

# Sustainable Aquaculture and the ECASA Project



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# What is Sustainability?

- Sustainability is an important concept which is very poorly defined.
- Specialists tend to use a narrower definition than the general public.
- Sustainable fisheries usually means that the yield is balanced by recruitment.
- Ecological and socio-economic sustainability is seldom taken into account.



# Sustainability of Aquaculture

- As aquaculture expands it is attracting attention on a broad social scale.
- This attention is both favourable and unfavourable:
  - It provides a new alternate source of food 
  - It may be unsustainable and damaging 
- To achieve the first point we need to address the second one.



# Views on Sustainability

- We often think that sustainability means that we can keep growing fish indefinitely.
- Thus we worry about eutrophication, benthic impacts, disease and other local issues.
- But we also need to ask whether the impacts we have on other coastal zone users and on wild stocks are sustainable.
- There is a lot of political pressure involved!



# Sustainable Agriculture

- We can learn a lot by looking at agriculture.
- Farming on land generates impacts that are similar to those of aquaculture:
  - Habitat loss and destruction
  - Demand for feed and other supplies
  - Pollution
  - Disease
  - Impacts on other users
  - Value to consumers.



# The Feed Issue

- The biggest current issue for sustainable aquaculture is opposition to the use of wild fish for feed.
- Well publicised, although often misleading, papers and talks have focussed attention on the fact that fish feed usually contains fish meal and fish oil from wild stocks.
- There are several concerns that come up relating to feeding wild fish products.



# Feeding Carnivores

- One problem is that many of the most valuable fish species are carnivores, so to produce 1 kg of salmon or tuna requires several kg of wild fish.
  - Often ignored is the fact that the wild fish are often species that no one wants to eat, such as Peruvian anchovy.
- Another concern is that pollutants in the wild fish may concentrate in farmed fish.



# Toxic Pollutants

- There is concern about the levels of pollutants in all fish products, including both wild and farmed fish.
- Several undesirable chemicals are commonly found in fish:
  - PCBs, PAHs and related compounds
  - Mercury and other heavy metals
  - Dioxins



# Alternate Feeds

- There is pressure to develop plant-based feeds as an alternative to fish products.
- Unfortunately carnivores like to eat meat, and feeds based on soy (*soja*) and other plant materials do not produce the best results in terms of growth and quality.
- Also fish raised on fish-based feed have the highest levels of omega-3 fatty acids, one of the main health reasons for eating fish.



# Disease

- Diseases can be transmitted both ways between wild and farmed fish.
- The high densities in fish farms increase the risk of disease breaking out.
- There is concern that these outbreaks could spread to wild populations.
- There is also concern that pharmaceuticals, particularly antibiotics, could escape and impact the environment.



# The ECASA Project



- To address these concerns, a project has been funded by the European Commission under the Sixth Framework called ECASA, which stands for **Ecosystem Approach for Sustainable Aquaculture (2.5 M€)**
- ECASA involves 16 partner institutions in 12 different countries and is coordinated by the Scottish Association for Marine Science (SAMS) in Oban, Scotland ([ecasa.org.uk](http://ecasa.org.uk)).



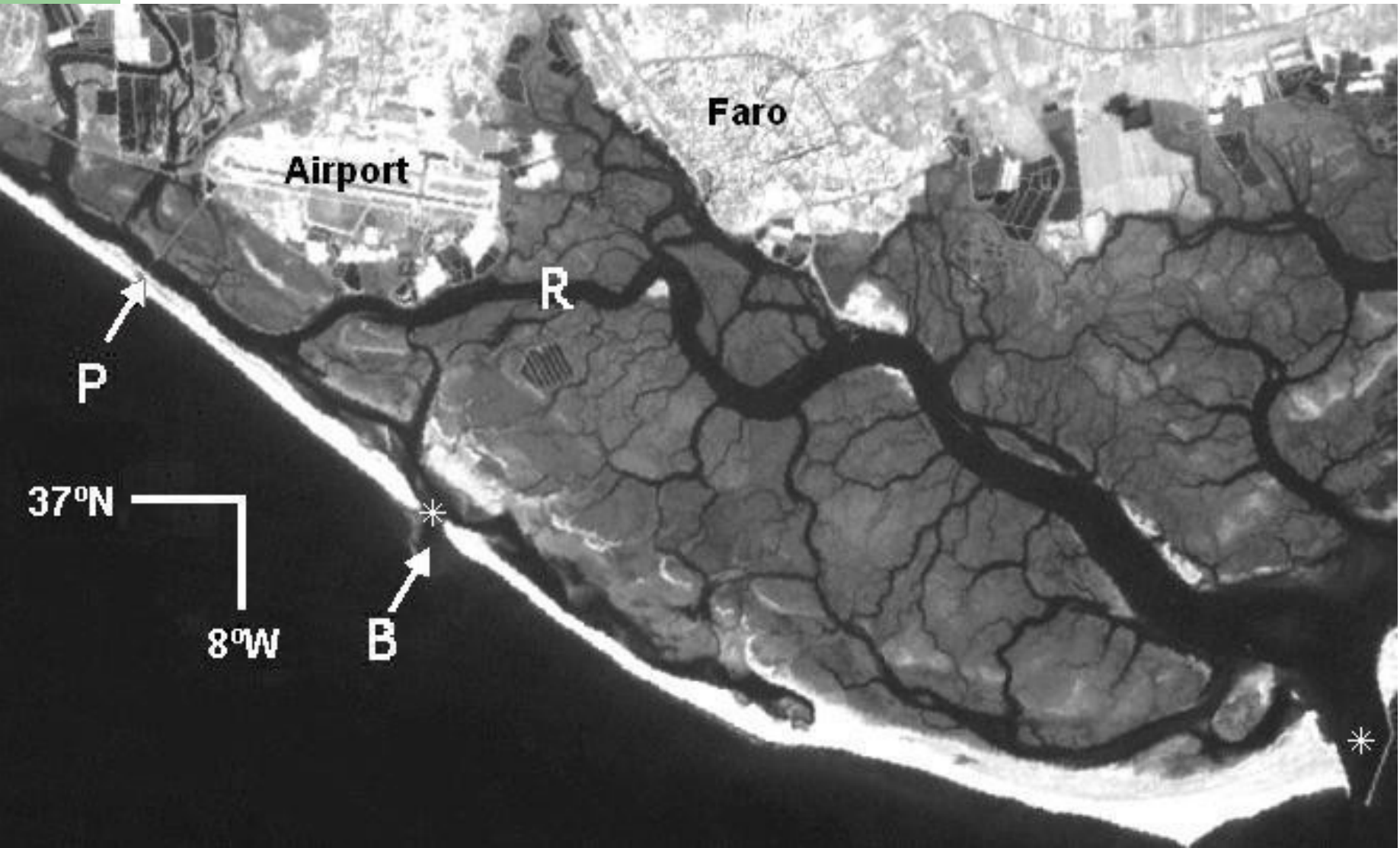
# Portuguese Participation

- IMAR is the Portuguese partner in ECASA and the chief investigators are João Gomes Ferreira (UNL) and Alice Newton (UAlg).
- Other Portuguese participants are John Icely and Ana Sequeira.
- I am working directly with SAMS and thus I am not officially a Portuguese participant!
- One of the major ECASA sub-projects is a study of the Ria Formosa.

# Stolen Slide!



- P: Shallow upstream channel
- B : Inlet exchanging with the ocean
- R: Inner channel adjacent to UWWT outlet





# Objectives of ECASA

- Identify indicators of how aquaculture affects the environment and vice-versa
- Develop operational tools, including models, to describe the relationship between environmental conditions and aquaculture
- Develop effective environmental impact assessment and site selection methods for coastal area management.



# Indicators - Procedure

1. Identify quantitative indicators of the effects of aquaculture on ecosystems through a process of expert working groups, workshops and meetings.
2. Identify indicators of the main drivers of ecosystem change affecting aquaculture.
3. Assess both sets of indicators for their utility by using existing datasets and considering appropriate selection criteria.

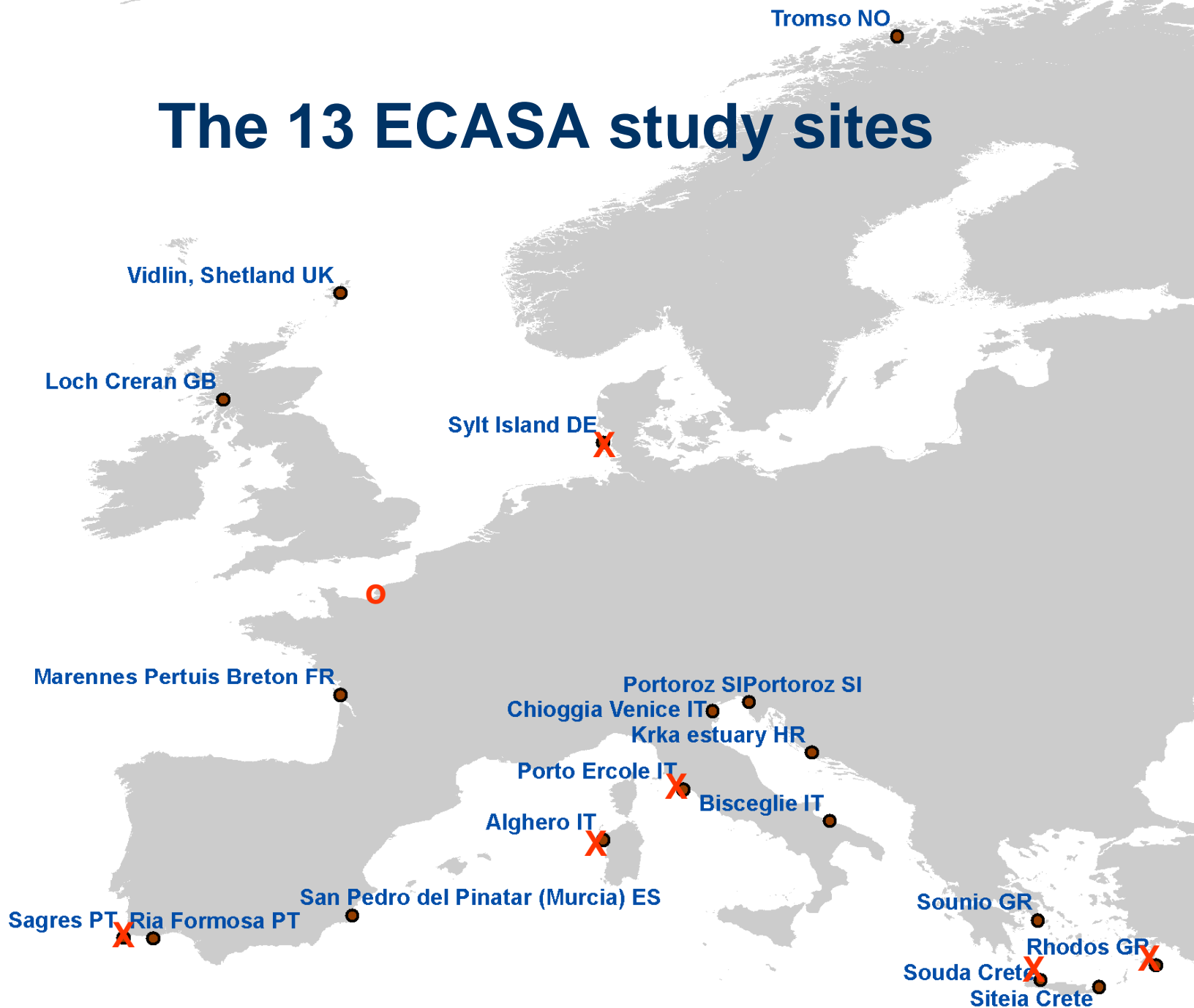


# Modelling - Procedure

4. Develop a range of tools, particularly models, encapsulating our best process understanding.
5. Test these models and indicators in a variety of field locations across Europe (13 in all) which cover a wide spectrum of environment types and culture species.
6. Use these data to test and select a final “tool-pack” of models and indicators, including appropriate decision support tools to guide users to effective implementation.



# The 13 ECASA study sites







# Progress Report

- During the first year of activity ECASA looked at indicators of environmental impact of aquaculture, and indicators of how the environment affects aquaculture.
- The next step was to look at models based on these indicators (which I think is kind of backwards!).
- Currently this work is being evaluated at the 13 test sites, including the Ria Formosa.



# The Tool-Box Concept

- The final product of this project will be a “Tool-Box” of measurements, indicators, models and other concepts which can be used for site-selection and management of aquaculture.
- This “Tool-Box” will be based on the idea of ecosystem management and should improve the prospects for sustainable aquaculture in the European Union.



## My Part in This

- My main contribution to the ECASA project will be to start developing an expert-system approach to site evaluation.
- This will probably involve the use of fuzzy variables to deal with the uncertainty in much of the analysis – for example, referring to “well-flushed sites” rather than “sites with a residence time shorter than X days”
- A paper on shellfish site selection is currently in press in Aquaculture (4 authors).



# The Challenges

- Deciding which indicators and models can be used throughout the EU is a huge task.
- Incorporating social and economic factors for all the different countries makes matters even more difficult (people are part of the ecosystem too, and ECASA has a social science component).
- Even with 16 institutional partners this is an ambitious and difficult job.