General Fisheries Commission for the Mediterranean
Commission Générale des Pêches pour la Méditerranée
LaMed-2 Project

Morocco country report

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Meeting on

Mediterranean coastal lagoons management: interaction between aquaculture and capture fisheries

Cagliari, Italy, 28-30 June 2011

number, surface, distribution of lagoons in Morocco

In general, there 6 lagoons on Moroccan coastline:

2 on the Mediterranean coast:
- **Lagoon of Nador (LN): the largest lagoon in Morocco;**
- **Lagoon of Smir (LS): the smallest lagoon in Morocco.**

4 on the Atlantic coast:
- **Lagoon of Moulay Bouselham (LMB),**
- **Lagoon of Sidi Moussa (LSM),**
- **Lagoon of Oualidia (LO),**
- **Lagoon of Khnifiss (LK).**

In addition to these 6 lagoons, there is 1 wide bay:

1 bay on the Atlantic coast:
- **Bay of Dakhla (BD): the largest coastal wetland in Morocco.**

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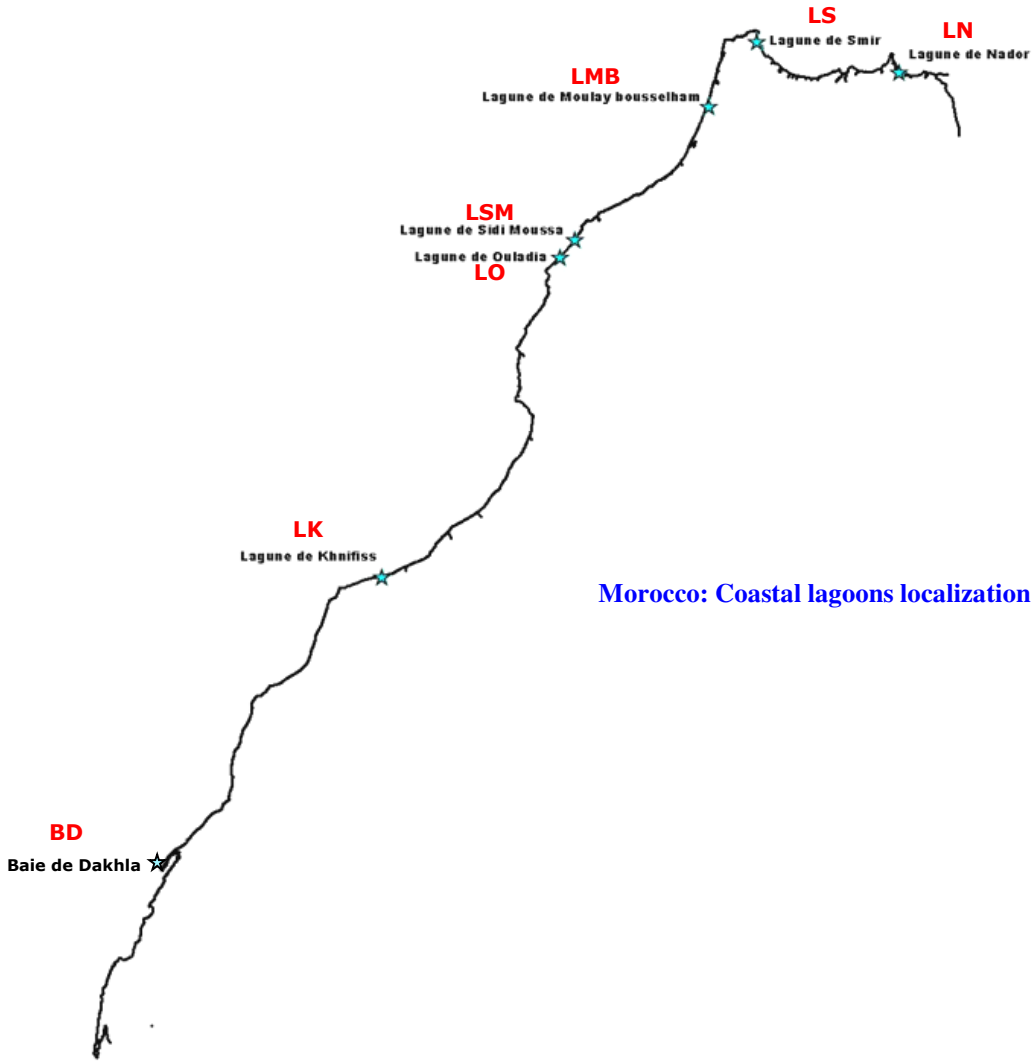

Morocco: Coastal lagoons localization

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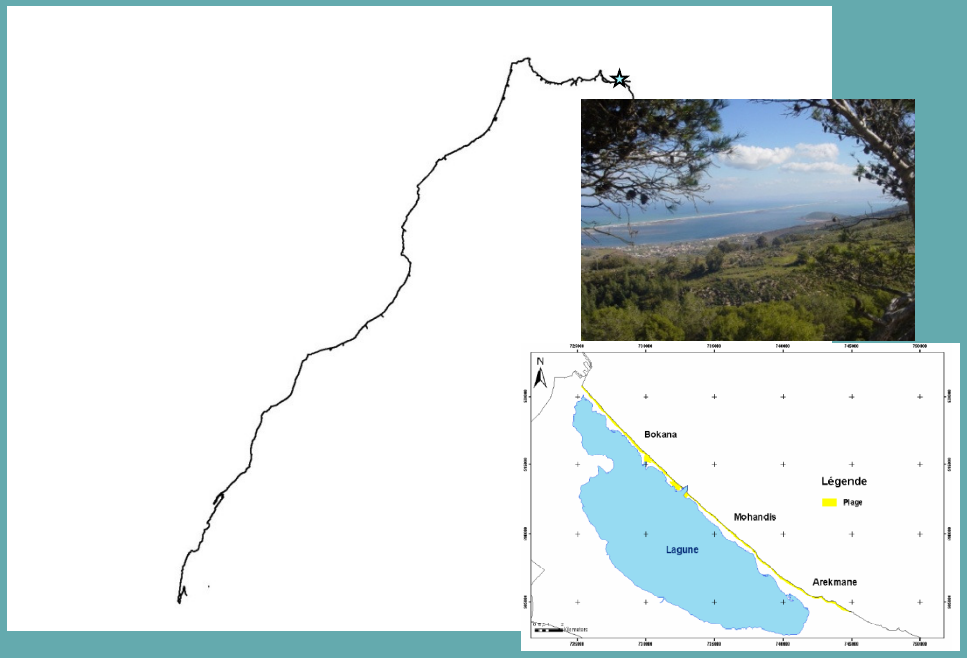
Nador lagoon

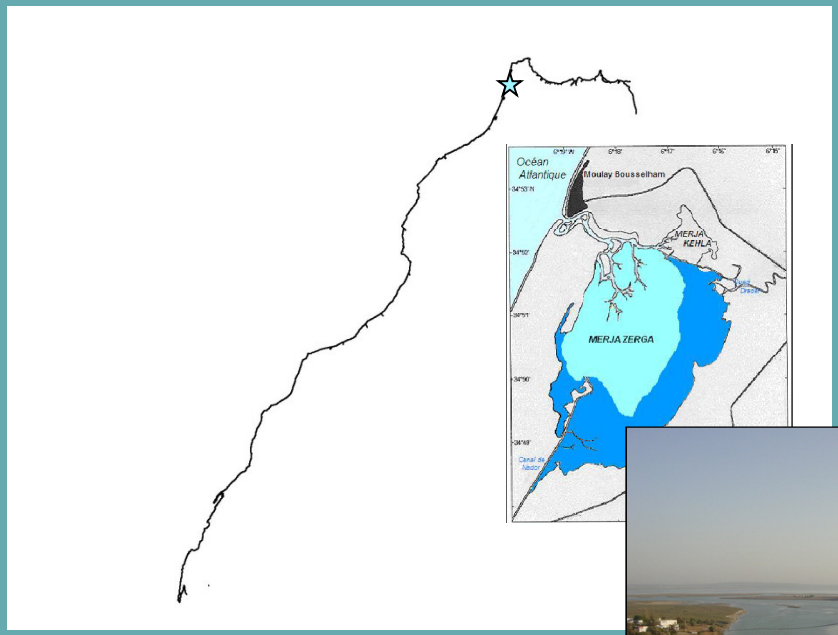


- Shoreline: Little rugged
- Water surface area : 11,500 ha
- Maximum Depth: 8m
- Temperature: 13 - 30°C
- Salinity: 35,5 - 41‰
- Dissolved Oxygen: 5,4 ~ 8,4 mg/l
- Chlorophyll-a : 2 ~13 mg/l
- MES : 40 ~ 120 mg/l
- Waves : the most frequent are the West-Northwest
- Tidal range: 0.5 to 0.9 m
-Presence of agarophyte algae: *Gracilaria sp*
- Oligotrophic ecosystem with high primary production in localized areas of major contributions

Smir lagoon

- Water surface area : 300 ha
- Maximum Depth: 2.5m
- Temperature: 11.9 – 27.6°C
- Salinity: 9 - 40‰
- Tidal range: 0.5 to 0.9 m
- bottom is extensively covered by macrophytes algae (e.g.: *Enteromorpha* and *Ulva*) and phanerogams (e.g.: *Rupia maritima* and *Zostera naultii*). On the borders, a halophyte plant grows *Salicornia fruticasa*

Moulay Bouselham lagoon



- Water surface area : 3,500 ha
- Maximum Depth: 5m
- Temperature: 13 – 31°C
- Salinity: 8 - 36‰
- Tidal range: 0.2 to 1.5 m
- Dissolved oxygen: 4 - 9.5 mg/l
- Chlorophyll-a: 0.03 – 1.8 mg/m³
- MES: 15 - 35 mg/l
- pH: 6.7 – 7.9
- Collection of European clam by local fisherwomen
- In winter season, this wetland receives a population of at least 100,000-200,000 birds of various species, including flamingos, little ringed plovers, black winged stilts and black tailed godwits.

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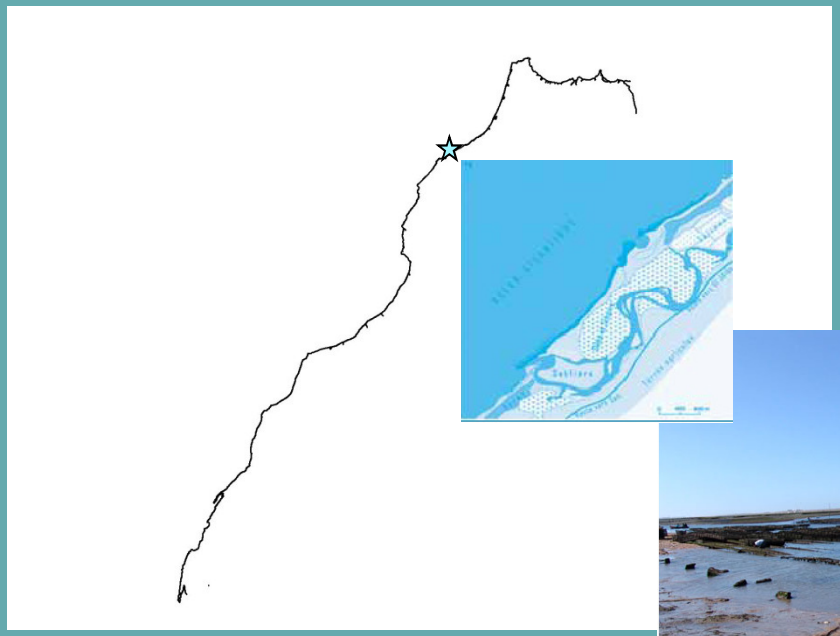
Sidi Moussa lagoon



- Water surface area : 420 ha
- Maximum Depth: 2.5m
- Temperature: 13 – 28°C
- Salinity: variable
- Tidal range: 2 to 4 m
- Collection of European clam by local fisherwomen
- This lagoon is one of the Moroccan sites classified as humid zones of national importance for the conservation of birds within the framework of the Ramsar Convention on Wetlands.

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Oualidia lagoon

- Water surface area : 350 ha
- Maximum Depth: 6 m
- Temperature: 13 – 28°C
- Salinity: variable
- Tidal range: 2 to 4 m
- Existence of nine farms of oyster culture
- Collection of European clam by local fisherwomen cooperative which
-The development of human and economic activities around the lagoon increases the pressure on biodiversity and threatens the area.
- A convention on the protection of Oualidia lagoon has been established to reduce potential threats and to ensure an integrated action plan for sustainable development of this lagoon, listed as an ecological site and a wetland of international importance under the Ramsar Convention.

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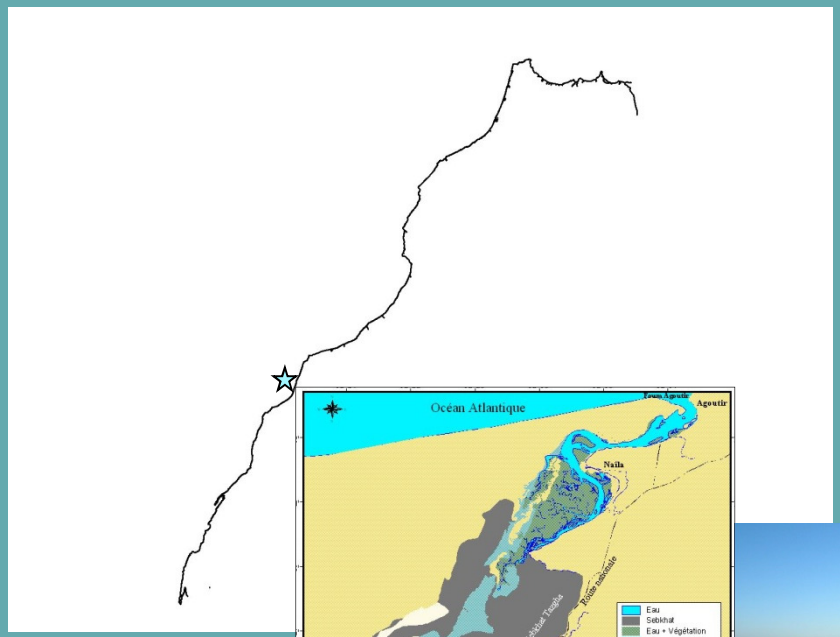
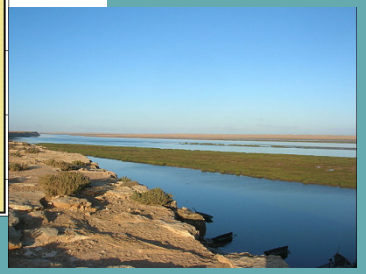
Khnifiss lagoon





- Water surface area : 6,500 ha
- Maximum Depth: 8.7 m
- Temperature: 16 – 26°C
- Salinity: 35 - 42‰
- Tidal range: 1 to 3.4 m
- Dissolved oxygen: 5.1- 8.5 mg/l
- Chlorophyll-a: 0.7 – 2.6 mg/m³
- MES: 15 - 35 mg/l
- pH: 6.7 – 7.9
-Nitrate: 6.9 et 80 µg/l with increasing gradient towards upstream.
- Phosphate: 50 - 270.6 µg/l, higher in downstream.
- Dominant winds : NNW to NE
-Water current speed: 20 cm/sec in upstream and 110 cm/sec in downstream
- This wetland receives more than 200,000 migratory birds of various species per year.

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Dakhla Bay

- Water surface area : 30.000 ha
- Maximum Depth: 20m
- Temperature: 15 – 22°C
- Salinity: 36 - 40‰
- Dissolved oxygen: 4 – 9 mg/l
- Chlorophyll-a: 0,6-3 mg/m³
- Tidal range: 0.5 to 2.5 m
- Collection of many bivalves species by local fishermen
-An integrated shellfish culture planning was established and implemented in the end of the nineties.
- Inside the bay, fishing is prohibited for professionals because it is a breeding ground for many fish species such as meagre, and the bay receives a variety of fish predators (meagre, shark, ray, dolphin, whale, ...). Only the bait fishing is allowed in the bay.

important coastal lagoons for fisheries and aquaculture

Importance in terms of aquaculture : mainly two lagoons:

- LO: from fifties up to now: oyster culture (9 farms), today: reorganization shellfish culture planning is undergoing;
- LN: from 1985 to 2006: finfish, shellfish and shrimp cultures (one farm), today : integrated aquaculture planning is undergoing;

Two others lagoons could be added :

- LSM: some algae experiment are undergoing by a private Company interested in culturing gracilaria alga;
- LK: before 2005, shellfish culture production (one farm). This activity was ceased since the EU law revision of heavy metals norms which were reduced by half. Consequently, LK was declassed on the shellfish sanitary level.

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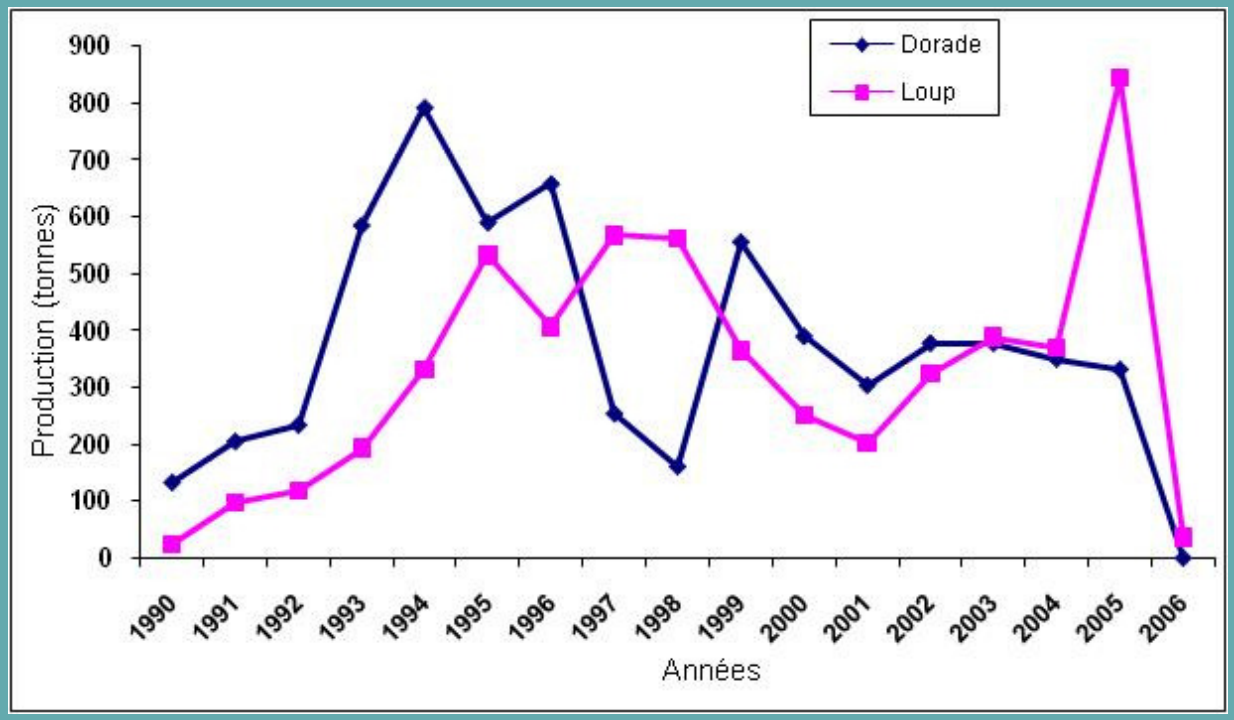

Nador lagoon - Evolution of aquaculture production of sea bream and sea bass in Morocco
(Data source: Department of Marine Fisheries)

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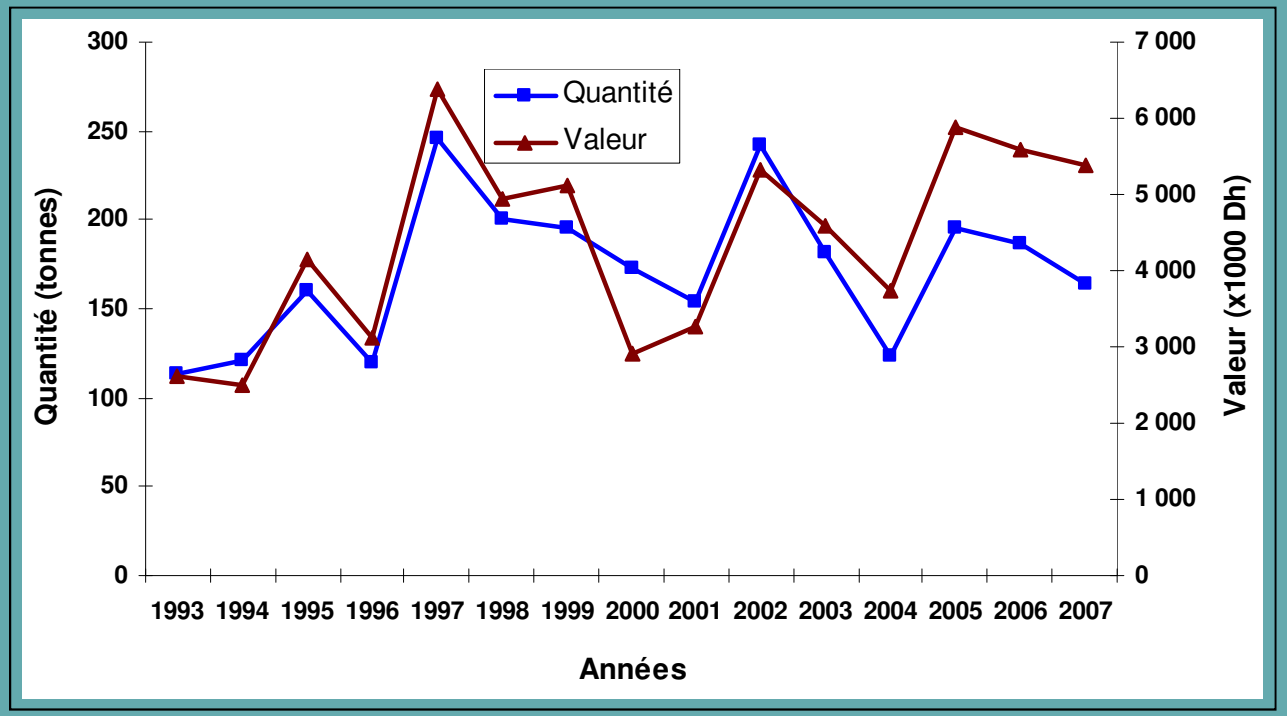

Oualidia lagoon - Annual cultured shellfish production evolution in Oualidia lagoon from 1993 to 2007 (Data source: Marine Fisheries Department).

important coastal lagoons for fisheries and aquaculture

Importance in terms of fisheries - four lagoons:

As general remark: there is no official statistical data system. Data are estimated by researchers.

- LN: important artisanal fisheries activity (mainly for fish capture);
- LMB: artisanal fish capture and clam collection activity by fisherwomen;
- LO: shellfish collection (mainly clams) by fisherwomen cooperative (culture of small clams);
- LK: small fish artisanal capture (7 boats) practicing mainly site seeing in lagoon for tourists.

main typologies of coastal lagoons

Ownership : All lagoons belongs to the Marine Public Domain;

Ecological classification :

- Biological and Ecological Interest Sites;
- Ramsar Convention;
- National Park.

Management :

- Aquaculture: LK (done), LN (underway) and LN (underway);
- Touristic: LN (underway)
- Ecological preservation: LO (underway).

other activities carried out in coastal lagoons

Importance in terms of tourism activity:

Tourism :

- LO: since many decades, famous as touristic resort centre both at national and foreign level. Many touristic facilities were constructed nearby the lagoon shore in the downstream area;
-LN: great touristic project is under construction in seven places around the shoreline of this lagoon;
- LK: part of national park of Naïla, emerging of an ecological tourism.

Salt production: LN, LO and LK.

environmental issues

Pollution: mainly domestic pollution (LO which had required an action plan to rehabilitate its ecological environmental;

Sand sedimentation reducing the importance of seawater inlet in lagoons and water exchange.

emerging problems

Planning needs to sustain old activities and to integrate harmoniously new emerging activities in respect with local environmental conditions (aquaculture, onshore urbanisation, tourism, etc.);

Ecological preservation: needs of scientific tools basin on ecosystemic approach, multidisciplinary studies, etc., to assess environmental impact modelling and prediction

development perspectives and interventions by the public administration

Concerted work of local planning involving all interested administrative, research and professional institutions both at local and national level to ascertain a well integrating projects development with local specific environmental conditions and with existing and running activities.

Knowledge state: there is a need to make an exhaustive list of achieved, published and none published studies and to a make a synthesis to assess the kind and the availability of gathered information and the still existing gaps.

Thanks a lot for your kind attention and good wishes for an efficient Mediterranean cooperation.