SUPPLEMENTARY MATERIAL

1. Sampling design for the study of the distribution of planktophagous fish

In the main channel, sampling was performed using a trawl with otters, with a mesh size of 35 mm in the net cup, 22 mm in the bag and 5 mm in the overbag. Six replicates were performed monthly in each area of the estuary between December 2005 and November 2006. Additionally, complementary sampling (six replicates) was performed at the end of the rainy season (June, July and August) and at the end of the dry season (December, January and February) between 2006 and 2009 (Figure S1). Trawls were performed during neap tide, for a period of 15 min, at an average depth of 2 to 5 m (Barletta et al. 2005, 2008).

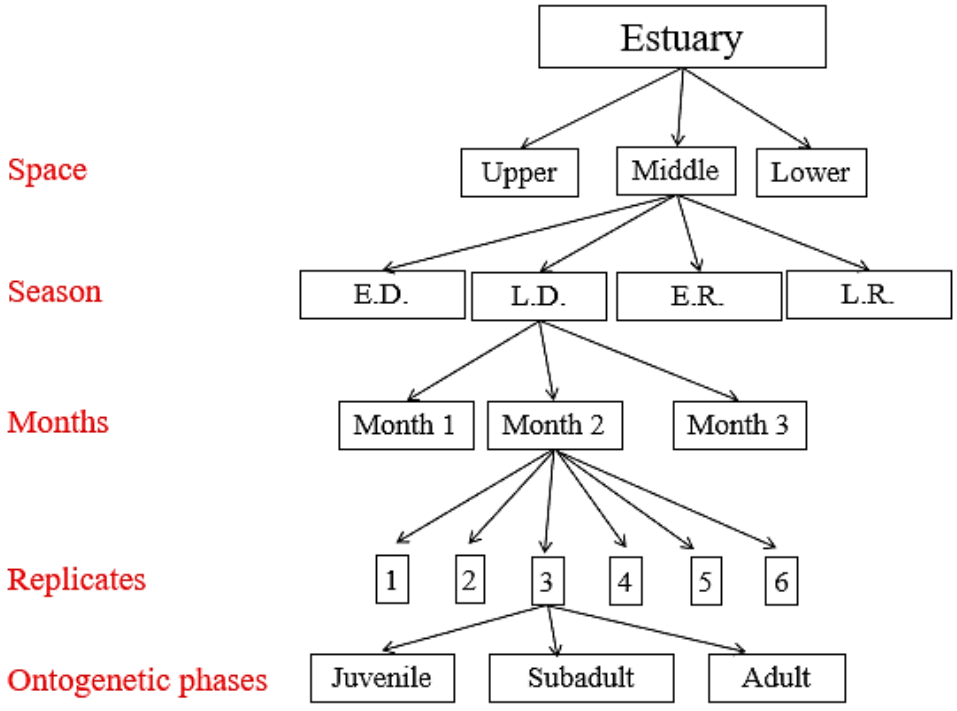

Figure S1. Sampling design for the study of the distribution of planktophagous fish (Modified from Barletta et al. 2020).

2. Sampling design for the study of feeding ecology and microplastic contamination

Ten fish per ontogenetic phase per sample (month, season and area) were used in the estuary (Figure S2).

3. Calculation of frequency of occurrence (FO%) and number of prey ingested (N%)

3.1. The quantification of food items ingested followed three criteria:

The percentage of frequency of occurrence of each prey according to the equation:

$$\%F_i = (F_i / F_t) \times 100 \quad \text{(Eq. 1)}$$

Where F_i is the number of stomachs containing food item ***i*** and F_t is the total number of stomachs examined (Hyslop 1980).

The percentage of prey abundance in number (%N) according to the equation:

$$\%N_i = (N_i / N_t) \times 100 \quad \text{(Eq. 2)}$$

Where N_i is the number of food items i and N_t is the total number of food items in the stomachs examined (Hyslop 1980).

4. Adjusting the distribution of the response variable

For *A. clupeoides* the random variable Y, the ZAGA distribution (μ, σ, ν), with the functional probability given by equation 3:

$$f_Y(y|\mu,\sigma,\nu) = \begin{cases} \nu & \text{if } y = 0 \\ (1-\nu)\left[\frac{1}{(\sigma^2\mu)^{1/\sigma^2}} \frac{y^{1/\sigma^2-1} exp\{-y/(\sigma^2\mu)\}}{\Gamma(1/\sigma^2)}\right] & \text{if } y > 0 \end{cases}$$

(Equation 3)

for 0 ≤ y < ∞ where 0 < v < 1, μ > 0, and σ > 0 with E(Y) = (1 − v) μ, σ > 0, Var (Y) = (1 − v) μ^2 (v + \sigma^2)

For *C. edentulus* the random variable Y, the distribution follows GA (μ, σ), with the functional probability given by equation 4:

$$f_Y(y|\mu,\sigma,) = \left[\frac{1}{(\sigma^2\mu)^{1/\sigma^2}} \frac{y^{1/\sigma^2-1} exp\{-y/(\sigma^2\mu)\}}{\Gamma(1/\sigma^2)}\right]$$

if $y > 0$ (Equation 4)

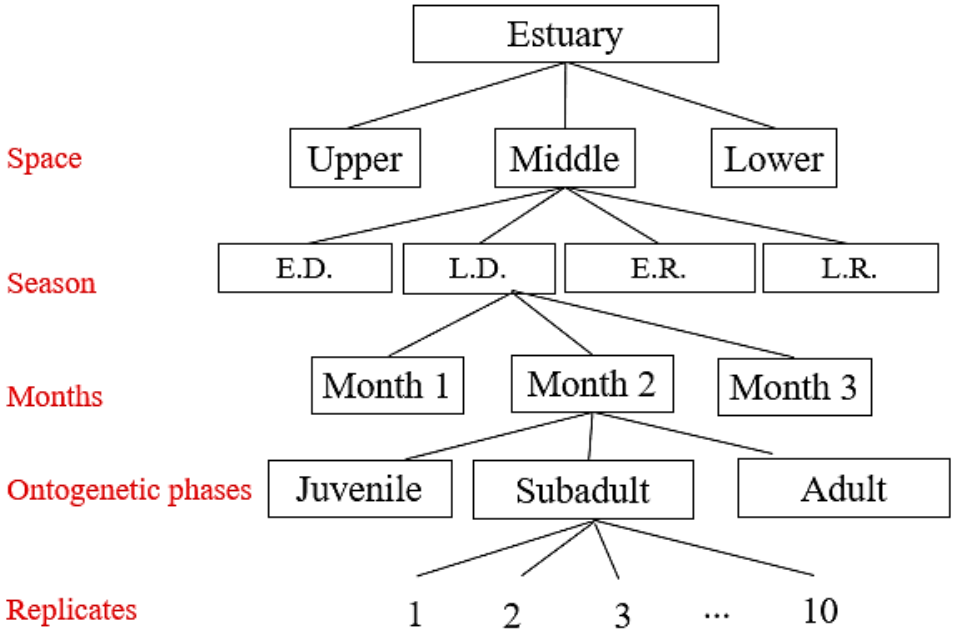

Figure S2. Sample design for feeding ecology and contamination by Microplastic (Modified from Barletta et al. 2020).

for y > 0 where μ > 0, and σ > 0 as E(Y) = μ, Var(Y) = \mu^2\sigma^2

The random variable, Y, follows the ZINBI (μ, σ, ν) distribution with probability density function given by equations 5 and 6:

$$p_Y(y|\mu,\sigma,\nu) = \begin{cases} \nu + (1-\nu)p_{Y'}(0|\mu,\sigma) & \text{if } y = 0 \\ (1-\nu)p_{Y'}(y|\mu,\sigma,\nu) & \text{if } y = 1,2,\ldots \end{cases}$$

(Equation 5)

for $\mu > 0$, $\sigma > 0$, and $0 < \nu < 1$ where $Y' \sim NBI(\mu, \sigma)$ where:

$$p_{Y'}(0|\mu,\sigma) = (1+\sigma\mu)^{-\frac{1}{\sigma}}$$

$$p_{Y'}(y|\mu,\sigma) = \frac{\Gamma(y+\frac{1}{\sigma})}{\Gamma(\frac{1}{\sigma})\Gamma(y+1)}\left(\frac{\sigma\mu}{1+\sigma\mu}\right)^{y}\left(\frac{1}{1+\sigma\mu}\right)^{\frac{1}{\sigma}}$$

(Equation 6)

for $y = 0, 1, 2 \ldots$ where $E(Y) = (1 - \nu)\mu$, $\sigma > 0$, $Var(Y) = (1 - \nu)\mu[1 + (\sigma + \nu)\mu]$

5. Identification of Ontogenetic Phases

Least squares regression between weight and length of 3030 specimens of *A. clupeoides* (Figures S3 and S4) and 1106 specimens of *C. edentulus* (Figure S3) was calculated by measuring length with a tape measure and weighing individuals with a precision scale.

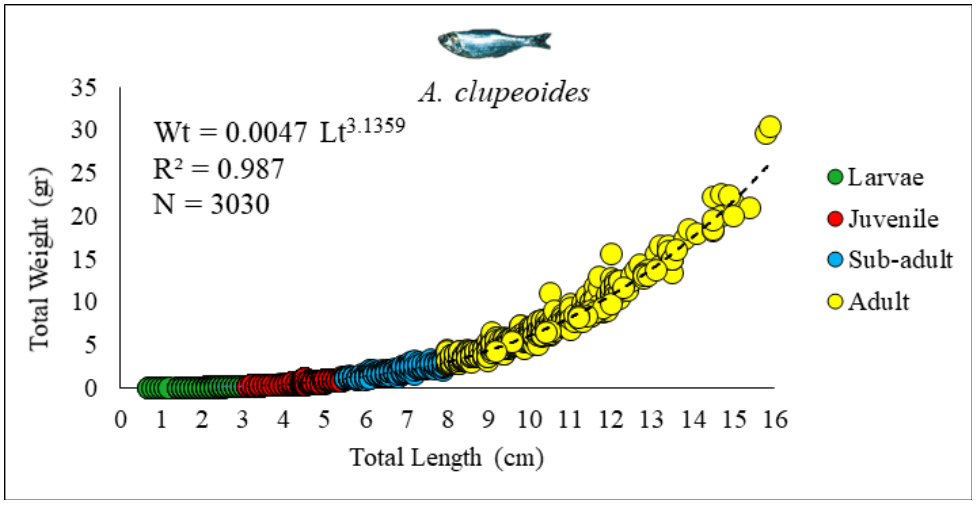

Figure S3. Ontogenetic classification of *A. clupeoides* into Larva (green), Juvenile (red), Subadult (blue), and Adult (yellow).

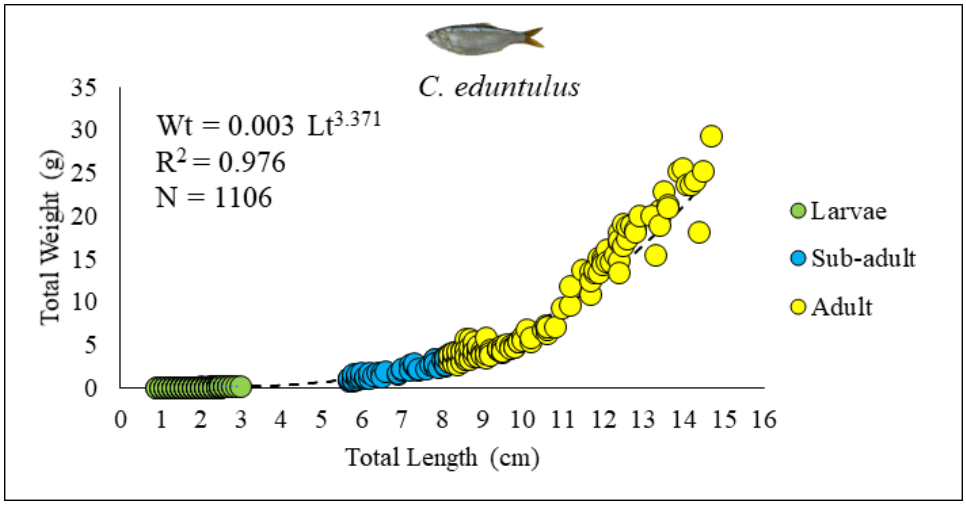

Figure S4. Ontogenetic classification of *C. edentulus* into Larva (green), Juvenile (red), Subadult (blue) and Adult (yellow).

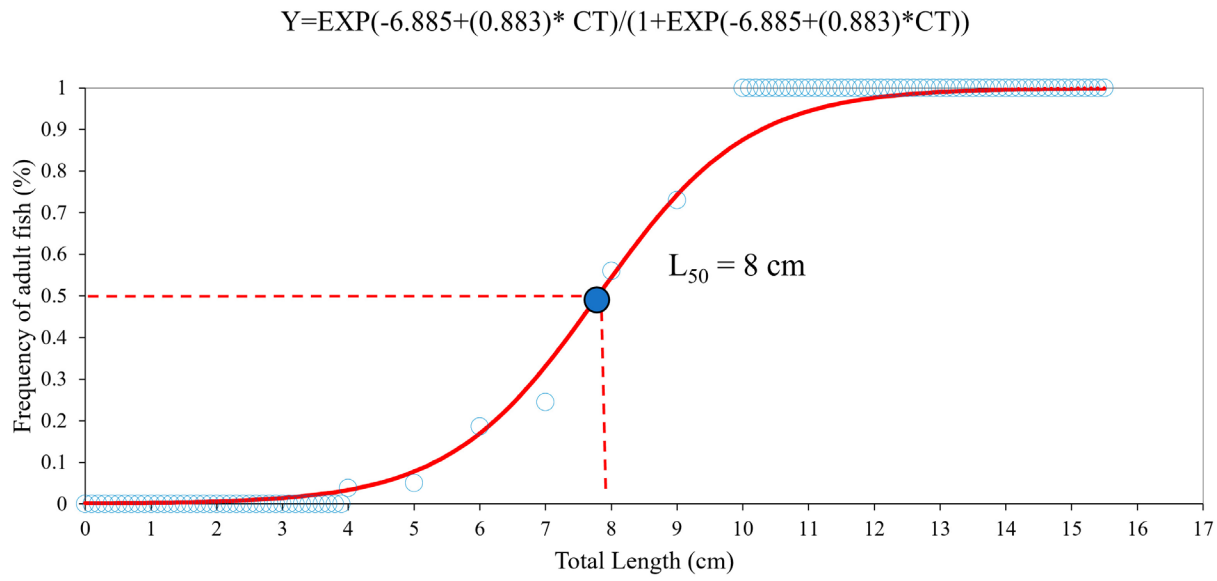

Figure S5. Logistic regression for males and females of ***A. clupeoides***.

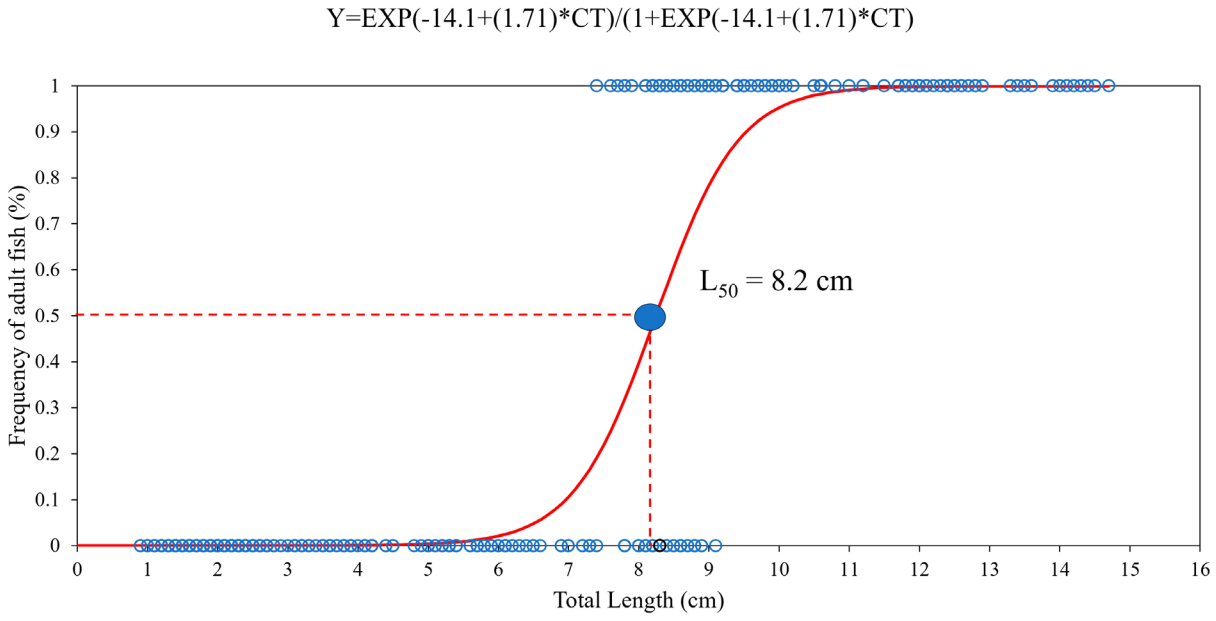

Figure S6. Logistic regression for males and females of ***C. edentulus***.

6. Determination of the frequency of first maturation of *A. clupeoides* and *C. edentulus*

Logistic regression was used to determine the length of first maturation of *A. clupeoides* (Figure S5) and *C. edentulus* (Figure S6). With this information, the subadult and adult ontogenetic stages could be accurately identified.

7. Spatiotemporal Distribution Models

The fitted model has an overall deviation value in the Density and Biomass of *A. clupeoides* of 1692.6 and 1861.1, respectively; and an AIC of 1716.6 and 1887.1, respectively. For *C. edentulus* it has an overall deviation value in the Density and Biomass of 124.9 and 180.9, respectively; and an AIC of 138.9 and 186.9, respectively. The plots of the deviation residuals versus fitted values (Figures S7a, S8a, S9a and S10a) and versus index plots (Figures S7b, S8b, S9b and S10b) demonstrated that they behave in a random manner with a constant dispersion. Figures S7c, S8c, S9c and S10c show that the residuals have a good approximation to the normal distribution. The normal probability plots show that there is no strong evidence of violations of the model assumptions (Figures S7d, S8d, S9d, and S10d). Therefore, the adjusted ZAGA and Gamma models are considered suitable for predicting the Density and Biomass of *A. clupeoides* and *C. edentulus*, respectively. Furthermore, 94.4% and 94.3% (Density and Biomass of *A. clupeoides*, respectively) and 91.7% and 100% (Density and Biomass of *C. edentulus*, respectively) of the residuals belong to [-2; 2].

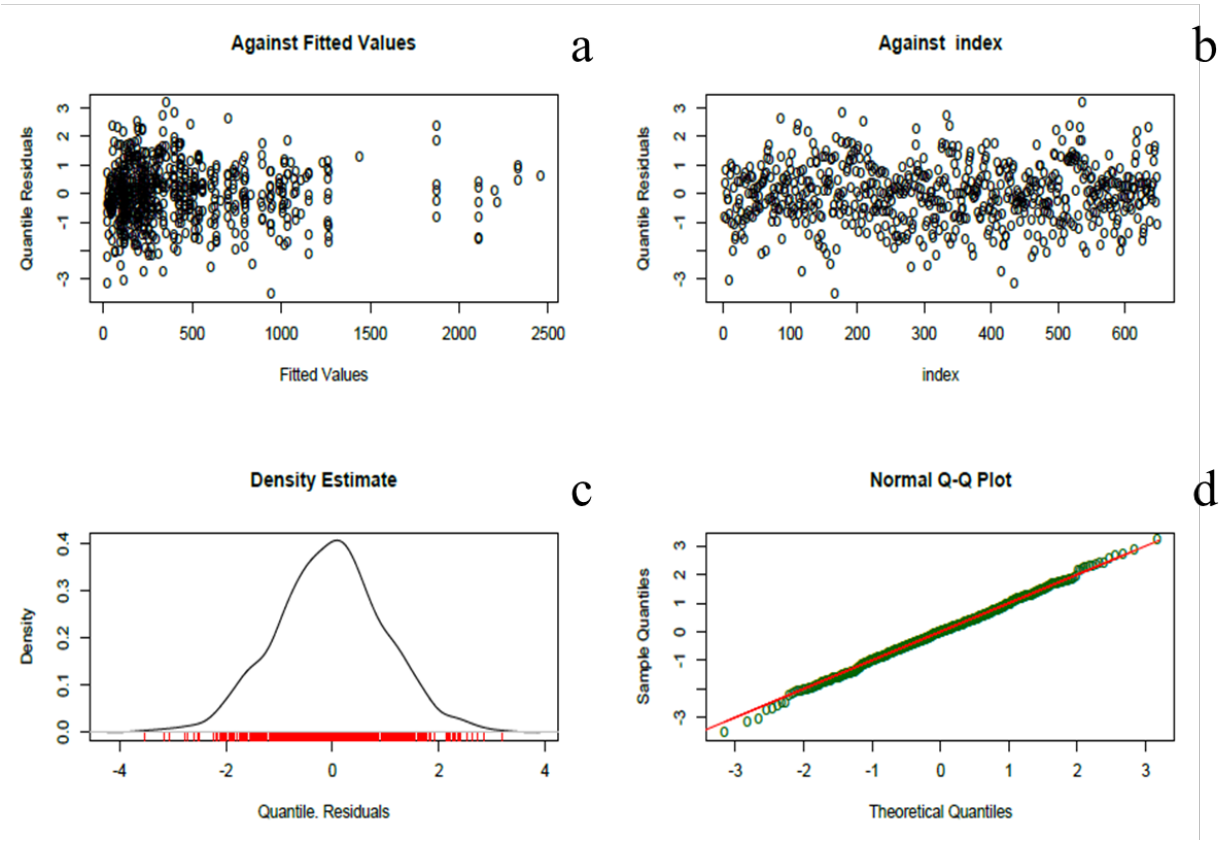

Figure S7. Plots of Residuals versus fitted values (a), residuals versus index (b), density estimate (c) and fit to the normal distribution (d) of the ZAGA regression model for the density of *A. clupeoides.*

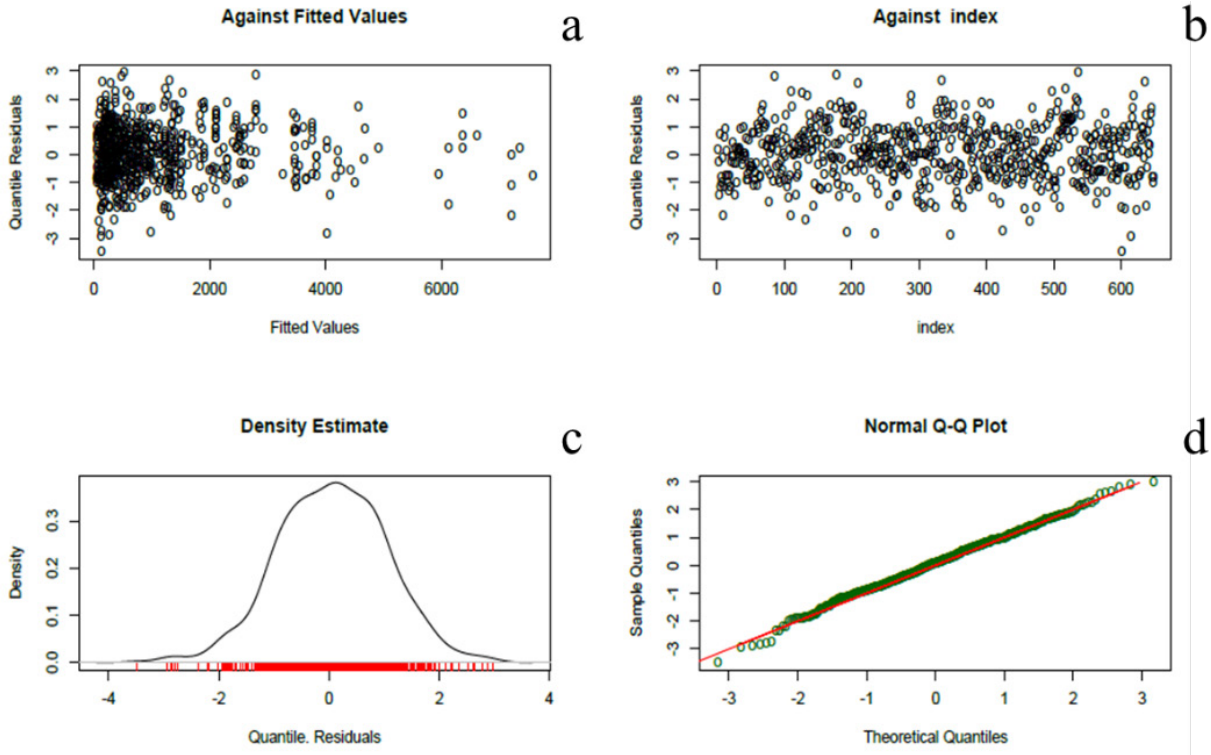

Figure S8. Plots of Residuals versus fitted values (a), residuals versus index (b), biomass estimate (c) and fit to the normal distribution (d) of the ZAGA regression model for the biomass of *A. clupeoides*.

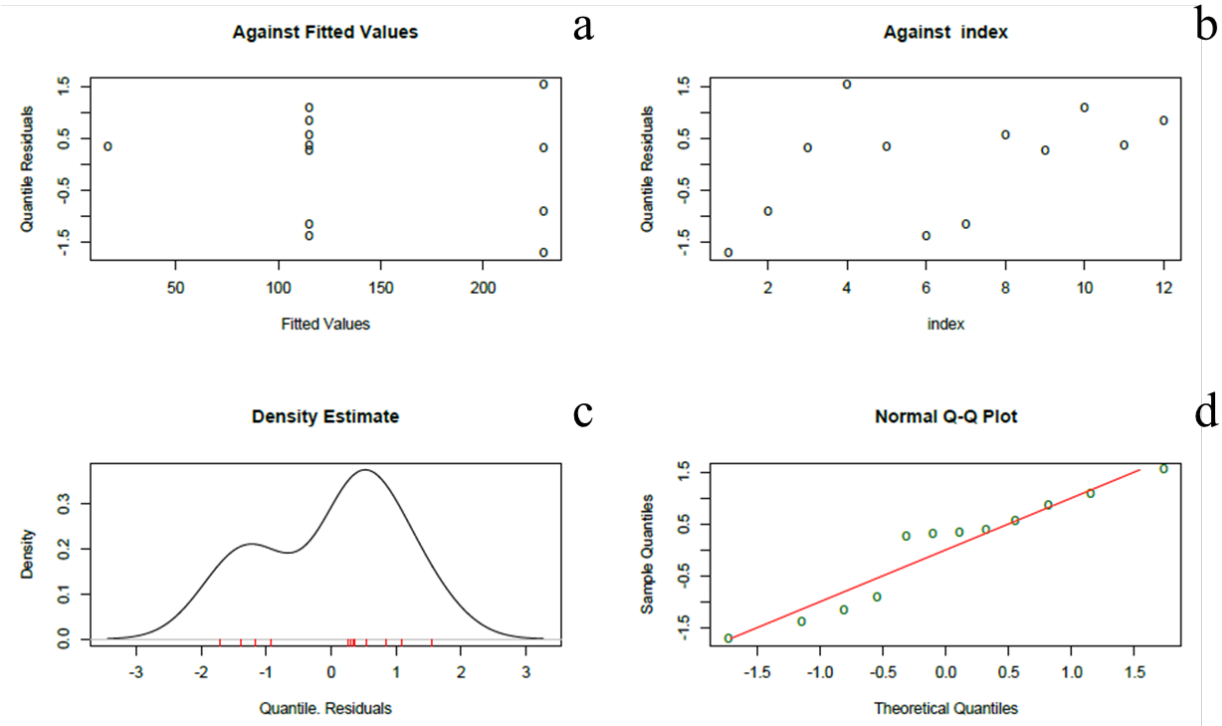

Figure S9. Plots of Residuals versus fitted values (a), residuals versus index (b), density estimate (c) and fit to the normal distribution (d) of the Gamma regression model for the density of *C. edentulus*.

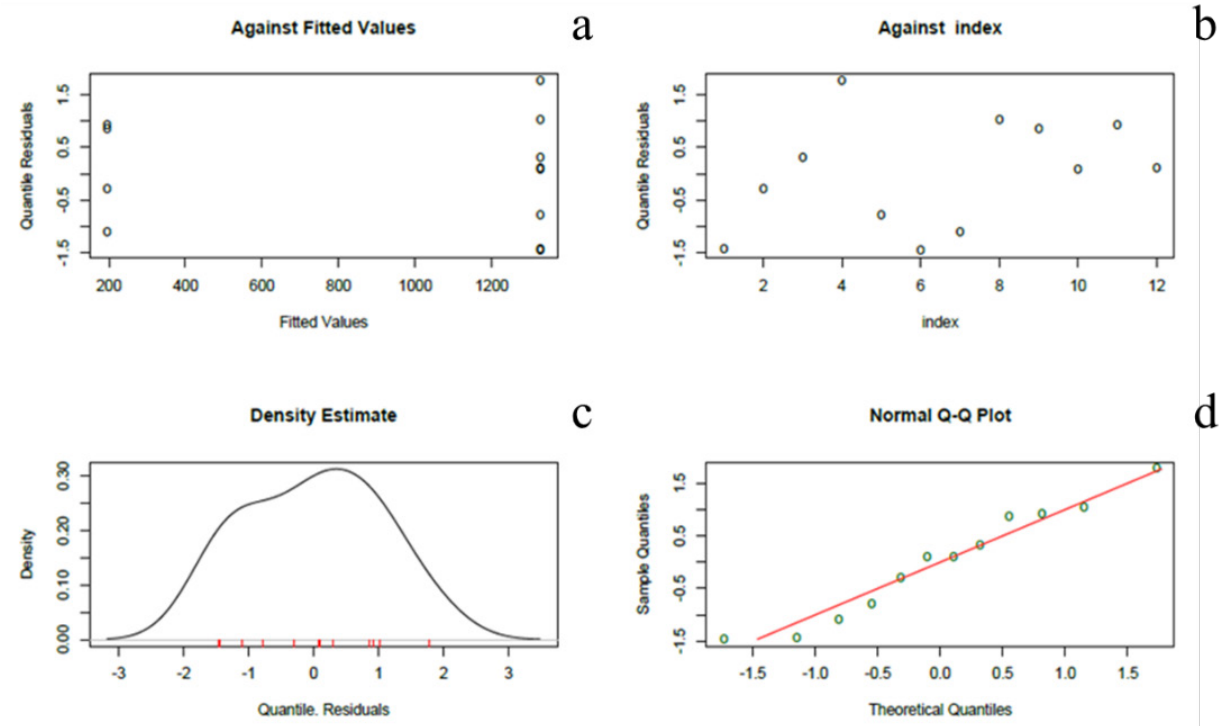

Figure S10. Plots of Residuals versus fitted values (a), residuals versus index (b), density estimate (c) and fit to the normal distribution (d) of the Gamma regression model for *C. edentulus* biomass.

8. Number of prey and microplastics ingested by *A. clupeoides* and *C. edentulus*

For *A. clupeoides*, from a total of 498 individuals analysed (59 juveniles, 188 subadults and 251 adults), 19 food items and 3 different colours of MPs were found.

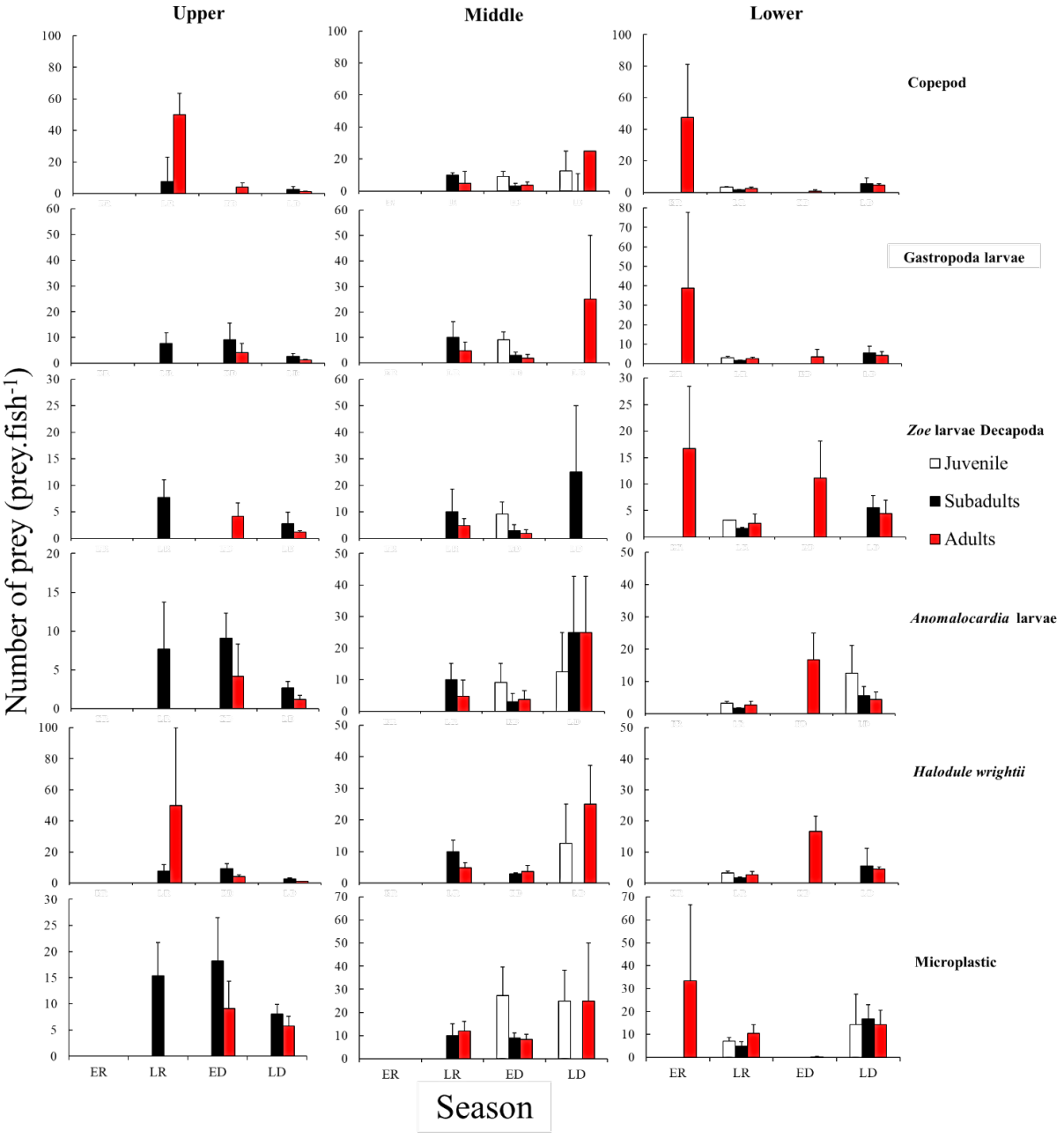

Figure S11. Mean and standard error (S.E.) of the number of prey ingested in the different ontogenetic phases (juvenile: white; subadult: black; adult: red) of *A. clupeoides* in the early dry season (ED), late dry season (LD), early rainy season (ER) and late rainy season (LR) for the different areas (upper, intermediate and lower) of the Goiana River estuary.

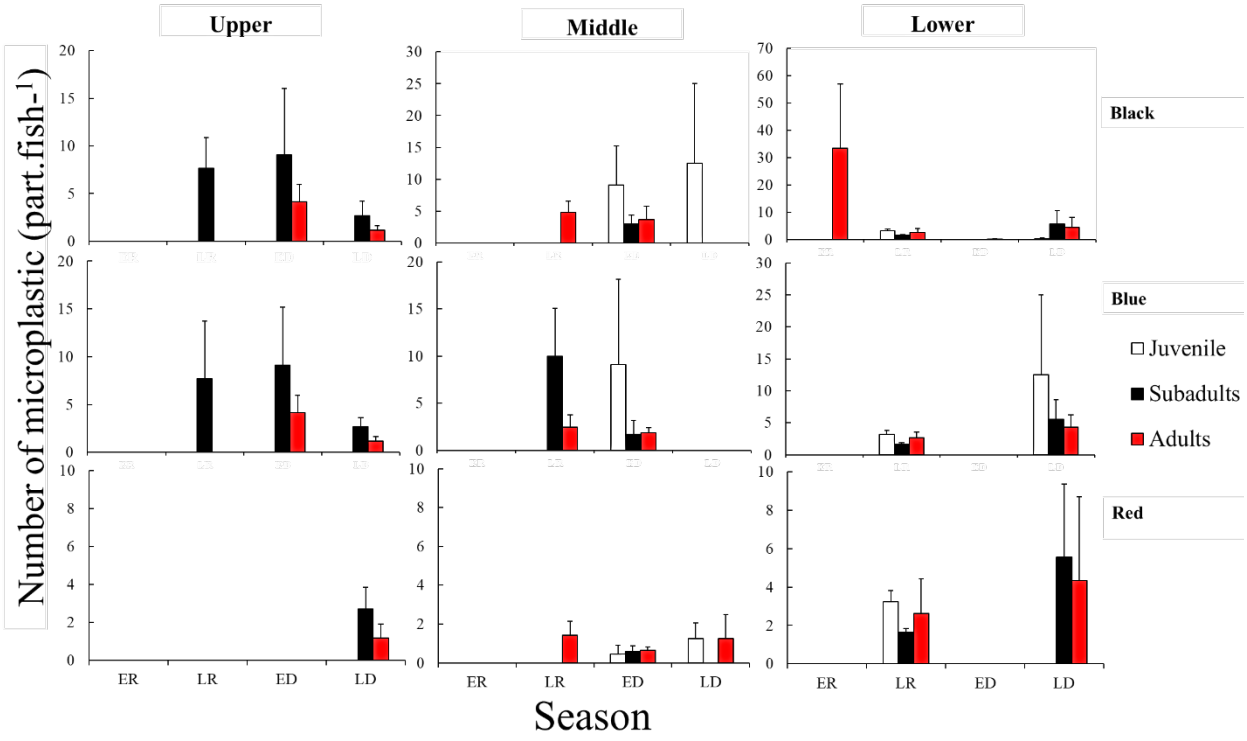

Figure S12. Mean and standard error (S.E.) of the number of the most relevant colors of microplastics (black, blue and red) ingested in the different ontogenetic phases (juvenile: white; subadult: black; adult: red) of *A. clupeoides* in the early dry season (ED), late dry season (LD), early rainy season (ER) and late rainy season (LR) for the different areas (upper, intermediate and lower) of the Goiana River estuary.

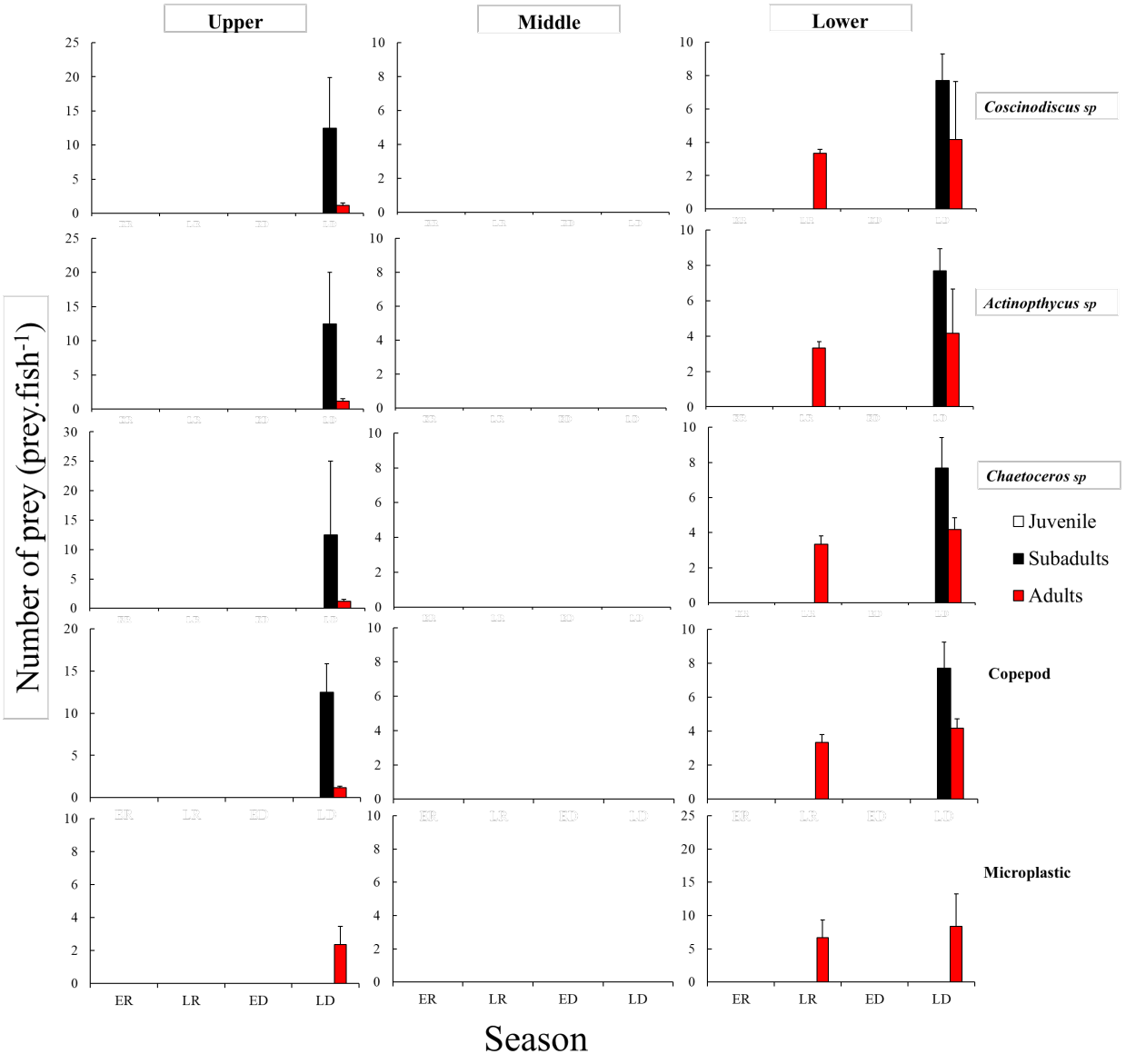

Figure S13. Mean and standard error (S.E.) of the number of prey ingested in the different ontogenetic phases (juvenile: white; subadult: black; adult: red) of *C. edentulus* in the early dry season (ED), late dry season (LD), early rainy season (ER) and late rainy season (LR) for the different areas (upper, intermediate and lower) of the Goiana River estuary.

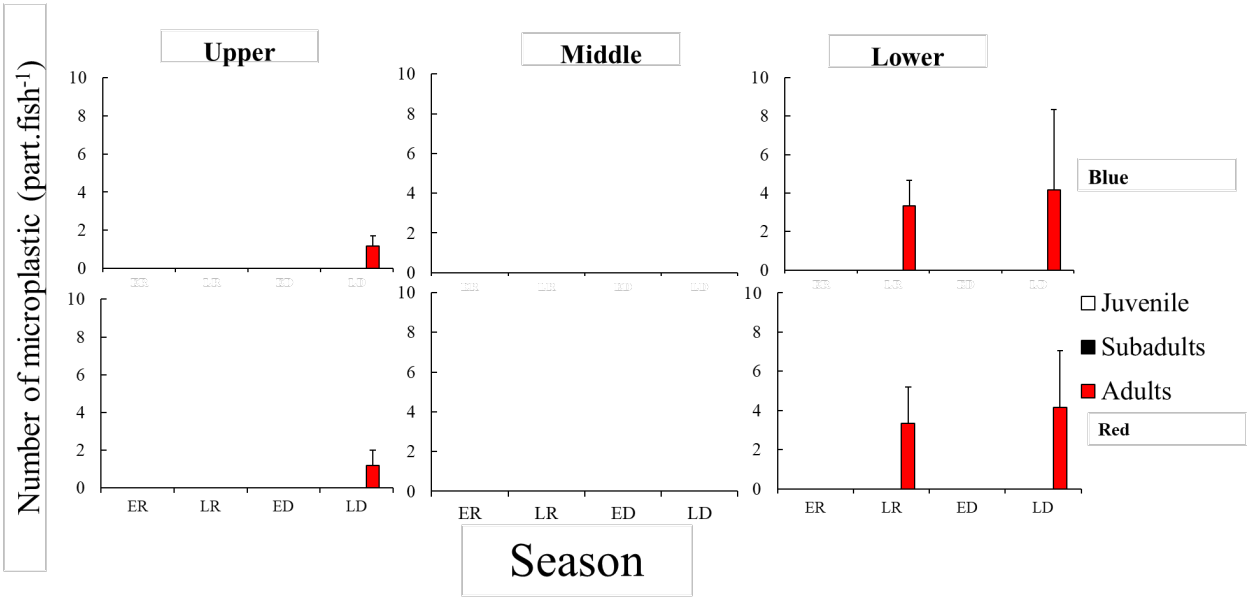

Figure S14. **Mean and standard error (S.E.) of the number of the most relevant colours of microplastics (blue and red) ingested in the different ontogenetic phases (juvenile: white; subadult: black; adult: red) of *C. edentulus* in the early dry season (ED), late dry season (LD), early rainy season (ER) and late rainy season (LR) for the different areas (upper, intermediate and lower) of the Goiana River estuary.**

9. Regression model of MP contamination in plankton-eating fish species

For *A. clupeoides*, the analysis of deviance residuals versus fitted values suggests that there were no significant violations in the data distribution (Figure S15a). Furthermore, the normal probability plot (Figure S15c), with simulated envelopes, indicated that there was no strong evidence of violations of the assumptions proposed by the model. The residuals demonstrated that they behave in a random manner with a constant dispersion (Figure S15b). Furthermore, 96% of the data are in the interval [-2; 2], therefore, the fitted model can be considered adequate.

For *C. edentulus*, the residual analysis shows that there was no strong evidence of violations of the model assumptions (Figure S16a). Furthermore, the residuals showed that the fitted values have a random behaviour with constant dispersion (Figure S16b). The normal probability plot suggests that there is no strong evidence of violations of the model assumptions (Figure S16d). Considering this evidence, it can be concluded that the fitted model is adequate. Furthermore, 92% of the residuals are dispersed in the interval [-2; 2] (Figure 16b).

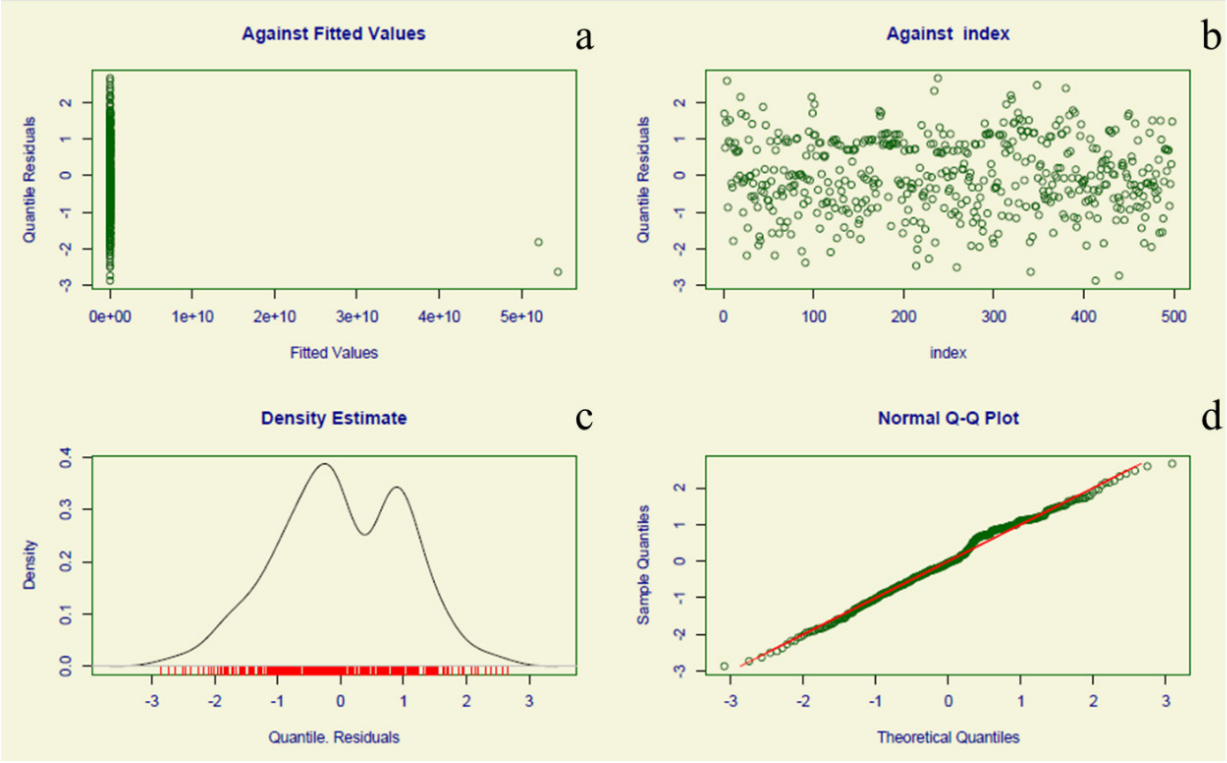

Figure S15. Plots of Residuals versus fitted values (a), residuals versus index (b), density estimate (c) and fit to the normal distribution (d) of the ZINBI binomial regression model for MP contamination of *A. clupeoides*.

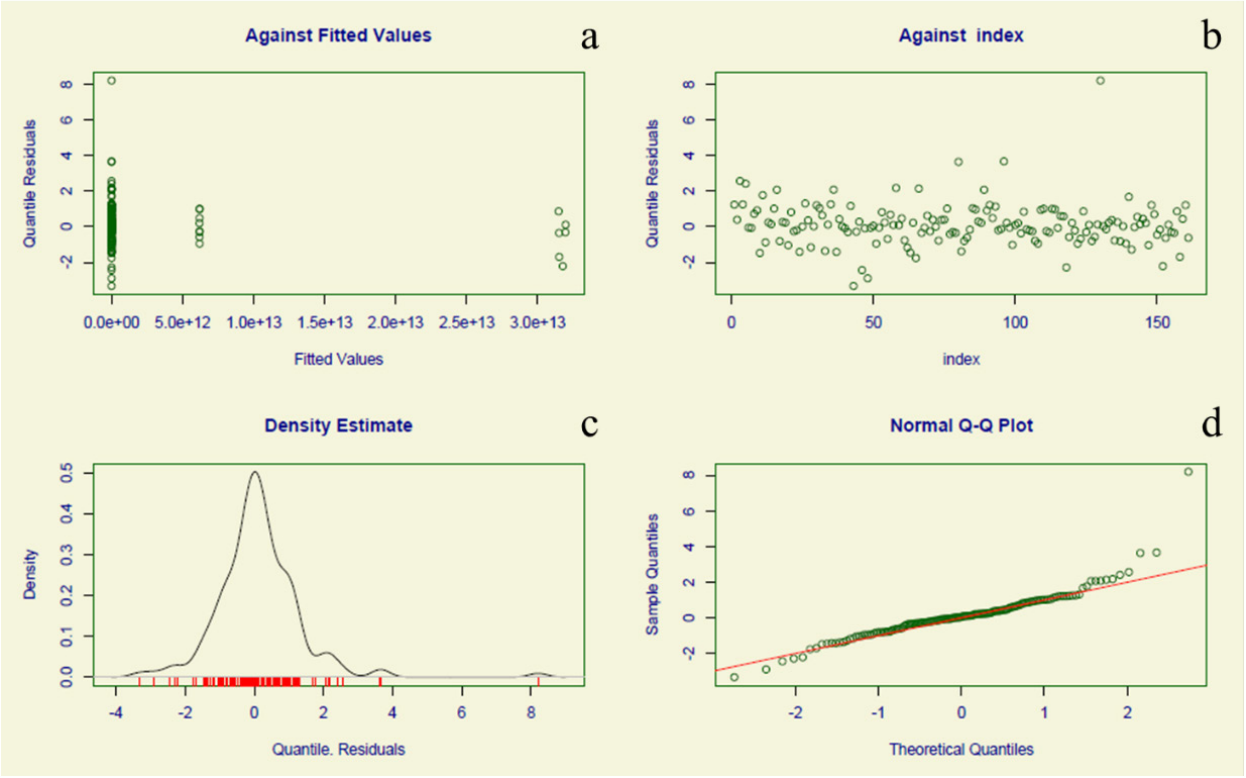

Figure S16. Plots of Residuals versus fitted values (a), residuals versus index (b), density estimate (c) and fit to the normal distribution (d) of the ZINBI binomial regression model for MP contamination of C. edentulus.