

## Group size influences individual metabolic traits in a social fish

### Supporting Information

#### Respirometry trial set-up:

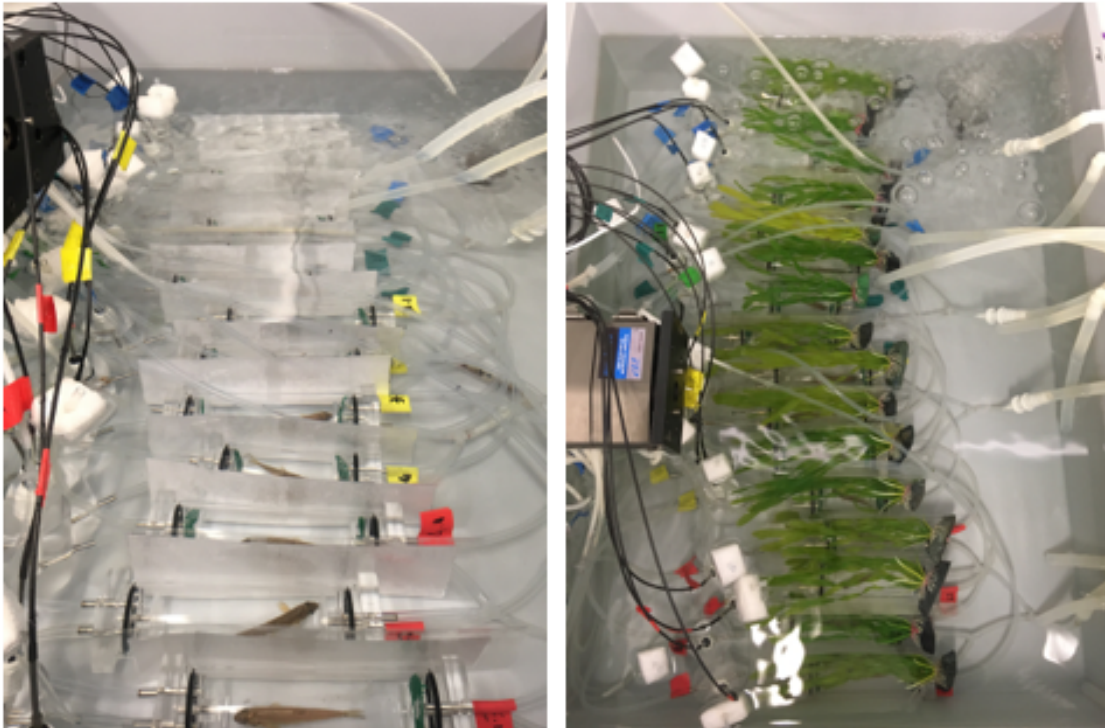


Figure S1: Respirometry trial setup. 16 fish tested each time. There were dividers between chambers so fish could not see each other. Trials lasted two days, one day during which chambers were not covered with plants, while the other day the chambers were covered with plants. Plant cover was randomly set to occur on the 1<sup>st</sup> or 2<sup>nd</sup> day of trial for each lot of fish tested together, and order was reversed for the final respirometry trial.

## Specific growth rate

Fish were fed *ad libitum* a combination of pellets and blood worms in their experimental holding tank during the 3-week social experiment to minimize potential effects of density on individual food intake and growth. We compared daily specific growth rate (SGR: in % day<sup>-1</sup>) across social treatments and observed that fish held in groups of eight had on average lower SGR (Table S1), but that SGR was overall very variable among individuals (Figure S2).

Further, we tested if SGR could influence metabolic rates. It was not possible to include SGR in the models presented in the results of the manuscript as those models included two estimates of metabolic rates per individual (initial vs final respirometry trial), while we have a single SGR per individual. Therefore, we tested if SGR and its interaction with the social treatment could influence metabolic rates estimated at the final respirometry trial. There was no effect of SGR on any metabolic rate (Table S2, Figure S3). In addition, there was no interaction between SGR and group size or shelter availability.

Table S1: Results of linear model relating specific growth rate (SGR) of Eurasian minnows to the social treatment (group size and shelter availability).

Response variable	Effect	Estimate ± standard error	<i>F</i>	p-value	R <sup>2</sup> <sub>adj</sub>
SGR	Group size	-0.152 ± 0.051	9.011	0.004	8.4
	Shelter availability	0.025 ± 0.050	0.248	0.620	

Table S2: Results of linear model relating final standard metabolic rate (SMR), maximum metabolic rate (MMR) and aerobic scope (AS) of Eurasian minnows to the specific growth rate (SGR), the social treatment (group size and shelter availability), and their interaction\*.

Response variable	Effect	<i>F</i>	p-value
Final SMR	SGR	2.036	0.158
	Group size	12.232	<0.001
	Shelter availability	0.190	0.664
Final MMR	SGR	0.028	0.868
	Group size	4.983	0.029
	Shelter availability	0.285	0.595
Final AS	SGR	0.001	0.972
	Group size	3.182	0.078
	Shelter availability	0.235	0.629

\*All interactions were non-significant and were therefore removed from models.

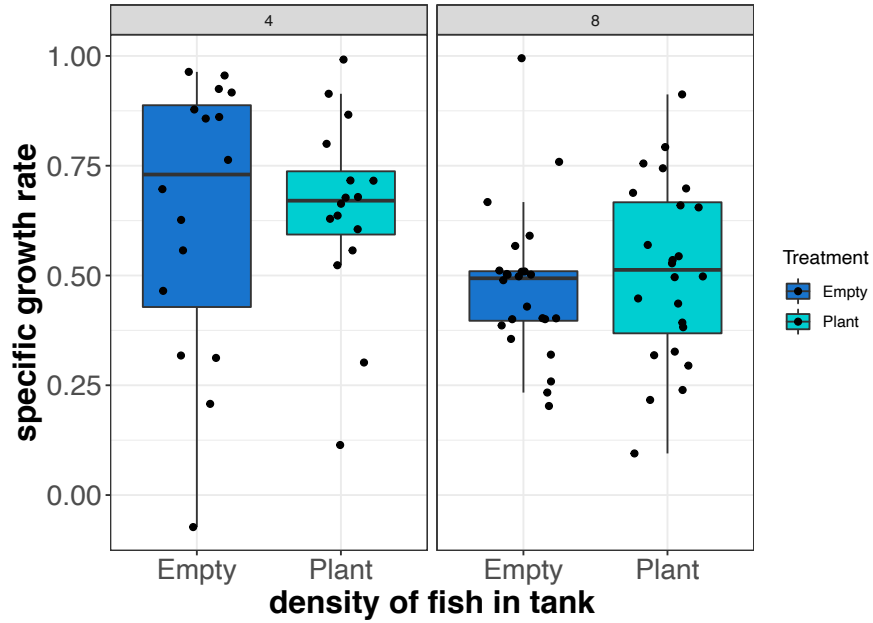


Figure S2: Boxplot of specific growth rate (SGR; in % day<sup>-1</sup>) of fish in each social treatment consisting in a combination of group size (left: four fish; right: eight fish) and shelter availability (no plant shelter in blue; with plant shelter in turquoise). Middle thick line of the boxplots corresponds to the median, lower and upper hinges correspond to the first and third quartiles of the data, and whiskers extend to the range of the data. Each fish SGR is overlaid on the boxplot (black dots).

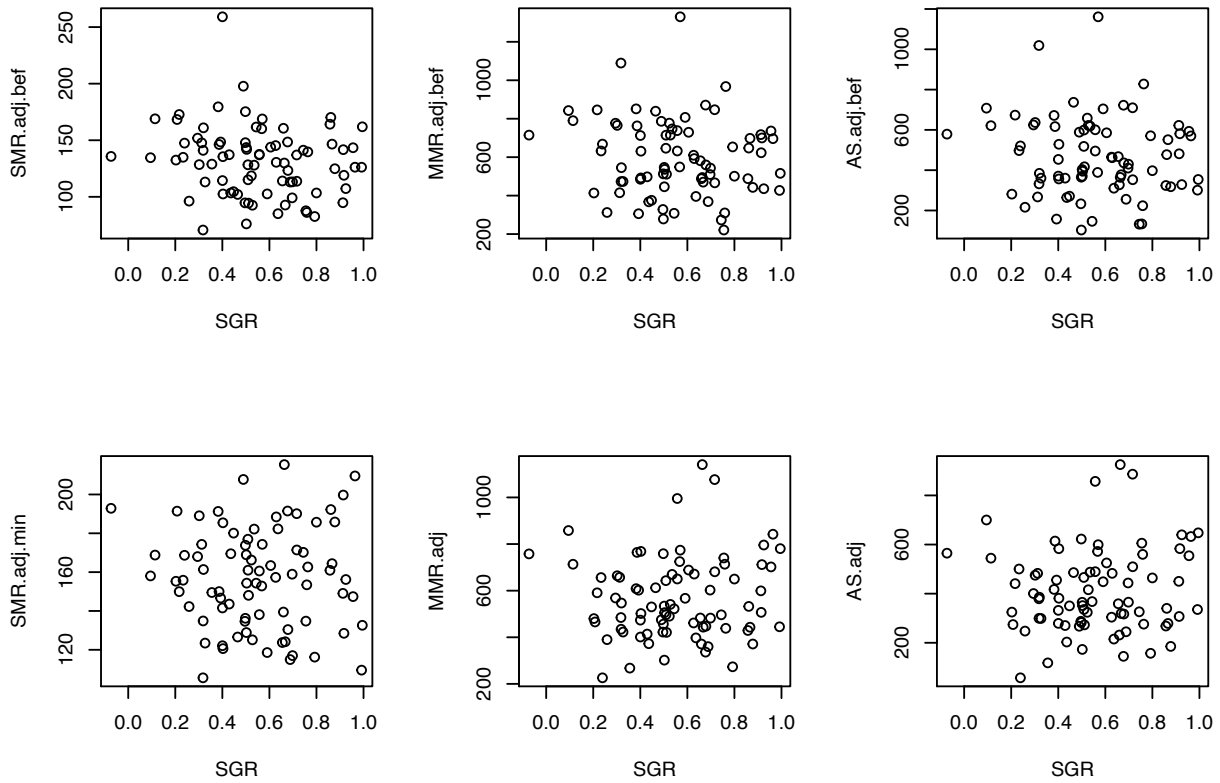


Figure S3: Observed SMR, MMR, and AS of Eurasian minnow (in  $\text{mg O}_2 \text{ kg}^{-1} \text{ hr}^{-1}$ ) during the initial (top row) and final (bottom row) respirometry trial in relation to specific growth rate (SGR; in  $\% \text{ day}^{-1}$ ).

## MMR and AS

Table S3: Results of linear mixed model relating maximum metabolic rate (MMR) and aerobic scope (AS) of Eurasian minnows to the moment of the respirometry trials and the social treatment (group size and shelter availability). Fish ID and lot number were included in the models as a random effect in a nested structure (lot number/Fish ID).  $R^2_m$  is the marginal  $R^2$  (variance explained by the fixed effects) and  $R^2_c$  is the conditional  $R^2$  (total variance explained by the fixed and the random effects).

Response variable	Effect	$\chi^2$	p-value	$R^2_m$	$R^2_c$
MMR	Trial	1.312	0.252	6.3	24.7
	Group size	6.717	0.010		
	Shelter availability	0.224	0.636		
AS	Trial	4.813	0.028	7.5	23.2
	Group size	7.159	0.007		
	Shelter availability	0.262	0.609		

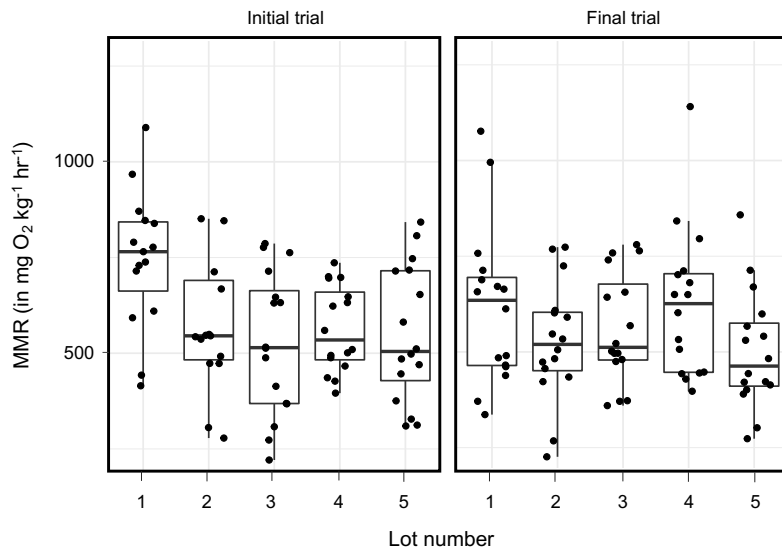


Figure S4: Maximum metabolic rates (MMR) per lot of fish captured together from the stock tank. Left panel shows rates measured in the initial respirometry trial, right panel shows rates measured at the final respirometry trial. Middle thick line of the boxplots corresponds to the median, lower and upper hinges correspond to the first and third quartiles of the data, and whiskers extend to the range of the data. Each fish MMR is overlaid on the boxplot (black dots).