

Photoperiod affects light/dark preference and exploratory behaviour in noble crayfish (*Astacus astacus*)

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Introduction

- Photoperiod is known to affect crayfish growth, behaviour and hemolymph physiology in aquaculture;
- Artificial day-night cycles have been related to stress in cultured animals;
- Decreased exploratory behaviour and increased light avoidance are considered anxiety-like behaviours, induced by stress (Fossat et al. 2014);
- We evaluated the effect of different photoperiods on noble crayfish activity and light/dark preference in an aquatic plus maze.

Materials & methods

The crayfish

- 135 two-summer-old noble crayfish;
- Five groups, each exposed to a different photoperiod (in triplicate):

Table 1. The photoperiods used in the experiment

	1	2	3	4	5
hours light/dark (L:D)	0:24	8:16	12:12	16:8	24:0

- Fluorescent lights (Philips T8 36W 827) were dimmed to 40 lux;
- Access to brushes and PVC pipes as shelters.

The light/dark preference maze

- Dimensions: width 29 cm, height 9 cm;
- Sides of dark branches were covered with black foil, top was closed with an opaque lid (see fig. 1 & 2).

The behavioural study

- After being exposed to different photoperiods for 144 days, the crayfish were submitted to a light/dark preference test;
- Before observation, the crayfish were acclimated in a cage (fig. 2);
- During ten minutes, the crayfish's location was scored every five seconds.

Analysis

- Light/dark preference was determined by the time spent in the dark or lit areas;
- Exploratory behaviour was assessed by quantifying the number of movements between different locations in the maze (fig. 3).



Fig 1. Crayfish in the plus maze.

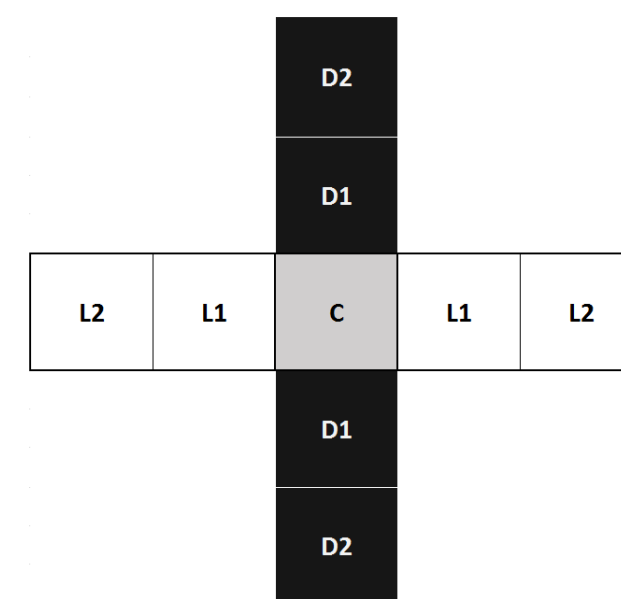


Fig 3. Coordinates within the plus maze. Movements between these locations were used to quantify exploratory behaviour.

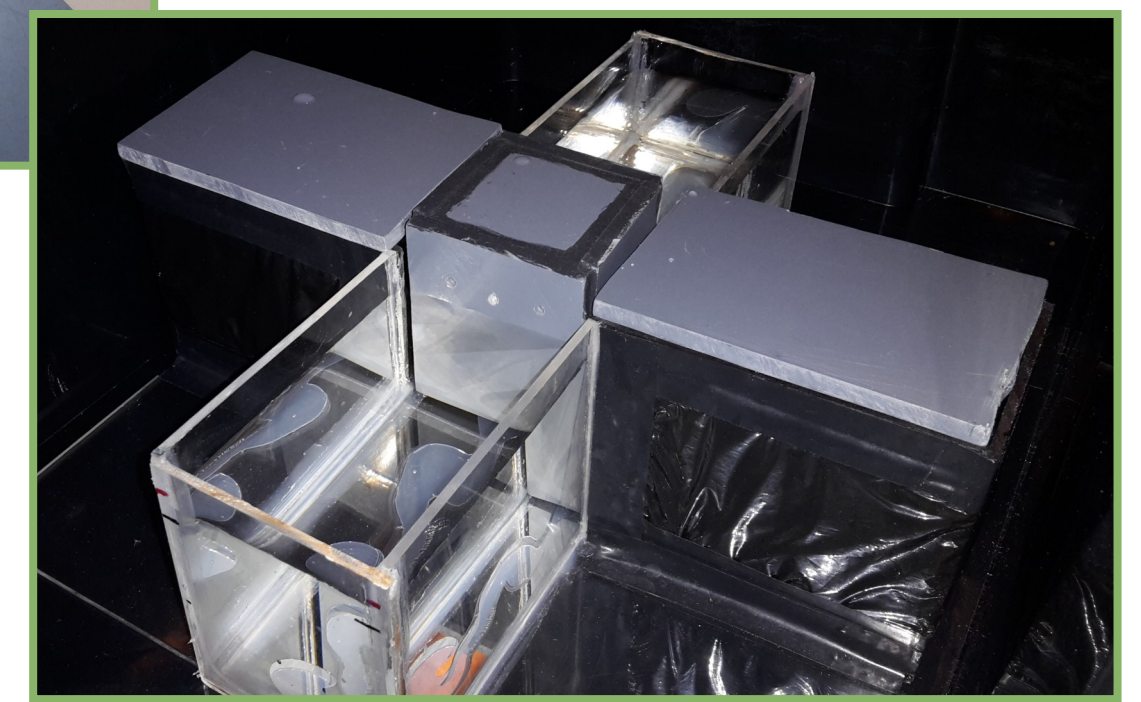


Fig 2. Dark/light preference maze setup just before observation. The crayfish is first acclimated in the central cage.

Results

- Crayfish kept in L:D 24:0 showed a higher amount of movements (43.6 ± 4.33 , mean \pm stdev) than individuals from all other treatments ($p=0.0004$) (see fig. 4);
- The L:D 24:0 crayfish also spent significantly more time in the lit arms of the maze ($43.40 \pm 1.74\%$) compared to animals from the L:D 0:24 treatment ($25.07 \pm 4.22\%$) ($p=0.040$).

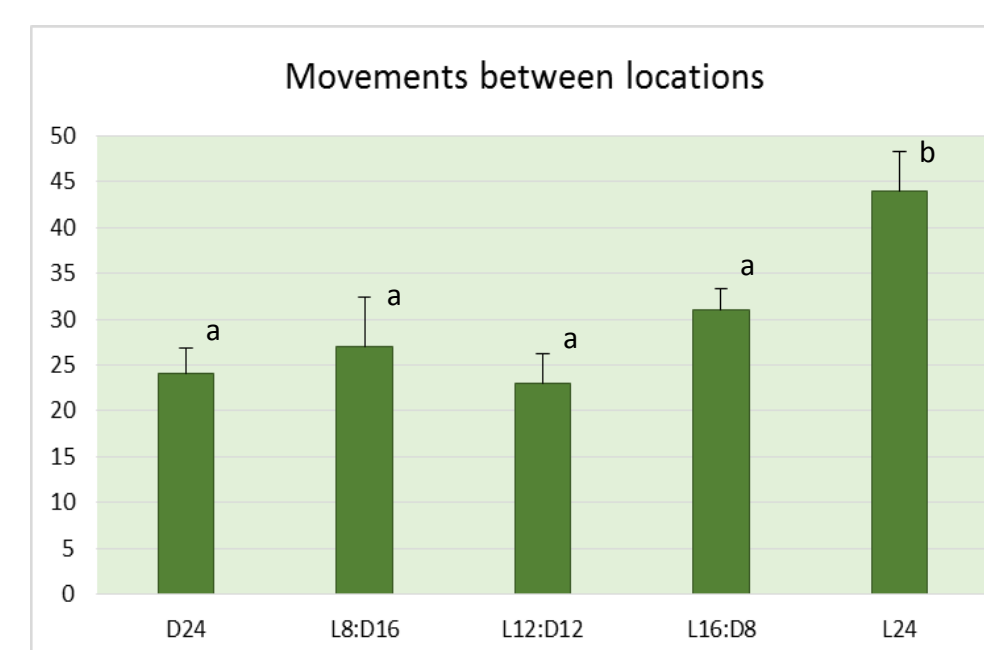


Fig 4. Crayfish activity expressed in number of movements between different maze locations. Different superscripts indicate statistical significance. L:D = hours of light:dark.

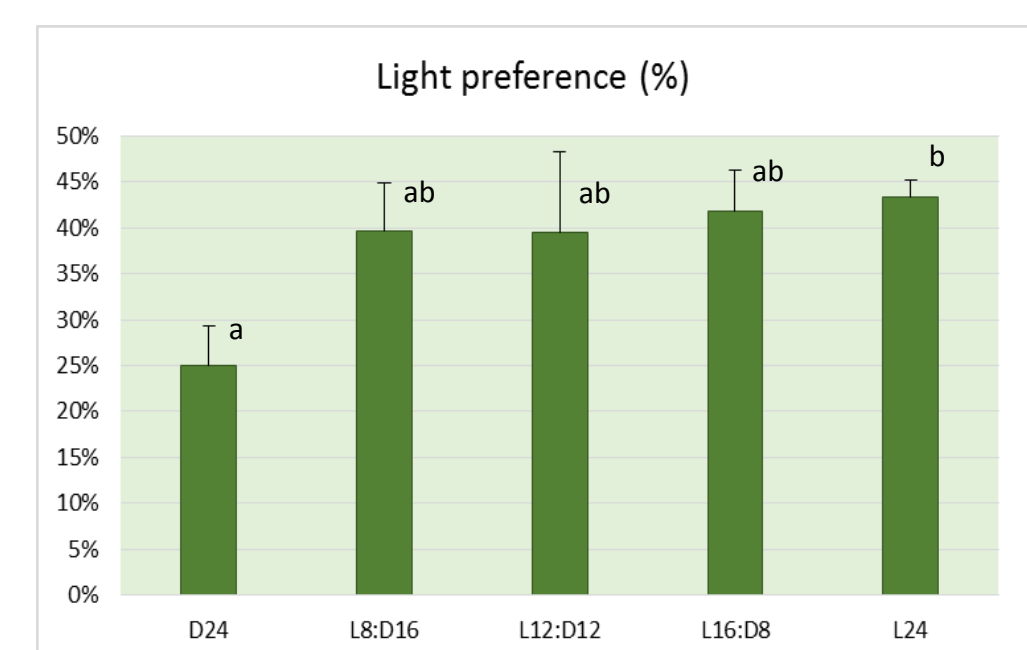


Fig 5. Light preference for crayfish from different photoperiods. Different superscripts indicate statistical significance. L:D = hours of light:dark.

Discussion & conclusion

- Different day lengths do not affect light/dark preference;
- Crayfish kept in conditions without photophase preferred the dark arms of the maze. This can be a consequence of neophobia;
- Continuous light appears to stimulate exploratory behaviour in noble crayfish;
- Photoperiod significantly affects exploratory behaviour and may possibly cause stress in captive rearing systems.