

Food availability modulates the combined effects of ocean acidification and warming on fish growth

Louise Cominassi^{1*}, Marta Moyano¹, Guy Claireaux², Sarah Howald^{1,3}, Felix C. Mark³, José-Luis Zambonino-Infante⁴, Myron A. Peck¹

¹ Institute of Marine Ecosystem and Fisheries Science, Center for Earth System Research and Sustainability (CEN), University of Hamburg, 22767 Hamburg, Germany

² Université de Bretagne Occidentale, LEMAR (UMR 6539), Centre Ifremer de Bretagne, 29280 Plouzané, France

³ Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Integrative Ecophysiology, 27570 Bremerhaven, Germany

⁴ Ifremer, LEMAR (UMR 6539), Laboratory of Adaptation, Reproduction and Nutrition of Fish, Centre Ifremer de Bretagne, 29280 Plouzané, France

*Corresponding author

+49 40 42838-6653

louise.cominassi@uni-hamburg.de

louise.cominassi@gmail.com

Supplementary tables:

Table S1: Significance of terms for the linear mixed-effect model (LME model) on the impact of feeding and PCO_2 levels on the dynamic of stomach pH in juveniles European sea bass reared at 15°C. Abbreviation: DF, degrees of freedom.

	Value	Standard Error	DF	t-value	p-value
Intercept	4.755315	0.3963488	183	11.997806	0.0000
Ration	-0.353966	0.4967770	183	-0.712526	0.4770
PCO_2	-0.000396	0.0003884	183	-1.020551	0.3088
Time	0.020390	0.0080774	55	2.524326	0.0145
Ration : PCO_2	-0.013210	0.0100713	183	-1.311601	0.1913
PCO_2 : Time	0.000002	0.0000079	183	0.235830	0.8138
Ration : Time	0.000389	0.0005559	183	0.699277	0.4853
Ration : PCO_2 : Time	-0.000008	0.0000113	183	-0.687857	0.4924

Table S2: Significance of terms for the linear mixed-effect model (LME model) on the impact of feeding and PCO_2 levels on the dynamic of stomach pH in juveniles European sea bass reared at 20°C. Abbreviation: DF, degrees of freedom.

	Value	Standard Error	DF	t-value	p-value
Intercept	4.242492	0.4961067	161	8.551571	0.0000
Ration	-0.62783	0.6308207	161	-0.099525	0.9208
PCO_2	0.000657	0.0005002	161	1.312855	0.1911
Time	0.033503	0.0134417	47	2.492456	0.0163
Ration : PCO_2	-0.000493	0.0007062	161	-0.697884	0.4863
PCO_2 : Time	-0.000013	0.0000138	161	-0.965925	0.3355
Ration : Time	0.010245	0.0170718	161	0.600090	0.5493
Ration : PCO_2 : Time	-0.000011	0.0000193	161	-0.583927	0.5601

Supplementary figures :

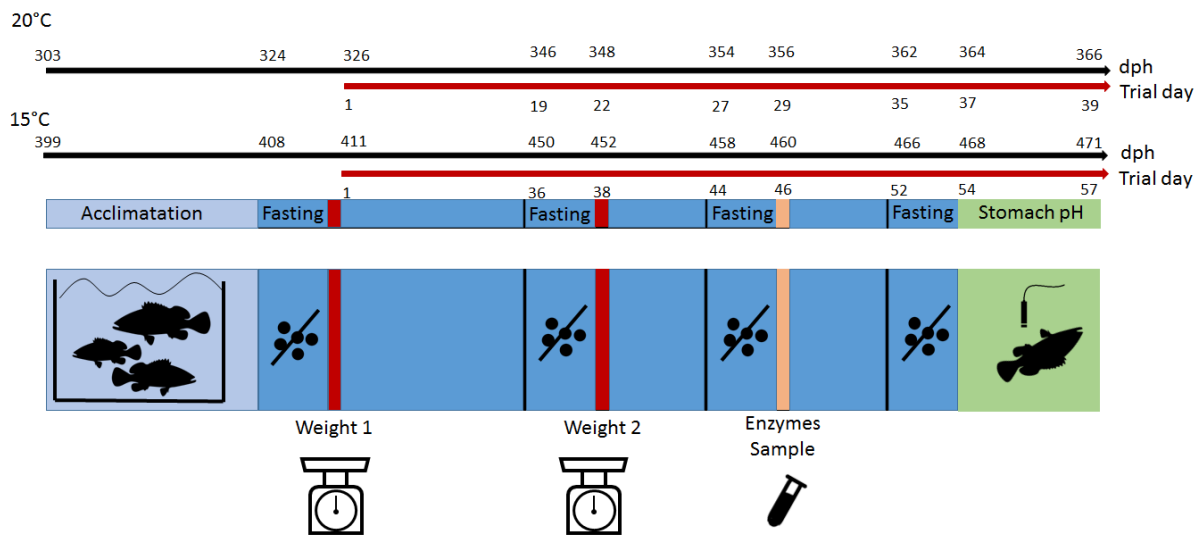


Figure S1: Proceeding of the feeding trial at two temperature regimes⁹⁴. Dph: days post-hatch
Fish icons (CC) by Adam Zubin, MV.

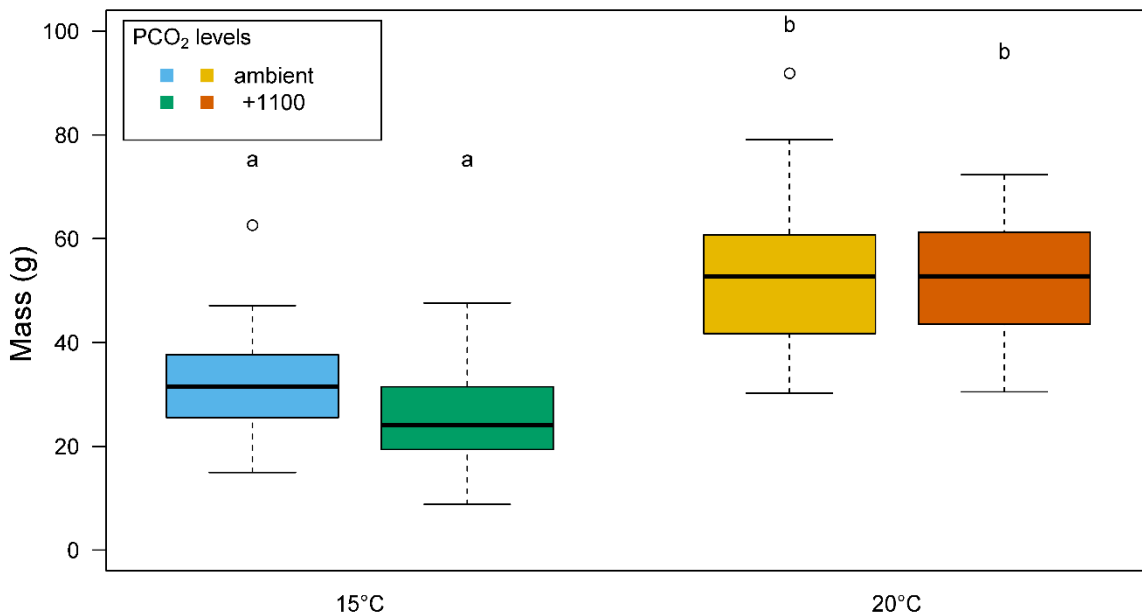


Figure S2. Box and whisker plots of wet mass of fish reared at two temperature regimes and two PCO_2 levels at 367 dph and 277 dph at 15°C and 20°C, respectively⁹⁴. The whiskers denote the 10th and 90th percentiles, the box denotes the 25th and 75th percentiles, the median value is shown (horizontal line) as well as outliers (points).

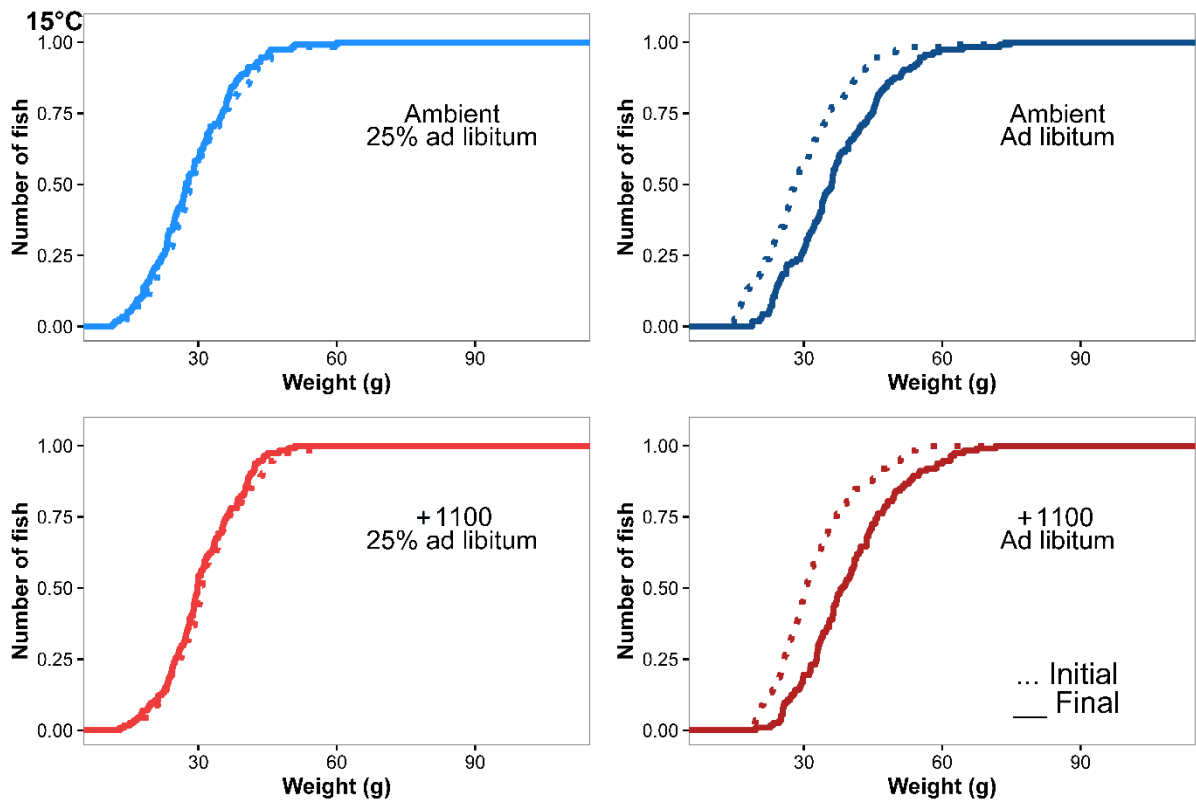


Figure S3. Wet mass cumulative distribution of fish reared at 15°C based on the initial and final measurements for each condition⁹⁴.

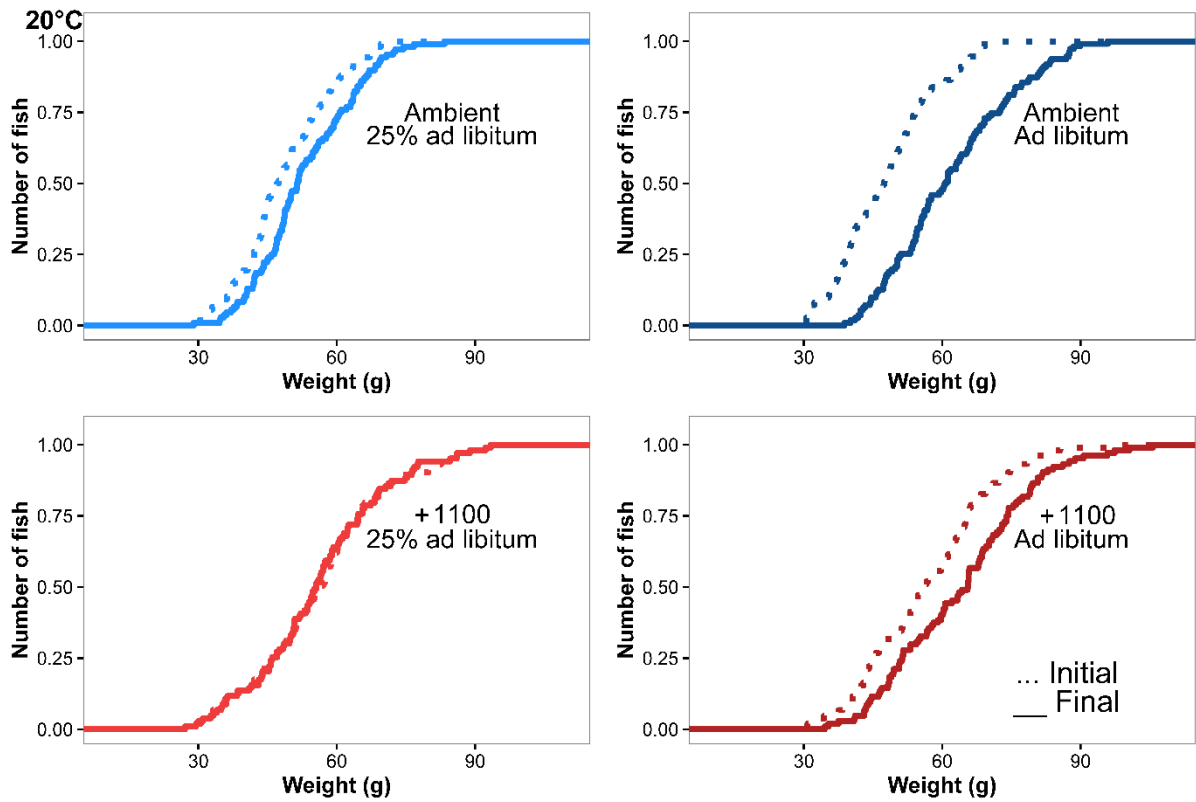


Figure S4. Wet mass cumulative distribution of fish reared at 20°C from the first weighing (Initial) to the second weighing (Final) for each condition⁹⁴.

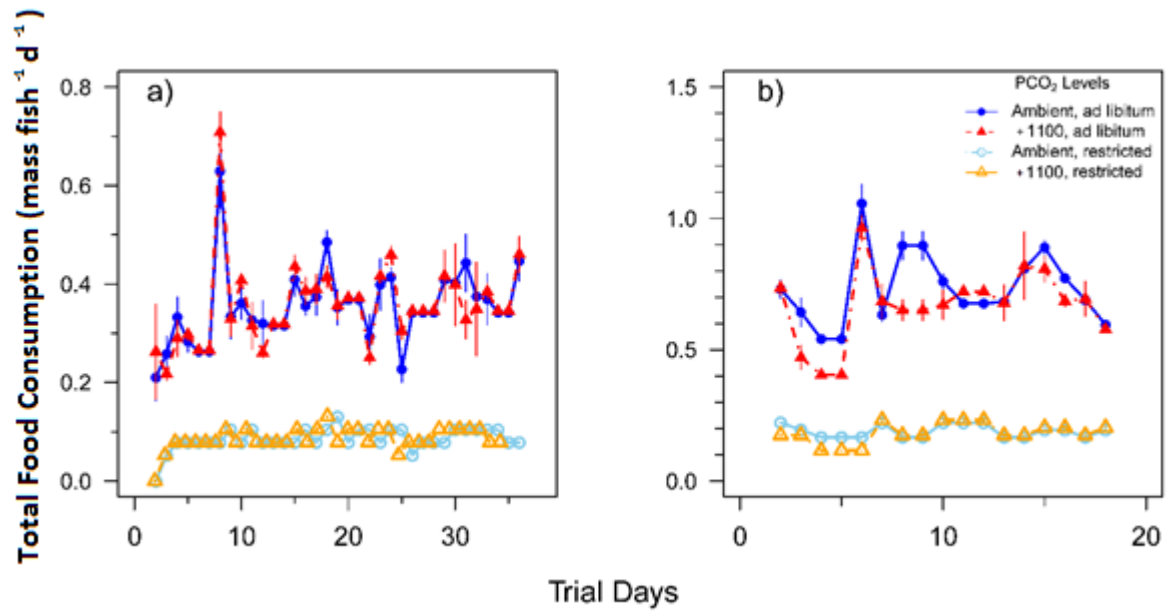


Figure S5. Mean (\pm SE, $n=3$) daily food consumption by juvenile sea bass at two PCO_2 and two feeding levels during each of two feeding-growth trials (a) $15^\circ C$ and (b) $20^\circ C$)⁹⁴. In each trial, PCO_2 levels were ambient (circles, $650 \mu atm$) or +1100 (triangles, $1700 \mu atm$) (see text) and feeding levels were *ad libitum* (filled symbols) or restricted (25% *ad libitum*, unfilled symbols).