

Figure S1: Boxplots showing gape carotenoid-chroma in unfed and fed males in May 2010, 2017 and 2018. For each group, points are slightly dispersed on the x-axis to avoid overlapping. The yellow diamonds correspond to the mean. Gape carotenoid-chroma varied with the interaction between treatment and year ($\chi^2_1 = 7.26$, $P = 0.027$). In 2010, fed males had higher gape carotenoid-chroma than unfed males ($\chi^2_1 = 5.32$, $P = 0.021$), while in 2017, they tended to have lower gape carotenoid-chroma than unfed birds ($\chi^2_1 = 2.48$, $P = 0.12$).

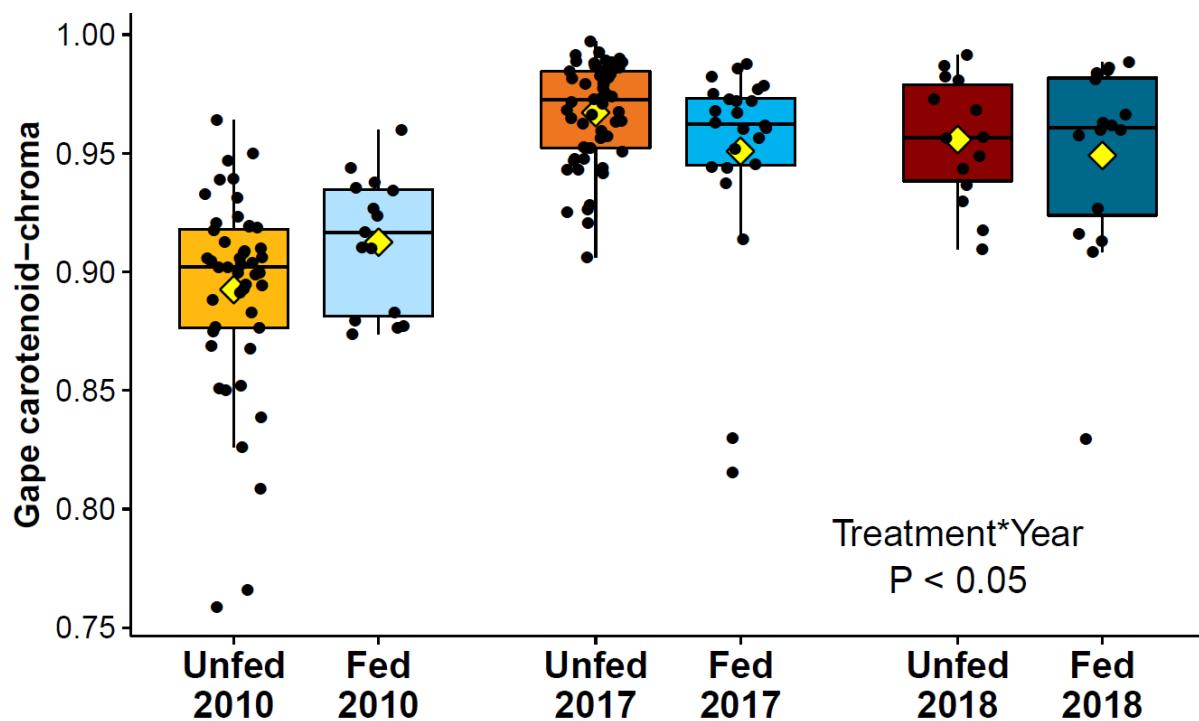


Figure S2: Gape carotenoid-chroma (boxcox-transformed) in relation to body condition in unfed males in May 2010, 2017 and 2018. Carotenoid-chroma increased with body condition in the three years studied ($\chi^2_1 = 4.56$, $P = 0.033$; interaction between year and body condition: $\chi^2_1 = 0.30$, $P = 0.86$).

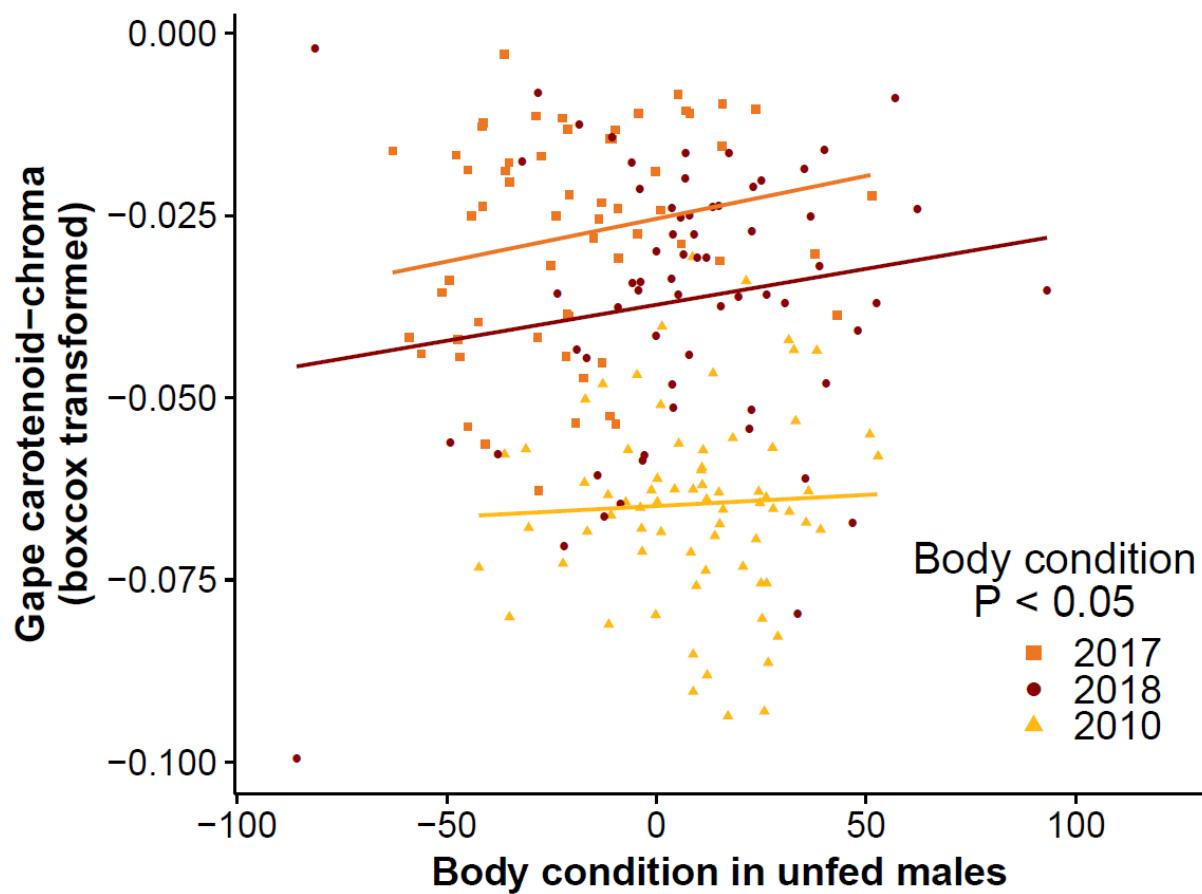


Fig. S3: Gape carotenoid-chroma in relation to (a) zeaxanthin and (b) astaxanthin plasma levels in unfed males in May 2010 and May 2017. Gape carotenoid-chroma increased with circulating zeaxanthin levels ($\chi^2_1 = 6.95$, $P = 0.0084$), but it did not vary with astaxanthin levels (astaxanthin levels * year: $\chi^2_1 = 2.19$, $P = 0.14$; splitting by year: in 2010: $F_{1,14} = 2.84$, $P = 0.11$, in 2017: $F_{1,30} = 0.02$, $P = 0.89$).

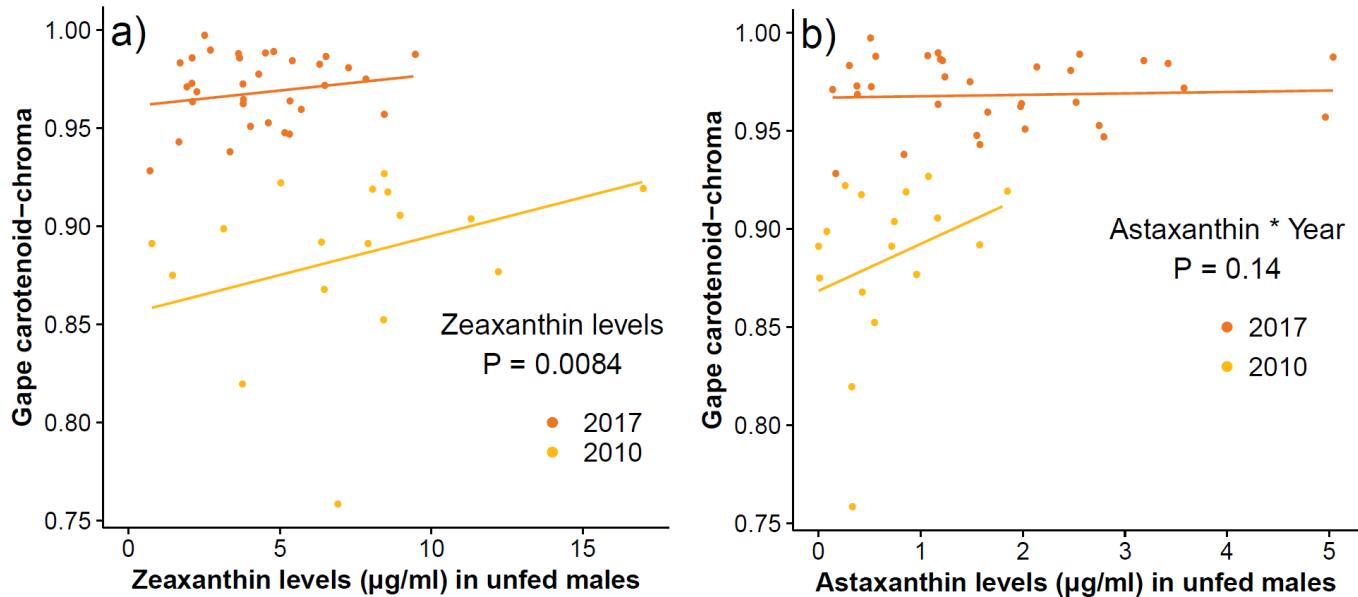


Figure S4: Plots showing correlation between each of the carotenoid levels in plasma in unfed and fed males in 2010 and 2017. Color and size of the ellipse represent Spearman's r value. *: P < 0.5, **: P < 0.01, ***: P < 0.001.

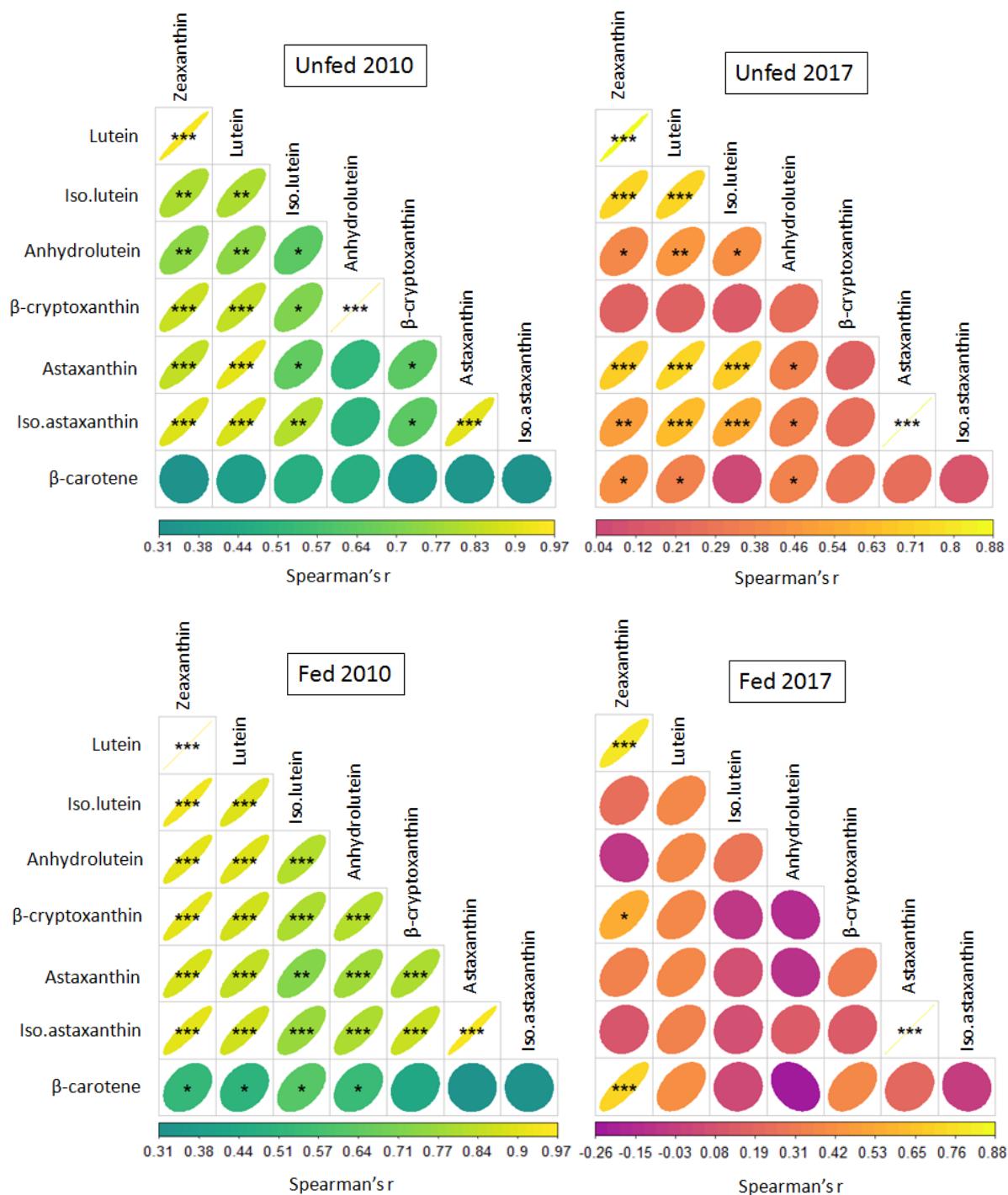


Figure S5: Carotenoid levels in unfed and fed males in 2010 and 2017 (mean \pm se).

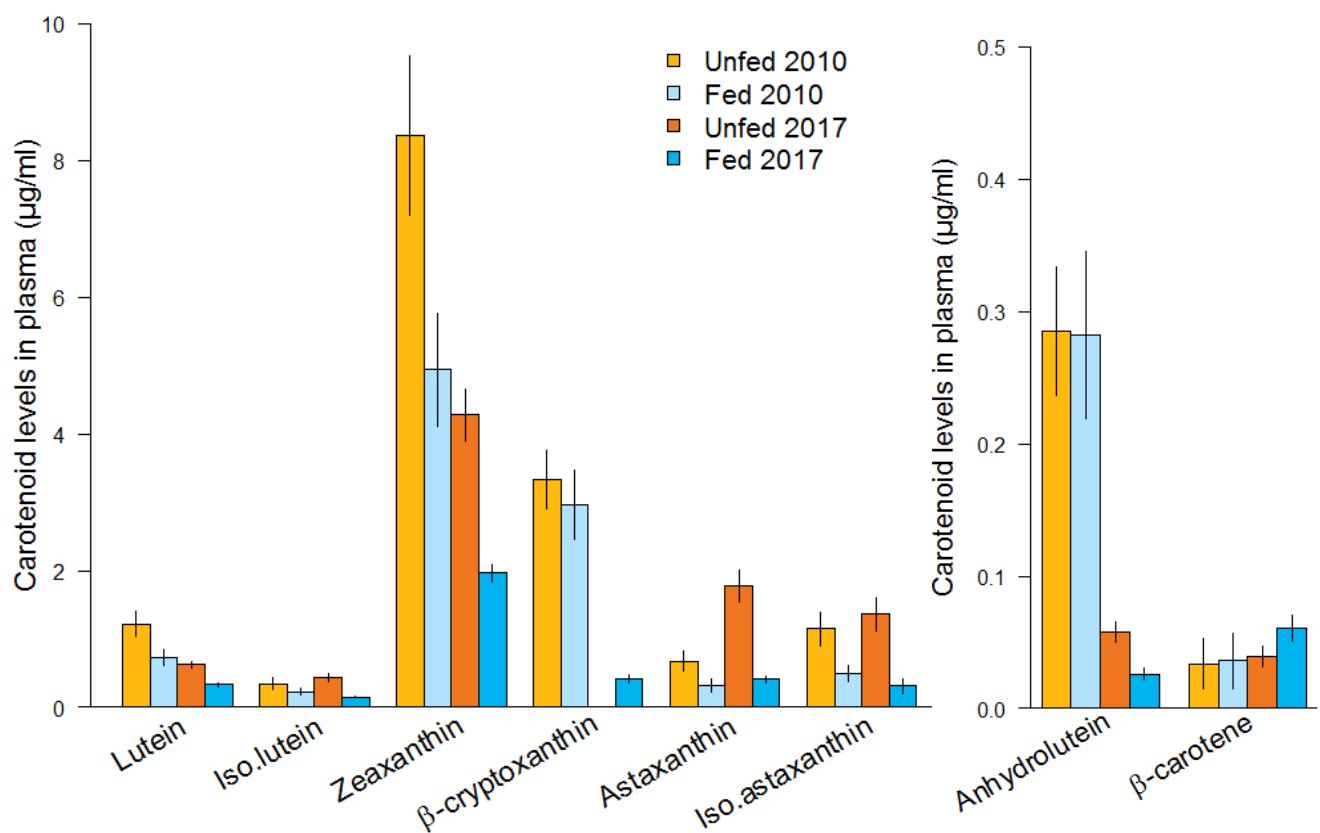


Figure S6: Mean reflectance spectra of gape in unfed and fed males in May 2010, 2017 and 2018. Shown are means \pm SE.

