TAPAS CASE STUDY

Nutrient retention of fish farm effluent and site assessment for the feasibility of integrated multi-trophic aquaculture (IMTA) in Malta

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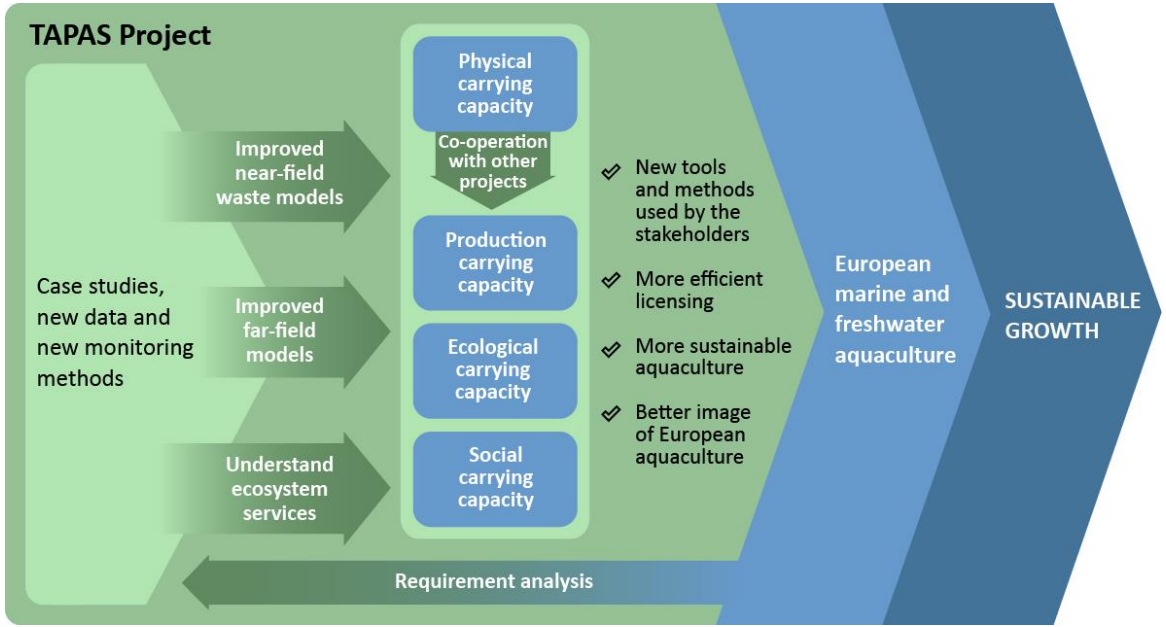
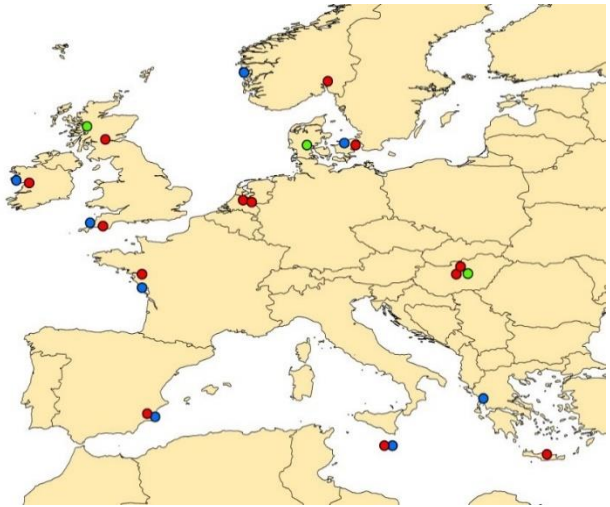
TAPAS: Tools for Assessment and Planning of Aquaculture Sustainability





TAPAS partners
Freshwater case study
Marine case study

This project has received funding from the EU H2020 research and innovation programme under Grant Agreement No 678396

TAPAS case study Malta: Hypothesis

Problems

- Very low public acceptance of aquaculture in Malta, mainly because of conflicts with tourism.
- What are the real and visible impacts of sea bream cage aquaculture on the marine environment?
- IMTA in the Mediterranean and in Malta.
- What IMTA species and methods could be used to mitigate the impacts and improve the public acceptance.

Research hypothesis:

- Particulate wastes from the farms have the largest visible impact on the water quality and on seabed communities resulting conflicts with tourism industry.
- In case of sea bream production while particulate wastes dispersion has a clear negative impact on the benthic life right under the cages, in the larger area of the farm it also provides nutrients for the valuable benthic communities.
- Patterns of benthic communities (species, abundance, biomass) can be used as bio-indicators of aquaculture impacts.
- Bio-indicators will show the best areas for IMTA production.

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TAPAS case study Malta: Methodology

2017 MFF nursery site in Marsaxlokk

1. Rough ROV mapping the area 300m around the cages to have a picture about the distribution of particulate wastes and benthic communities to plan sampling strategy.
2. Deploy the sediment traps and sample for quantification of nutrient retention:
   - Fish from the cages
   - Fish feed as a control source of isotopes.
   - Biofilm or seaweeds from each sedimentation traps
   - Additional analysis: C:N:P ratio on sediment
3. Detailed ROV mapping of selected areas (defined by step 1. and 2.) to identify bio indicators.

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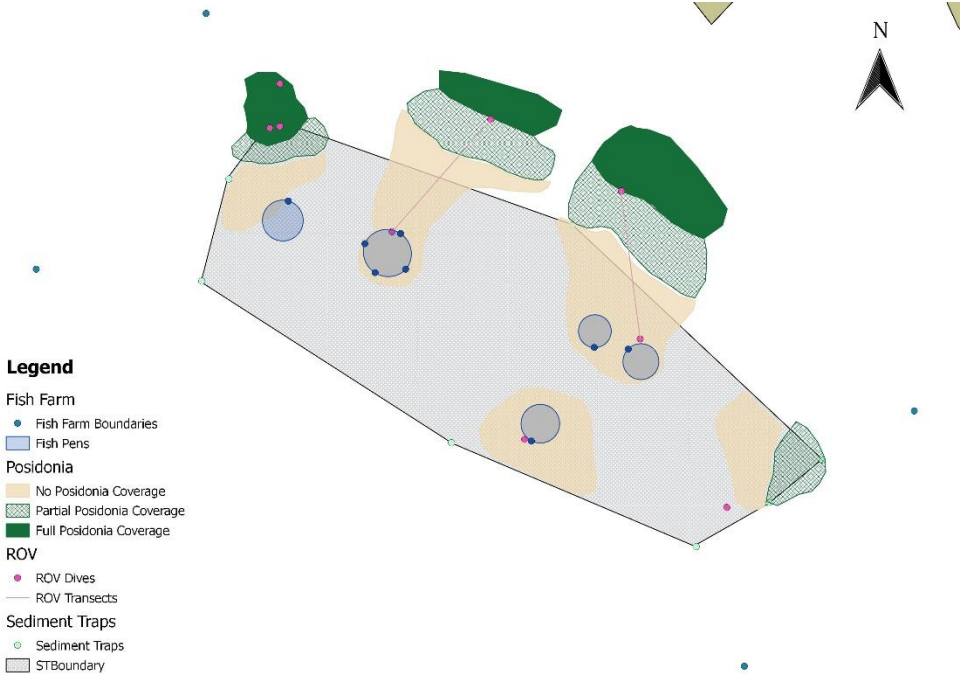
TAPAS case study Malta: Results

ROV survey of the area

1. ROV surveys were conducted by transects. The ROV started the dive by the fish pen and would survey the seabed outwards, perpendicular to the fish farm boundary line.
2. Degraded benthic ecosystems under the cages
3. Posidonia abundance increase after certain distance from the cages



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TAPAS case study Malta: Research Plan

1. Quantification of nutrient retention by isotopes of C and N
   a) Sediment traps
   b) Sampling of farmed fish and fish feed
   c) Sampling of Posidonia, sediments and colonizing invertebrates
2. Research how the nutrient retention data and the survey of seabed communities can be used for the designing IMTA systems in the Mediterranean
   a) ROV mapping of seabed to identify visible impacts of particulate waste dispersion and mapping seabed communities
   b) Investigate the nutrient retention by *Posidonia oceanica*
3. Testing the IMTA production on the identified best locations.
   a) Stocking IMTA species on the identified best locations and investigate growth and nutrient retention.

Main output: Bio-indicator based IMTA planning tool

1. MFF Fish farm and nursery in Marsaxlokk bay

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TAPAS case study Malta: Results

Sediment trap survey

1. The amount of sediments in the traps shows the main dispersion patterns
2. The amount of sediment in the traps was influenced by period of high winds. Sediment traps in the southern area of the fish farm collected the most sediment and the traps were covered in invertebrates and algae more than the other traps.
3. The sediment trap design has to be further developed

Location of sediment traps surrounding the fish farm. The average suspended sediment collected during a two-week period in illustrated at each site.

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TAPAS case study Malta: Further research

2018: MFF nursery site and production in Marsaxlokk (2,3)

1. Evaluation of results from 2017: correlation amongst, dispersion of particulate wastes, nutrient retention and seabed communities.
2. Start IMTA production on selected sites around nursery cages (2). Potential species are:
    1. Sea cucumber (*Holothuria poli*)
    2. Oyster (*Ostrea edulis, Crassostrea gigas*), Mussel (*Mytilus galloprovincialis*)
    3. Sea urchin (*Paracentrotus lividus*) → High local consumption
3. ROV mapping of the area around ongrowing site (3).
4. Sampling according the refined methods on the ongrowing site (3).

1. National Aquaculture Research Centre, MFF hatchery
2. Nursery cages
3. MFF ongrowing site

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TAPAS case study Malta: Links to partners, WPs and Case Studies

Univ. of Murcia: common method for the nutrient retention study, comparable results with Western Mediterranean (UM) case study. → data for WP5 Task 5.2 and 5.3

Univ. of Stirling: Modelling of the planned sites to support sampling strategy, validation of model with seabed mapping data and bio-indicators → data for WP5 Task 5.4

HCMR: Method development of ROV surveys and image analysis for WP7

NIVA: WP4, Environmental services of Maltese aquaculture by providing nutrients for the development of Posidonia fields, production of locally consumed species.

WI: Testing and collecting data with WISP devices about the yearly pattern of chlorofill a at the fish cages.

Univ. of Nantes, MI: cooperation in setting up and investigation of the IMTA production

PML: WP6, What far field models can support the IMTA design tool.

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For further information about the TAPAS project please visit our website

tapas-h2020.eu

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