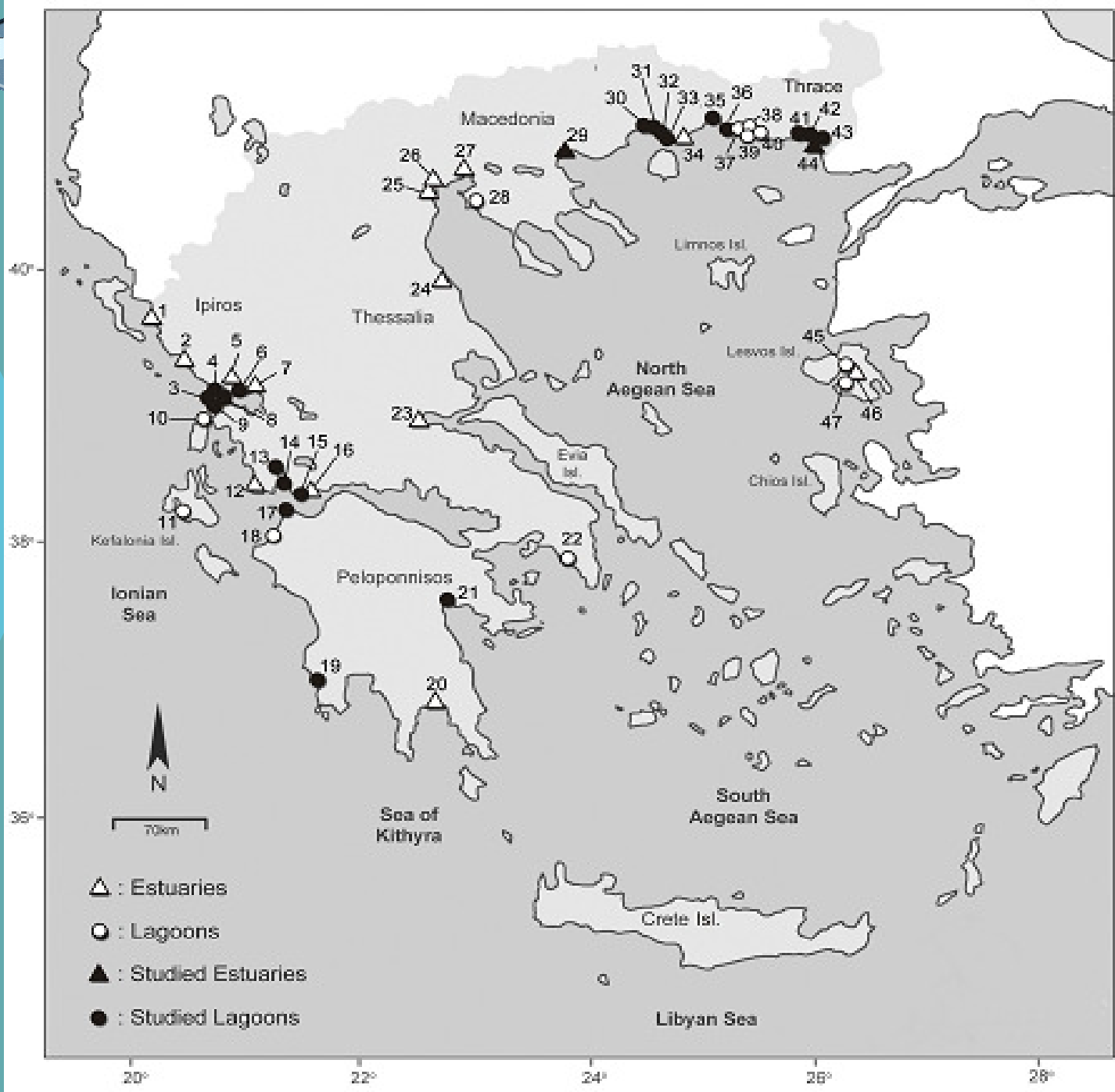# Greece country report

by Sofia REIZOPOULOU

Hellenic Centre for Marine Research

Meeting on

Mediterranean coastal lagoons management: interaction between aquaculture and capture fisheries
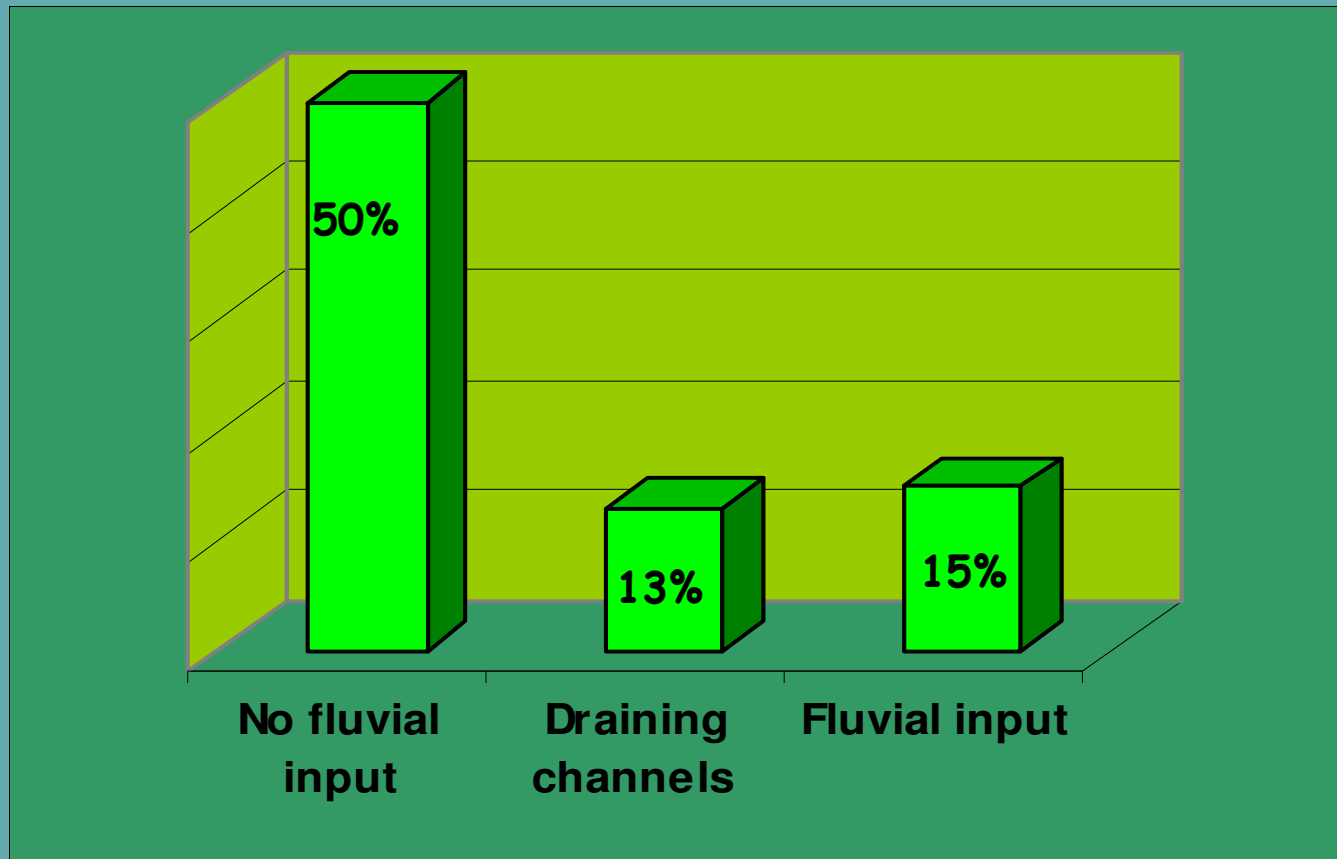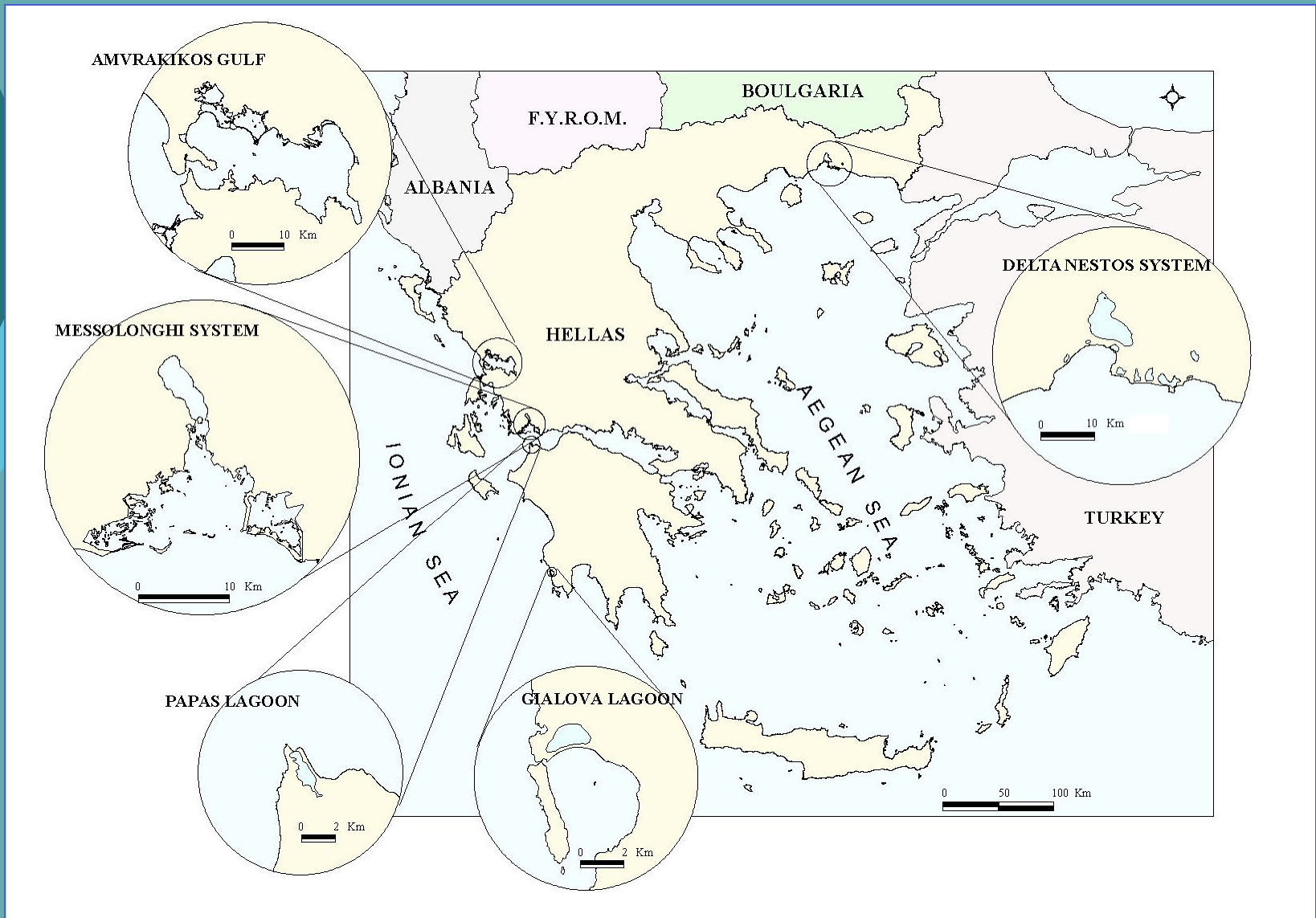
Cagliari, Italy, 28-30 June 2011

U2

U2   please insert name of country
Unset, 30/05/2011

# Recorded 76 lagoons covering an area of about 345km² (Dimitriou *et al.,* 2001)

| Province	Lagoons (no)	Surface (ha)	lagoons (%)	surface (%)
Eastern Macedonia & Thrace	**22**	8256	**28,9**	23,9
Central Macedonia	1	30	1,3	0,1
Thessaly	1	36	1,3	0,1
Sterea Hellas	2	120	2,6	0,3
Attika	4	176	5,3	0,5
Peloponnese	7	606	9,2	1,8
Western Greece	16	**14946**	21,1	**43,3**
Ionian Islands	5	1550	6,6	4,5
Epirus	18	8792	23,7	25,5
Total	76	34511,2	100	100

AMVRAKIKOS GULF

0   10   Km

MESSOLONGHI SYSTEM

0   10   Km

DELTA NESTOS SYSTEM

0   10   Km

PAPAS LAGOON

0   2   Km

GIALOVA LAGOON

0   2   Km

BOULGARIA

F.Y.R.O.M.

ALBANIA

HELLAS

TURKEY

IONIAN SEA

AEGEAN SEA

0   50   100   Km

Coastal Lagoons: Enclosed water bodies situated in coastal locations in Greece separated from the sea by narrow barriers with openings allowing limited water exchange with the sea

Internal Lagoons: with out a direct communication with the sea, connected by an opening with the coastal lagoons. Example: Tsoukalio-Rodia system in Amvrakikos Gulf.
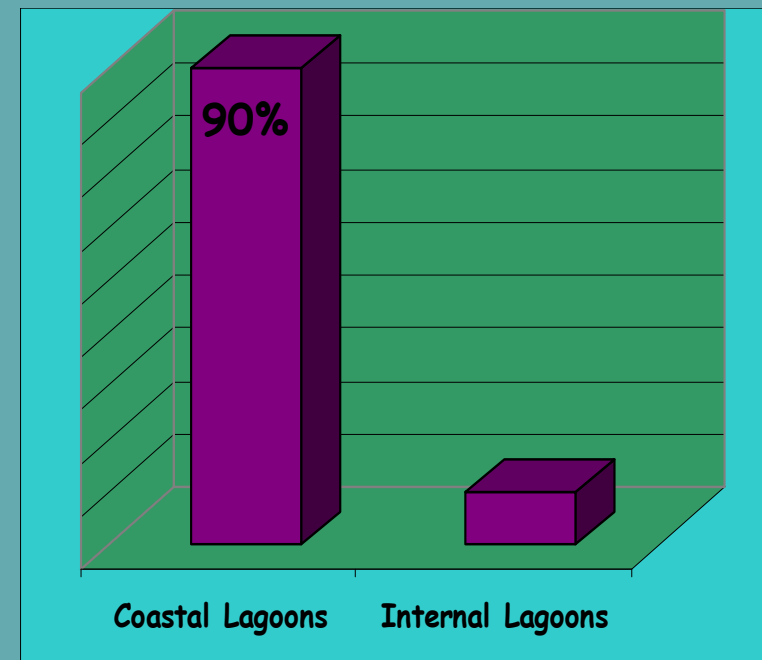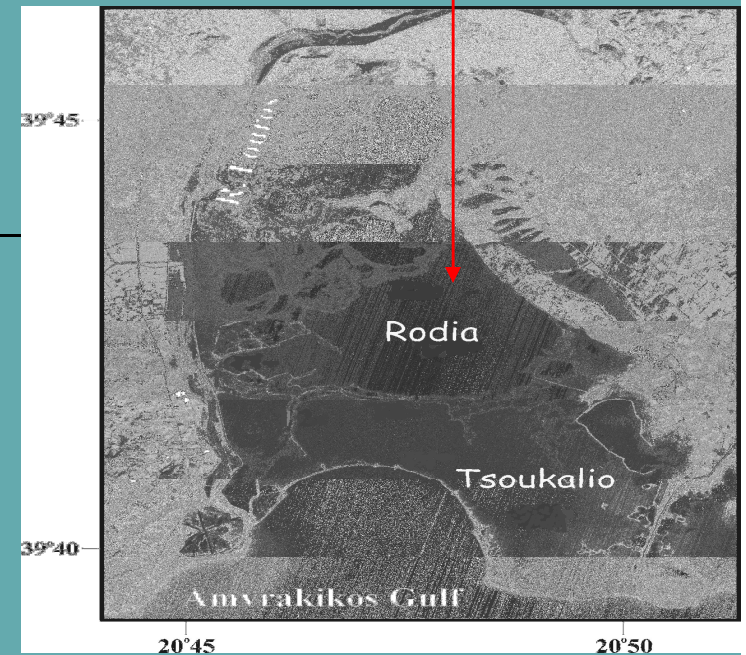
Characteristics of lagoons and parameters studied

LAGOONS	Amvrakikos Gulf					Patraikos Gulf			Ionian Sea	Eastern Macedonia & Thrace					Evros Delta
	Ma	T	Ts	R	L	Me	A	P	G	Va	E	Ag	Ke	F	
Size (km)	1,6	1	16,5	13,5	25,7	100	26	3	2.5	0,8	3,0	3,9	1,0	1,9	
Exploitation	AE, F	F, AE, ASI	F, AE, ASI	F, AE, ASI	F, AE, ASI	F, AE	F, AE	F, AE	F, AE	F, AE	F, AE	F, AE	F, AE	F	F, AE
Conservation	RAMSAR	RAMSAR	RAMSAR	RAMSAR	RAMSAR	RAMSAR	RAMSAR	NATURA	NATURA	RAMSAR	RAMSAR	RAMSAR	RAMSAR	RAMSAR	RAMSAR
Human impact							DC	DC	DC						D
Abiotic	*	***	***	***	***	***	***	***	***	*	*	*	*		***
Plankton				**					**						
Phyto-benthos	*	**	**	**	**	**	**	**	*	**	**	**	**	*	**
Zoo-benthos	*	***	***	***	***	***	***	***	***						***
Fishfauna						*	*	*	*						**

(Parameters studied: Abiotic, Plankton, Phyto-benthos, Zoo-benthos, Fishfauna)

* =occasional, ** =seasonal, *** =seasonal, more than one year

(F=Fisheries, AE=Extensive aquaculture, ASI=Semi-intens. aquaculture, DC=dystrophic crisis, D=Drainage)

Nicolaidou et al. 2005

The lagoons operate as extensive fish farms and except for a few cases, they belong to the state and are leased to local fishing cooperatives.

Several commercial fish species (*Anguilla anguilla, Mugil, Solea, Gobius niger, Sparus aurata, Dicentrarchus labrax*) are exploited traditionally in the lagoons, entering seasonally through the openings with the sea.
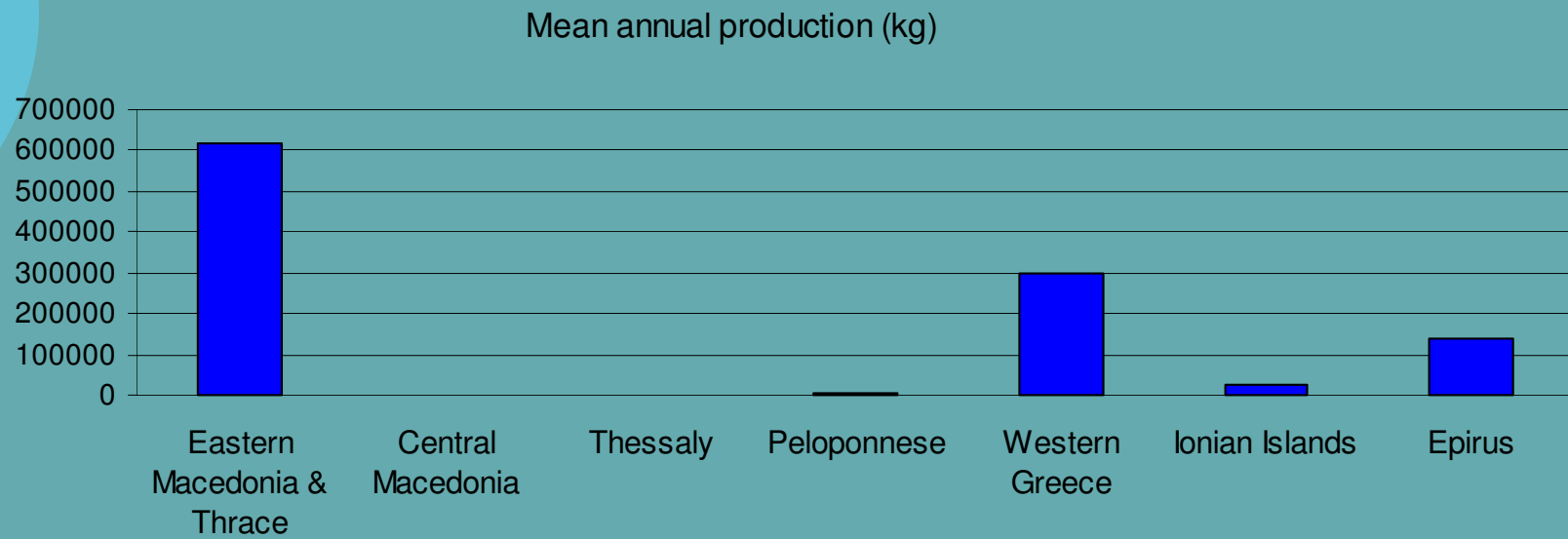
Traditional fish trapping installations made out of reeds
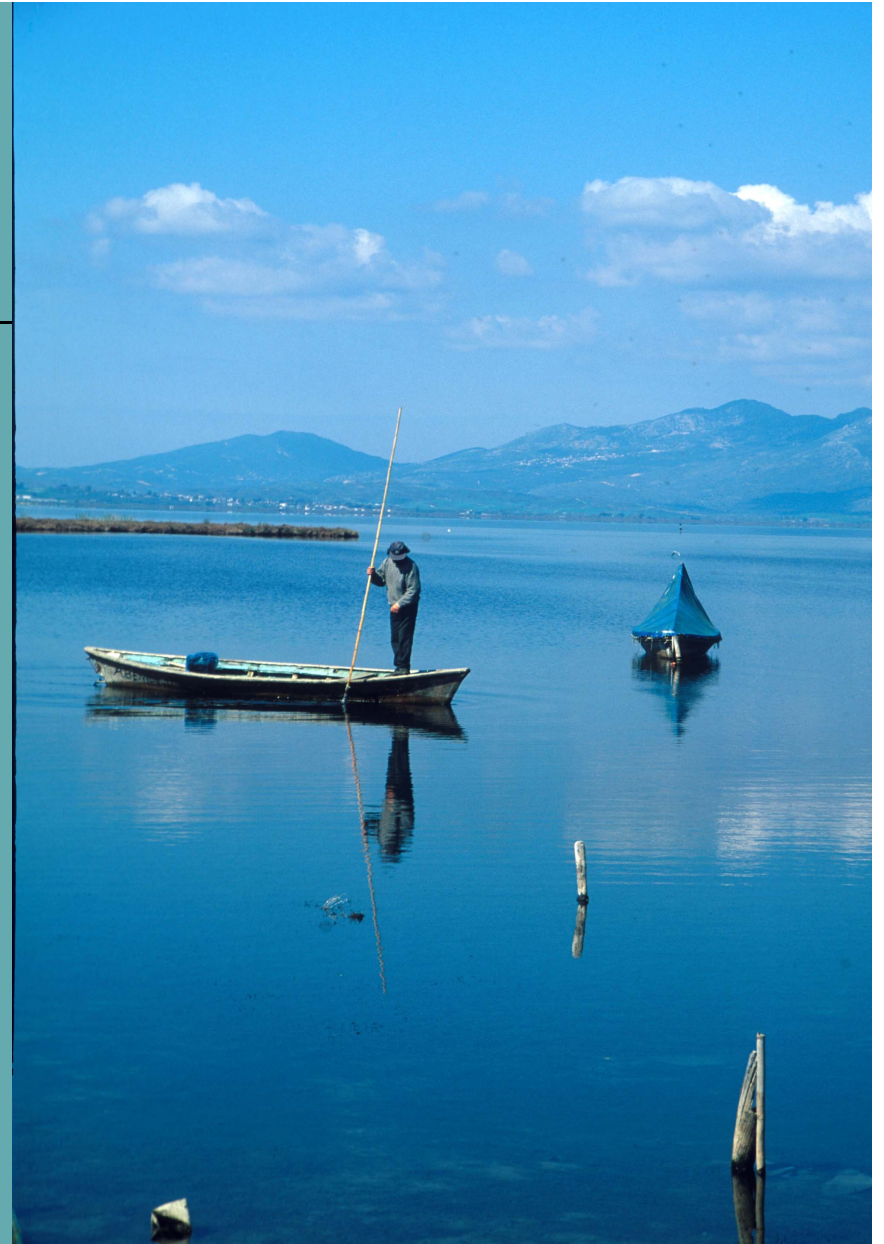
The traditional fishing method «kamaki»

Mean annual production

Mean annual production (kg)

Lagoons of Amvrakikos Gulf

Amvrakikos wetland

The Amvrakikos wetland (Ionian Sea) it is one of the most ecologically important lagoonal systems in the Mediterranean, covering about 200 km², including more than 20 coastal lagoons. It is protected by the convention of Ramsar and it is also included in the Natura 2000 network.

Most lagoons in Amvrakikos, such as Pogonitsa, Mazoma, Tsopeli, Tsoukalio-Rodia and Logarou are characterised as Coastal Lagoons. They are relatively enclosed water bodies with wide range of temperatures and salinities (euryhaline and eurythermic).

Pelecanus crispus is resident to the site's lagoons and salt marshes. The breeding population of this species in the site represents about 20% of the respective total EU populations and 3.5 % of the global one.
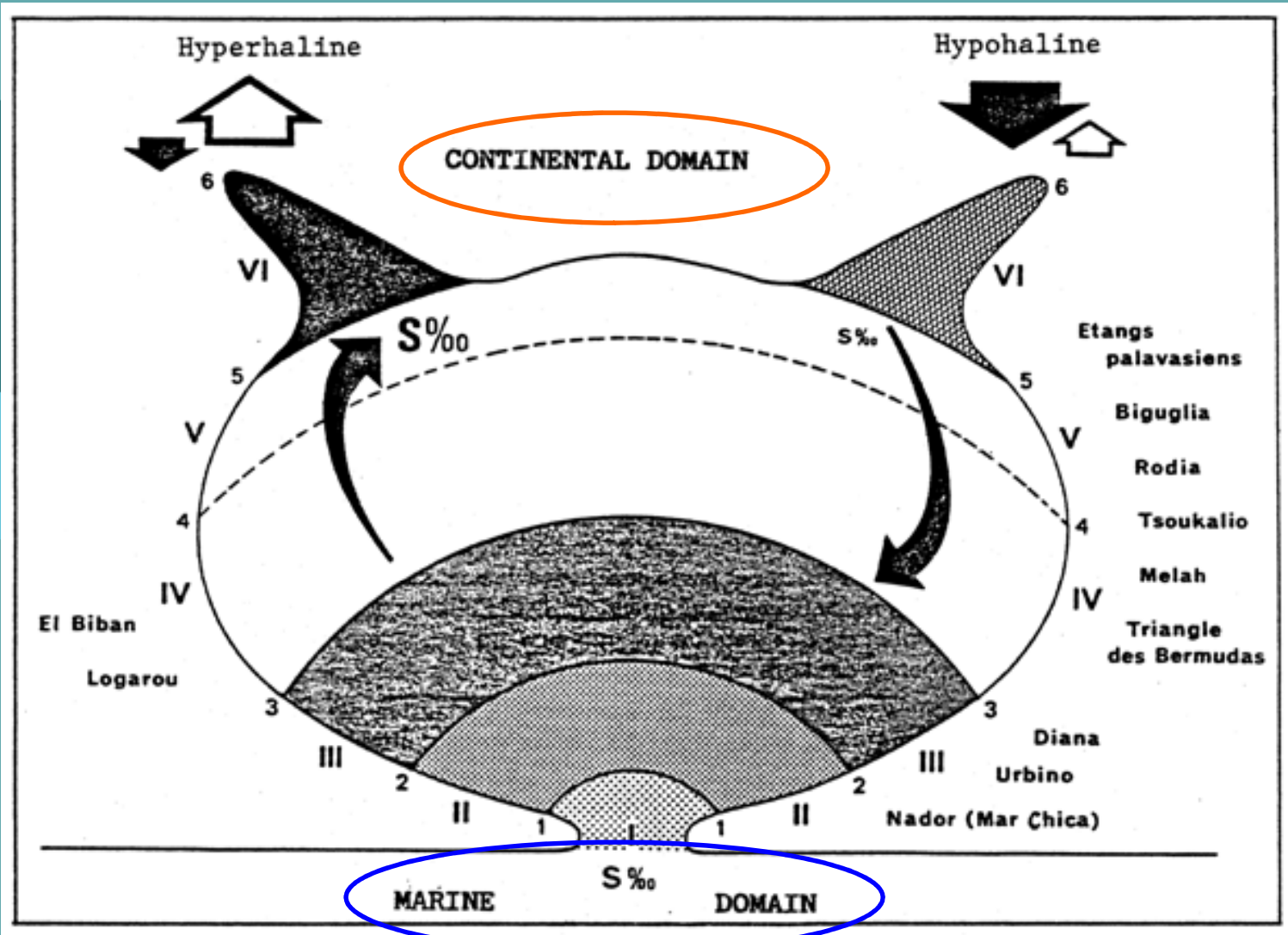
Biological zonation: In the lagoons seawater influence has the primary control in determining spatial distribution of biota (Guelorget & Perthuisot, 1992)

The degree of confinement affects community diversity: Diversity decrease with increasing confinement
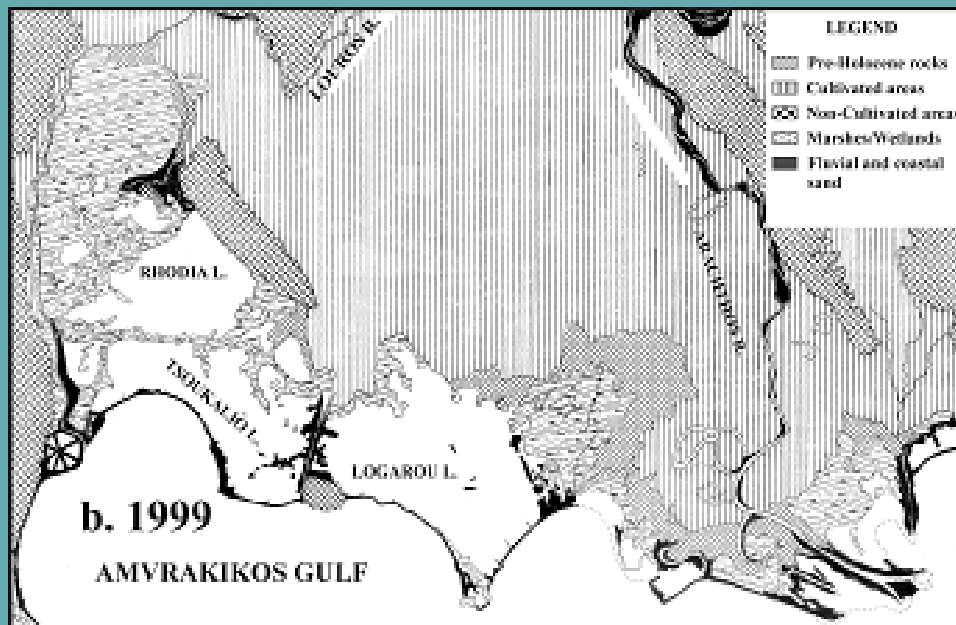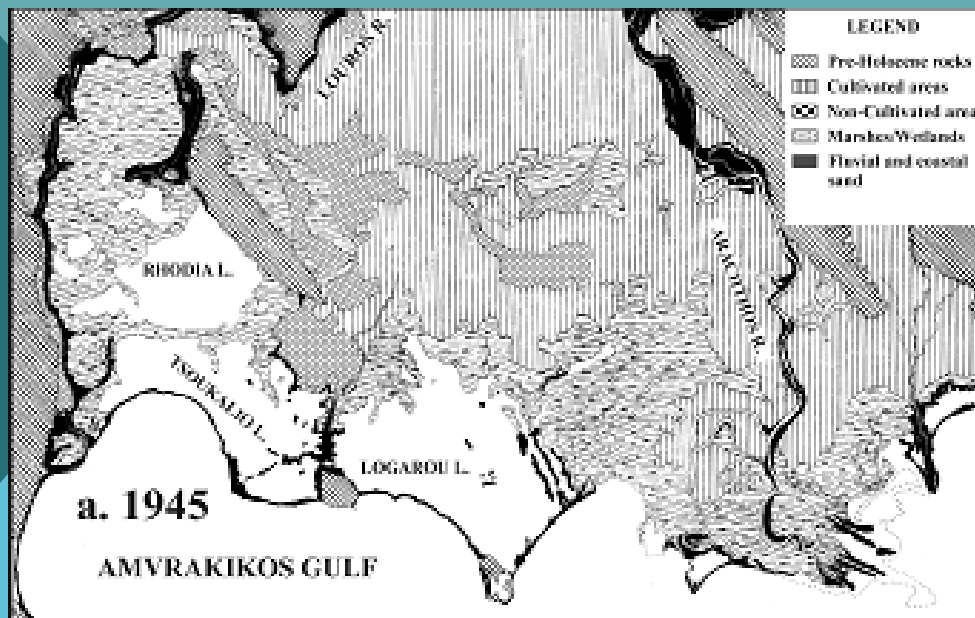

Logarou Ecological Indices
October 2004

Logarou Ecological Indices
July 2005
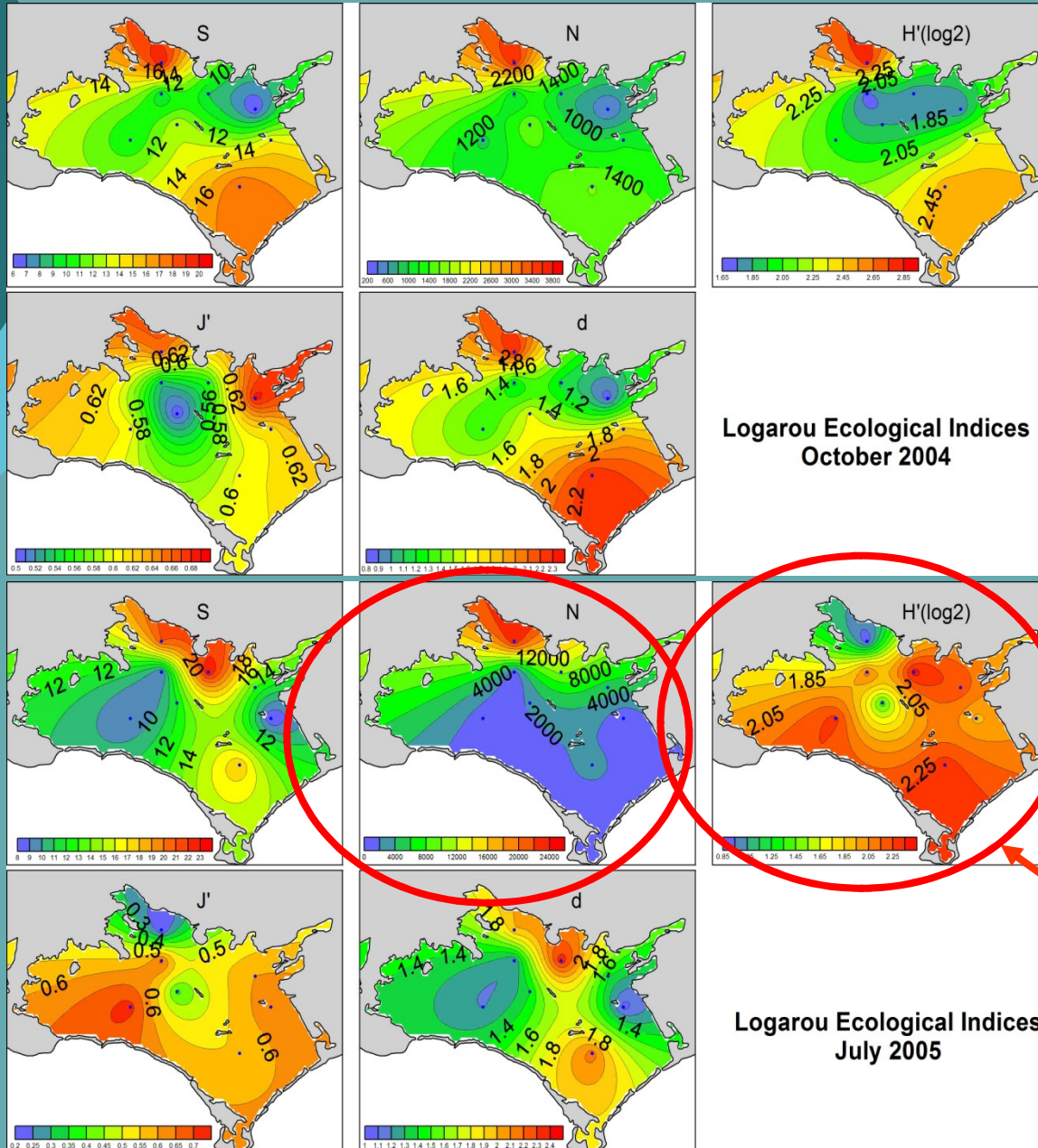
✓Decreasing species number, diversity and evenness towards inland
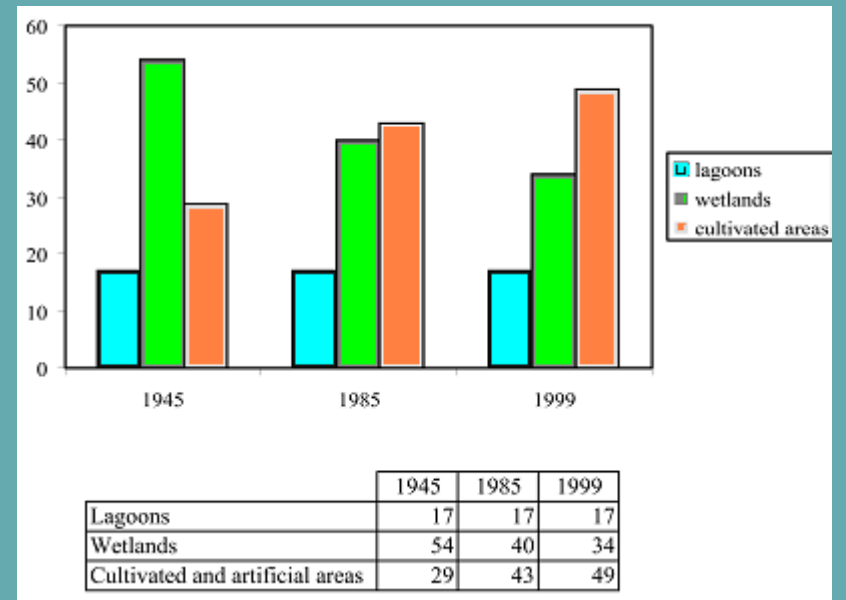
✓Decreasing density number towards marine communication

➢Zonation is better evidenced during summer season
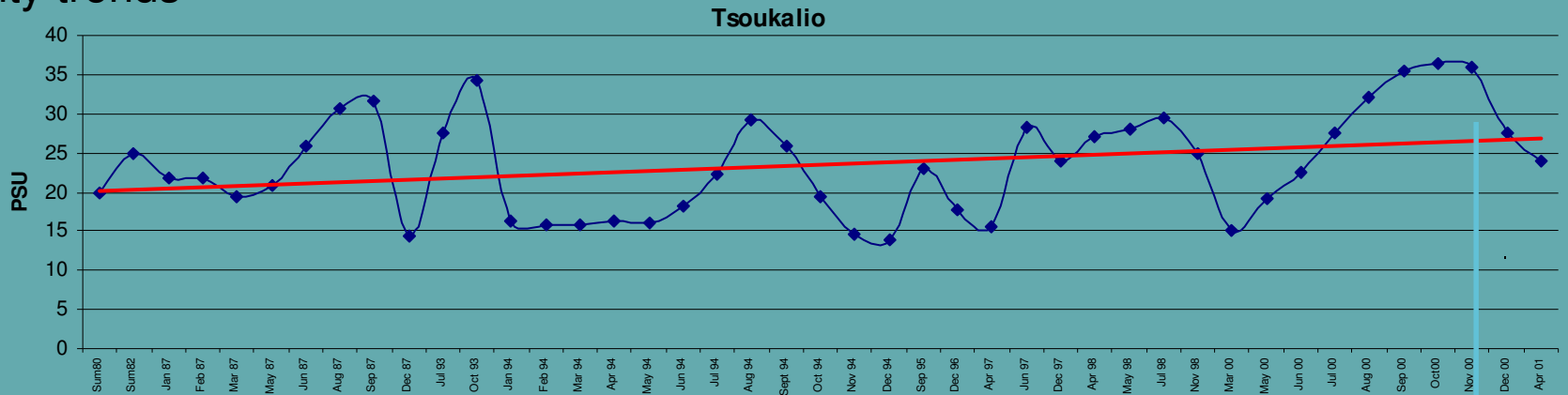
Multiple stressors

•Hydrological modifications
(damming, water level alterations, water abstraction, channelling etc.)

•Pollution (agriculture)

•Land use change

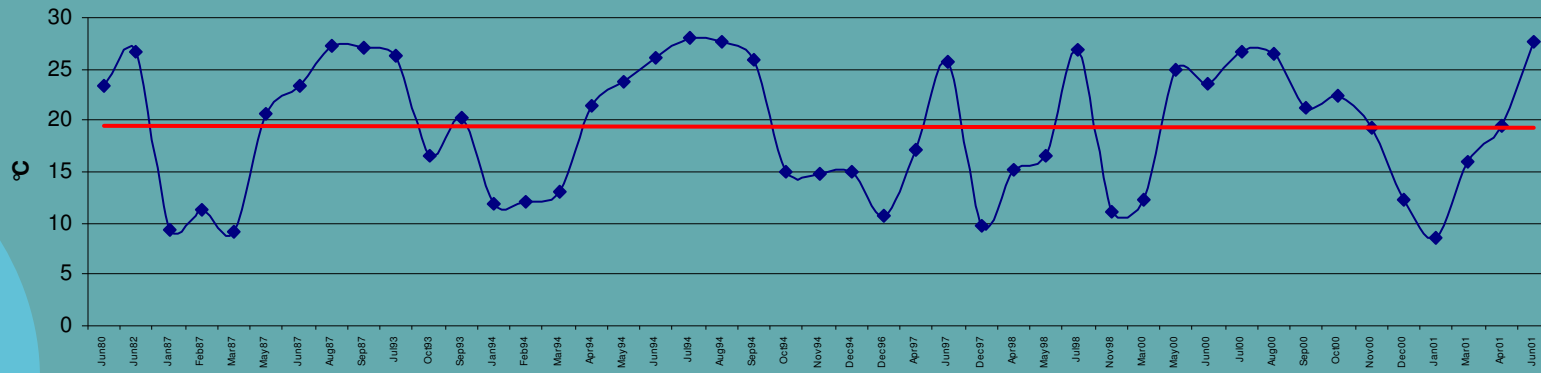•Habitat loss
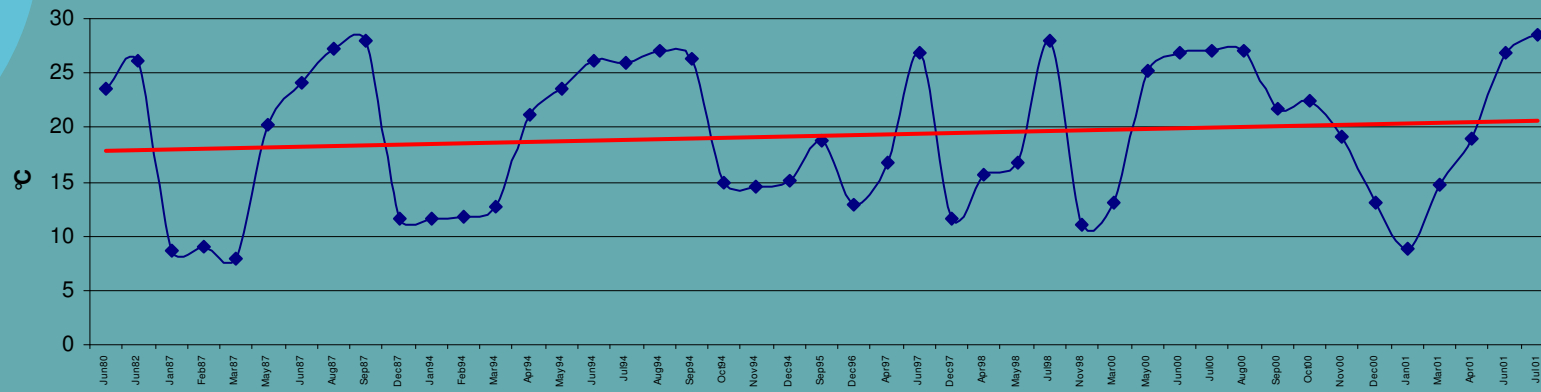
•Overfishing

•Alien species

Habitat loss

	1945	1985	1999
Lagoons	17	17	17
Wetlands	54	40	34
Cultivated and artificial areas	29	43	49

Salinity trends
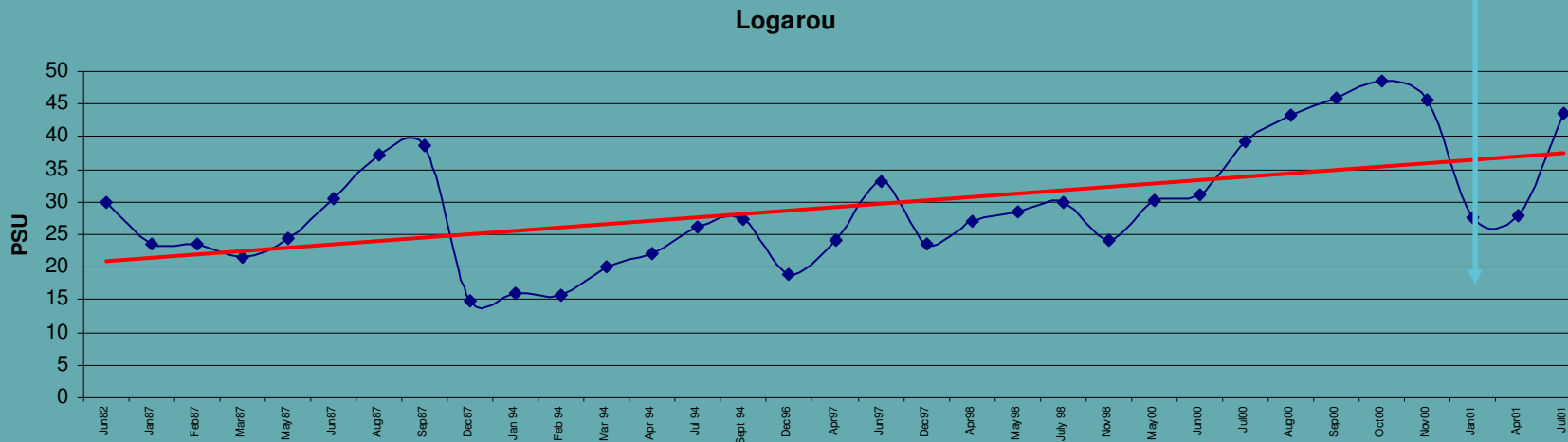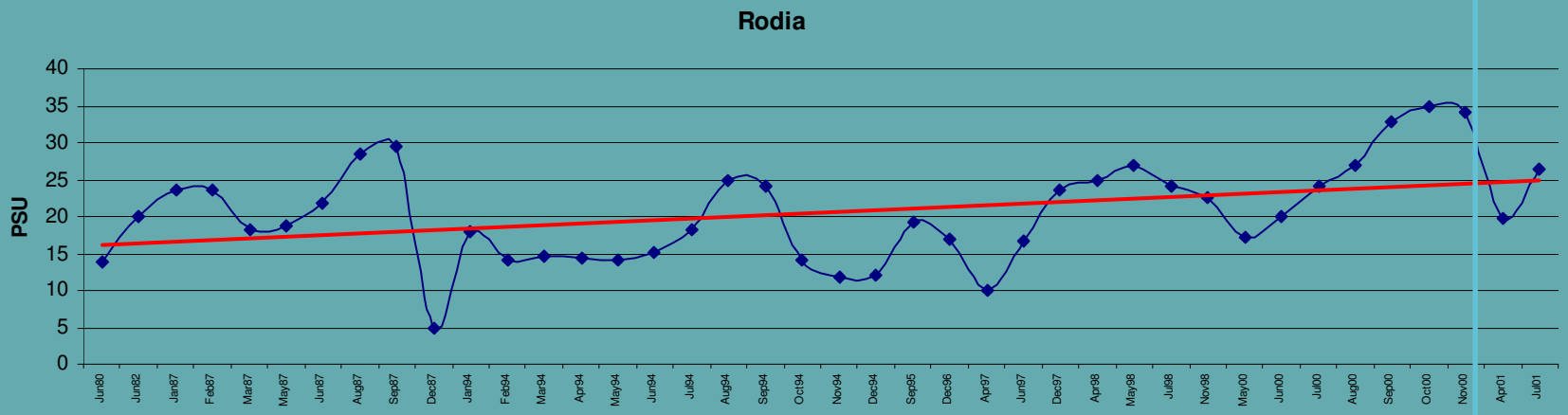
Tsoukalio

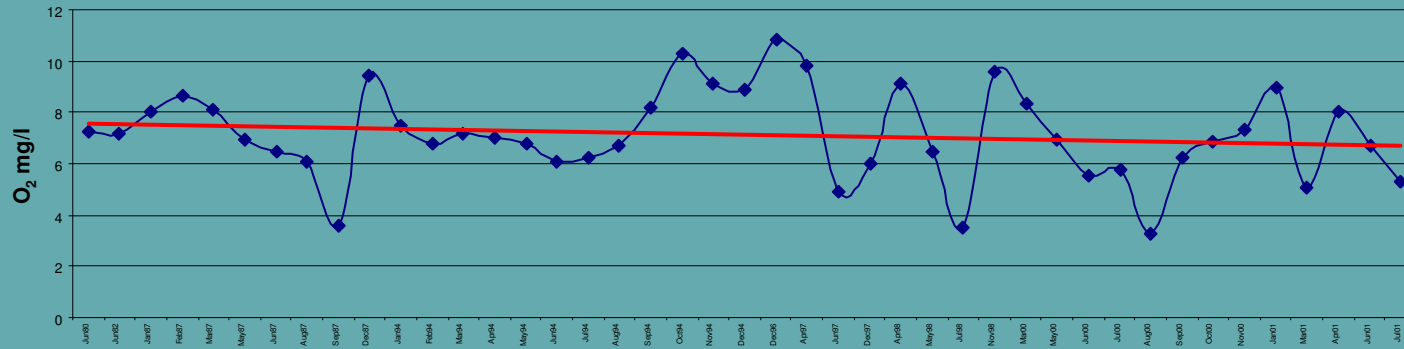Rodia

Logarou

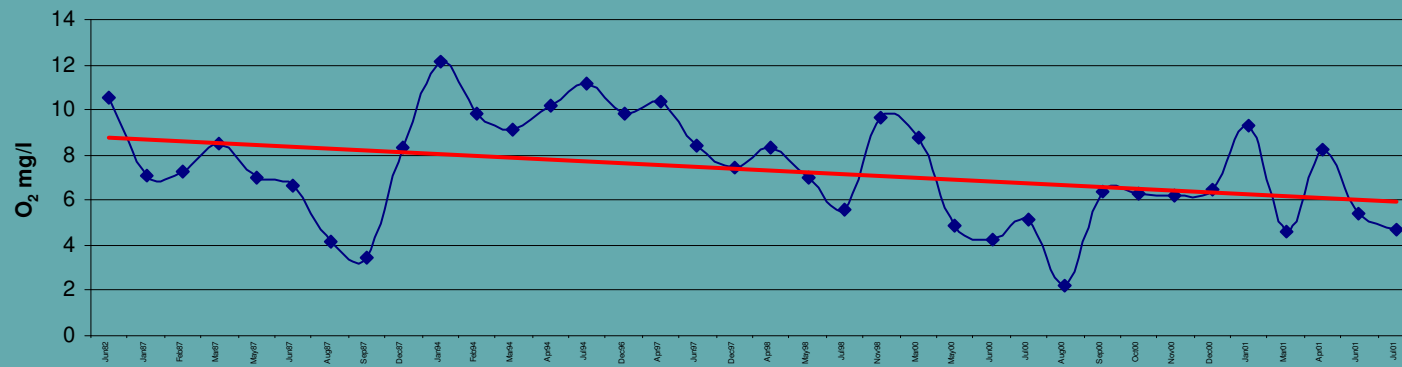# Temperature trends
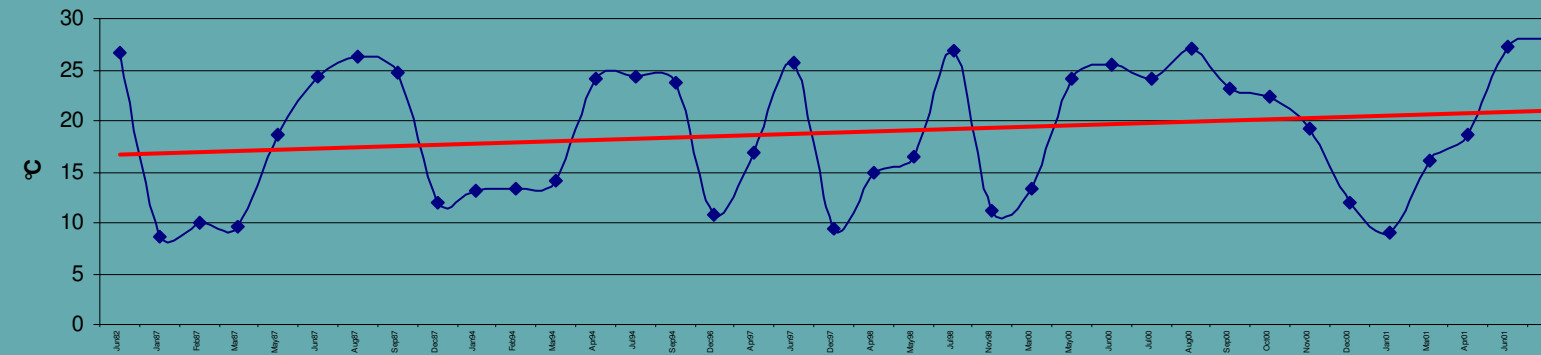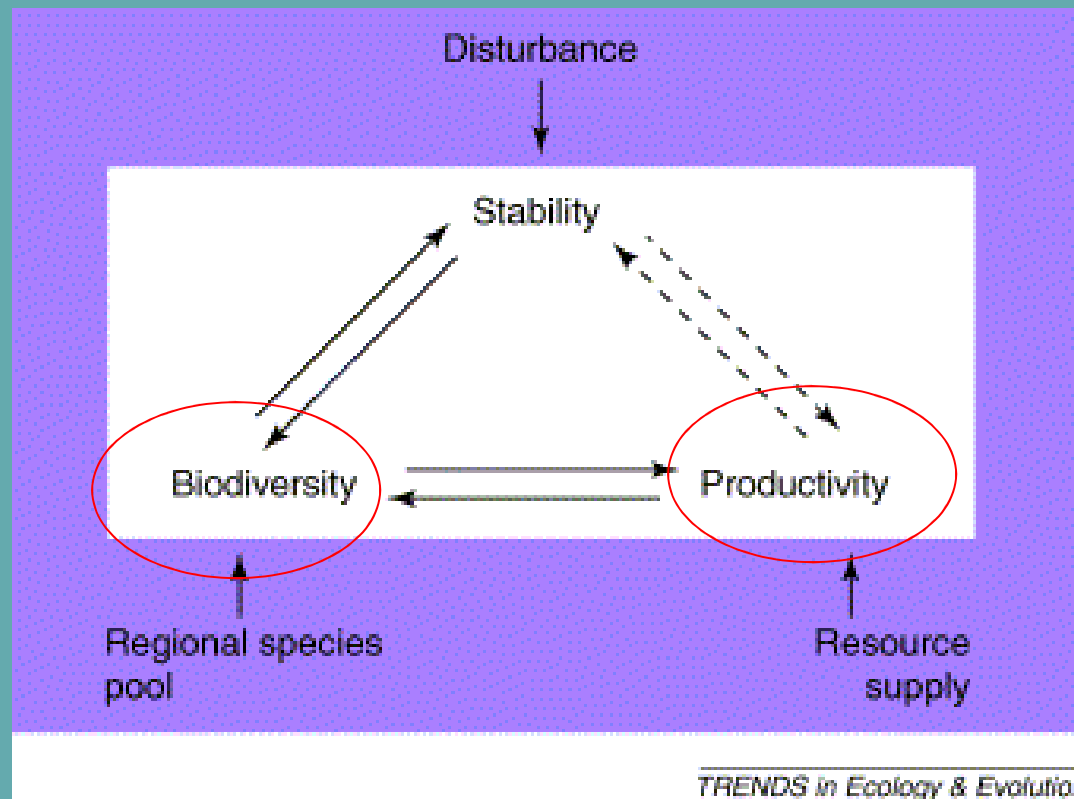
Oxygen trends

Tsoukalio
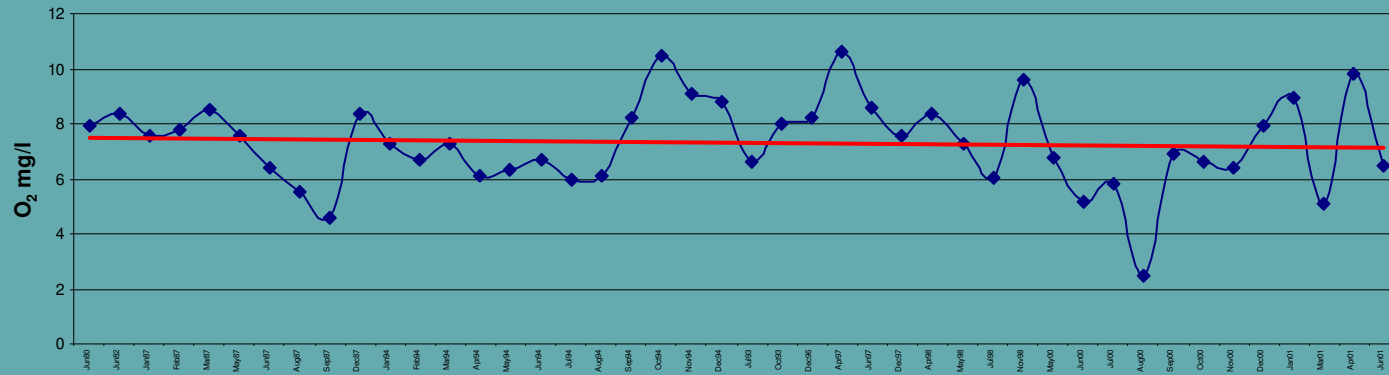
Rodia

Logarou

Alteration of physico-chemical parameters
Nutrient enrichment
Alien species
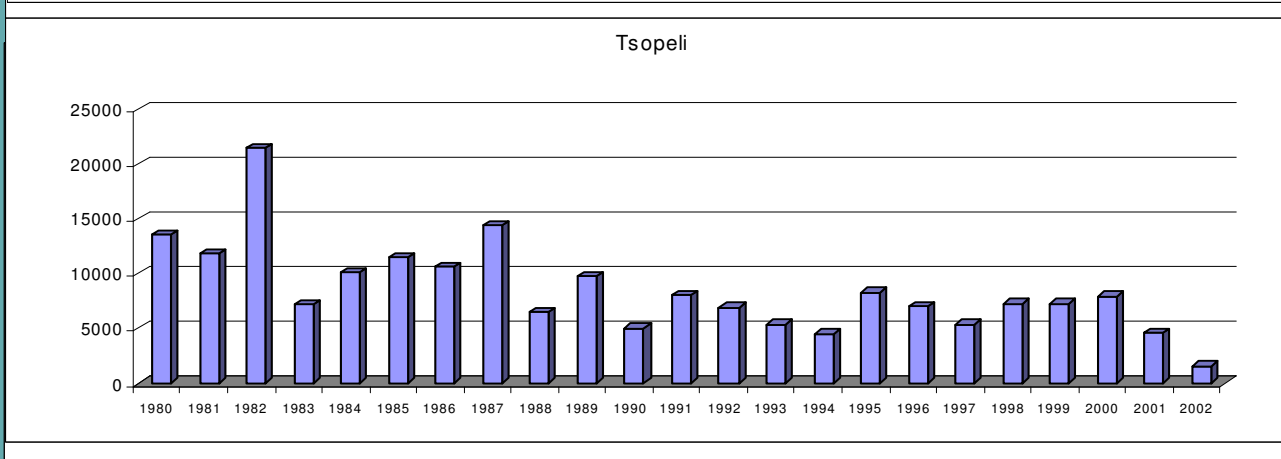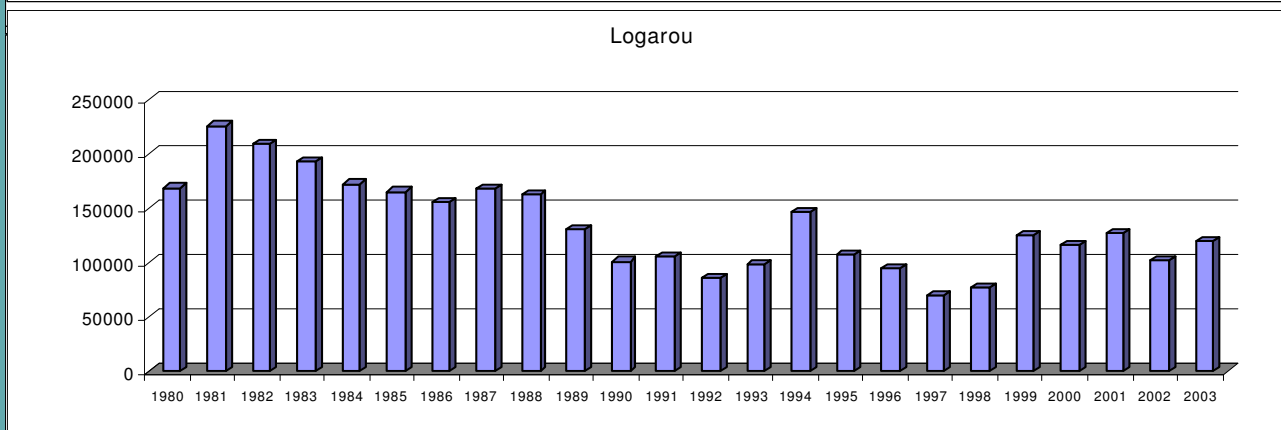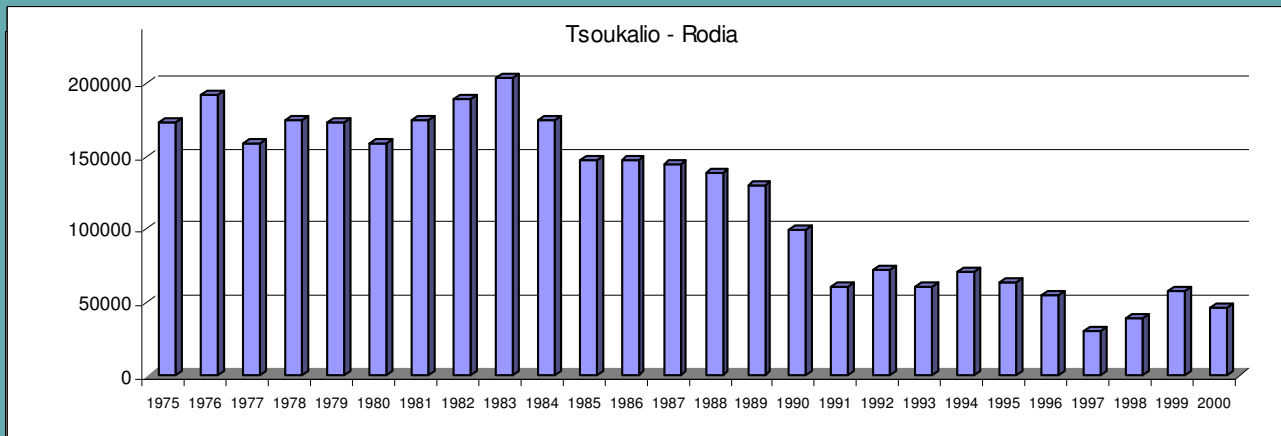Habitat loss

Worm & Duffy, 2003

The diversity and biomass changed in space and time.

nutrient enrichment => replacement of sea-grasses by opportunistic green macroalgae
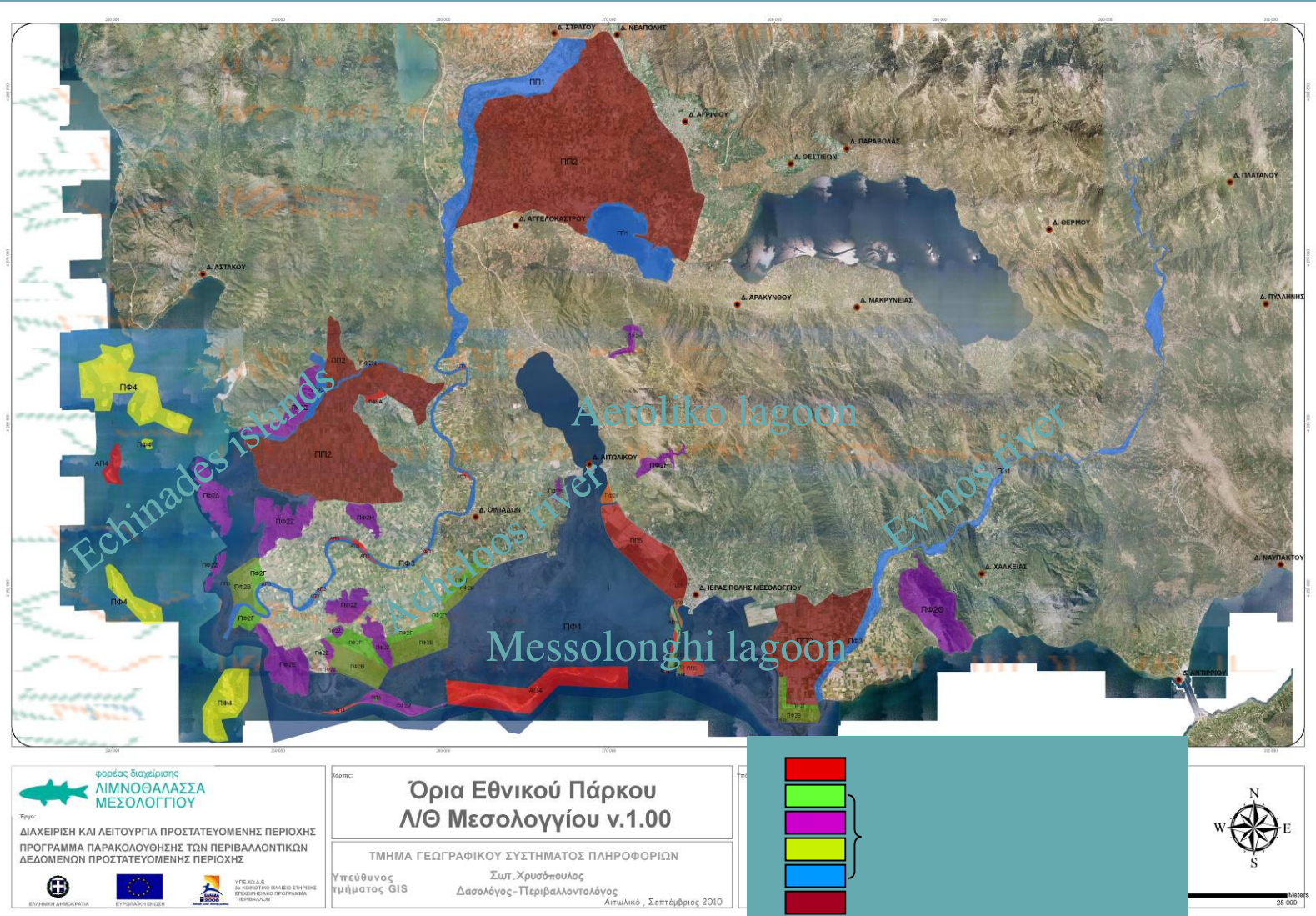

In most lagoons diversity decreased and the algal biomass increased towards the inner fresh water sources.

Fish production

NATIONAL PARK OF MESSOLONGHI-AETOLIKO LAGOONS, ESTUARIES OF ACHELOOS, EVINOS AND ECHINADES ISLANDS
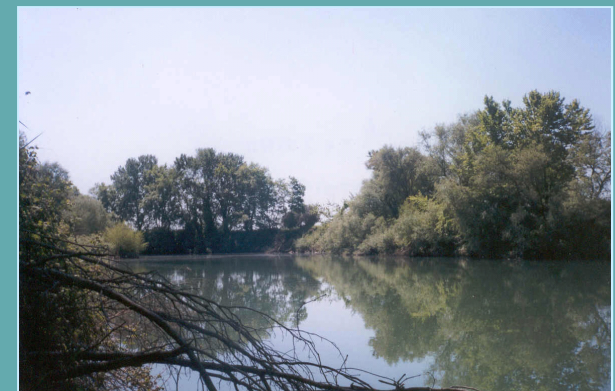
The centre of the National Park is the lagoons complex (~150000 acres - ~40% of the Greek lagoons)

Salt-marches & wetlands

Rivers & estuaries

Aquatic & riparian forests…..

Sand dunes…..

Major threats

- Uncontrolled & illegal waste disposal
- Trespassing & illegal constructions along the marine front
- Hunting (even inside the absolutely protected areas)

• Illegal and/or extensive sediments excavations from the Acheloos and Evinos rivers beds in combination with the construction of dams in both rivers decreased sediment supply to the deltas

•Destruction/deformation of dunes and sand barriers

Conservation Measures

In general the conservation measures and the management bodies in Greece have often been proved insufficient due to:

- Lack of funding

- Coordination issues

- Lack of establishment of well defined Integrated Coastal Zone Management schemes and Marine Spatial Planning

- Conflict of land and sea users

|	Ecosystem Services Lost
Food	Dramatic decline and/or total loss of fish stocks in the lagoonal and adjacent marine environment
Fresh water	Decline of water retention and purification capacity, due to loss of wetland habitats River damming: Reduced fresh water input and sediment input Decline of ground water quantity and quality
Water regulation	Declined capacity to regulate peak flows during floods due to loss of wetland habitats

Expected sea level rise in the next 100 years
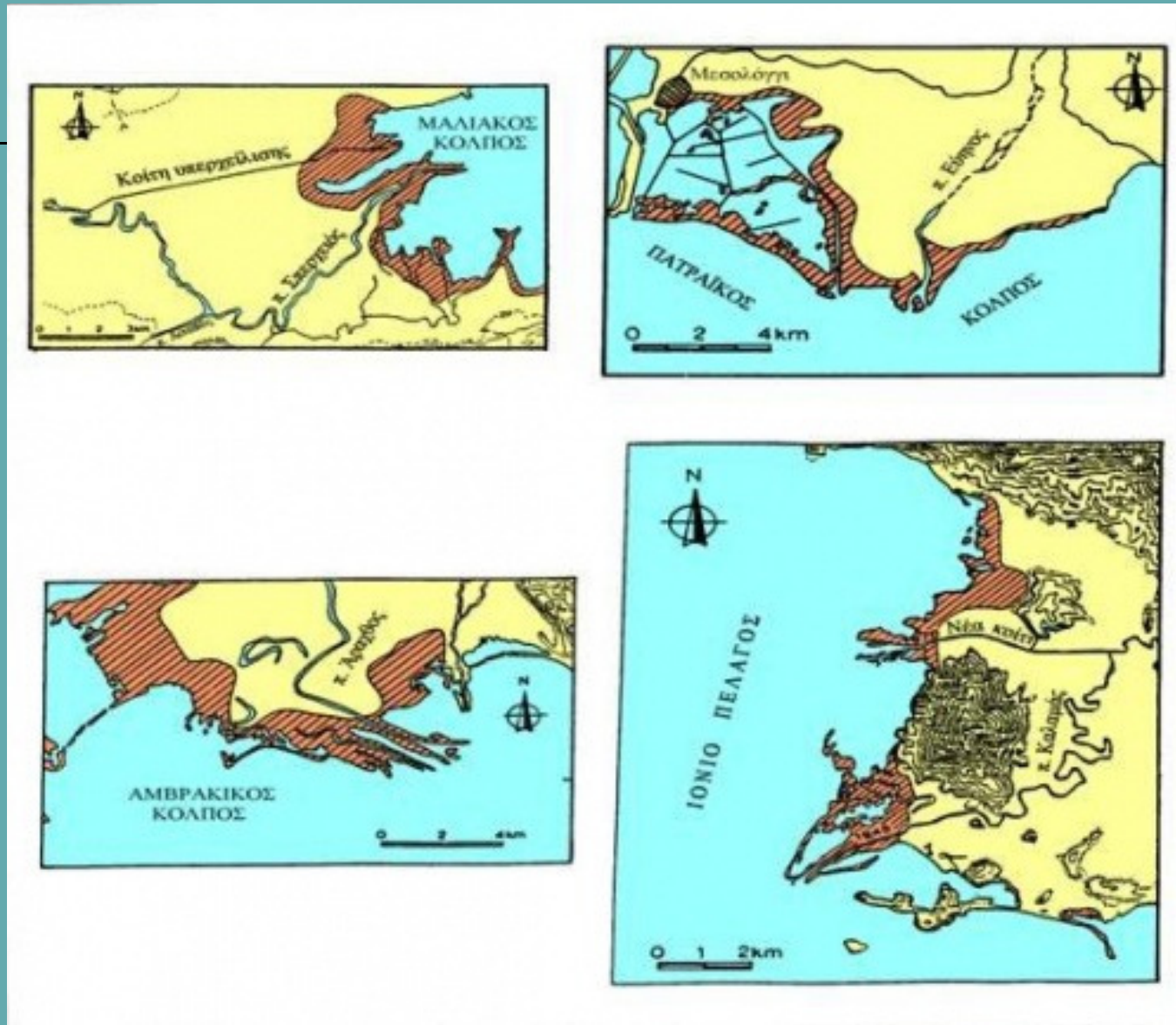
About 307 km² of land will be lost by the year 2100 (Encora, Pavlopoulos)
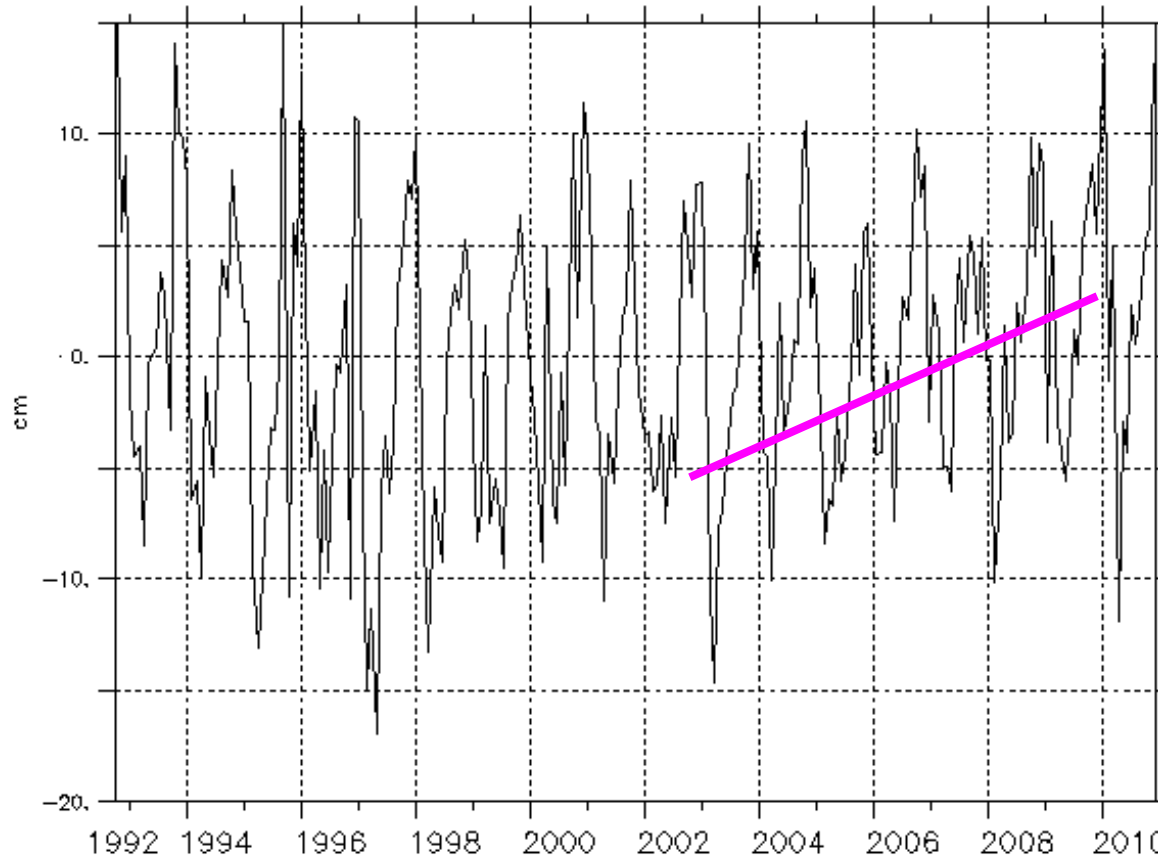
Sea Level changes for the Amvrakikos Lagoons.
There is an evident and persistent positive trend from 2003-2011 of the order of ~1.3 cm/year

WATER FRAMEWORK DIRECTIVE

WFD 2000/60/EC implementation in Greece (HCMR/EKVY/Ministry of the Environment)
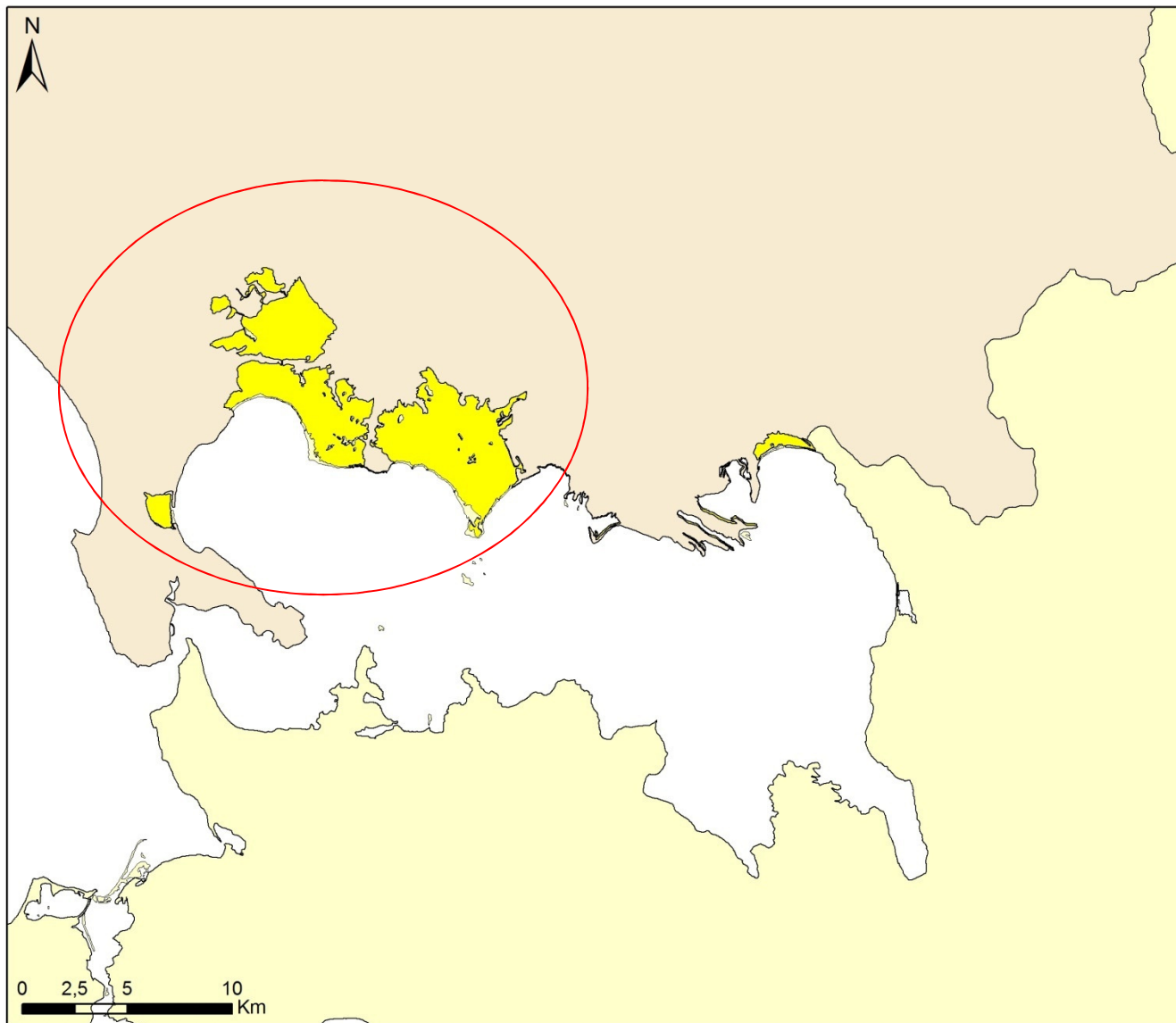
A. CLASSIFICATION OF ECOLOGICAL QUALITY

B. TYPOLOGY & REFERENCE CONDITIONS

C. MONITORING NETWORK DESIGN

TYPOLOGY - TRANSITIONAL WATERS

- Size

- Mean water depth

- Salinity

- Tidal range

- Exposure

- Mixing characteristics

1. Coastal lagoons

2. Deltas / River mouths
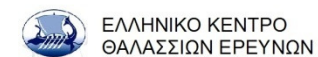
ΥΠΟΜΝΗΜΑ

High

Good

Moderate

Poor

Bad

Unk (unkown)

HM (Heavily modified)

Υ.Δ. 05 - ΗΠΕΙΡΟΣ

ΟΙΚΟΛΟΓΙΚΗ ΚΑΤΑΣΤΑΣΗ
ΠΑΡΑΚΤΙΩΝ & ΜΕΤΑΒΑΤΙΚΩΝ ΥΔΑΤΩΝ

ΕΦΑΡΜΟΓΗ ΑΡΘΡΟΥ 5
ΟΔΗΓΙΑ - ΠΛΑΙΣΙΟ 2000/60/ΕΕ

ΕΛΛΗΝΙΚΟ ΚΕΝΤΡΟ
ΘΑΛΑΣΣΙΩΝ ΕΡΕΥΝΩΝ

ΥΠ. ΠΕΡΙΒΑΛΛΟΝΤΟΣ, ΧΩΡΟΤΑΞΙΑΣ
ΚΑΙ ΔΗΜΟΣΙΩΝ ΕΡΓΩΝ
ΚΕΝΤΡΙΚΗ ΥΠΗΡΕΣΙΑ ΥΔΑΤΩΝ
ΝΟΕΜΒΡΙΟΣ 2008

0   2,5   5   10
                              Km

**WFD TRANSITIONAL MONITORING NETWORK
(34 SITES)**

Selection of quality elements and monitoring frequencies TW in Greece

Quality Element	Proposed frequency
Biological	
Aquatic flora	2/year
Macro invertebrates	2/year
Fish	2/year
Hydromorphological	3years
Physico-Chemical	
Thermal Conditions	4/year
Oxygenation	4/year
Salinity	4/year
Nutrient Status	4/year
Priority Substances	12/year
Other Substances	4/year

Thank you for your attention!