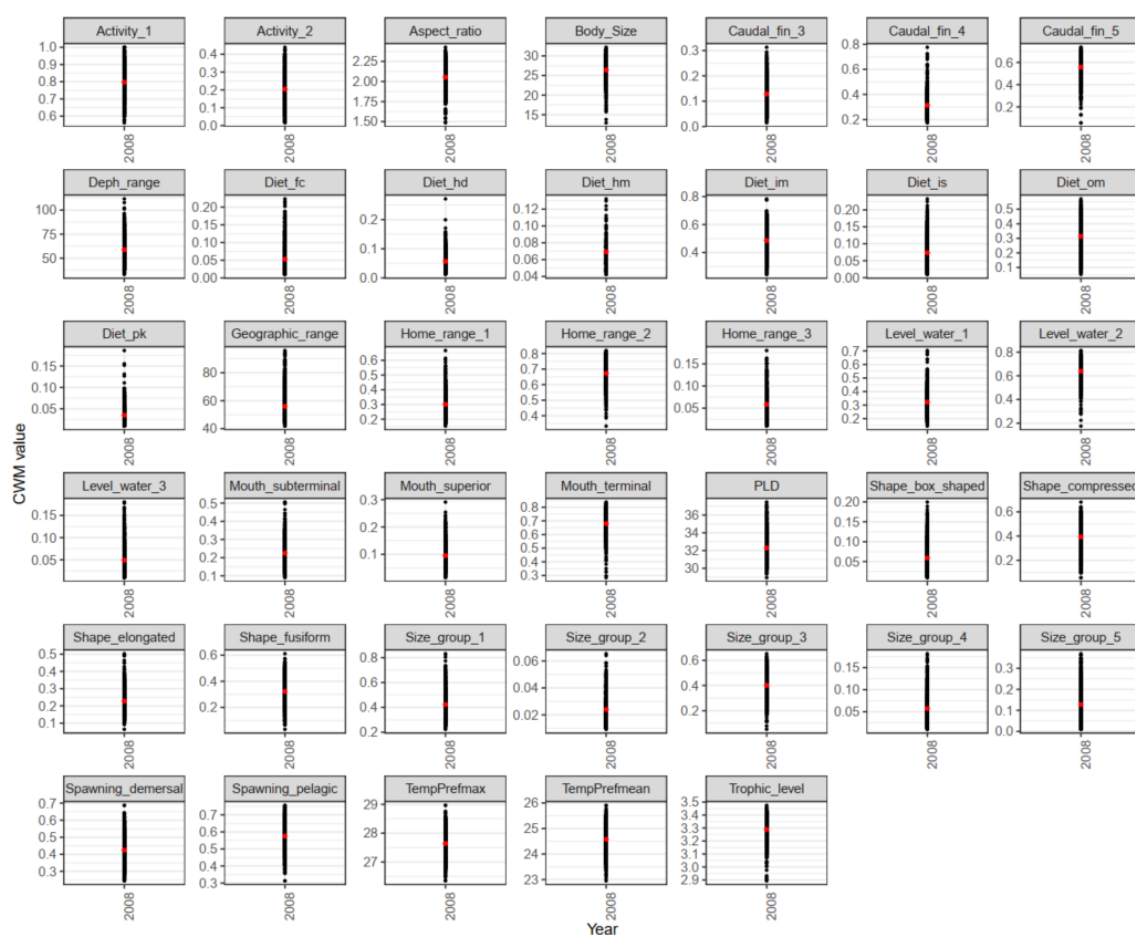


Fig S9. Time-series of the community weighted mean (CWM) traits of fish in **Moleques do Sul Island**. Note that for some years there is no data available. The black dots represent the range of 1000 CWM traits values calculated from the computed random communities. The red dots represent the mean CWM trait value for each year, and are the value used as input in the multiple factor analysis (MFA).

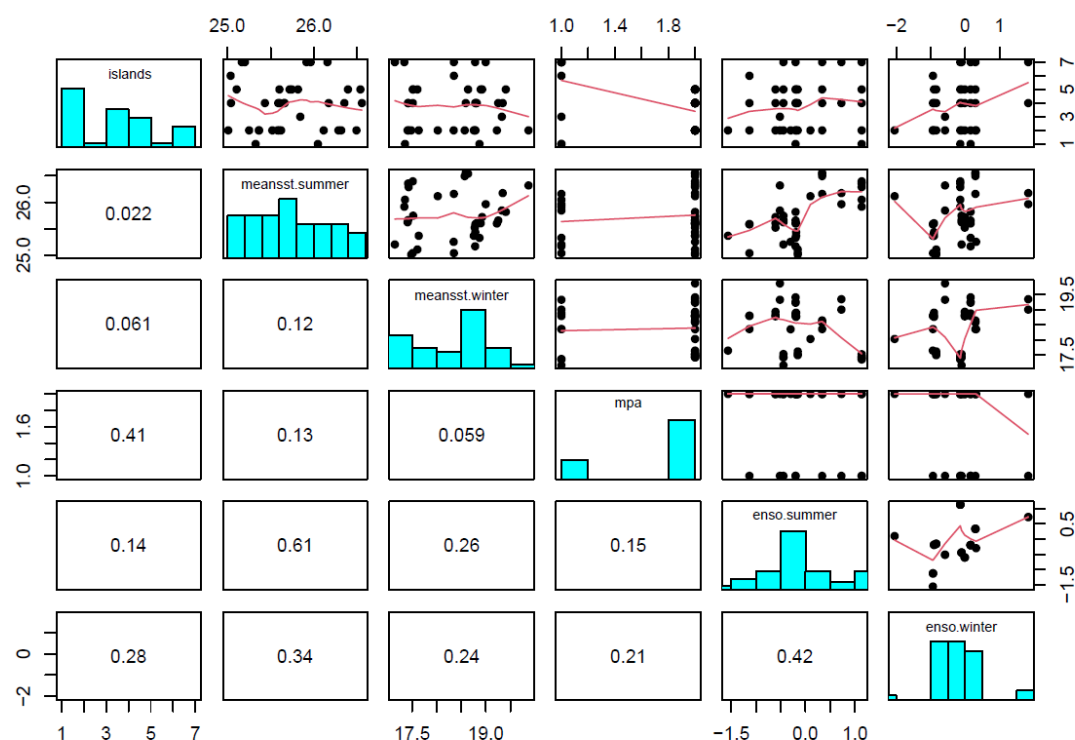


Fig S10. Pearson's correlation among all environmental and geographical predictors considered in the models. Correlations $r < \pm 0.7$ are considered as a cut-off to define collinearity among variables in GAMs (see Material and Methods, main text). Seven islands sampled (islands), Mean SST in summer season (meansst.summer), Mean SST in winter season (meansst.winter), Protection level – inside or outside Marine Protected Area (mpa), El Niño/Southern Oscillation (ENSO) in summer season (enso.summer), El Niño/Southern Oscillation (ENSO) in winter season (enso.winter).

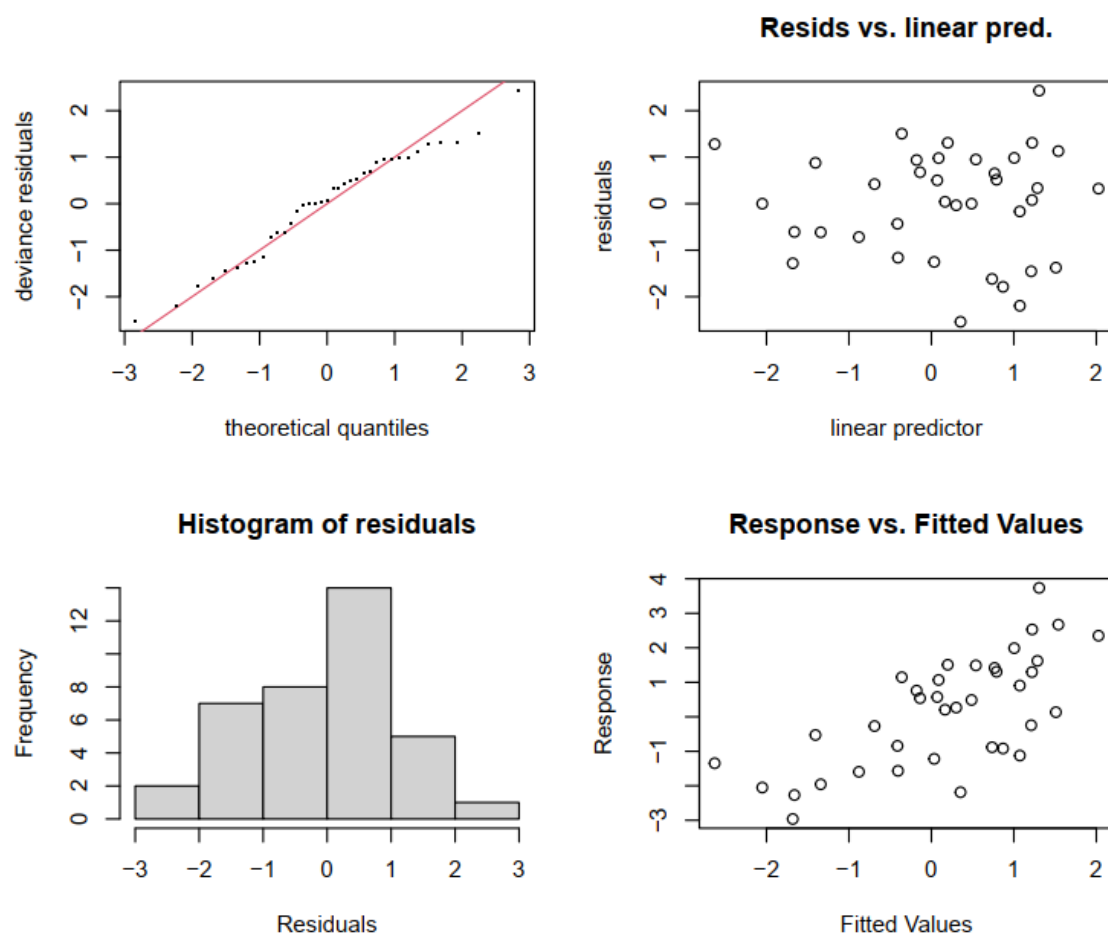


Fig S11. Validation of the generalized additive models for CWM trait dynamic (weighted by abundance) through residuals distributions.

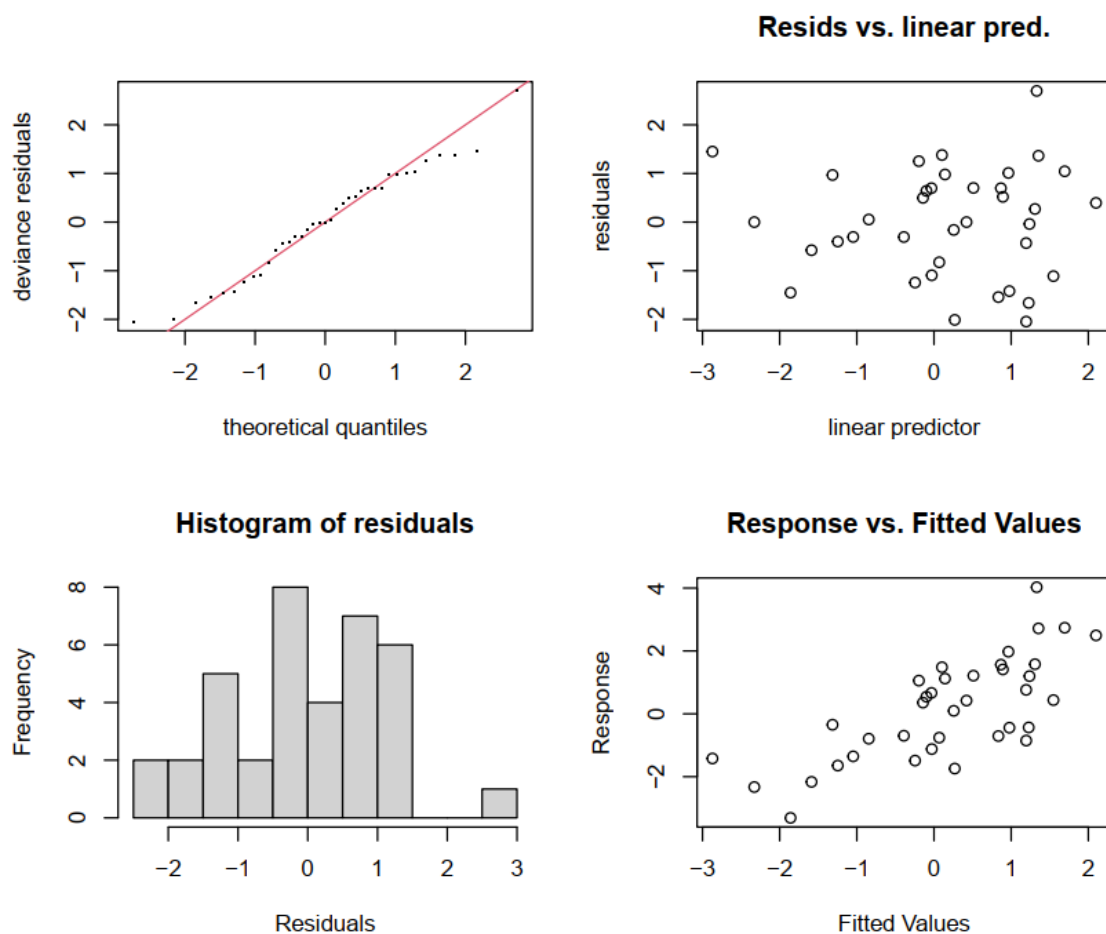


Fig S12. Validation of the generalized additive models for CWM trait dynamic (weighted by abundance) without fishing target species in the dataset.

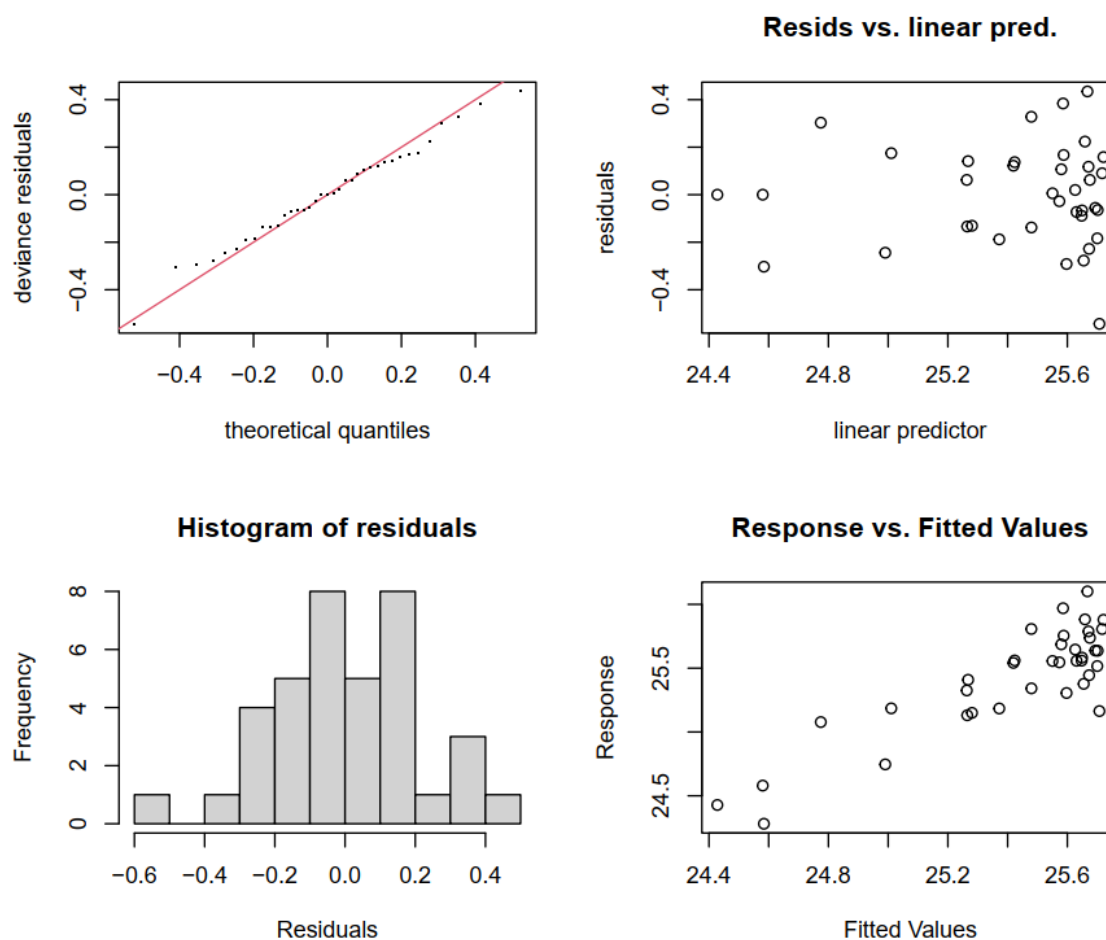


Fig S13.Validation of the generalized additive models for CTI values through residuals distributions.

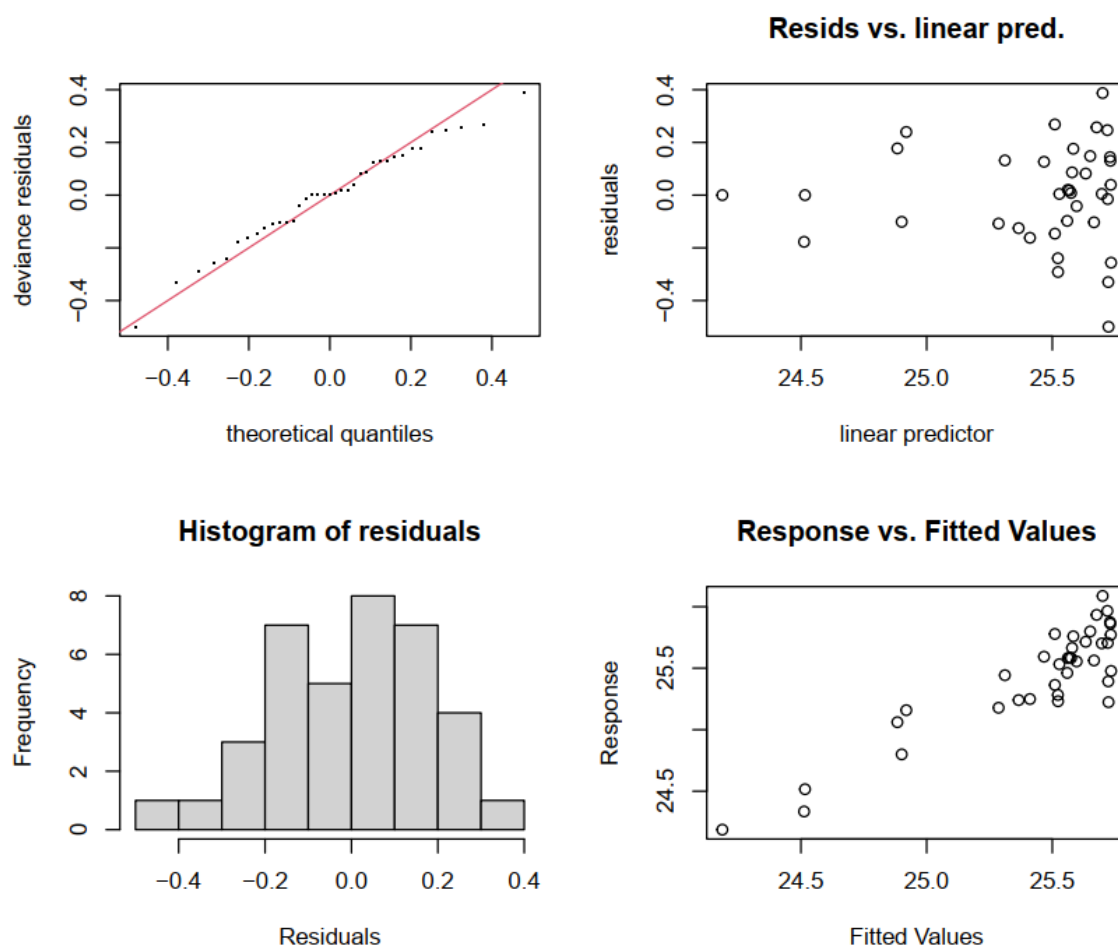


Fig S14. Validation of the generalized additive models for CTI values without fishing target species data through residuals distributions.

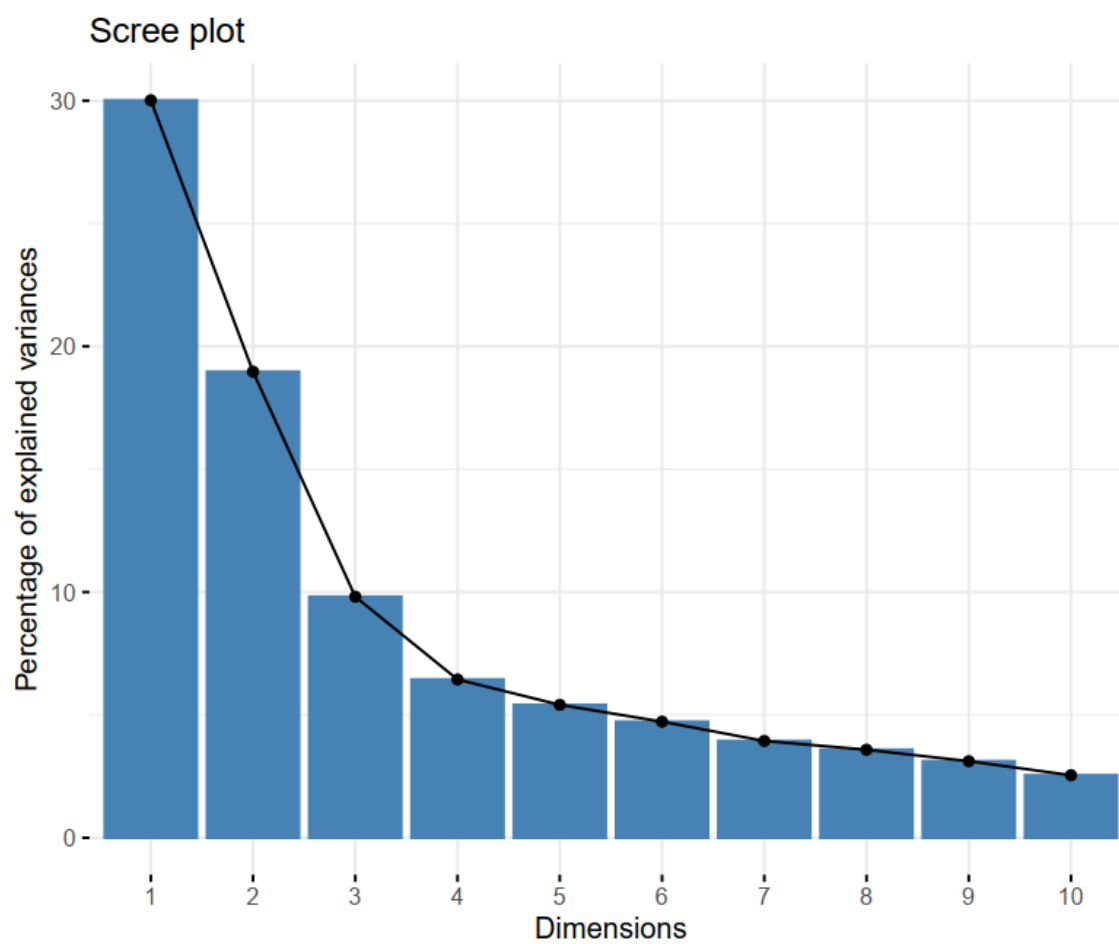


Fig S15. Visualization of the eigenvalues showing the percentage of variances (r^2) explained by each principal component of the MFA analysis considering whole community dataset.

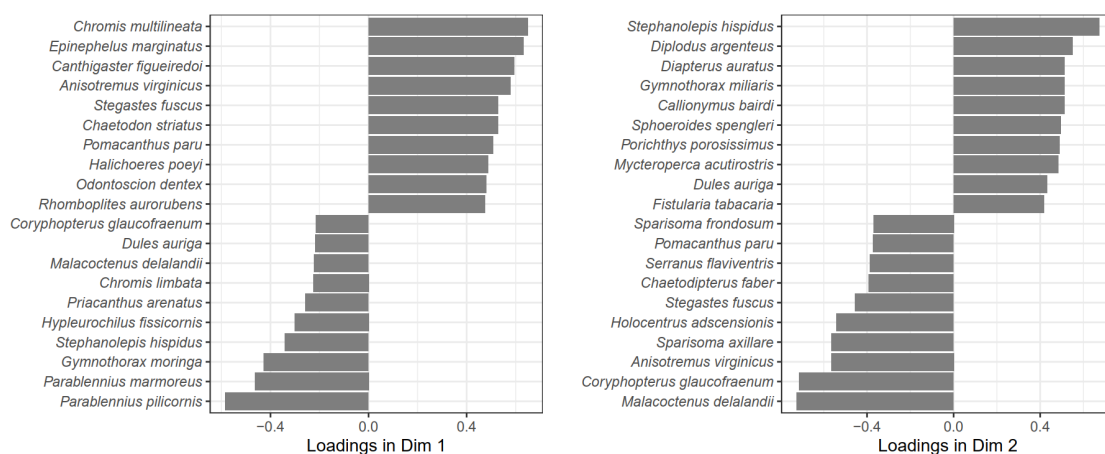


Fig S16. Highest and lowest Loadings of the reef fish species weighted by abundances (considering whole community dataset) along the first (a) and second (b) dimensions obtained from a multiple factor analysis (MFA) for the studied area. Species abundance data were included in the analysis as an additional group of variables and therefore did not impact the MFA results

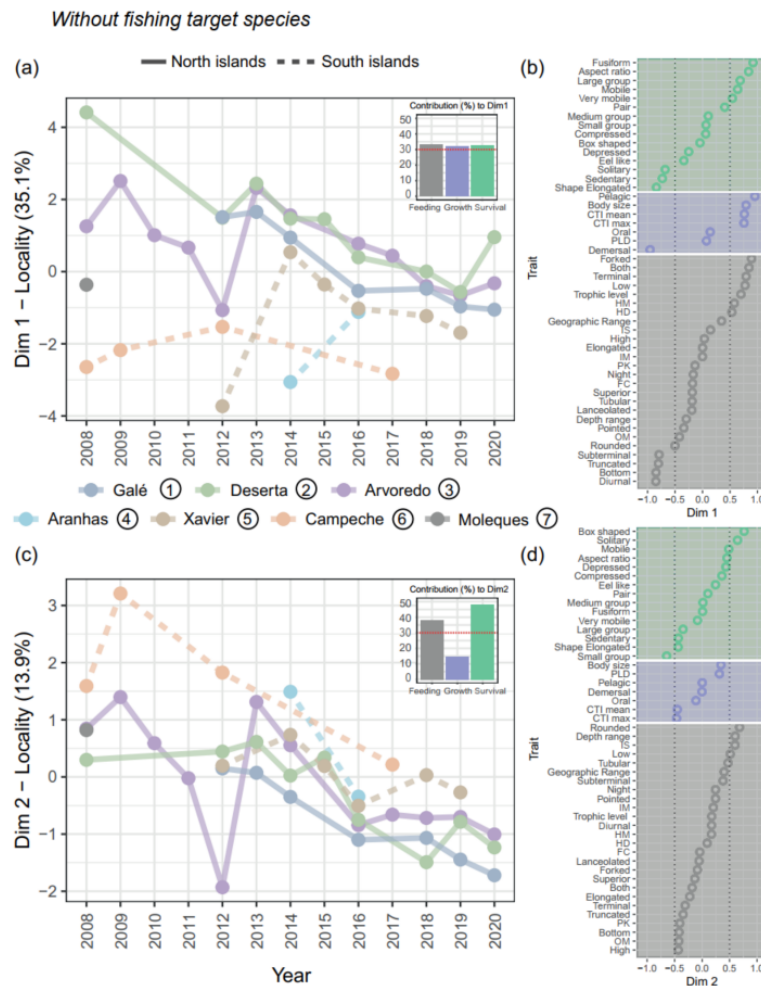


Fig S17. Temporal variation in the reef fish traits (CWM) weighted by abundances filtering fishing target species from the dataset in several islands of Santa Catarina - Brazilian province (Aranhas, Arvoredo, Campeche, Deserta, Galé, Moleques do Sul, and Xavier). The results were obtained from Multiple Factor Analysis (MFA). After bootstrapping, mean CWM values were used as input to conduct the MFA resulting in one single value per island per year. Time Time-series of the Dimension 1 (a) and Dimension 2 (c) of CWM traits variability and the contribution of each group of traits to the dynamic. CWM traits loadings displayed for Dim 1 (b) and Dim 2 (d). The groups of traits are represented by colors: gray (feeding), violet (growth), and green (survival). We include the black dotted line to clarify loadings values higher and lower than 0.5. Trait loadings > 0.5 were considered the most important for the temporal trends.

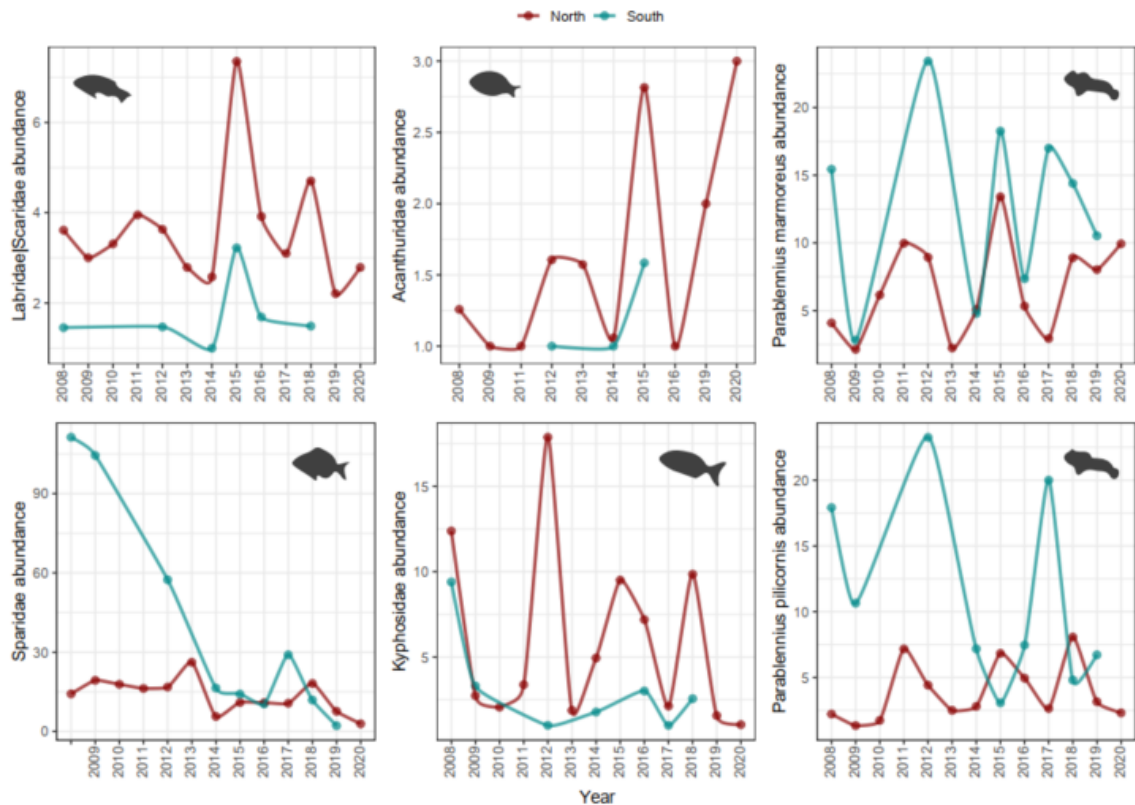


Fig S18. Temporal abundance of key families and species of reef fish inside (north) and outside (south) MPA islands of Santa Catarina - Brazilian province. To better visualize trajectories in species abundances, we grouped the values of the far north (Galé, Arvoredo and Deserta) and the southernmost locations (Aranhas, Xavier, Campeche and Moleques do Sul). Warm affinity: Labridae/Scaridae (a), Acanthuridae (b) and *Parablennius marmoreus* (c). Cold affinity: Sparidae (d) Kyphosidae (e) and *Parablennius pilicornis* (f).

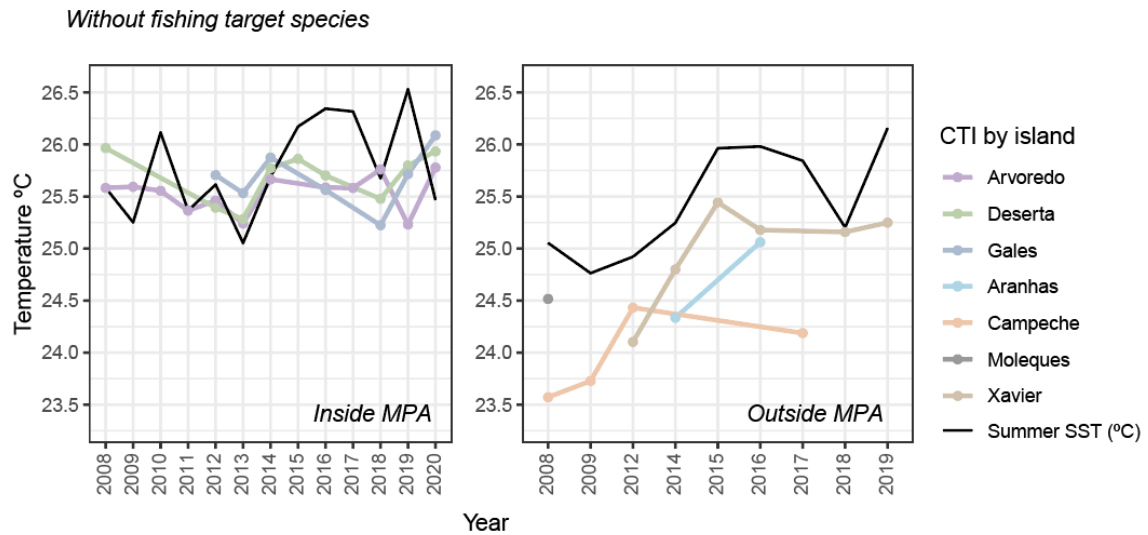


Fig S19. Sea surface temperature (SST) at islands located inside Marine Protected Area – MPA (North, left panel) and outside MPA (South, right panel) in Santa Catarina transition zone from 2008 to 2020. The associated Community Thermal Index (CTI) trends for reef fishes weighted by abundance were calculated using the dataset filtering fishing target species. CTI represents the mean of the Species Temperature Index for all species recorded in a survey weighed by their abundances and is presented here as the mean across all surveys in each year. SST represents the mean of sea surface temperature summer to each survey date.

Table S1. Pearson correlation coefficients between north and south islands isolated and combined.

<i>Islands</i>	<i>Pearson correlation</i>
Galé	0.008
Deserta	0.412
Arvoredo	-0.048
All north islands	0.156
Aranhas	1
Xavier	0.759
Campeche	0.219
Moleques	-
All south islands	0.679