Universitat Autònoma de Barcelona

L'aquàrium BARCELONA

FACULTAT DE VETERINÀRIA

# USE OF CLEANER FISH AS BIOLOGICAL CONTROL FOR PARASITES IN AQUACULTURE AND THE EVALUATION OF NEW SPECIES FOR MEDITERRANEAN AQUACULTURE

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## INTRODUCTION

Worldwide, the aquaculture industry has experienced an exponential increase since the mid-twentieth century. During the last decades, the major issue in salmon farming has been sea lice, also known as salmon lice (*Lepeophtheirus salmonis*, Krøyer 1838) and resistances have appeared towards the drugs currently used.

As a consequence for the developed resistances, new approaches for dealing with sea lice have emerged; these range from physical control to biological control procedures, where wrasse (*Labridae*) as well as lumpfish (*Cyclopteridae*) fish are being used and have been successfully implemented in the north Atlantic aquaculture industry.

## AIM OF THE STUDY

• Assess for the first time cleaning behaviour in different native Mediterranean fish species from the *Labridae* family as an alternative to the current chemical treatments for ectoparasitic control to avoid their environmental and ecological impact as a consequence of the increase in the prevalence of:

- *Lernanthropus kroyeri* (Van Beneden 1851)
- *Ceratothoa oestroides* (Risso 1826)
- *Sparicotyle chrysophrii* (Van Beneden & Hesse 1863)
- *Diplectanum aequans* (Wagener 1857)

## MATERIALS AND METHODS

### AQUARIA

**QM-23**

- **Volume:** 200L
- **Environmental enrichment**
- **Temperature:** 17.29 ± 0.47°C → 21.72 ± 0.35°C
- **pH:** 7.52 ± 0.12
- **Water renewal:** 66L/ h

**QM-18**

- **Volume:** 200L
- **Environmental enrichment**
- **Temperature:** 17.29 ± 0.47°C
- **pH:** 7.52 ± 0.12
- **Water renewal:** 66L/ h

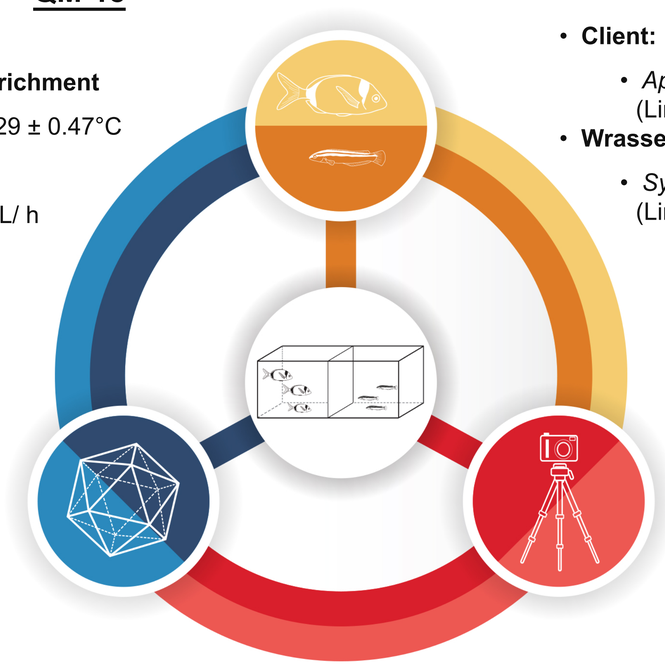
### SPECIMENS

**QM-23**

- **Client:**
  - *Diplodus vulgaris* (Geoffroy Saint-Hilaire, 1817)
- **Wrasse**
  - Juvenile *Coris julis* (Linnaeus, 1758)

**QM-18**

- **Client:**
  - *Apogon imberbis* (Linnaeus, 1758)
- **Wrasse**
  - *Symphodus tinca* (Linnaeus, 1758)



### FILMING AND PHOTOGRAPHY

- **Filming:** JVC Everio GZ-HM430 video camera - 252h
- **Photography:** Sony α-3000 reflex camera
- Two AmazonBasics aluminum tripods
- **CowLog:** Open - source software

## EVALUATION OF CLEANING INTERACTIONS

- Body (**FIGURE 1**)
- Fins (**FIGURE 2**)
- Opercular Region (**FIGURE 3**)
- Oral cavity

**FIGURE 1.** *Labroides dimidiatus* presenting cleaning behaviour towards the client fish body.

**FIGURE 2.** *Labroides dimidiatus* presenting cleaning behaviour towards the client fish fins.

**FIGURE 3.** *Labroides dimidiatus* presenting cleaning behaviour towards the client fish opercular region.

## ECTOPARASITIC CONTROL APPROACHES

### BATH TREATMENTS

- Pyrethroids
  - Deltamethrin
  - Cypermethrin
- Organophosphates
  - Azamethiphos
- Desinfectants
  - Hydrogen peroxide
  - Formalin

### IN-FEED TREATMENTS

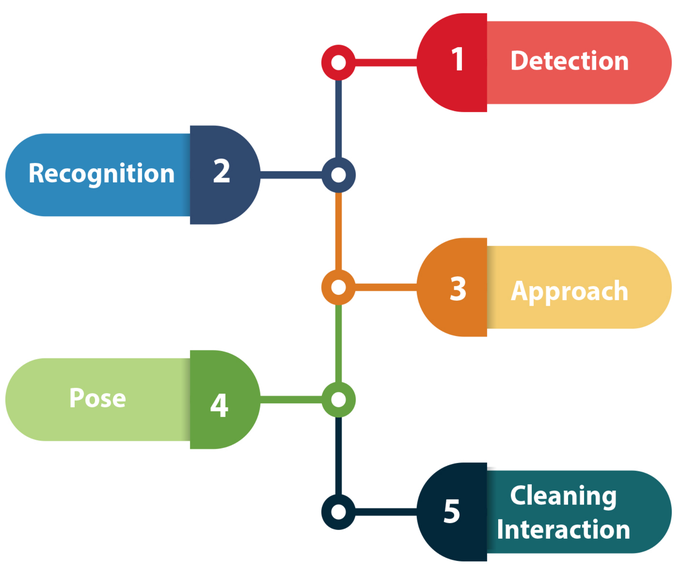
- Benzoyl ureas
  - Diflubenzuron
  - Teflubenzuron
- Avermectins
  - Emamectin benzoate

- Sea lice skirts
- Anti-Sea lice functional feed
- Snorkels
- Thermalicers
- Hydrolicers
- Lasers
- Fallowing
- Sea lice traps
- Deep lights - feeding
- Bubble curtains

- *Labridae*
- *Cyclopteridae*

## RESULTS AND DISCUSSION

### CLEANING RITUAL




**QM-23**

- 17.29 ± 0.47°C + pH at 7.52 ± 0.12
  - **NO RESULTS OBSERVED**
- 21.72 ± 0.35°C + pH at 7.52 ± 0.12
  - **DETECTION + RECOGNITION**

**QM-18**

- 17.29 ± 0.47°C + pH at 7.52 ± 0.12
  - **NO RESULTS OBSERVED**

- First study regarding the cleaning behaviour of Mediterranean wrasses → **Pilot study** (Trial and error)
- Layed foundations for optimising the conditions for further research in Mediterranean wrasses
- ***Coris julis*** (Linnaeus, 1758)
  - Extremely nervous species
- ***Symphodus tinca*** (Linnaeus, 1758)
  - Remarkably passive
- Future studies → *Sparus aurata* (Linnaeus, 1758) and *Dicentrarchus labrax* (Linnaeus, 1758)

## CONCLUSIONS

- **Further research**
  - Environmental impact research:
    - Biological control may require treatments
    - Risk of escapees
    - Avoid *Labridae* fish niche exploitation
  - Cleaner fish:
    - Wild cleaning behaviour is key
    - Individual differences → Broodstock selection
    - Re-evaluation of evaluated wrasse + Evaluation of unevaluated wrasse
    - It is suspected that cleaning behaviour is seasonal