# Results

## Methods

## *Statistical anylysis*

All statistical analyses were performed with the software R. Adjusted fish mass was calculated as the fish mass minus parasite mass (Lagrue and Poulin, 2015). Parasite mass was estimated with the mean mass of 20 parasites (Vic, in prep). For bass tapeworm, adult average was 0.003g and larval form was 0.0008g. We decided to exclude nematodes since the mass varies grandly between individuals and is found rarely in our fish. Blackspots mass was considered too small to be subtracted from total mass (10^-7g). Body condition was calculated with the Fulton index (mass/standard length3 in cm) (Jakob, 1996) using the adjusted fish mass for the 2 measures of body condition after the experimental infection (we assume there is no parasite before the experimental infection).

Exploration was distributed normally. Activity and boldness were log-transformed to impose normality. We used a Bayesian statistical inference with MCMC sampling to build our models. All variables were z-scaled. Three steps were required to analyze the data: Step 1: we build two similar models with the personality traits as response variables, treatment as a fixed effect, and fish ID and cage number as random effects. Model 1 also add tank effect as a fixed factor compared to Model 2. Step 2: we subset the dataset into two groups : “E” for experimental fish and “C” for control fish. Model 3 and 4 were using the group “E” for each personality trait. Parasite load was included as a fixed factor; fish ID and cage were random factors. Model 4 was similar, except we added a exponent 2 for parasite load as another fixed factor. Model 5 used the control dataset with ID and cage as random effects. Finally, Model 6 used body condition as the response variable …

Repeatability (R) was calculated using the squared standard deviation for fish ID divided by the squared standard deviation for fish ID, cage and sigma from model 2 for each treatment group and for the average across groups. To estimate if repeatability was different from 0, we choose 0.05 as a threshold since the values can’t be 0 in the distribution. Correlation between traits were extracted from model 2 to determine if there was a behavioural syndrome between traits. To measure the average correlation for each group, we pooled the two MCMC chains from the treatments into a giant vector 32,000 rows.

### Results

#### *Experimental infection*

The caging experiment successfully infected our treatment fish. Control fish that stayed in the laboratory had no alive parasite, which indicate that the praziquantel treatment was effective. The two most abundant species found in the experimentally infected fish were trematodes causing the blackspot disease (Trematoda: *Apophallus sp.* and *Uvulifer sp.*; min-max: 0- 62; median: 9) and the bass tapeworm (Cestoda: *Proteocephalus ambloplites*; min-max: 0 - 36 ; median: 4). The most abundant species of trematode causing blackspots was *Apophallus sp*. (Binning, Lanthier, unpublished data), but *Uvulifer sp.* was found more frequently inside the muscles (MG, personal observations).Experimentally fish gained in mean 8.347 blackspots, and were found on the fines, body, gills and inside the muscles. Bass tapeworm were mostly found in the liver, stomach and digestive tract, occasionally around the spleen (parasite count: 9), and rarely on the gills (parasite count: 3) or the heart (parasite count: 2). Unknown nematode species were found rarely in the body cavity (alive parasite count: 4).

#### *Evidence of personality and behavioural syndrome*

Boldness, exploration and activity were all repeatable accross trials (Boldness: 0.157, 95% CI: 0.03 to 0.31, = 0.068; Exploration: 0.256, 95% CI: 0.12 to 0.4, = 0; Activity: 0.321, 95% CI: 0.17 to 0.46, = 0). We did not observe among-individual variation to be higher in the control vs experimentally infected groups ([Tab. 1](#tbl-tab1)). Repeatability did not differ between treatment for boldness (p-value = 0.959), exploration (p-value: 0.483) and activity (p-value:0.69).

#### *Behavioural syndrome*

summary(model1.2)

#### *Effect of parasite*

#### *Boldness*

|  |
| --- |
| Figure 1— Repeatbility of behavioural traits |

Table 1— Repeatbility estimates for traits

| Trait | Group C | 2.5% CI (C) | 9.75% CI (C) | Group E | 2.5% CI (E) | 9.75% CI (E) | p\_value |
| --- | --- | --- | --- | --- | --- | --- | --- |
| log\_Boldness | 0.175 | 0.013 | 0.363 | 0.170 | 0.003 | 0.376 | 0.959 |
| Exploration | 0.289 | 0.111 | 0.470 | 0.189 | 0.004 | 0.410 | 0.483 |
| log\_Activity | 0.346 | 0.169 | 0.516 | 0.289 | 0.052 | 0.492 | 0.690 |