

Mass-balance modelling
for the Ecosystem of N.
Aegean Sea (Greece)

HCMR - Greece

MariFish Med WP7 - Corsica

EBM

- Shift from single-species management to multi-species and Ecosystem Based Management
- Research/management towards this direction already takes place in the Mediterranean
- MariFish is an opportunity for collaboration towards this issue
- **Ecosystem modelling** integrates single species stock assessments & biological/ecological information and is a useful tool for EBFM

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North Aegean Sea - Model area

- One of the most productive areas in E. Mediterranean
 - ✓ extended continental shelf
 - ✓ Black Sea Water input
 - ✓ river runoffs
- 30% of Greek fisheries catches
- Model for the period 2003-2006

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Modelling approach

Ecopath

- Simulation of the trophic relationships in the Ecosystem
- Mass-balance model

$$\text{Production} = \text{Predation mortality} + \text{Fishing mortality} + \text{Other mortality} + \text{Net Migration} + \text{Production} * (1 - \text{Ecotrophic Efficiency})$$

$$\text{Consumption}(i) = \text{Production}(i) + \text{Respiration}(i) + \text{Unassimilated food}(i)$$

- Input required
 - Biomass (B)
 - Diet composition
 - P/B
 - Q/B
 - U/Q
 - Fisheries data

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Data sources

- Biomass data from
 - Acoustic surveys (regular basis – MEDIAS)
 - Trawling surveys (regular basis – MEDITS, Discards)
 - Zooplankton sampling (regular basis - MEDIAS)
 - Other samplings (scarce data)
- Diet composition and other input (ongoing projects, past projects, published results)
- Landings data (regular basis) - 5 fleets were defined
- Discards data (observers on board – regular basis)

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Functional groups

- Definition of FG was based on
 - economical importance
 - ecosystem importance
 - available data

1	FG Phytoplankton	21	FG Demersal Fish 3
2	Microzooplankton	22	Demersal Fish 4
3	Mesozooplankton	23	Benthopelagic Fish
4	Mysids & Euphausiids	24	Picarels and Bogue
5	Jellyfish & mnemiopsis	25	Sharks
6	Benthic & Suprabenthic small crustacea	26	Rays & Skates
7	Polychaetes	27	Juvenile Anchovy
8	Shrimps	28	Adult Anchovy
9	Crabs	29	Juvenile Sardine
10	Norway lobster	30	Adult Sardine
11	Benthic invertebrates (no crustacea)	31	Horse mackerel
12	Benthic cephalopods	32	Mackerel
13	Benthopelagic cephalopods	33	Other Small pelagic fishes
14	Mulletts	34	Medium pelagic fish
15	Anglerfish	35	Large pelagic fishes
16	Flatfishes	36	Loggerhead turtle
17	Other gadiforms	37	Sea birds
18	Hake	38	Dolphins
19	Demersal Fish 1	39	Detritus
20	Demersal Fish 2	40	Discards

↑
benthic
pelagic
↓

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Preliminary results

Statistics, flows and indices

Sum of all consumption	856.83	t/km ² /year
Sum of all production	789	t/km ² /year
Mean trophic level of the catch	3.46	
Total biomass (excluding detritus)	32.964	t/km ²
Total catches	2.345	t/km ² /year
Connectance Index	0.294	
System omnivory index	0.18	
Primary Production Required	10.01%	
Finn's cycling index (of total throughput)	25.03%	
Finn's mean path length	6.36	
Ascendency	17.5%	

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Preliminary results

Mixed trophic impacts

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Future objectives

- Ecopath results
- Dynamic simulations (Ecosim)
 - Fisheries scenarios
 - Environmental changes
- Reconstruction of Ecosystem in the past
- Comparison of models from different areas & periods in the Mediterranean, e.g.
 - keystone species
 - exploitation rates
 - trophic flows
 - trophic levels