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ASSOCIATING SEA BREEM, OYSTER, CLAM AND SHRIMP IN AN EARTHEN-POND LOOP: TOWARD AN ENVIRONMENTALLY FRIENDLY SYSTEM

Christophe Jaeger, Vincent Gayet, Joël Aubin

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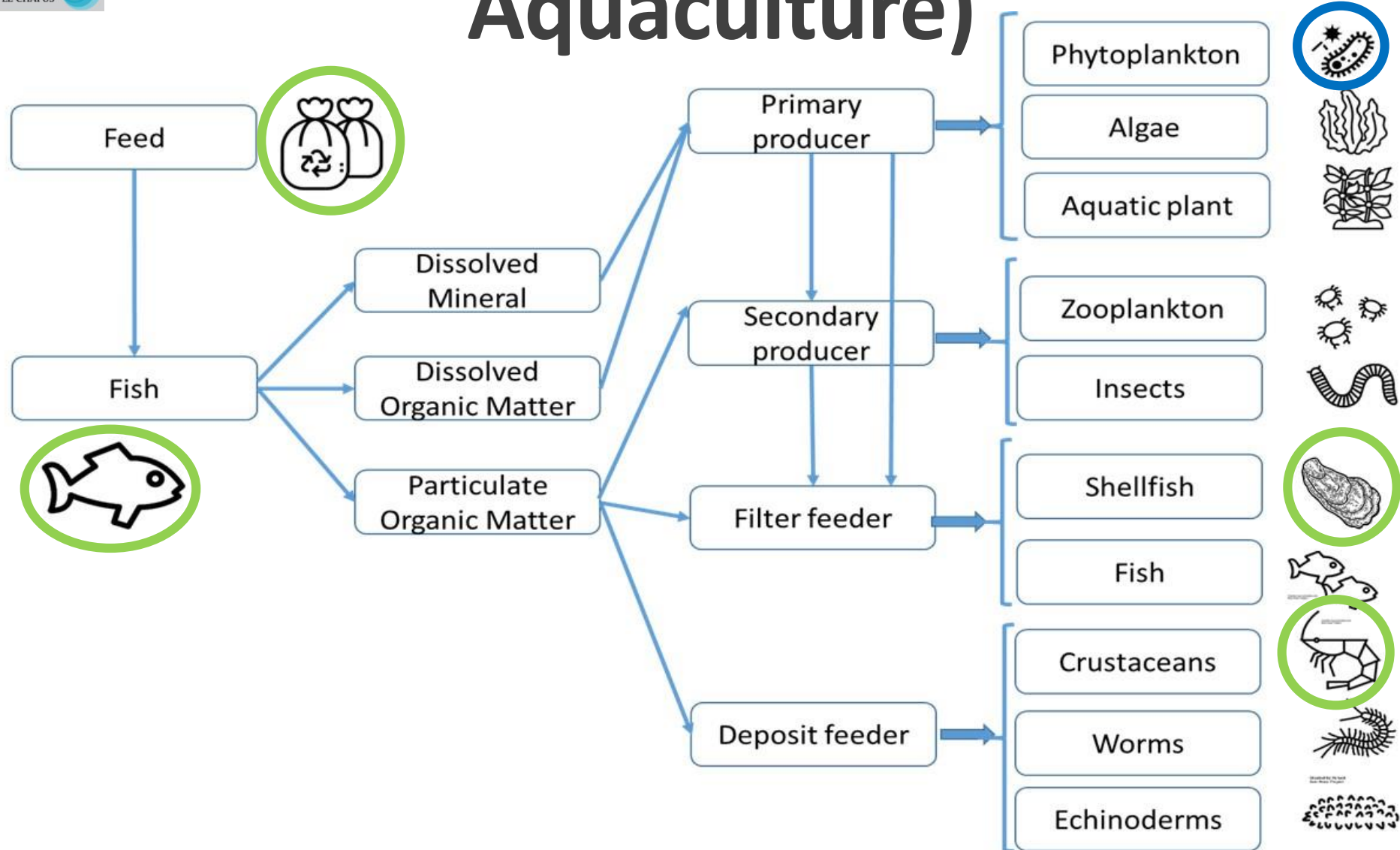


INTRODUCTION



- **SIMTAP project:**
 - ❖ **PRIMA grant**
 - ❖ **Based on IMTA approach**
 - ❖ **To reduce the waste emissions**
 - ❖ **To reduce the use of resources (energy, water, fishmeal, fish oil, soybean)**
- **System designed in ponds to meet the purposes of the project**
- **Assessed on:**
 - **water quality results**
 - **growth performances**
 - **nutrients use efficiency**

IMTA (Integrated MultiTrophic Aquaculture)



Description of the system



Formulated feed: only composed of vegetal raw materials (without fish meal, fish oil, soybean), delivered 5 days/week



Mussels out of calibration, delivered 1 day/week, isoenergetic to formulated feed



Gilthead Seabream (*Sparus aurata*): from RAS, 1 387 pre-grown (stocked at 0.720 kg/m²), ability to eat mussels



Shrimp (*Penaeus japonicus*): 2.5 post-larva/m²

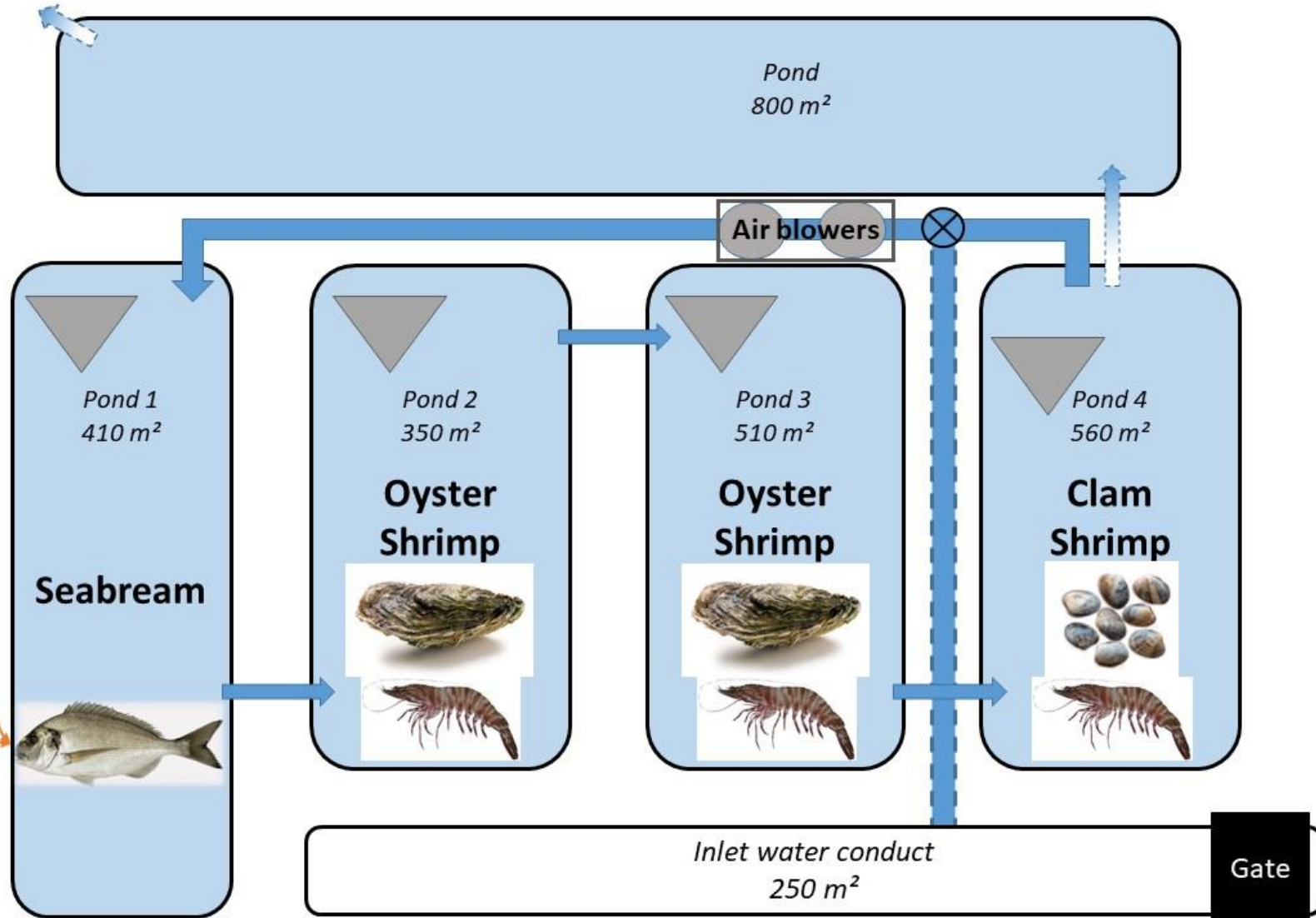


Oyster (*Crassostrea gigas*): 2.5 individuals/m²

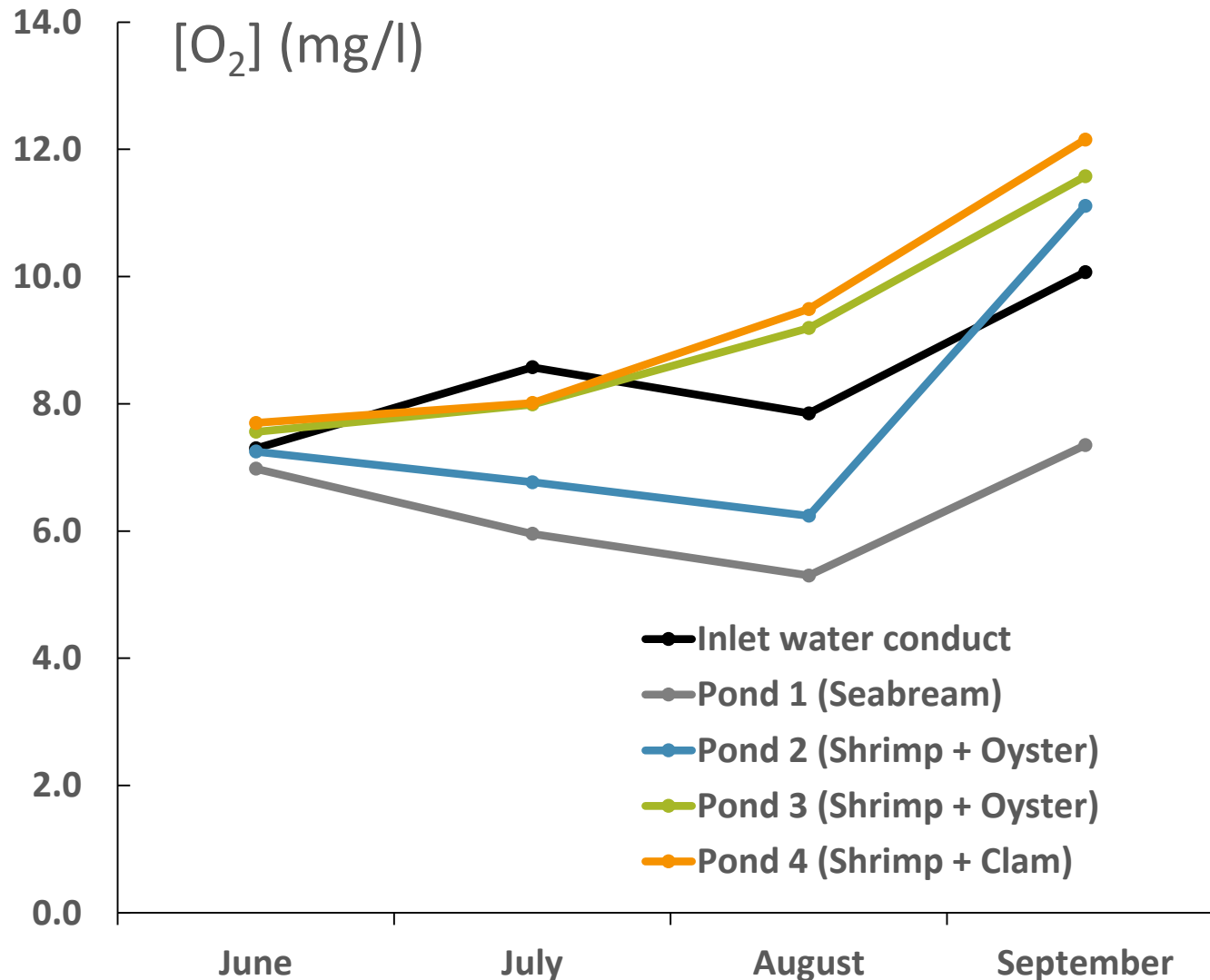


Clam (*Ruditapes decussatus* / *philippinarum*): 21 individuals/m²

Pilot design



Water quality



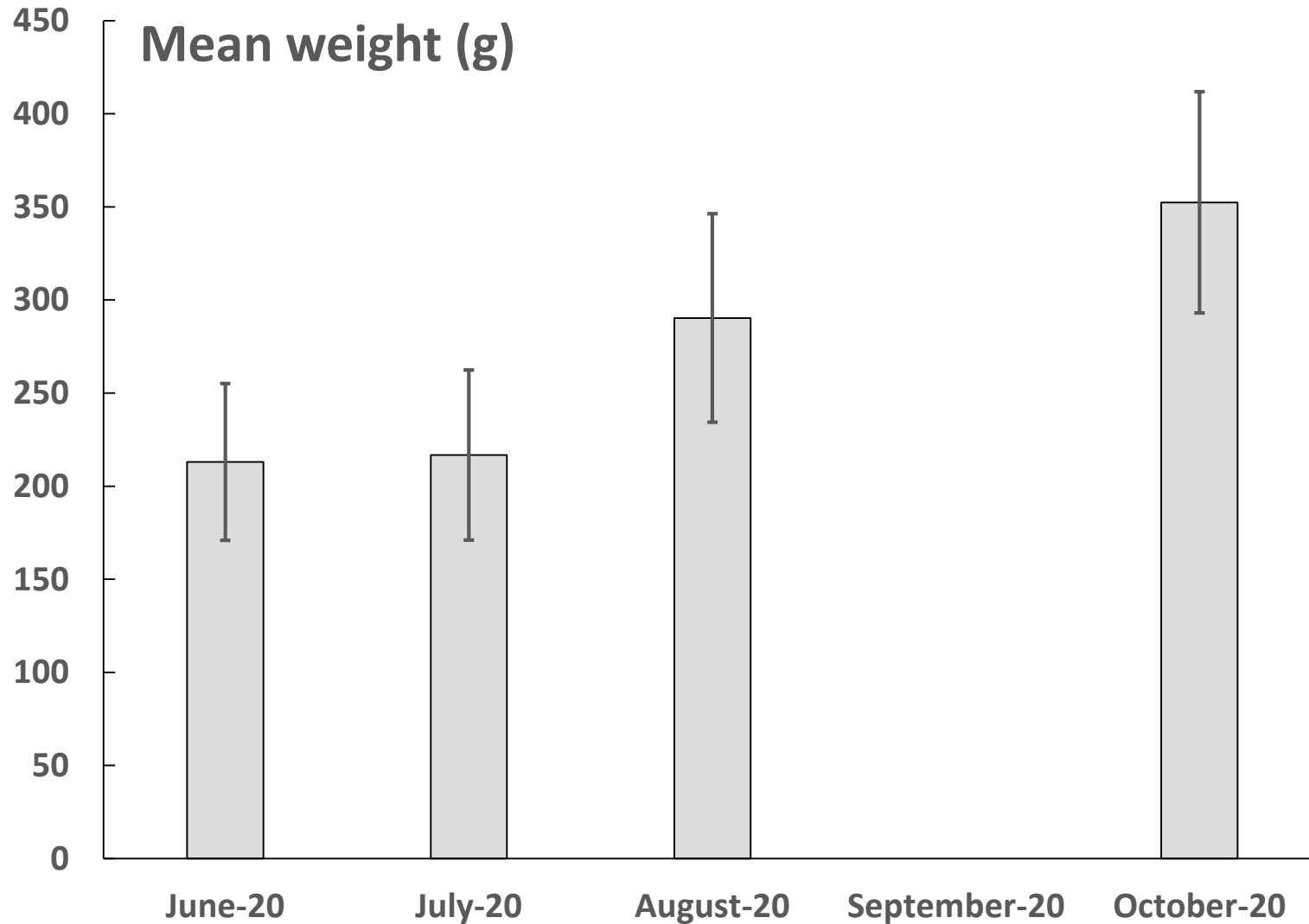
❖ No significant differences observed between ponds for [TN], [NH₄], [NO₂], [NO₃], [TP] and [PO₄] ($p < 0.05$)

❖ [O₂] pond 1 < ponds 3 and 4 ($p < 0.05$)

❖ Strong variations between night and day

❖ ↗ [Total chloro] (2.5 → 61 µg/l) in the ponds, not in the conduct (5-11 µg/l)

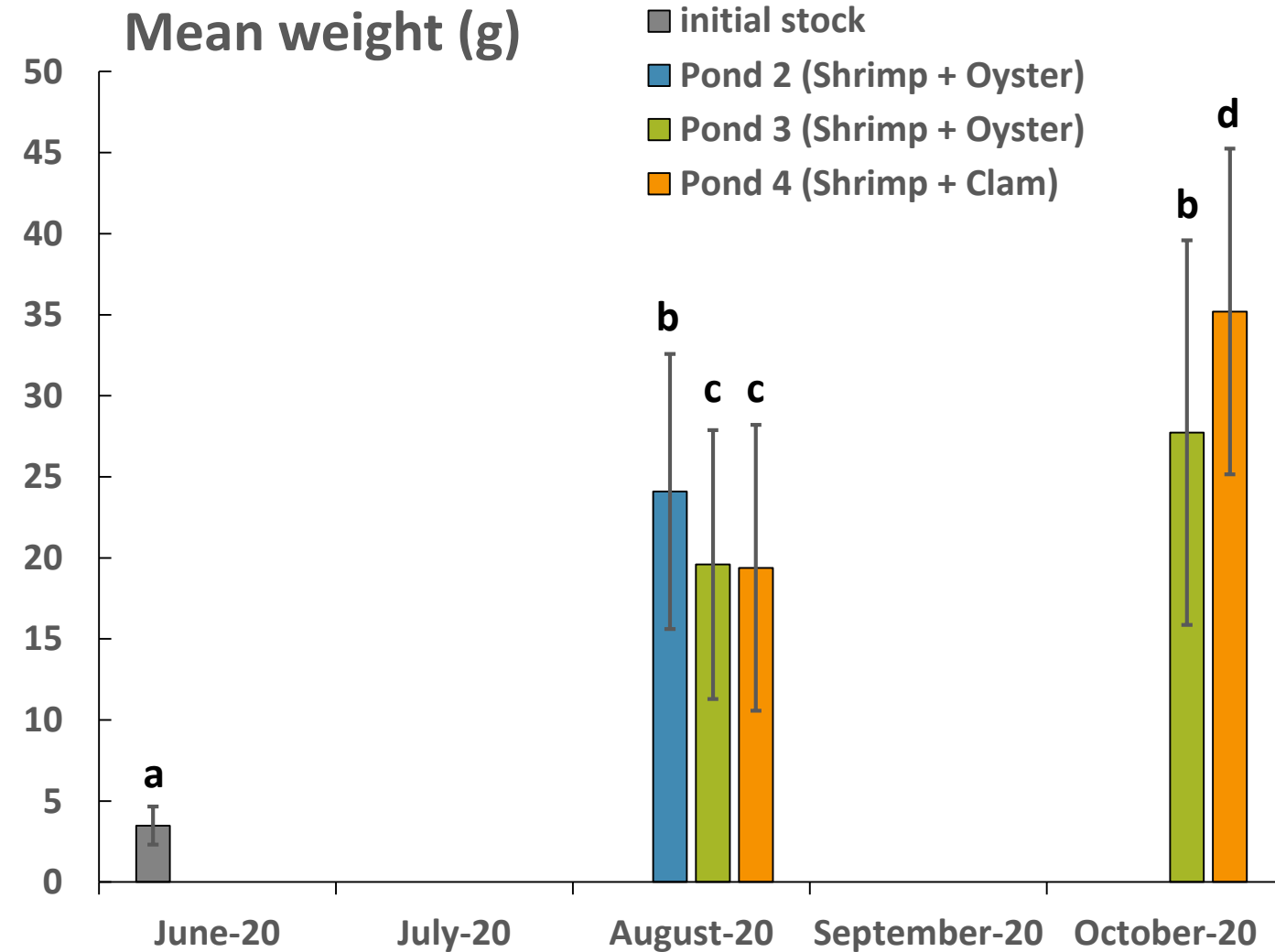
Gilthead seabream



- **Good growth except during the first month due to the adaptation of fish**
- **FCR : 1.9 (in eq. form. feed)**
- **Survival rate : 90%**

Shrimp

Mean weight (g)

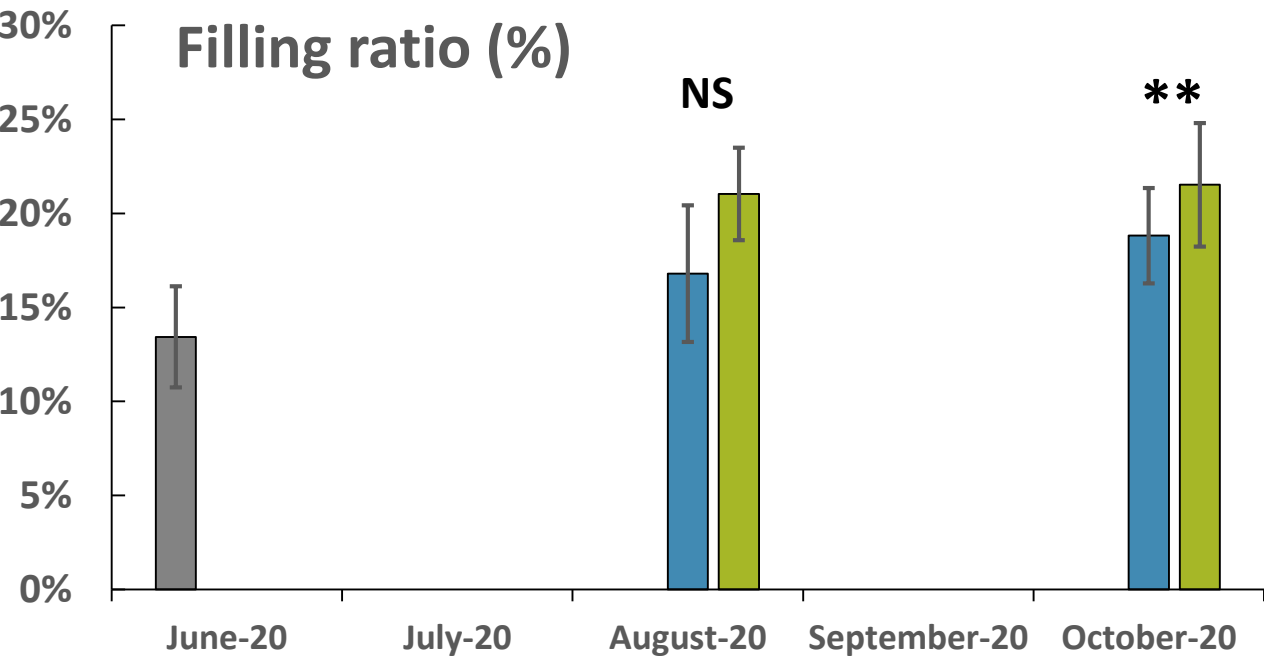
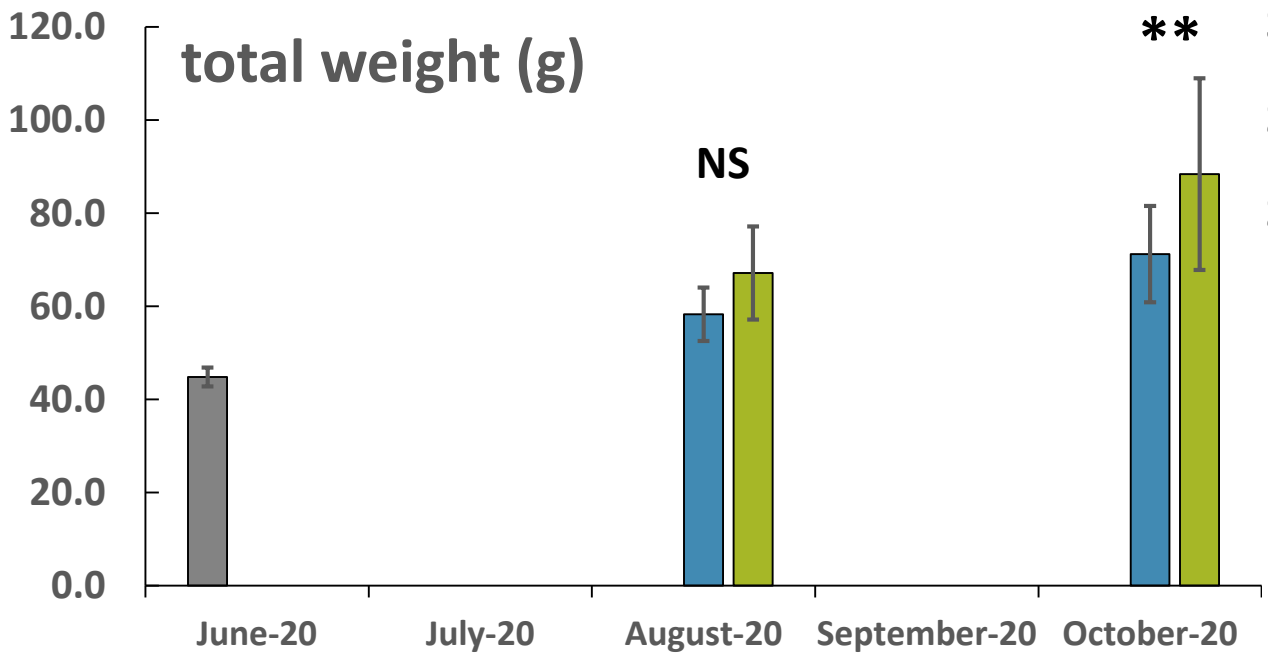


- Mean weight increased 9-fold
- Final weight similar to fed shrimps
- High variability due to sexual dimorphism
- All shrimps from the pond 2 died, just a few days before harvesting.
- survival rate : 38% pond 3, 58% pond 4 (predation by eels ?)

Oyster



- Increase of the mean total weight (shell + flesh)
- Filling ratio over the standard quality (12%-15%)
- Survival rate = 90%

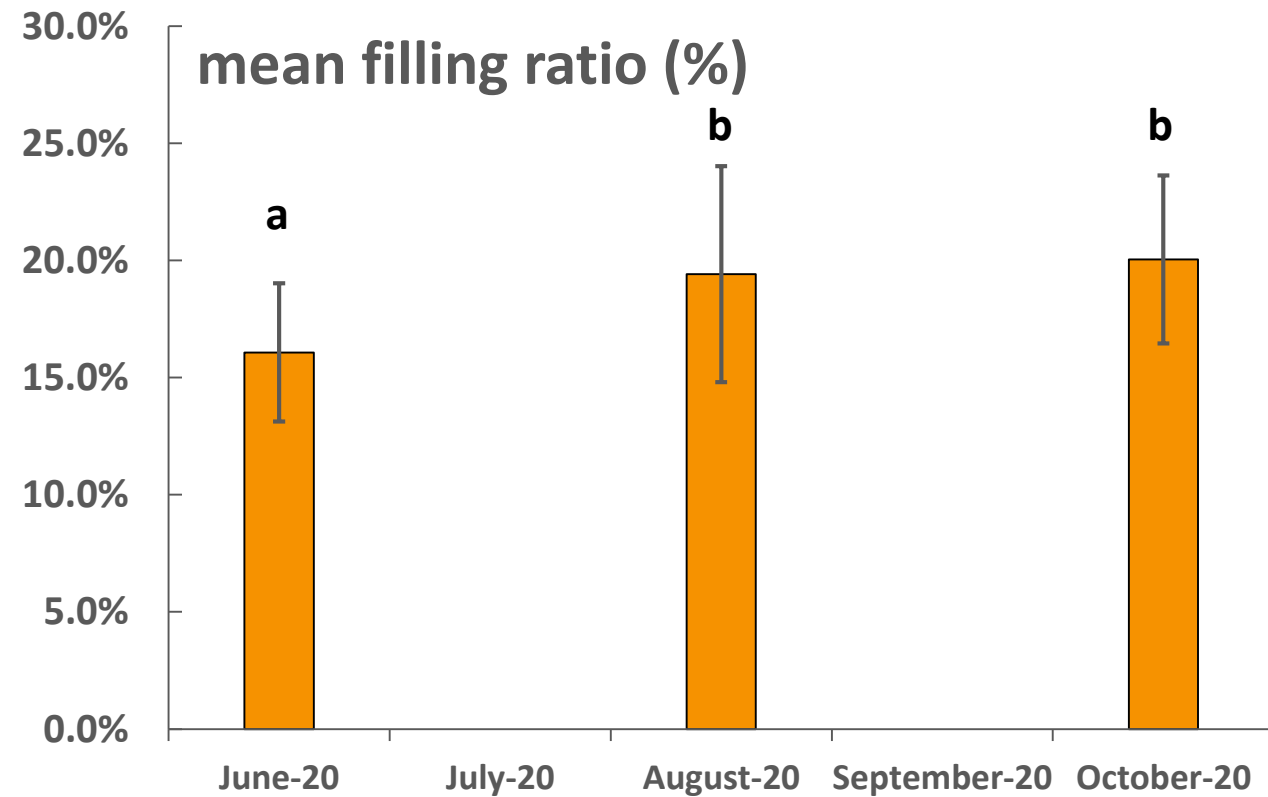
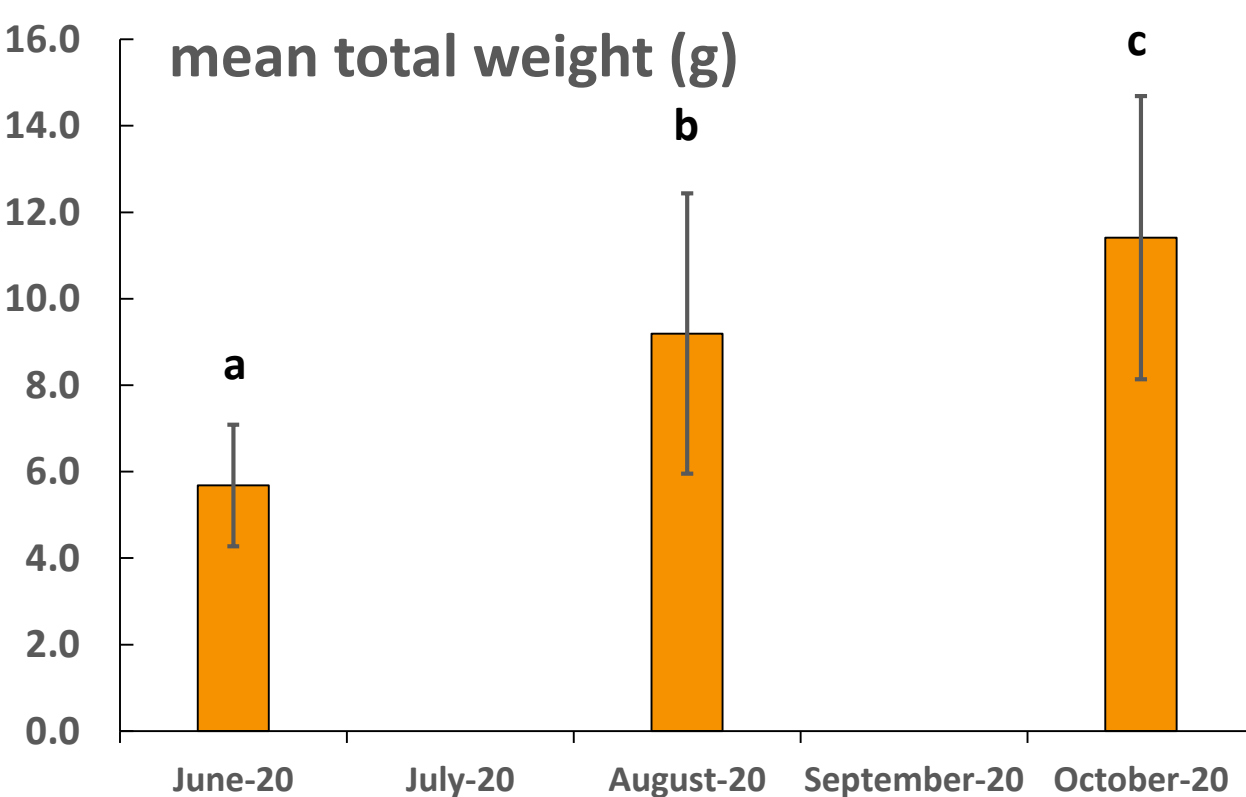


■ initial stock ■ Pond 2 (Shrimp + Oyster) ■ Pond 3 (Shrimp + Oyster) ■ initial stock ■ Pond 2 (Shrimp + Oyster) ■ Pond 3 (Shrimp + Oyster)

Clam



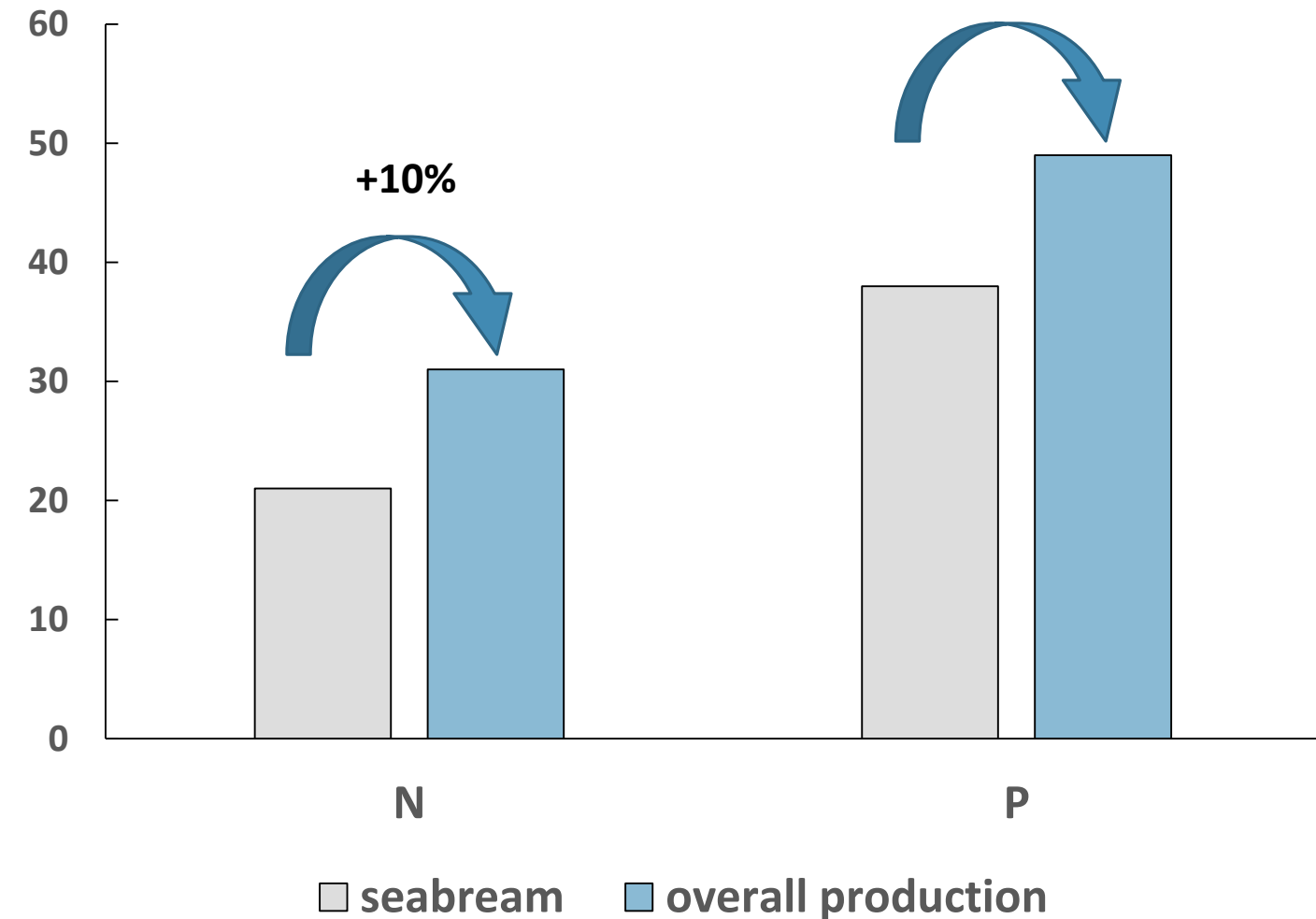
- Mean total weight doubled until a marketable size
- Mean filling ratio 20% at harvest (vs 16% at stocking)
- Survival rate estimated around 70%



Nutrient use efficiency



Nutrient Use Efficiency (%)



- Input = formulated feed + mussels
- Output = seabream + shrimp + oyster + clam
- Calculations based on body composition from literature
- Improvement of 10% of NUE and PUE



Conclusion



- **The use of a plant based feed and local discarded mussels possible to growth seabream**
- **Shrimps grew up without additional feed, but survival has to be improved**
 - ⇒ **Air supply is necessary to support production**
- **Shellfish had good performances**
 - ⇒ **Possible to increase production of shellfish**

Conclusion

- **The overall system improves use efficiency of the feed delivered**
 - ⇒ **limit use of ressources (feed ingredients and water)**
 - ⇒ **limit waste emissions**
 - ⇒ **increase number of marine products**





Thank you