



WP 20: Grow out Husbandry Meagre

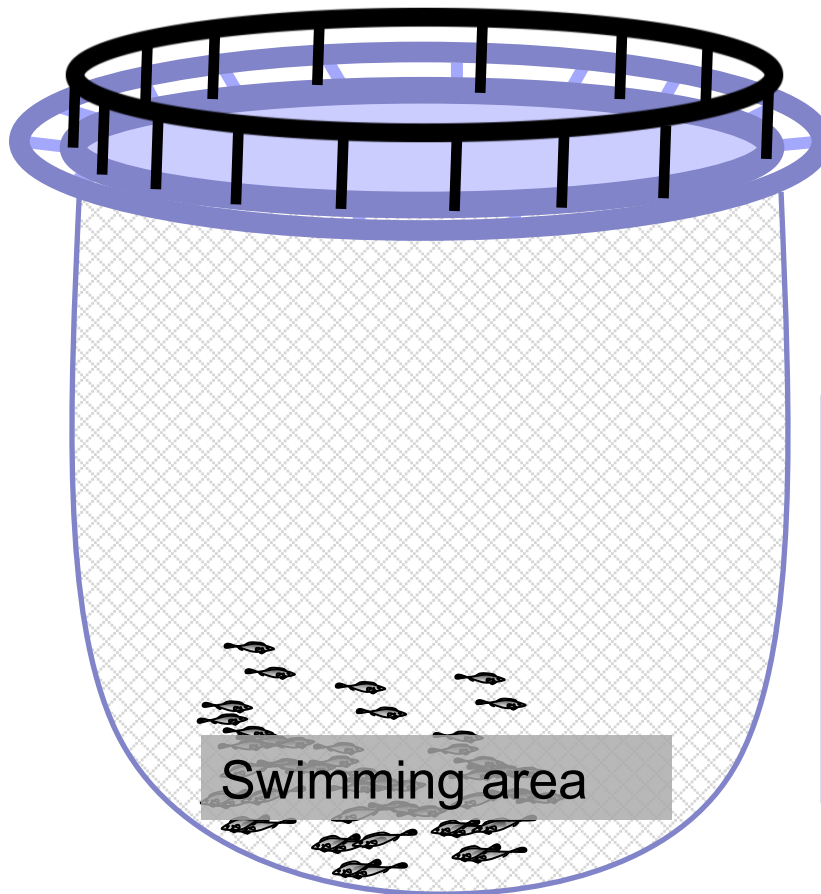
Task 20.3 Development of feeding methodology

**"The effect of different stimuli on meagre
feeding behavior"**

Ioannis Papadakis , HCMR



The study examines the effect of different stimuli on feeding behavior.



In **nature** meagre inhabit areas close to the sea bottom.

Related to:

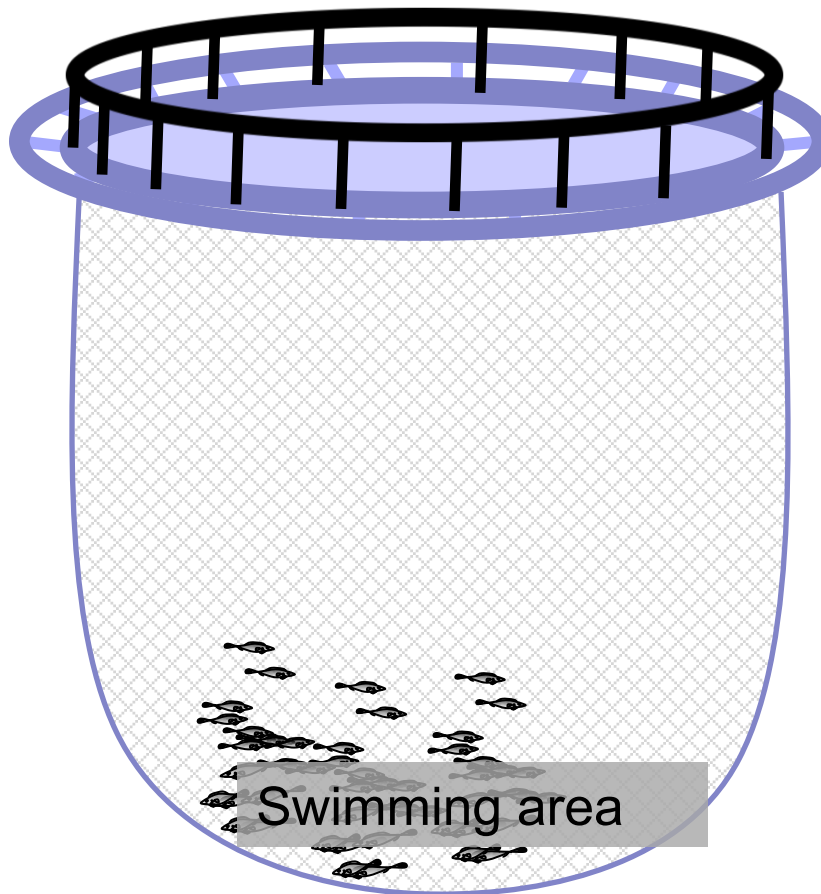
- Mouth position.
- Slow swimming activity.
- Visual system (2D vision).

In farming cages fish express the **same** behavioral pattern inhabiting the lower section of the cage.

Modification by:

- Light conditions
- Availability of food

The study examines the effect of different stimuli on feeding behavior.

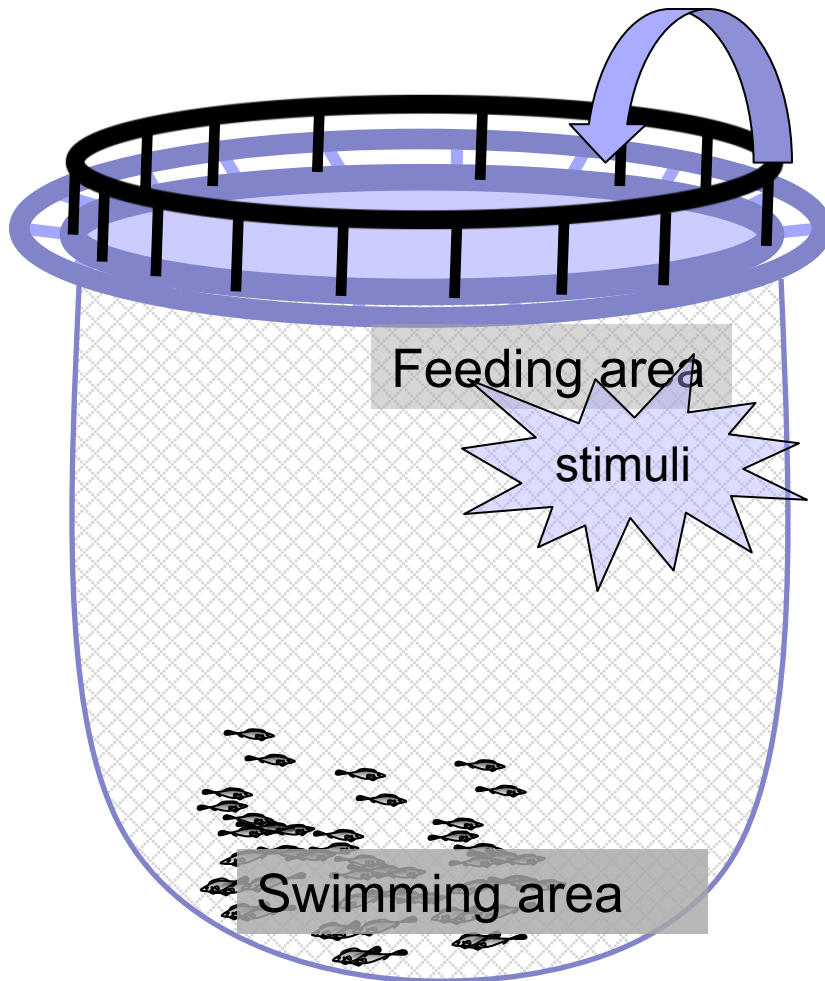


Feeding in cages is **problematic** because the farmers do not see the fish during the feeding procedure.

Resulting in:

- Loss of food
- High Food Conversion Ratios (FCR)
- Increase production costs.

The study examines the effect of different stimuli on feeding behavior.



Objectives

Develop a feeding method for cage farming, attracting the population to a **specific feeding area**, where management will be more effective.

The methodology is based on three steps:

1. “**Stimulus**” for the feeding time
2. “**Attraction**” to the feeding area
3. Actual “**Feeding**”

**The stimuli used rely on
*vision and mechanoreception.***

Stimuli

Sensory system

- Light (fading) → Vision
- Air bubbles → Mechanoreception and vision

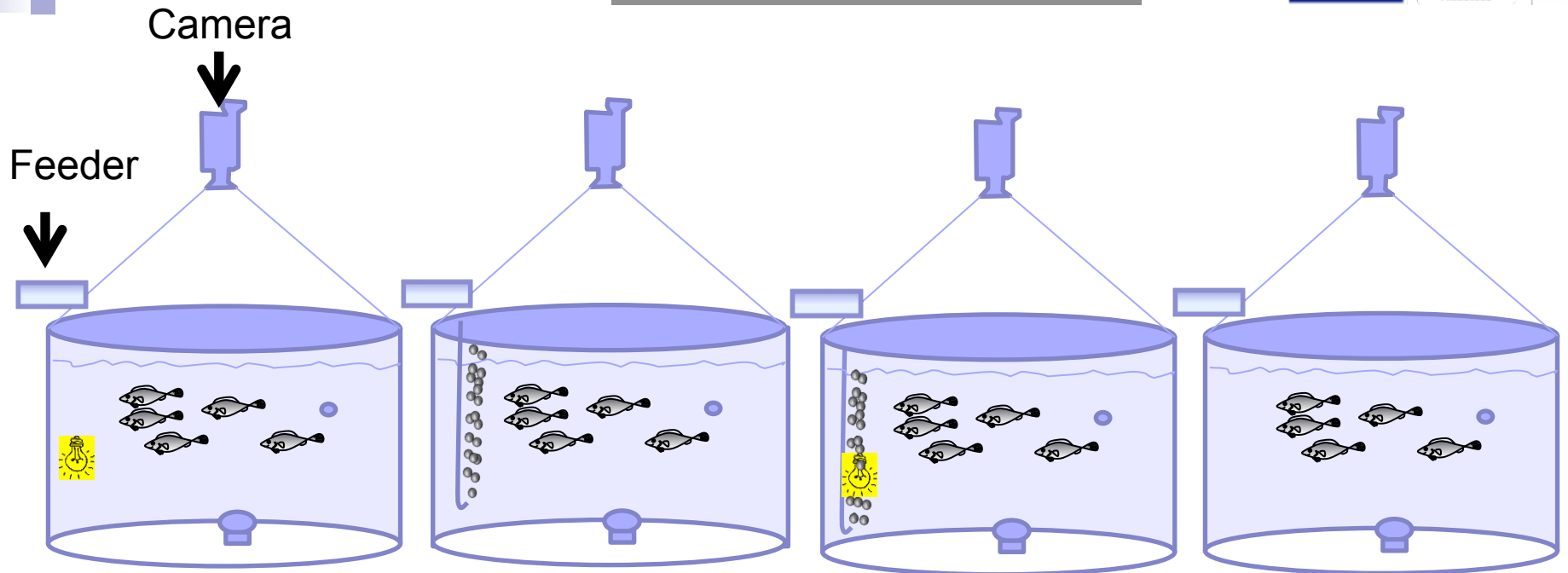
Two consecutive experiments were performed

❖ **Experiment 1 (Exp. 1) duration of 40 days.**

The effect of stimuli on feeding behavior of a naive population of meagre.

❖ **Experiment 2 (Exp. 2) duration of 40 days.**

The effect of stimuli on feeding behavior of a trained population of meagre.



Light.

- ❖ light in the water column

Bubbles

- ❖ air bubbles from a tube at the bottom

Light & bubbles.

- ❖ light during dawn/dusk
- ❖ Bubbles during noon

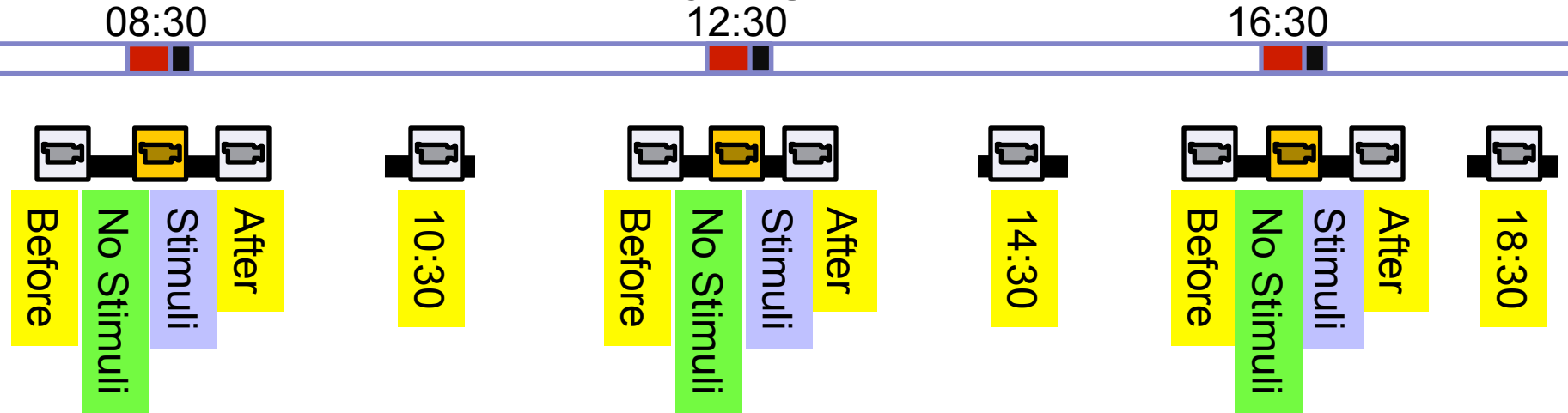
Control
Feeding
without
stimuli





Experimental conditions:

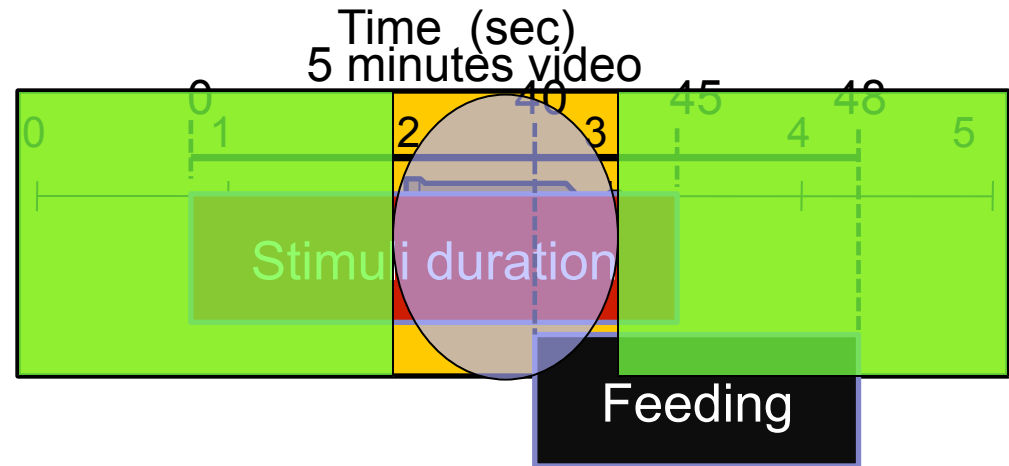
- 500 l tanks, (in triplicate)
- Initial fish weight (55 – 80 gr)
- 11 individuals in each tank

Schematic representation of recording periods during the day and analysis of stimuli

Day length

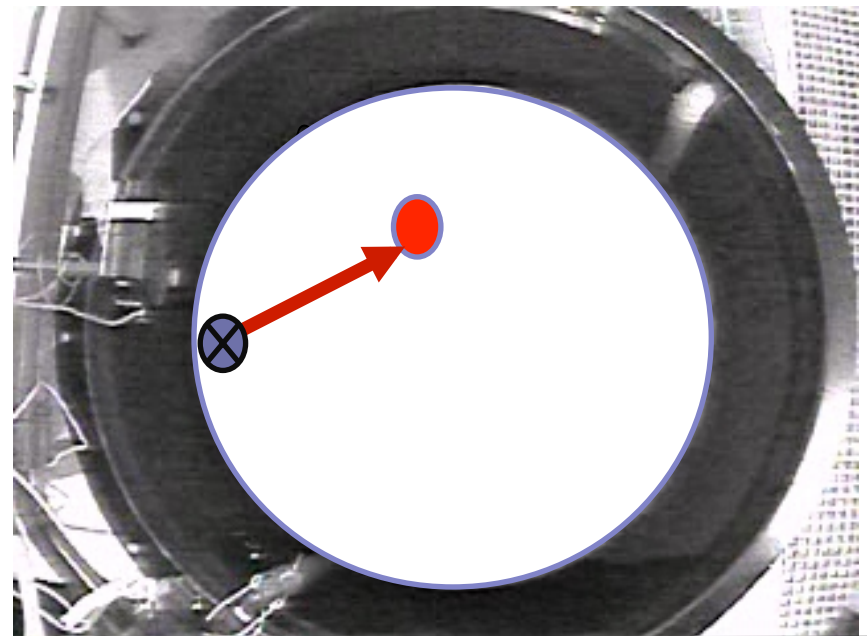
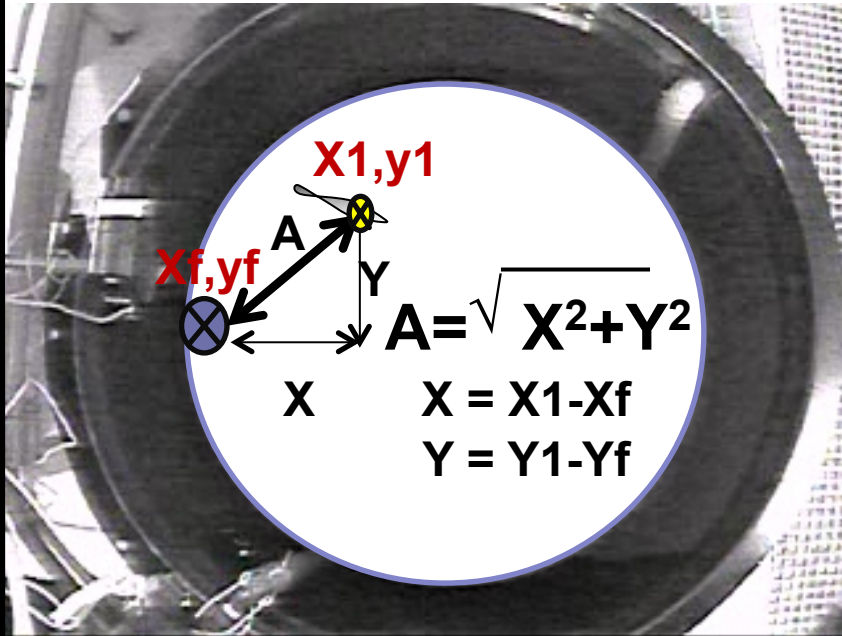


-  Feeding time
-  Recording periods
-  5 minutes video
-  5 minutes video stimuli + feeding



Calculations

Analysis with Image j program



(X=0, Y=0)

⊗ Place of feeder and stimuli

⊗ Place of fish

↔ Distance between feeder and fish

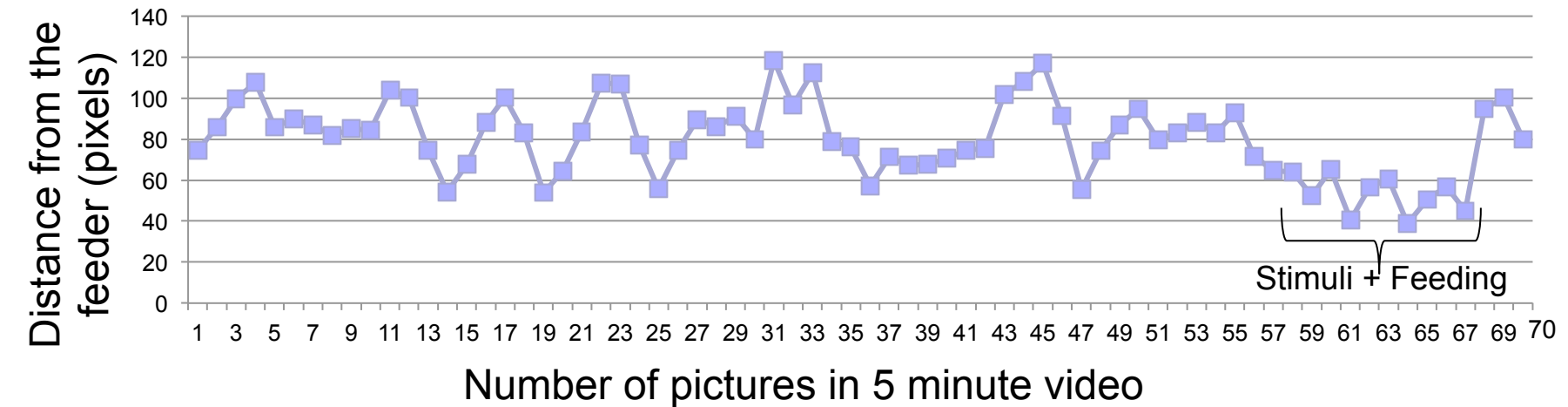
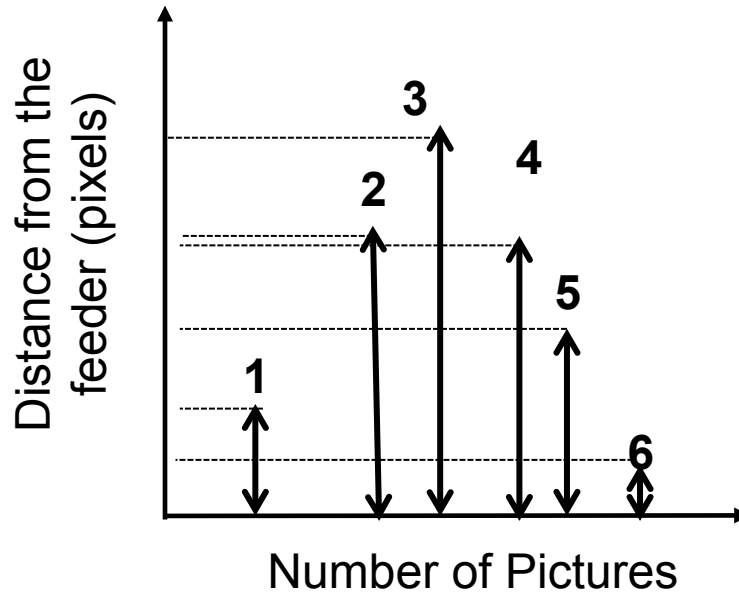
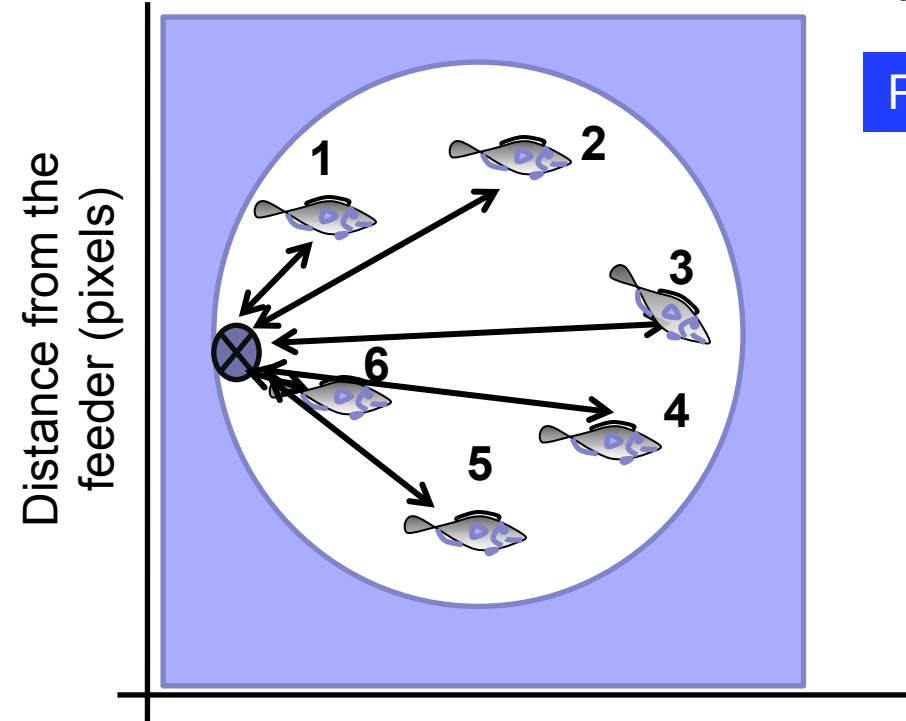
→ ● Mean distance between feeder and population of fish

Analyzed 70 pictures for each 5 minute video in different times per day.

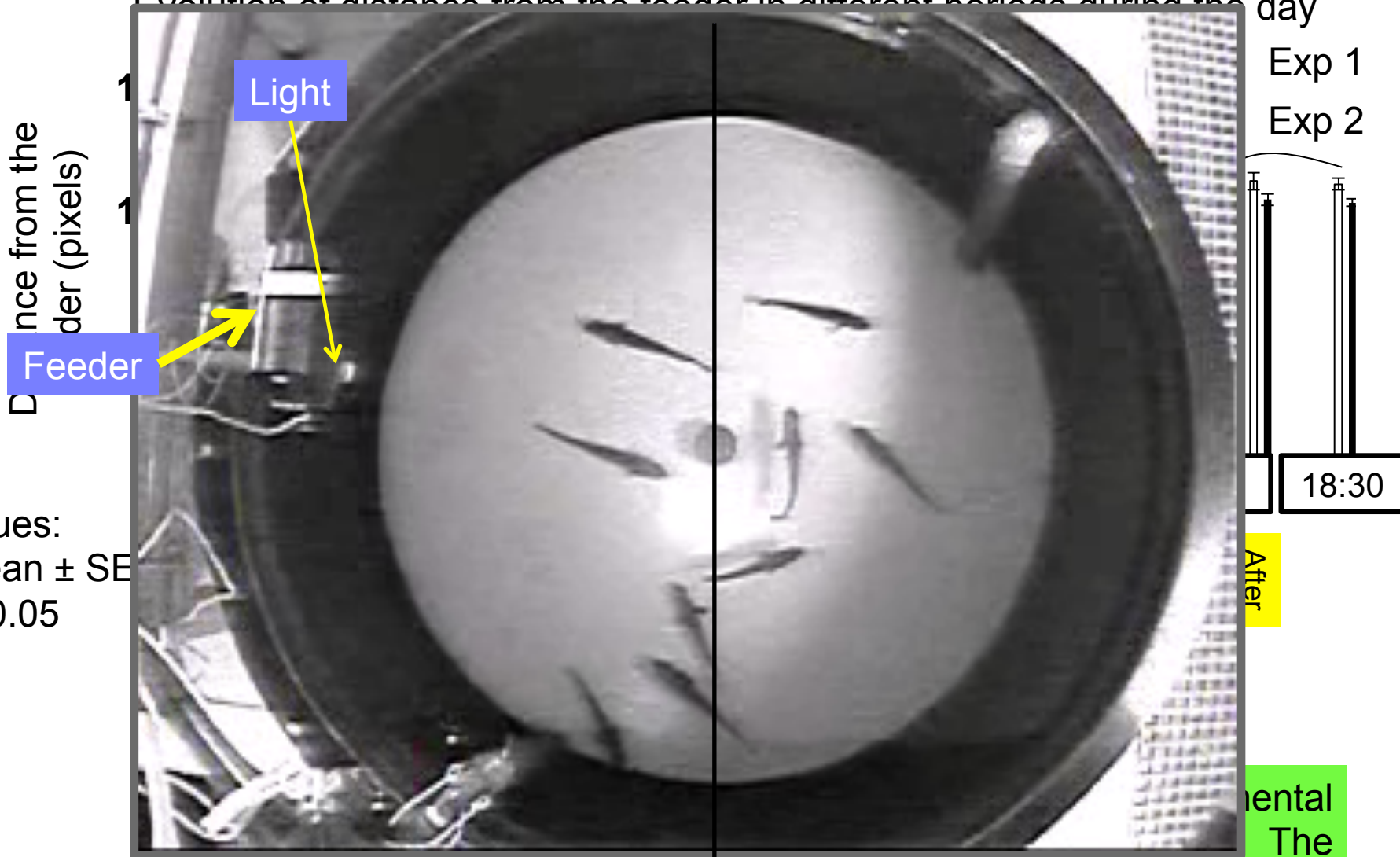
Calculations

Picture 6

10 cm = 20 pixels

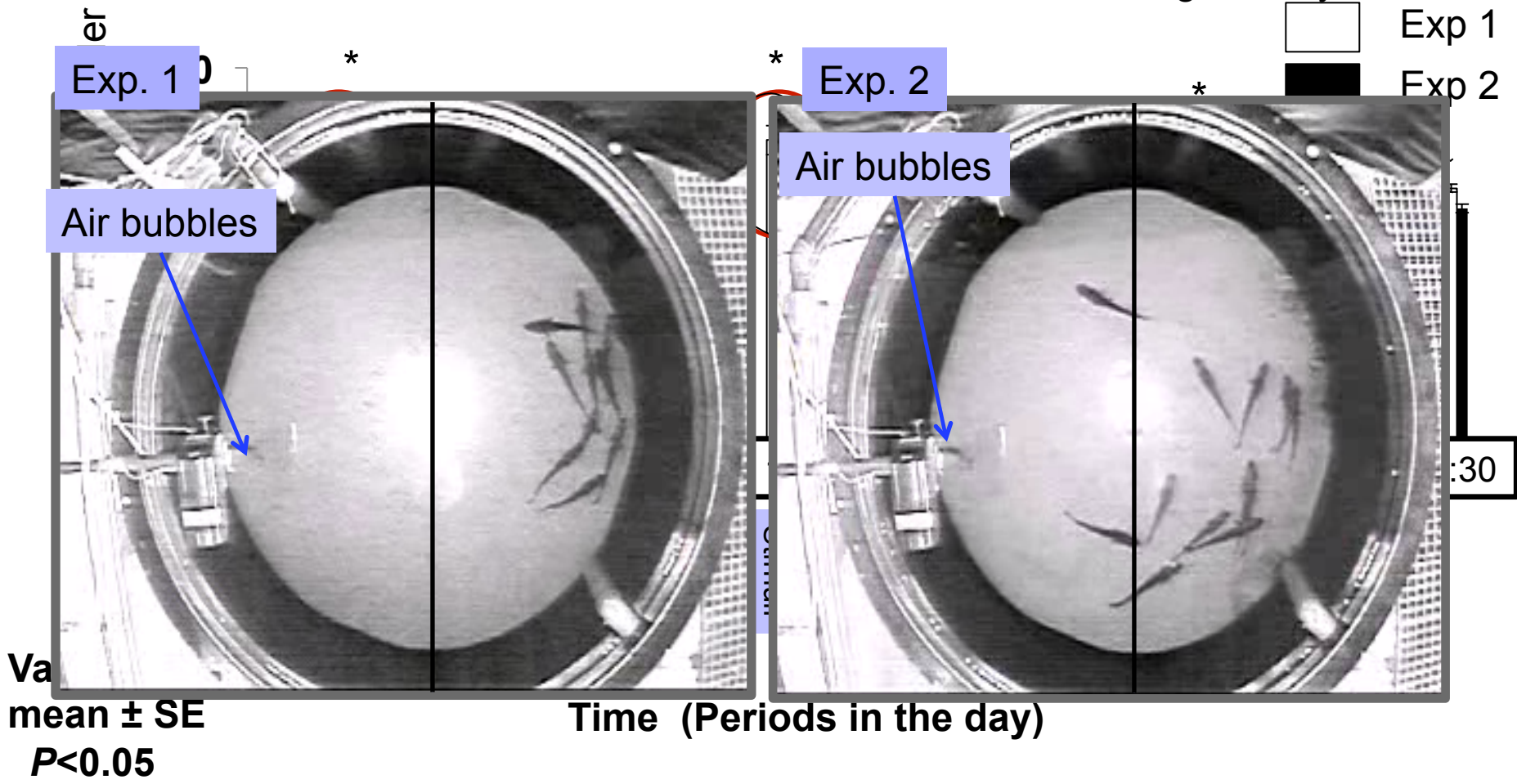


Evolution of distance from the feeder in different periods during the day



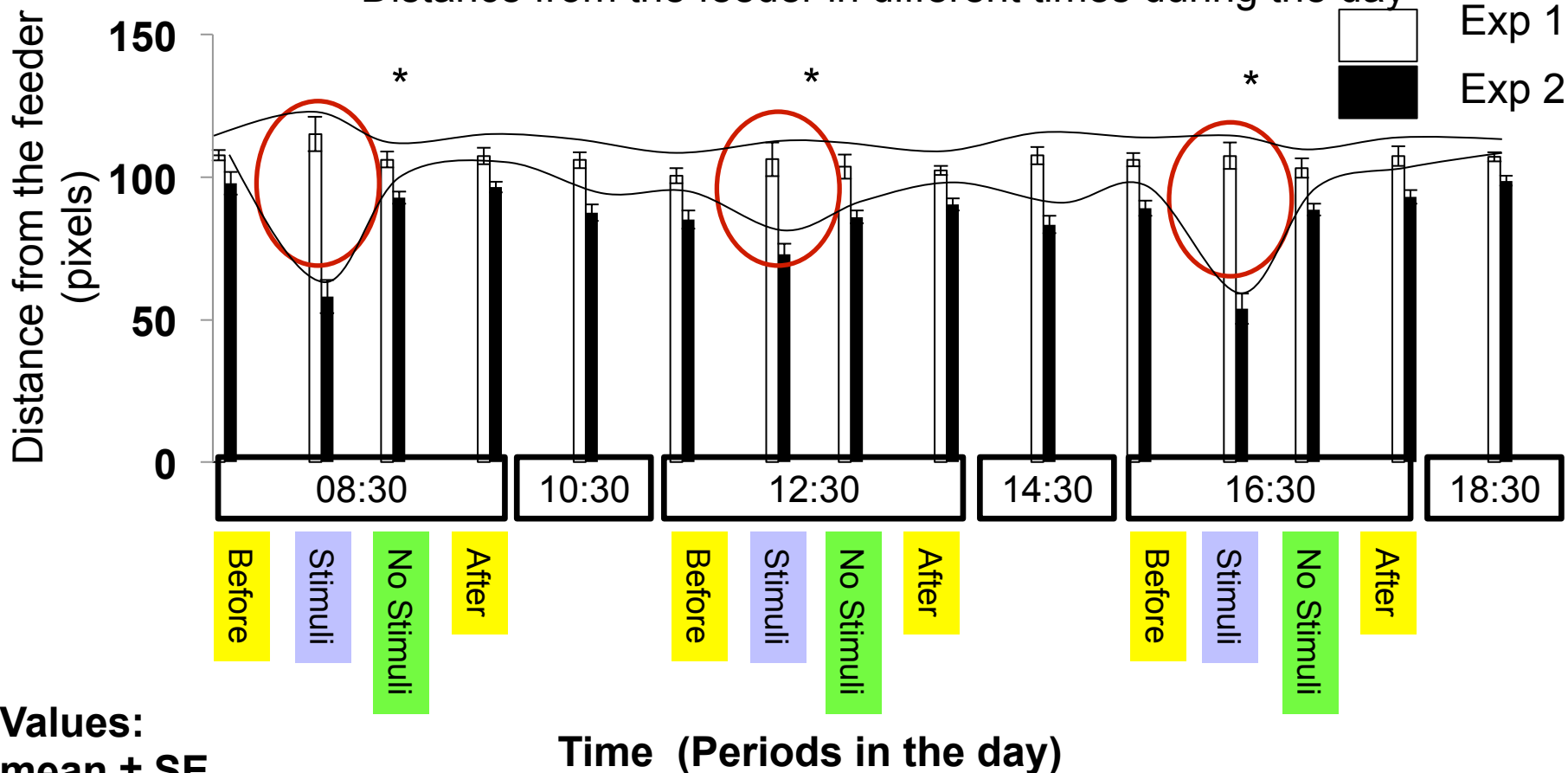
Experimental
The distance from the feeder during the stimulus is significantly smaller than during the other periods of the day ($p < 0.05$).

Distance from the feeder in different times during the day



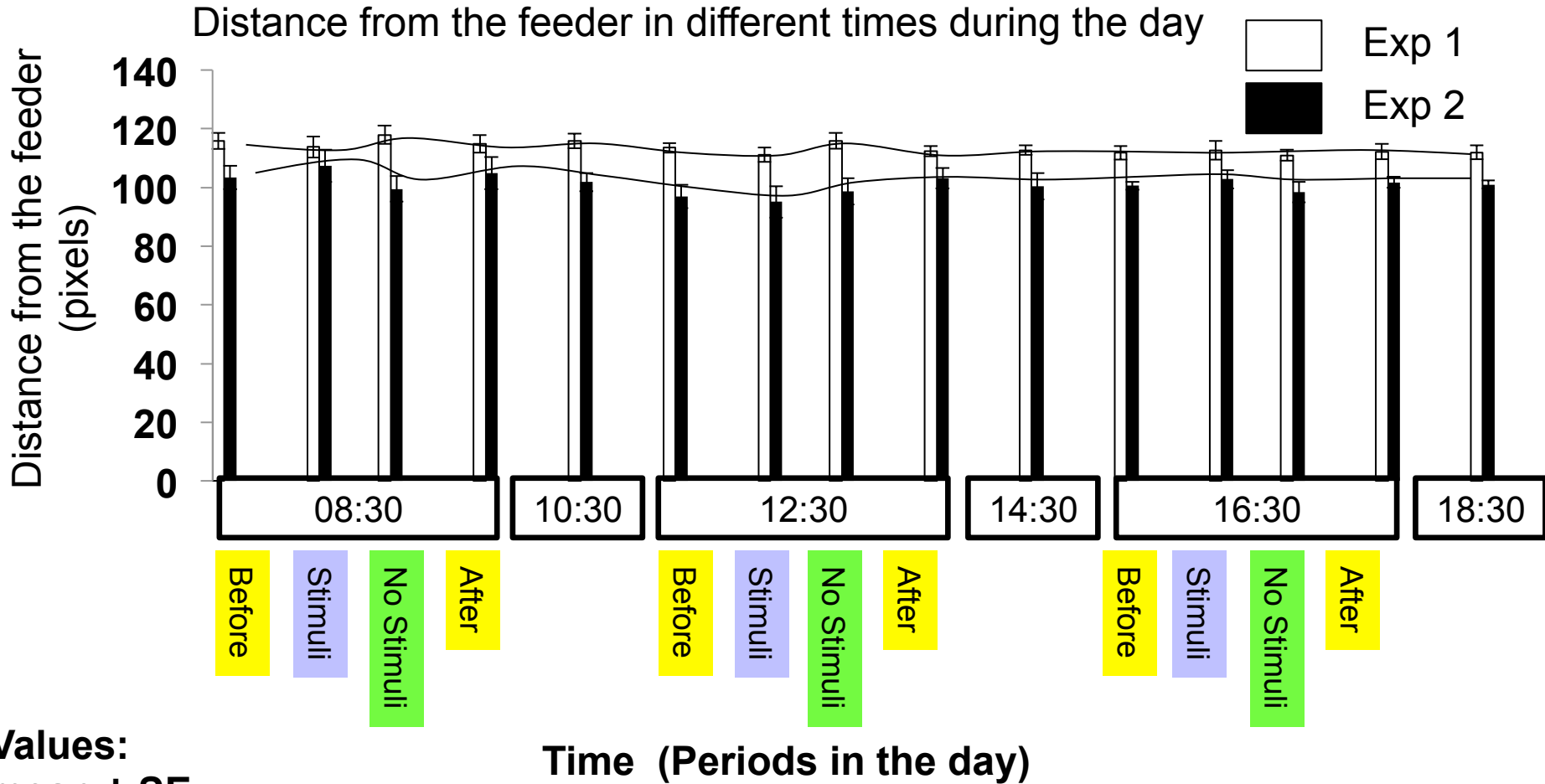
The air bubbles during the Exp. 1 **did not** attract the fish to the feeding area. However in Exp. 2, the air bubbles attracted the fish.

Distance from the feeder in different times during the day



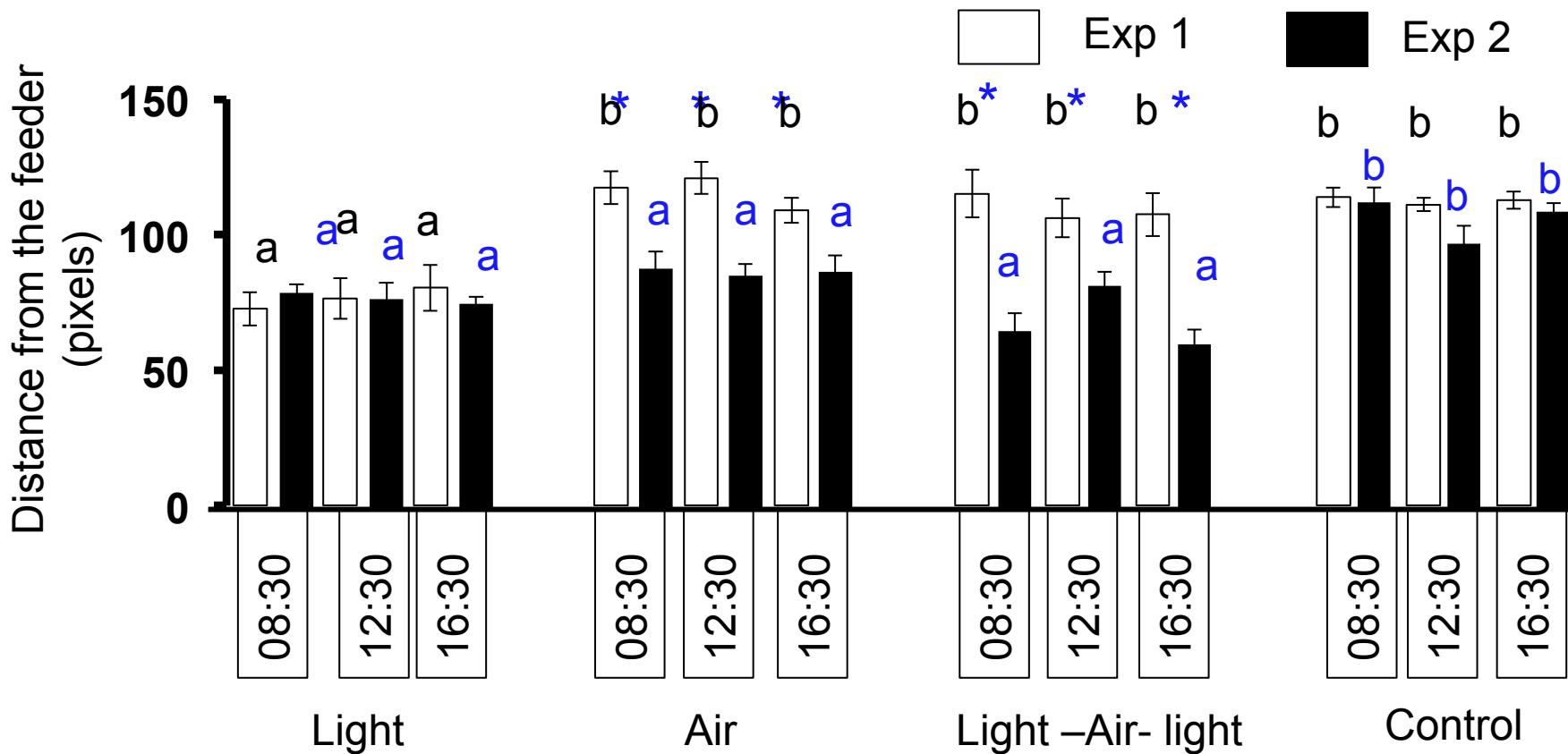
Values:
mean ± SE
 $P < 0.05$

The combination of light and air bubbles did not attract the fish to the feeding area in Exp.1. Conversely, in Exp. 2 the combination attracted the fish to the feeding area.



Values:
 mean ± SE
P < 0.05

When there is no stimulus, no change in the distance of the fish from the feeding area in any experiment.



Values are mean \pm SE. Latin characters (a, b) indicate differences between the different times of day and asterisks (*) indicate differences between experiments (ANOVA, Duncan test, $P < 0.05$).

➤ In naive fish (Exp.1) the light is considered the optimum feeding stimulus.

➤ The air bubbles and the combination with light can be used after training (Exp. 2).

- How is the feeding behavior of meagre affected by different stimuli?
 - meagre is able to learn and remember specific stimuli that are associated with feeding.
- Which is the optimum stimulus for meagre in order to increase feeding activity?
 - Meagre responded to light very quickly (from the second day of its application).
 - Small fish (50-100 g) require a long learning period to be trained to air bubbles.
 - **But, big fish (700-900 gr) respond quickly to air bubbles, from the second day of its application (data is under analysis).**
- Which is the most appropriate stimulus that can be implemented in commercial settings?
 - Both air bubbles and light can be used in an industrial setting, as they can be manufactured, implemented and managed easily with existing technologies in sea cages.



Thank you

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