

# Assessing the effect of different light conditions on crayfish welfare using a dark-light preference maze

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## Introduction

Noble crayfish (*Astacus astacus*) are freshwater crustaceans of European streams, rivers and lakes that frequently hide in dark places and naturally explore new environments. Fossat et al. (2015) validated a paradigm to assess stress by using a subaquatic dark-light plus maze for red swamp crayfish (*Procambarus clarkii*). They concluded that stressed animals show less explorative behaviour and remain preferentially in the dark arms - a response similar to the anxiety-like behaviour observed in rodents. We used this preference test on noble crayfish in order to investigate the welfare consequences of different light conditions in an indoor aquaculture system.

## The animals

- 468 noble crayfish;
- 18 tanks, containing groups of 26 individuals;
- Two different light intensities:
  - weak light (38 lux);
  - bright light (761 lux);
- 3 different light spectrums:
  - cool white (CCT ≈ 5500 K);
  - warm white (CCT ≈ 2600 K);
  - neutral white (CCT ≈ 3800 K);
- Access to shelters;
- Photoperiod L:D 10:14;
- Period of six months.



Fig. 1



Fig. 2

## The maze

- Dimensions: width 29 cm, height 9 cm;
- Sides of dark branches were covered with black plastic, top was closed with a lid (see fig. 3 and 4);
- Light spectrum and intensity were adapted for animals from different treatments;
- Measured illuminance:
  - dark branches: 21 lux;
  - light branches & center: 550 lux.

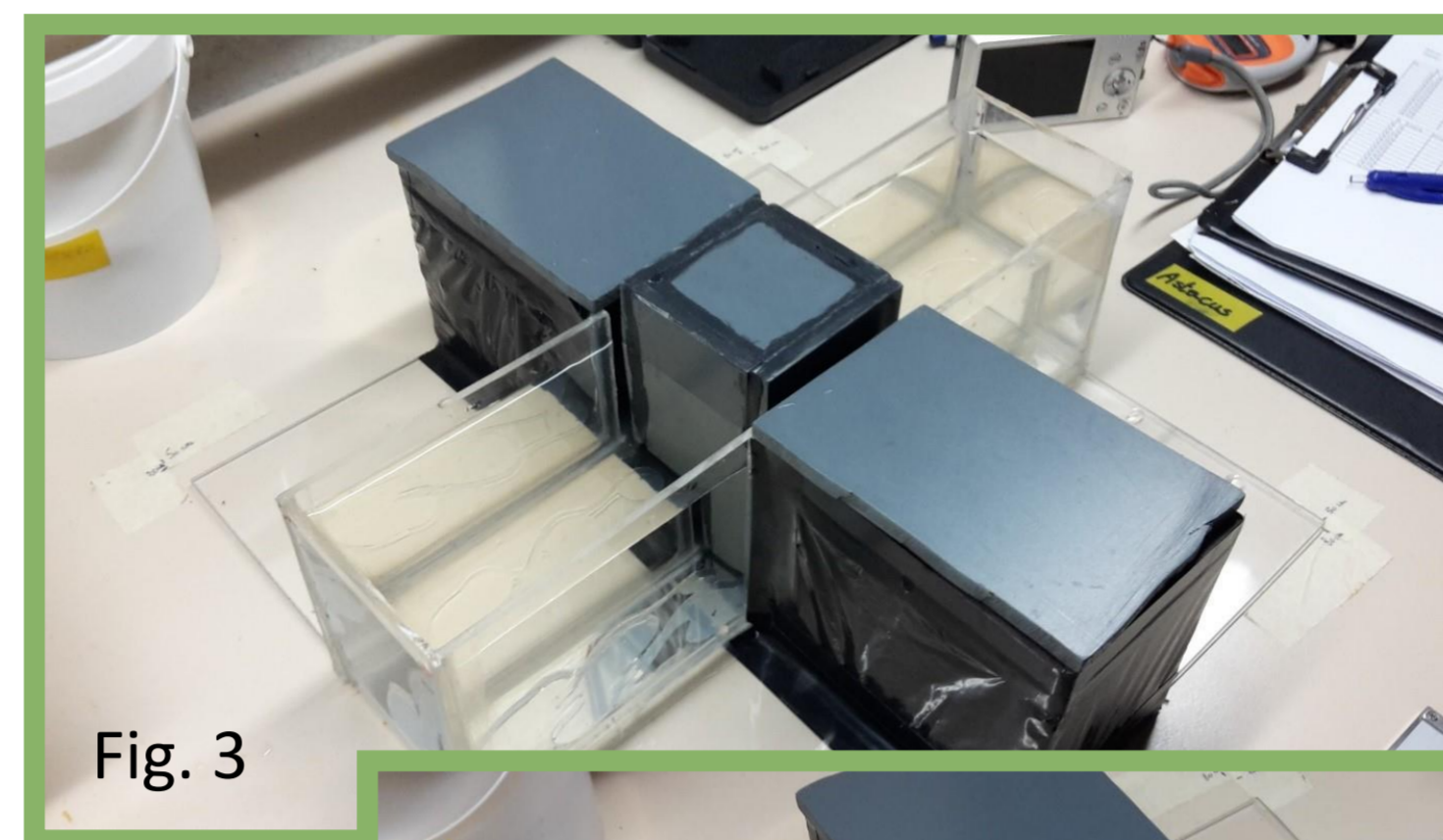


Fig. 3



Fig. 4



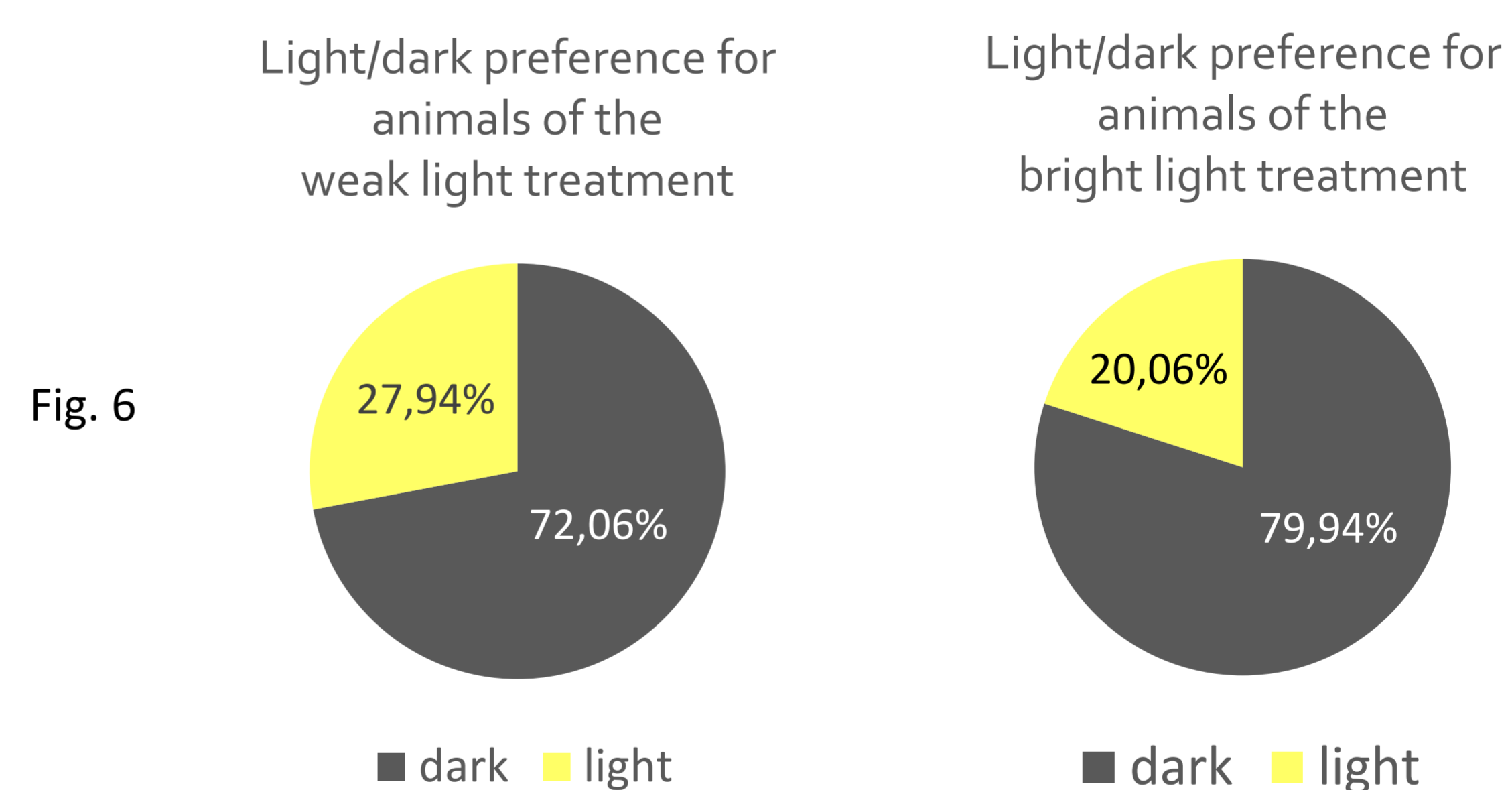
Fig. 5

## Observation method

- 2 males and 2 females were caught from each tank (72 crayfish in total);
- 1 minute of acclimation in a small cage in the center of the maze (see fig. 3);
- Crayfish could freely explore the entire maze during 10 minutes (fig. 4);
- The animal's location was scored (light/dark) every 5 seconds.

## Results

- Crayfish kept in low lux conditions spent 7.87% (SD=9.48, p value Mann-Whitney-U test = 0.098) more time in the light arms of the plus maze than those kept under high lux;
- The light spectrum had no effect (p-value Kruskal-Wallis test = 0.715);
- There is a trend in crayfish to show less anxious behaviour when being housed under low light conditions.



## Discussion

Living in an environment with a cool, warm or neutral white light spectrum, did not affect the behaviour of the crayfish in the maze. Light intensity however did tend to have an effect. Therefore, crayfish should at least have the opportunity to seek shelter. Nevertheless, providing merely a small shelter place may not be sufficient to guarantee the animals' welfare when they are kept in an environment with high illuminance.

We will investigate further whether free choice between sections with weak or bright light may alter crayfish performance in the maze experiment. Also, other behavioural parameters such as activity and specific behaviours, will be looked at.

## References:

Fossat, P., Bacqué-Cazenave, J., De Deurwaerdère, P., Delbecq, J., Cattaert, D. 2014. Anxiety-like behavior in crayfish is controlled by serotonin. *Science*. 344, 1293.

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