EUROMARINE
EUROPEAN MARINE RESEARCH NETWORK

EUROMARINE 2018 General Assembly meeting

CIIMAR Porto, Portugal 17 – 18 January 2018

FISHERIES AND AQUACULTURE IN TUNISIA : STATUS AND RESEARCH NEEDS

Unité de Recherche وحدة البحث
منظومات بيئية وموارد مائية
ECOSYSTÈMES & RESSOURCES AQUATIQUES
UR03AGRO1

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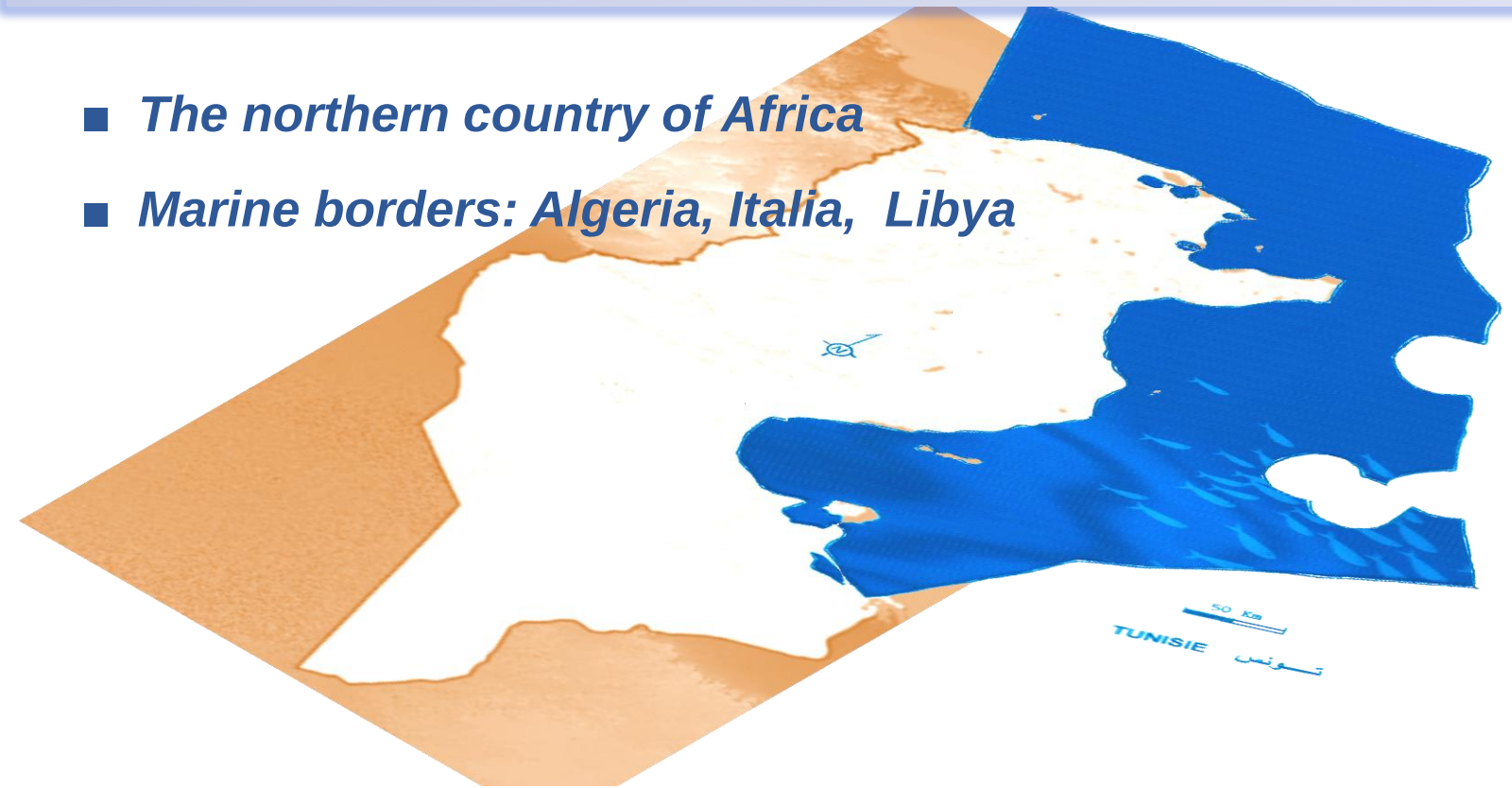
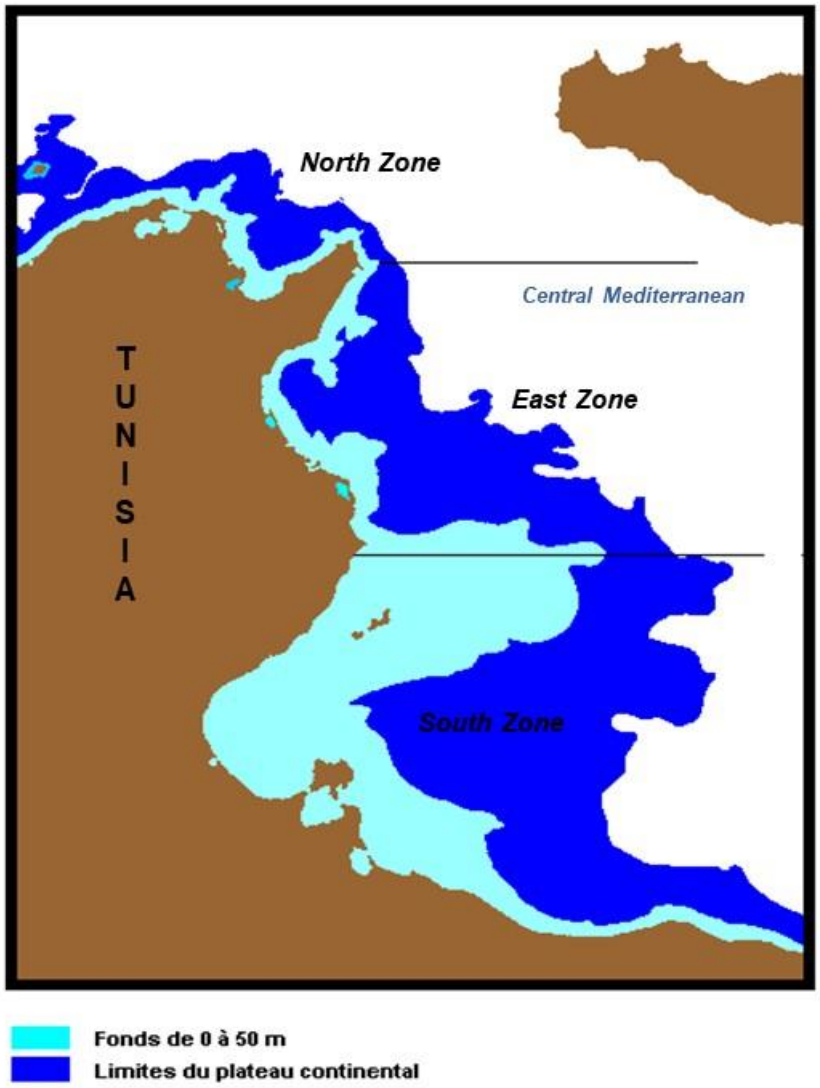
TUNISIAN MARINE AREAS CHARACTERISTICS

- *The northern country of Africa*
- *Marine borders: Algeria, Italia, Libya*



- *Strategic position in the Mediterranean: Navigation, Fishing, Tourism, Migratory Species...)*
- *88,000km² (marine area), Coastal line : 2290 Km*
- *7 Marine and Protected Coastal Areas (MPA), 16 Coastal Wetlands (Ramsar Sites), 13 Coastal Important Bird Areas (IBA)*

TUNISIAN MARINE AREAS CHARACTERISTICS



- **Large continental shelf in the south (isobaths 200 m at 250km Gabes),**
- **Highest tidal zone in Mediterranean**
- **Salinity varies between 37 and 40 psu**
- **Water temperature gradient of 4.3 °C, north to south.**
- **High chlorophyll a concentration in the Gulf of Gabès.**
- **80 to 120 windy day per year (NW Winter, SE Summer)**
- **Marine species 2425**
- **3 fishing zones : North, East and South**

TUNISIAN MARINE AREAS CHARACTERISTICS

North zone and Tunis Gulf

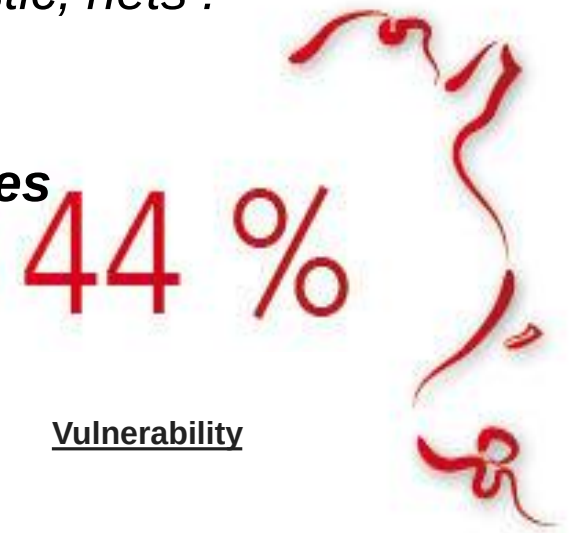
Eutrophication related to sewage (*40 million m3/year)*
Pollution issued from industrials and *harbor zones (660 factories:* ***Tunis-Goulette-Rades, Bizerte)****, with daily sewage of 10 000 m3.*
Navigation corridor ,

East zone and Hammamet Gulf

Urban pressure *, 2 touristic zones 3 marinas,*
Pollution from small factories *(textiles, plastic, nets : Sousse, Monastir, Ksar Hellal)*.

South zone and Gabès Gulf

Pollution*, (240 factories) 3* ***industrials zones*** *(Sfax, Skhira, Gabès),*
Touristic zone (*Jerba Zarzis)*



Vulnerability

BIODIVERSITY AND FISHERIES

190 to 275 fishing target species (fishes, molluscs, crustaceans)

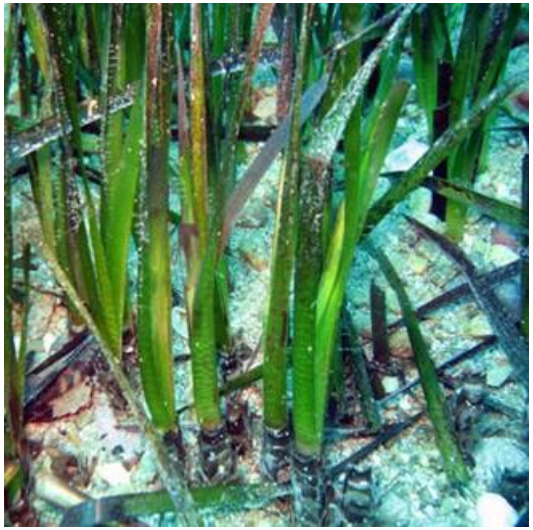
PHYTOPLANCTON

- Dinoflagellates (175 species)
- Diatoms (147 species),
- Cyanobacteria (7species)
- Chlorophycea (7species)
- Euglénophycea
- Dictyochophycea

17 potentially toxic species Gulf of Gabès

Karenia sp **(December 2017)**

BIODIVERSITY AND FISHERIES



MACROFLORA:

- **4 magnoliophyta, *Posidonia oceanica*, *Cymodocea nodosa, Zostera noltii***
- **1 exotic species *Halophyla stipulacea*.**

- **407 algues: 251 Rhodophyta,**
  83 Phycophycea
  73 Chlorophyta

- **Limited and irregular exploitation: manual collecting: *Padina, pavonica, Gracilaria verrucosa,***

- **Aquaculture master plan in Tunisia revealed of 70 potential species.**

BIODIVERSITY AND FISHERIES

ZOOPLANCTON : 398 species

- **69 to 83% Copepods**

ANNELIDS: 234 species

- ***4 exotic species : Ficopomatus enigmaticus, Hydroides dianthus Hydroides dirampha and Hydroides elegans.***
- **Uncontrolled exploitation of Nereids used as bait**

BRYOZOANS : 187 species.

- ***1 exotic species : Tricellaria inopinata.***
- ***no exploited species***

ECHINODERMS: 69 species

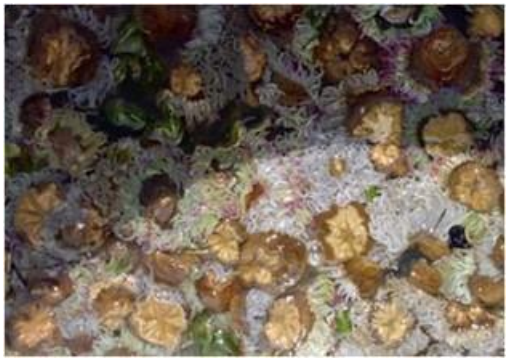
- **1 threatened species *Centrostephanus longispinus***
- **1 traditionally exploited species *Paracentrotus lividus*. (12 Tons/year)**

BIODIVERSITY AND FISHERIES

SPONGARIANS: 143 species

- 6 species are considered endangered or threatened
- *4 species of sponges are exploited , l*ow production over the last decade

Sponges	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Prod.(T)	101	21	20	10	10	15	9	11	23	19	35



CNIDARIANS: 74 species

- 1 exploited species : *Corallium rubrum*
- Uncontrolled exploitation species: *Anemonia sulcata*

Red Coral	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Prod.(T)	6	11	8	5	10	5	4	4	8	11	8

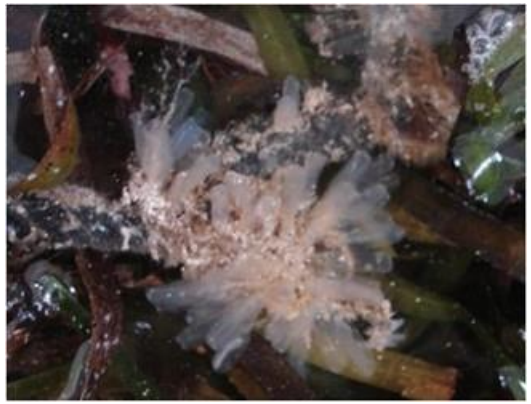
BIODIVERSITY AND FISHERIES

MOLLUSCANS:459 species

- ***265 gastropods, 155 bivalvias, 26 cephalopods, 7 polyplacophores and 6 scaphopods,***
- ***2 aquaculture species mussels and oysters.***
- ***40 potentially exploitable species.***
- ***9 threatened species.***
- ***14 exotic species and***
- ***6 commonly exploited species (octopus, cuttlefish, squid, clam and murex),***

ASCIDIANS: 100 species

- ***2 species are classified exotic.***
- ***Echtinascidia turbinata has been commercially exploited for 4 years (pharmaceutical use)***



Ascidians	2000	2001	2002	2003
Prod. (T)	36801	52226	71320	131211

BIODIVERSITY AND FISHERIES

CRUSTACEANS : 345 species,

- **13 exotic species**
- **10 species in common exploitation (prawns, lobsters and shrimps).**

PISCES : 333 species (endemic, Atlanto-Mediterranean, Lessepsian or cosmopolitan species).

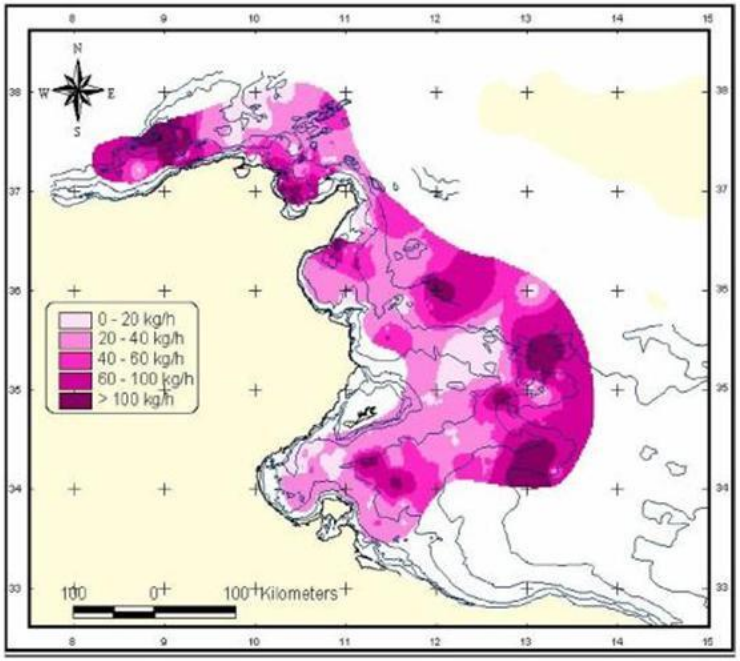
- **169 exploited species**
- **16 threatened species**
- **23 exotic species (some commercial proportions)**

FISHERIES RESOURCES:OPERATIONNAL STATUS

BENTHIC RESOURCES

Wide Variability in hourly yields (trawling), with values ranging from 0 to 131 kg / h.

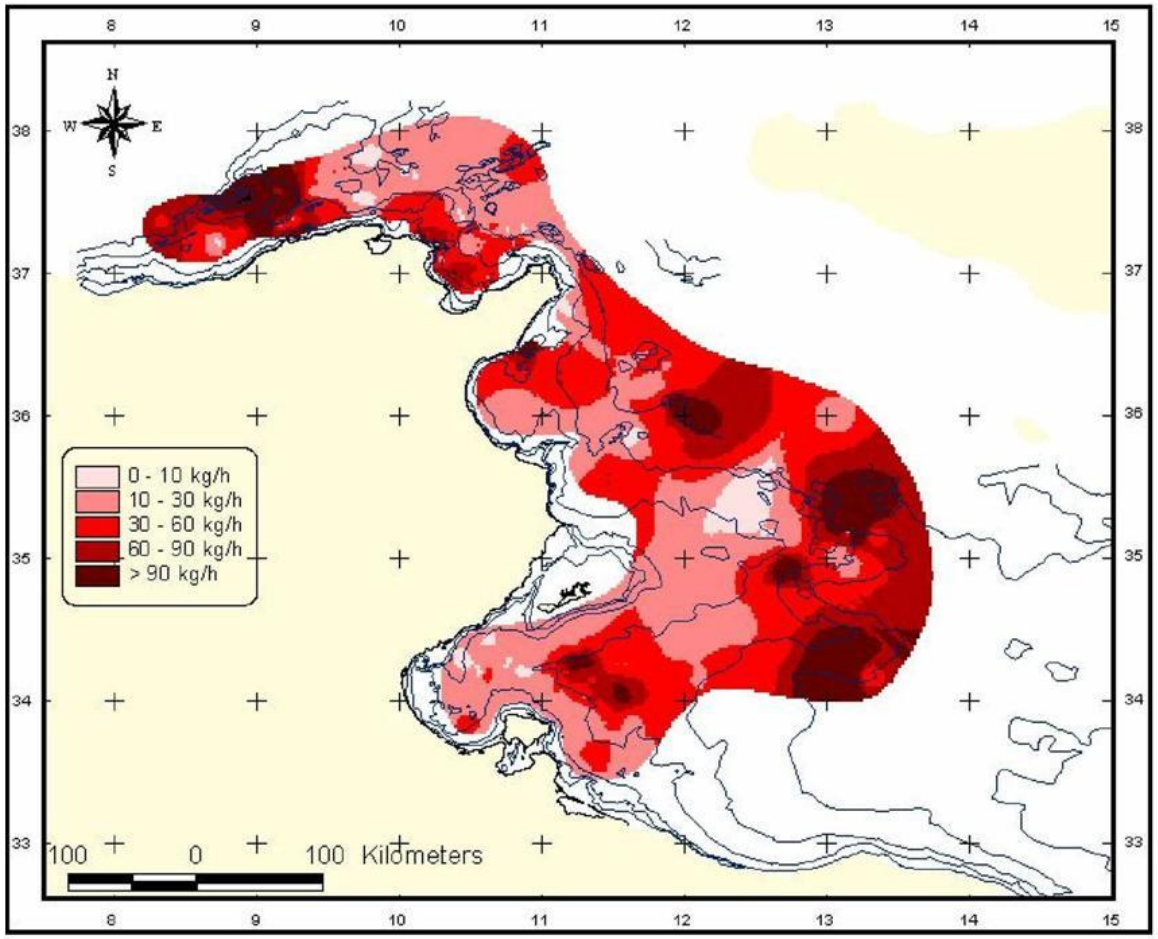
- **Fishes are most represented: 91% (Northern area), 84% (eastern area) and 87% (Southern area).**
- **Crustaceans yields varied respectively as 4%(Northern area), 3% (eastern area) and 3%(Southern area).**
- **Cephalopods catches respectively from 5% (Northern area), 13% (eastern area) and 10% (Southern area).**

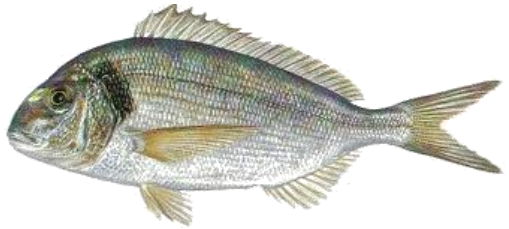


Stocks assessment campaign 2005

The fishery resources in Tunisia have been subject to successive Stocks assessment campaign during the period 1999-2002, 2004-2006 2009 2010 by the National Institute of Marine Sciences and Technologies (INSTM).

FISHERIES RESOURCES:OPERATIONNAL STATUS





Groups of species exploited	
Rays	18
Sharks	14
Fishes	97
Total	129

Commercial hourly yield of fish in Tunisian Fisheries (INSTM 2005)

FISHERIES RESOURCES:OPERATIONNAL STATUS

- Hourly yields of the commercially group are decreasing especially for fish
- The offshore areas remain the most productive.
- Bycatch are generally greater in shallow depths.

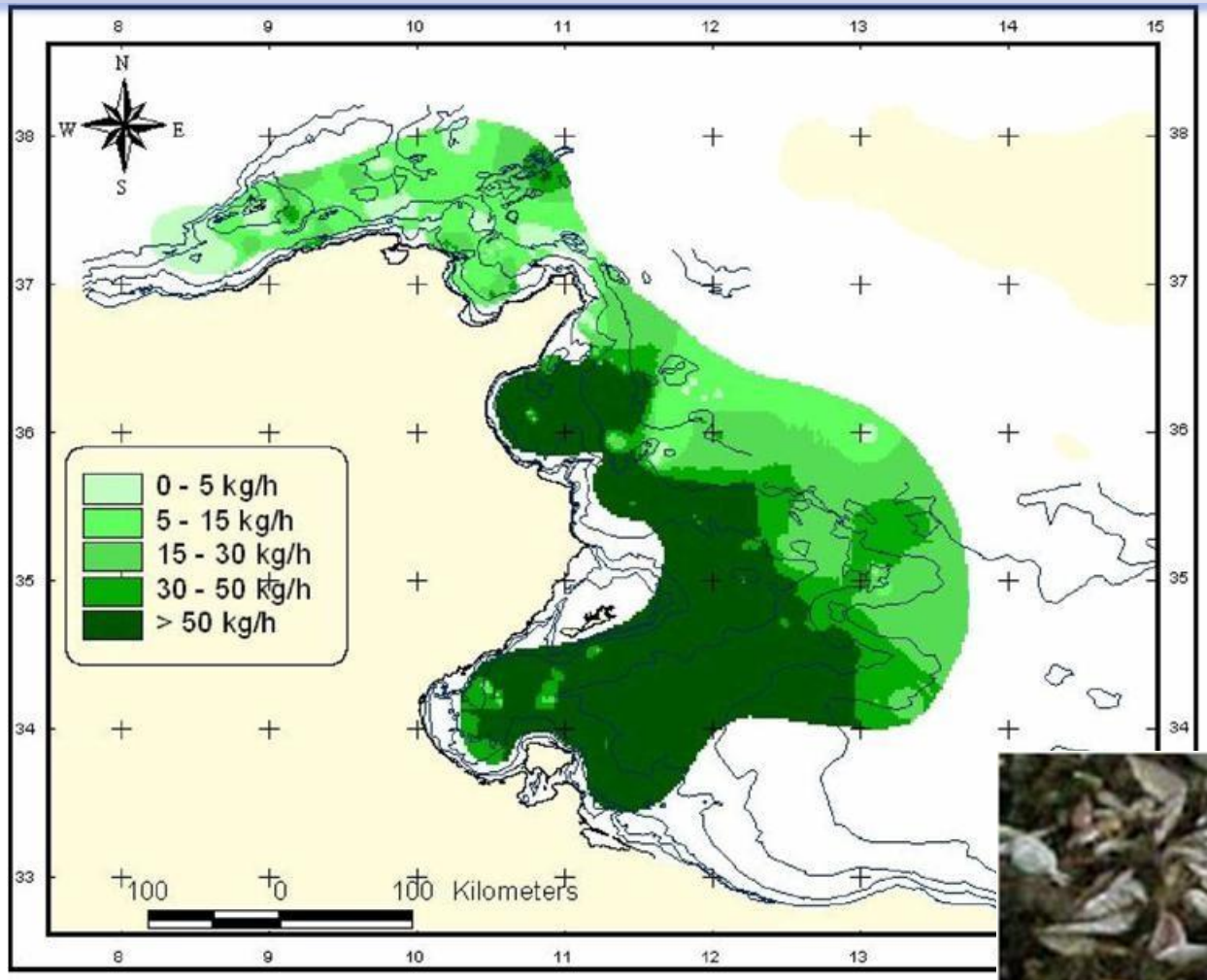
Stock assessment for 18 benthic (demersal) species (4 crustaceans, 4 mollusks and 10 fish)

underfished
Octopus
Caramote prawn
Musked octopus

Optimal fished
Annular seabream
Cuttle fish
White shrimp
Pink shrimp

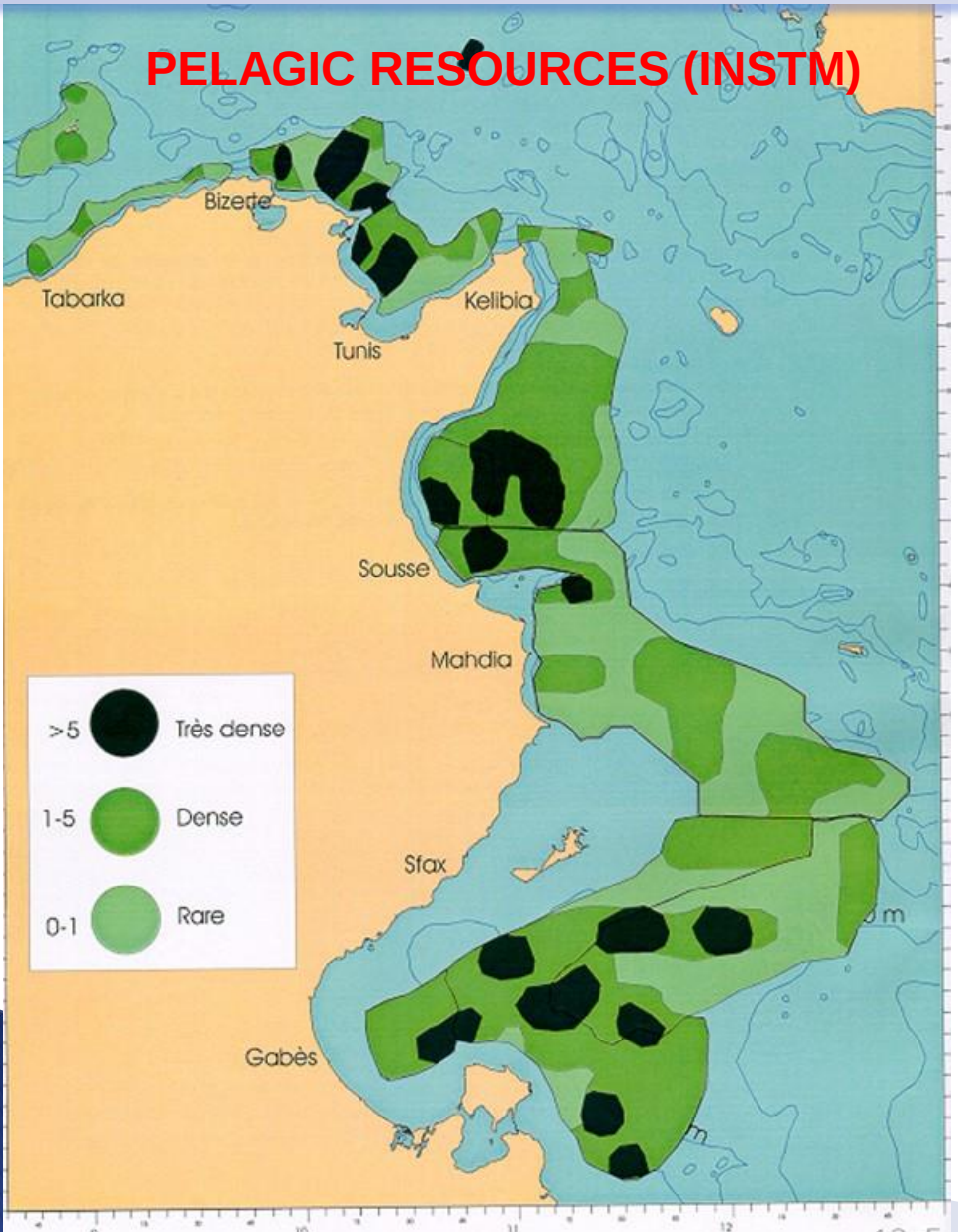
overfished
Pandora
Common seabream
Dentex
Seabream
Red mullet
Striped red mullet
Blue fish
Hake
Barracuda
Squid
Lobster

FISHERIES RESOURCES:OPERATIONNAL STATUS



Mean hourly biomass of discard (INSTM)

FISHERIES RESOURCES:OPERATIONNAL STATUS



latest assessments of pelagic resources reveal significant exploitable biomass till 80000 Tons, This under-exploited resource is related to :

- traditionally frequented areas
- efficiency of fishing gear and techniques used.

Pelagic exploited species(Nbr)	
Large pelagic fish	10
Small pelagic fish	15
Total	25

AQUACULTURE STATUS

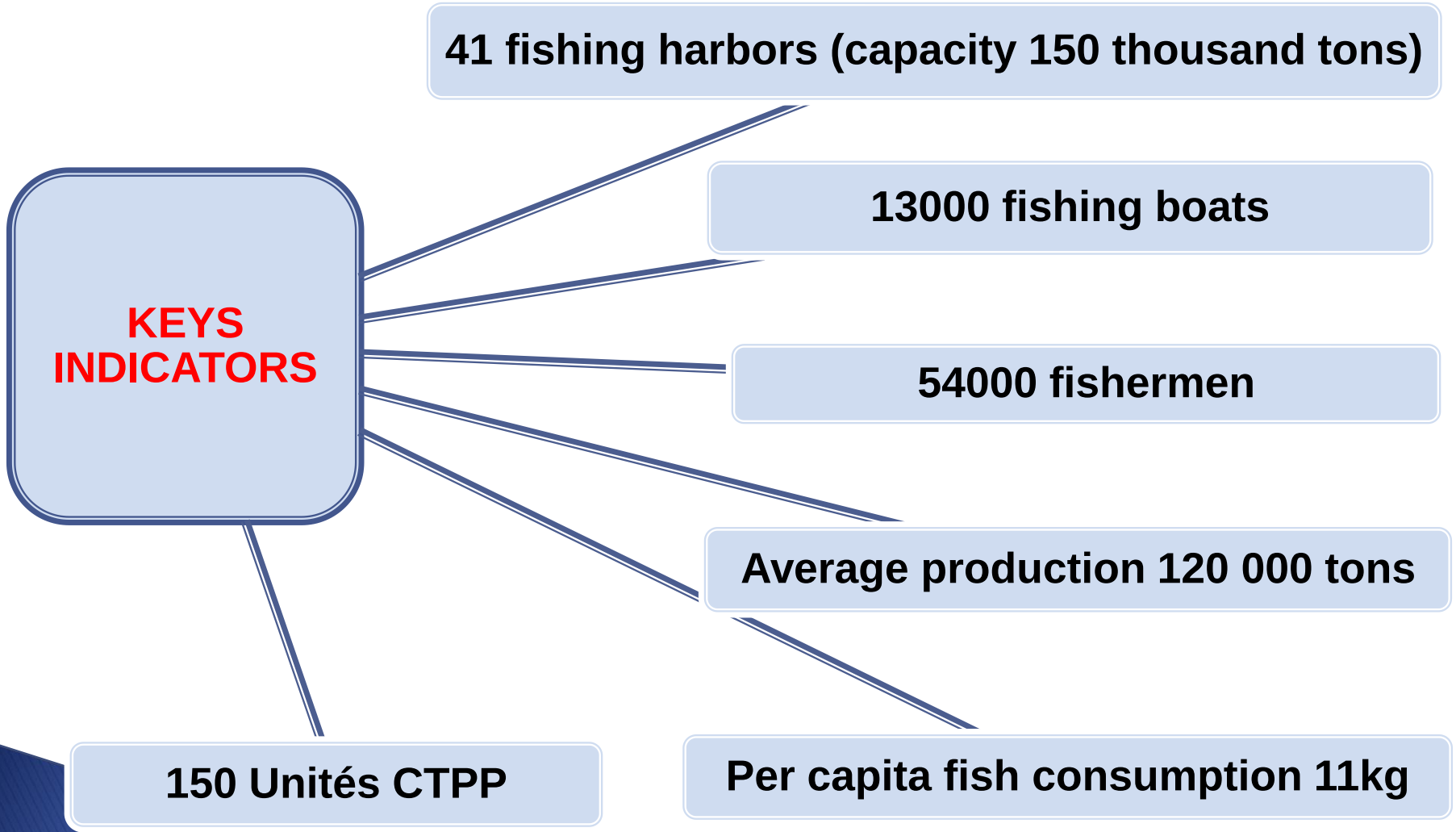
	Farms (Nbr)	Production (T)
Schell farms	14	170
Fish Farms	42	16500

2015		
Fish Fry (x1000)	Importation	80 000
	Local Production	15 000
Fish Food for aquaculture (T)	Importation	27 136
	Production local Production (T)	8 708

FISHERIES AND AQUACULTURE PRODUCTION

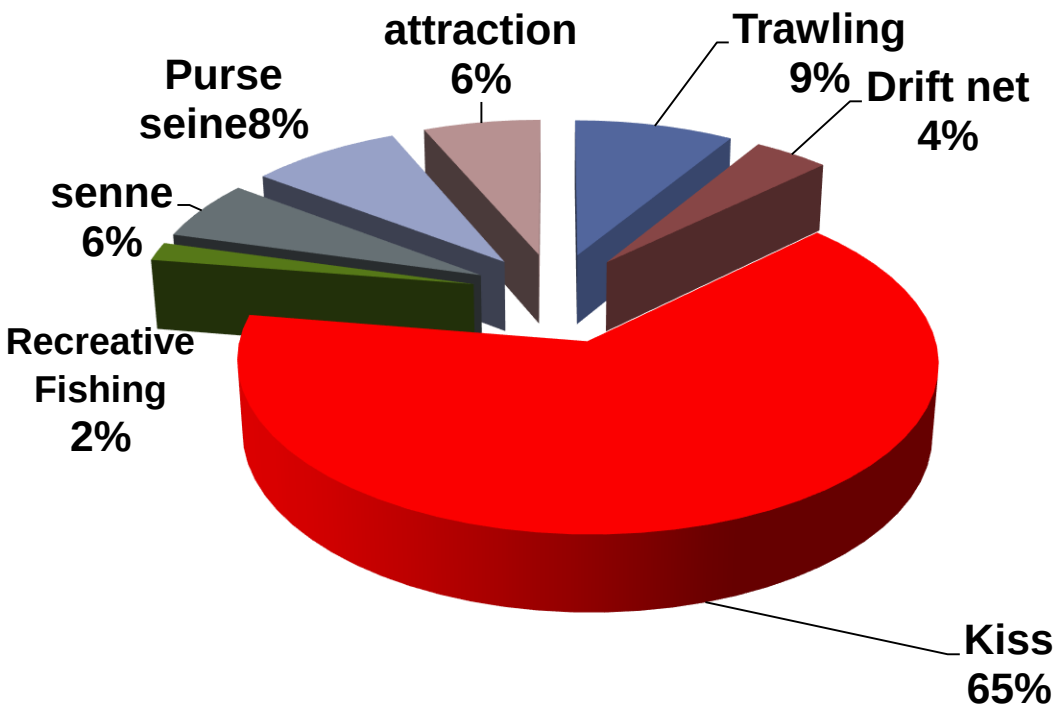
Categories	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Small pelagic	36986	37755	35521	35729	46965	48854	53406	50772	48988	49067	44208	50863	51439	51833	52480	54487	47378
Artisanal fisheries	26086	26060	26971	26208	27444	26979	27003	25759	23578	22662	26640	24705	28577	27734	31812	32110	32347
Bottom trawl	24688	25648	25628	26183	27198	23828	22581	20836	19636	19875	22133	22618	25643	26839	26873	27252	26611
Lagoon	445	583	681	623	546	620	740	750	585	448	404	302	302	392	274	463	550
Thons	4281	5654	3933	1722	3182	3779	2674	2400	2679	2259	1937	1924	1313	1822	1364	1403	1562
Pelagic Trawl	576	509	897	1588	1811	1018	914	481	780	924	1026	750	392	440	360	289	119
Schell fish	973	589	1103	605	597	766	488	615	536	473	433	690	770	1102	1635	1385	1547
Sponges	15	23	44	31	24	33	101	21	20	10	10	15	9	11	23	19	35
Shrimps	52	40	33	55	47	39	34	30	30	36	38	27	33	40	46	55	48
Red Coral	2	2	1	2	3	4	6	11	8	5	10	5	4	4	8	11	8
Aquaculture	1444	1766	1871	2039	2455	2780	2956	3453	3738	4692	5437	7261	9151	11964	11637	14231	16323
TOTAL	95550	98628	96685	94784	110272	108699	110903	105128	100578	100451	102066	109160	117637	122181	126512	131705	126528

FISHERIES RESOURCES:OPERATIONNAL STATUS



FISHERIES RESOURCES:PROBLEMS AND THREATS

Illegal, unreported and unregulated (IUU) fishing:



FISHERIES RESOURCES PROTECTIONS

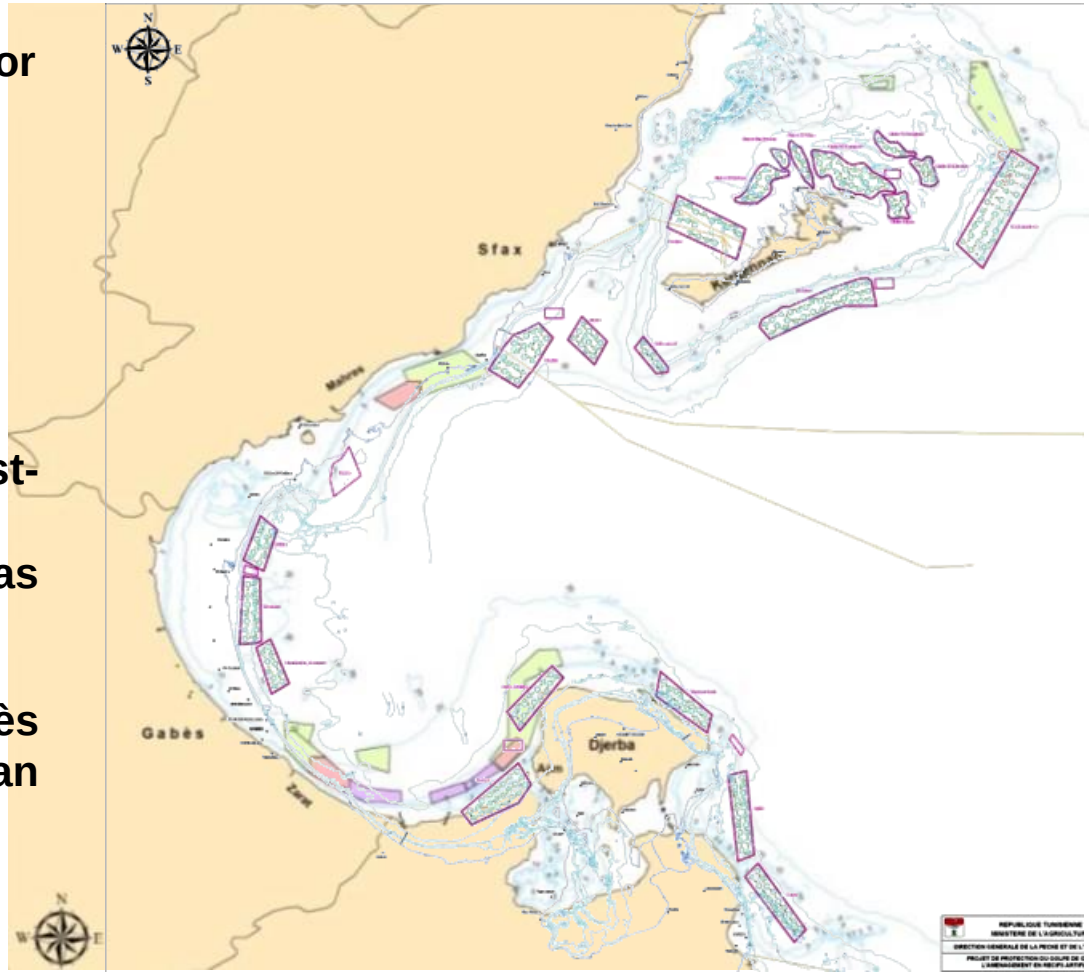
Establishment of fishing ban periods for some stocks (Shrimp, Octopus, Clam, Lobster, Dolphinfish, Sponge, Swordfish, Tuna and Blue fish.),

Implementation of a VMS system (vessels over 15 mTL),

Biological rest : 3 month (July-August-September) since 2009

Marine Protected Areas : 7 MPA areas designed,

Artificial reefs : in the gulf of Gabès 11000 blocks are immersed more than 65000 other in program



RESEARCH PROGRAMS AND PROJECTS (INSTM, INAT)

STOCKS ASSESMENTS AND MANAGEMENT OF FISHERIS

Stock assessment results for 10 species and lagoon stock (2016-2017)
Hake, pink shrimp, octopus, caramote prawn, red mullet, red striped mullet, red coral, Horse mackerel, carp and common roach,
Ongoing operations for other species (database implementation)

Experimental fishing campaigns already achieved 2017 :
Experimental fishing campaign in the North Region (May-June 2017) (75 trawling operation).
Stock assessment of clams in zone G2 (200 samples)

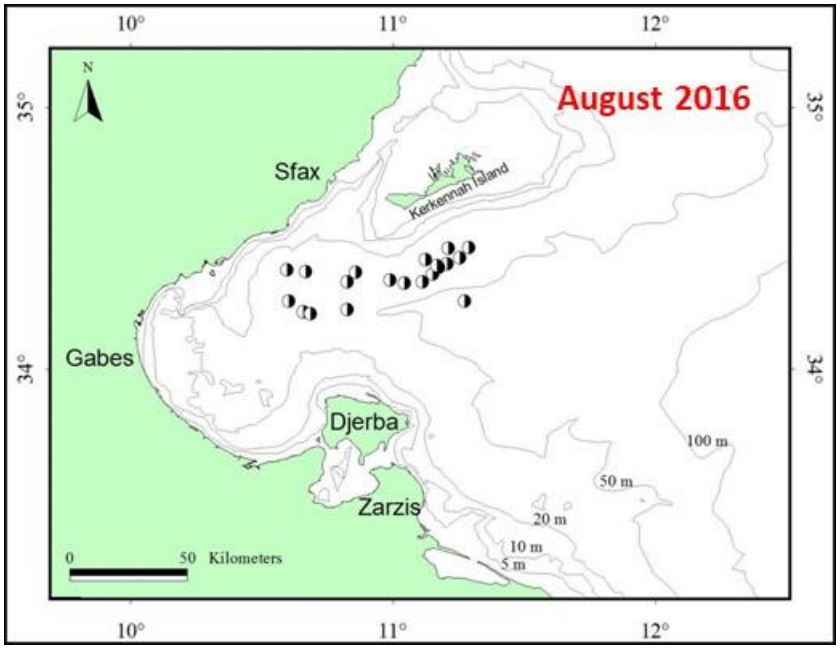
- Biological studies already done: Octopus, Caramote prawns, blue crab, sole, hake, red coral, crabs
- continuous sampling and update of the demographic structures of the main species (in the different ports)

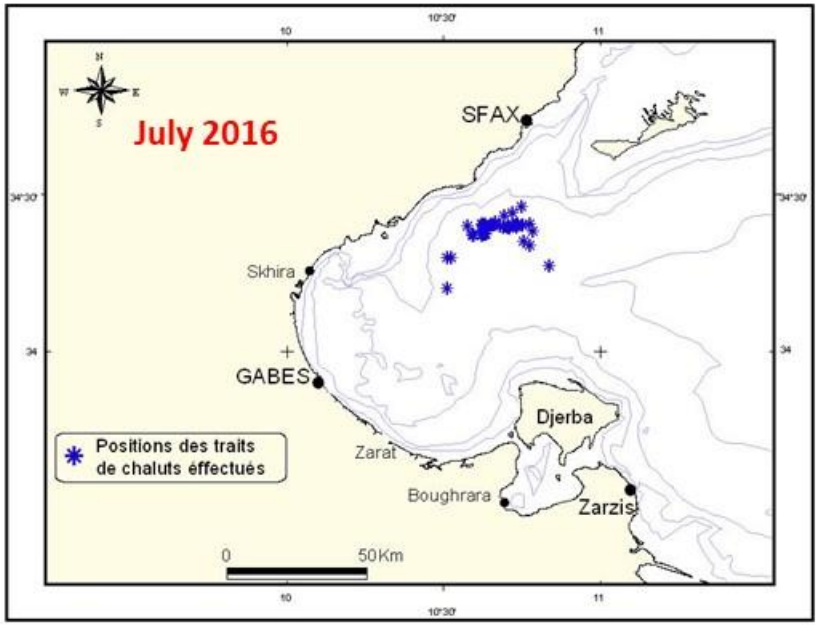
RESEARCH PROGRAMS AND PROJECTS

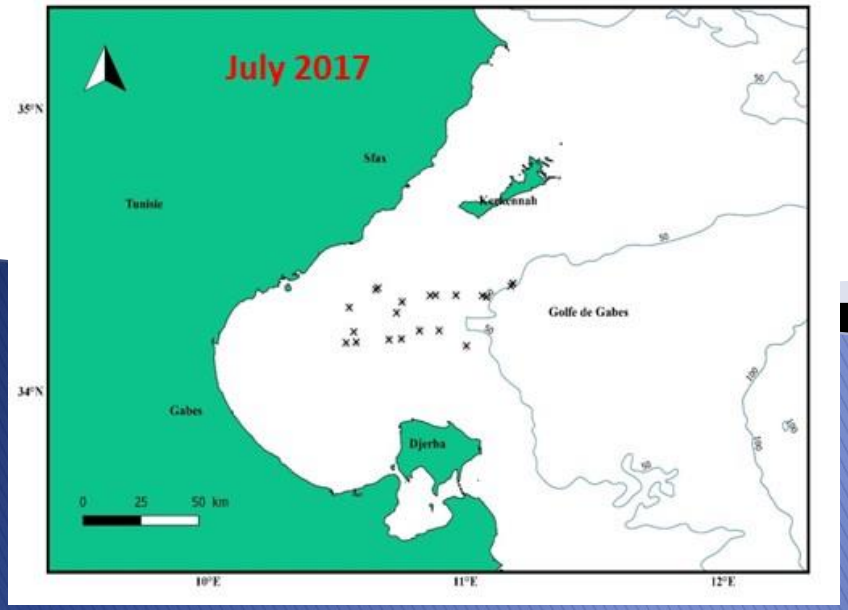
BIOLOGICAL REST

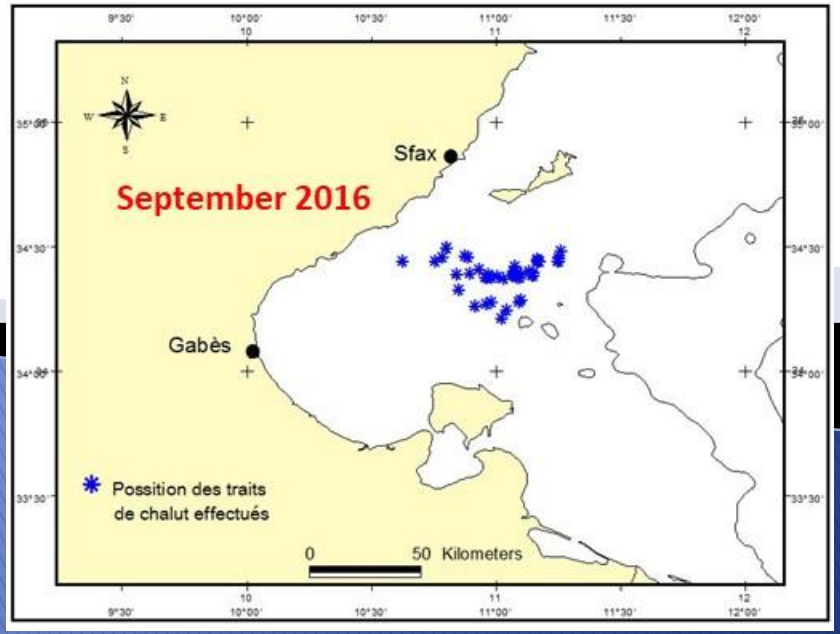
- Biologic rest monitoring (5 campaigns, 110 trawling operation)
- Compilation of survey with 400 fishermen from the Gulf of Gabès concerning the shrimp campaign.
- Monitoring of annual, seasonal and regional trends in landings of the main exploited marine benthic species
- Scientific Opinion on the Usefulness and Impact of Biological Rest on Fish
- Resources and Marine Ecosystems in the Gulf of Gabès (according to 4 years monitoring)
- Development and rationalization of small-scale and artisanal fisheries

Biologic rest monitoring Bottom trawling campaign (2016-2017)









RESEARCH PROGRAMS AND PROJECTS

BIOLOGICAL STUDY OF THE MAIN PELAGIC SPECIES

- Operation in progress to update the biological parameters of the regular species of small pelagics (Sardine, Sardinelle, Anchovy, Mackerel, ...)

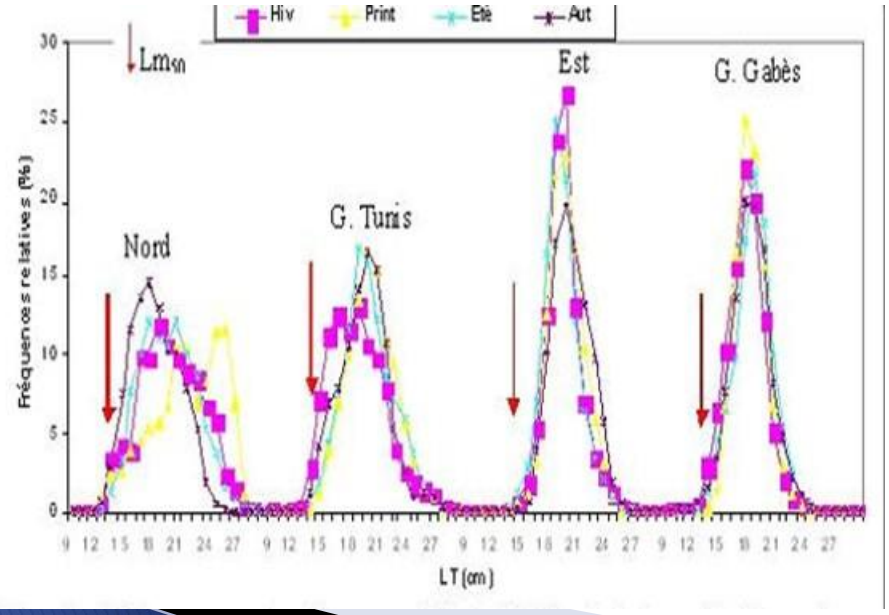
- Biological parameters of the dolphinfish and for theswordfish

- Biological parameters of some freshwater species in dams (roach, carp,)

RESEARCH PROGRAMS AND PROJECTS

STOCK ASSESSMENT AND DATA ANALYSIS

- Data collection of statistical analysis on the effort and production of small pelagic fisheries (Production Models)
- sampling program for major small pelagic fishes (Analytical Models)
- Stocks assessment of fresh waters fish species (inland waters).



RESEARCH PROGRAMS AND PROJECTS

SELECTIVE FISHING GEAR DEVELOPMENT

- Experimentation of traps for blue crab fishing in the Gulf of Gabes
- Monitoring the exploitation of traditional set nets (Charfia in eastern region)

RESEARCH PROGRAMS AND PROJECTS

AQUACULTURE AND SPECIES DIVERSIFICATION

Mugil cephalus (Grey mullet), Pangasianodon hypophthalmus **(Panga) and *Solea vulgaris* (Sole):**

- **Selection and establishment of broodstock**
- **Acclimatization**
- **Induction and control of spawning**

Argyrosomus regius **(meagre) :**

- **pilot test for ongrowing in floating cages**

Oreochromis niloticus **(Nile Tilapia), *Sander lucioperca (*Zander)*:***

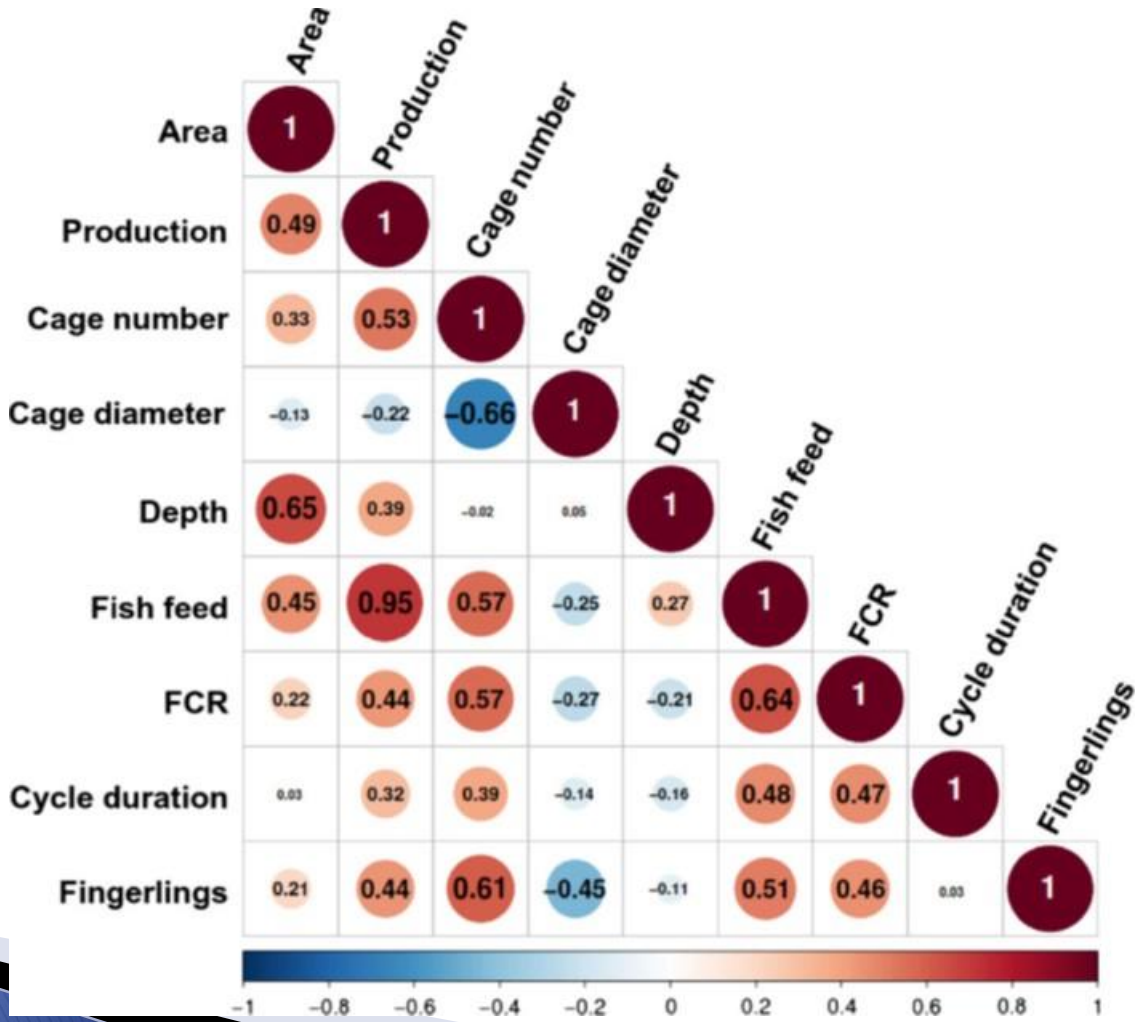
- **Fry production and stock enhancement in reservoirs**

AQUACULTURE AND ENVIRONMENT

- **Improvement of the zootechnical performances of sea bass and sea bream farming.**
- **Pilot project of open-sea integration: bivalve breeding with fish farming**
- **●Environmental monitoring of fish farms: water quality, pathology, sediment and habitats around aquaculture site**
- **Marine Bivalee monitoring program**

RESEARCH PROGRAMS AND PROJECTS

Rearing performances and environmental assessment of sea cage farming in Tunisia using life cycle assessment (LCA)



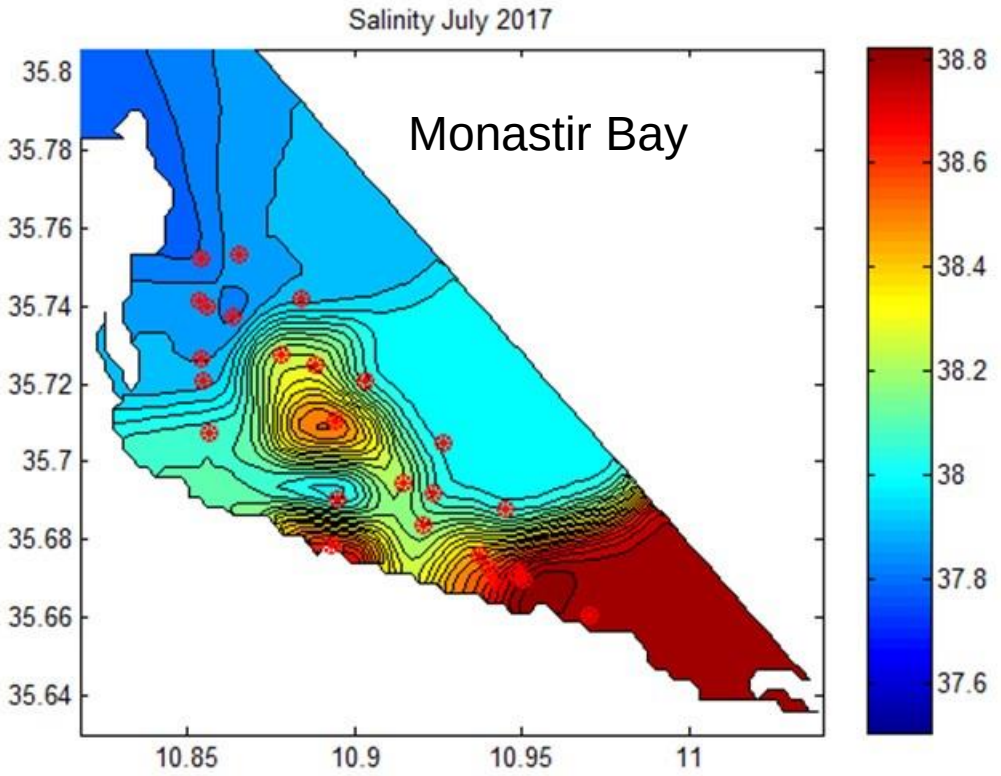
RESEARCH PROGRAMS AND PROJECTS

OCEANOLOGY :

Modelling for management conflicts :

● 16 Offshore fish farms, 5 fish site, 1 Marine protected area, 3 Coastal effluent

● Numerical model to understand the functioning of the bay, the impact of the discharges and the interaction with activities (fisheries aquaculture).



Trophic capacity of the Gulf of Gabes system anthropization impact of on the first links of the food chain.

● Nutriments, ultraphytoplankton, microplankton and zooplankton sampling, numeration and quantification.

● Spatial, seasonal or daily measurements

RESEARCH PROGRAMS AND PROJECTS

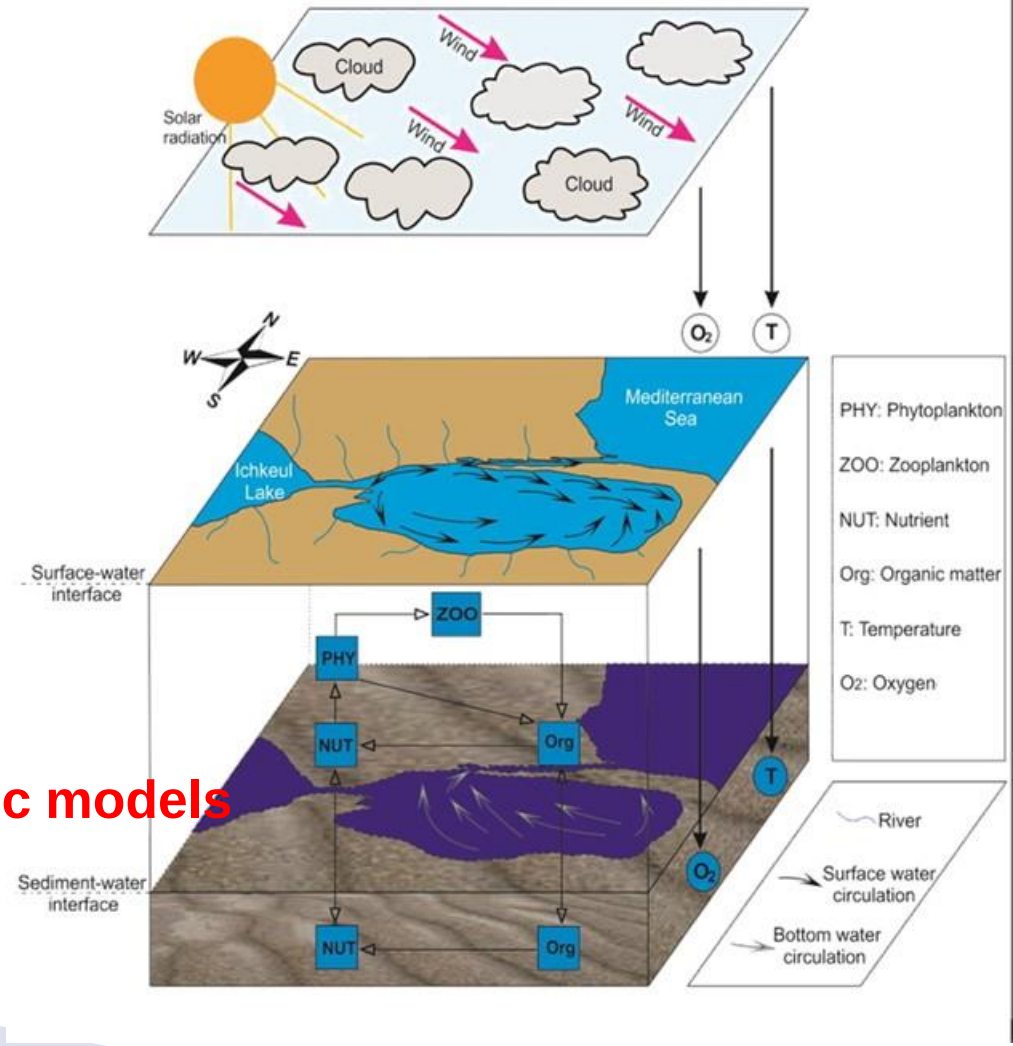
Modeling effects of water and atmospheric exchange : Bizerte and Ichkeul Lagoons

- **Eeffect of external inputs (Atmospheric, Urban, Industrial) and Climate Change on the equilibrium of the lagoons ecosystem**

- **Effect of river inputs, urban discharges, atmospheric inputs as well as water exchange with Lake Ichkeul.**

- **Monthly measurements (water and sediment):T, S, O2, pH, Tr, NO2, NO3, PO4, Chl a, Si…**

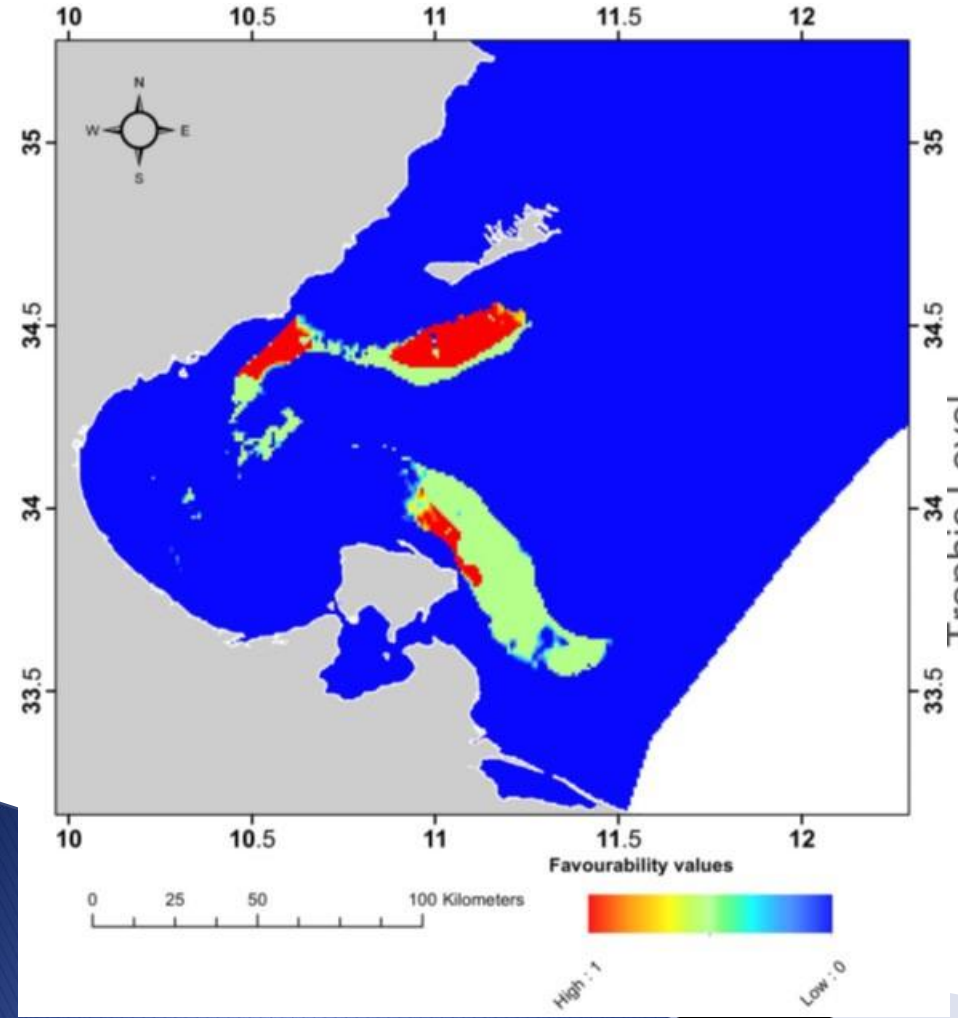
- **Phytoplankton**



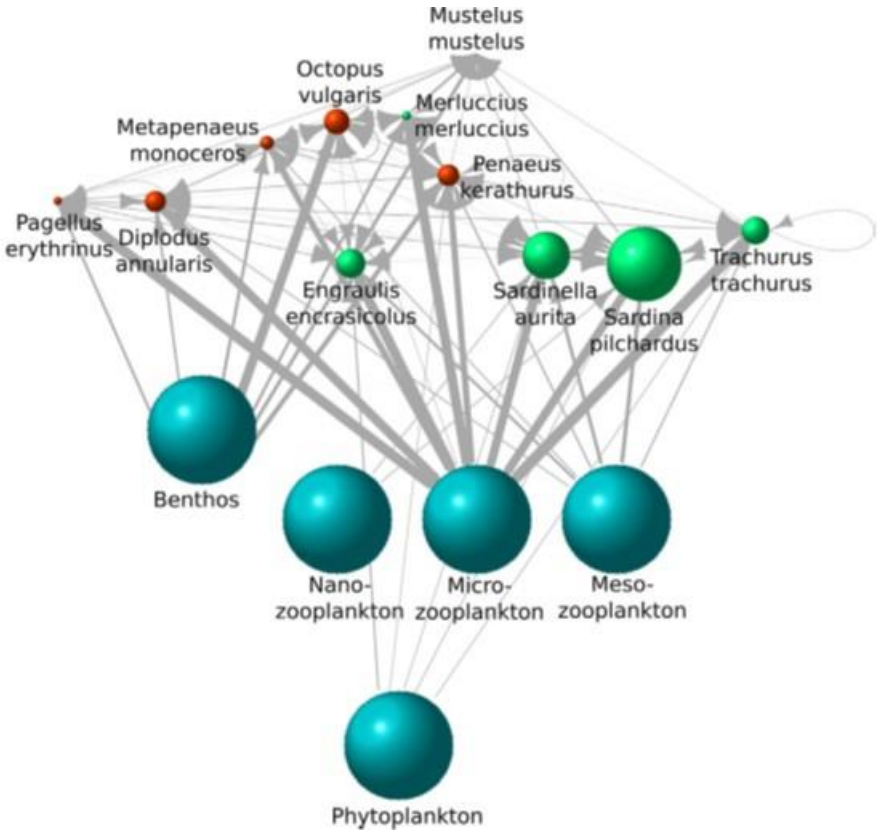
Biogeochemical and atmospheric models

RESEARCH PROGRAMS AND PROJECTS

- **The Use of a Predictive Habitat Model and a Fuzzy Logic Approach for Marine Management and Planning Gulf of Gabès.**



- **Modelling food web structure using an end-to-end approach in the coastal ecosystem of the Gulf of Gabes (Tunisia).**



RESEARCH PROGRAMS AND PROJECTS

MARINE BIODIVERSITY

- **implementation of international conventions ratified by Tunisia and the Mediterranean action plans elaborated in the framework of the Barcelona convention (Barcelona, Bonn, Bern, ACCOBAMS and CBD)**

- **Sea turtle program, Beaching of Marine turtle and cetaceans, Longlines by catch…**

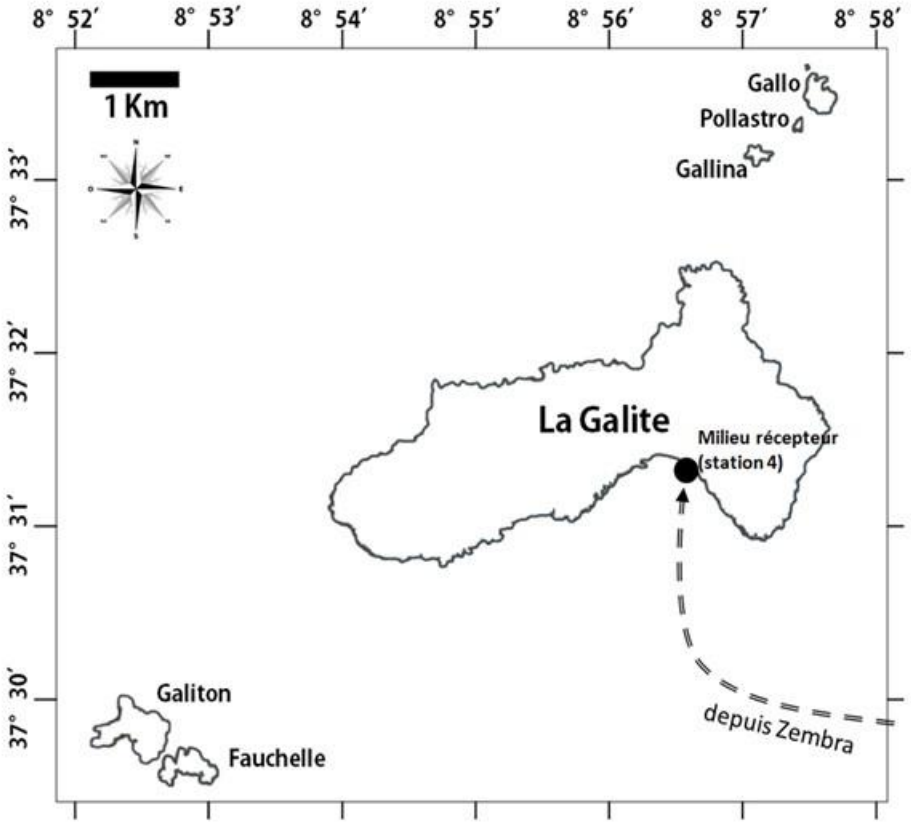
- **Impact assessment study and Monitoring: fish farms impact, bottom trawling using multimarkers uses, Posidonia and coralligenous habitats.**

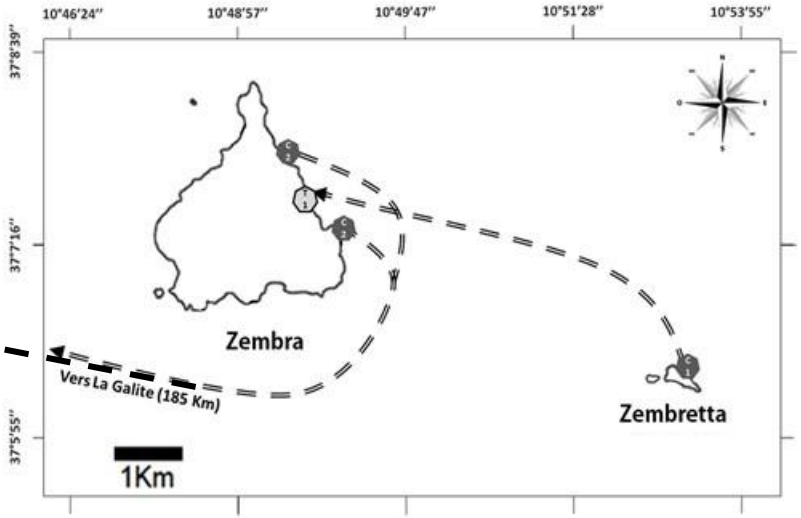
- **INDICIT (Implementation Of The Indicator Of Marine Litter On Sea Turtles And Biota In Regional Sea Conventions And Marine Strategy Framework Directive Areas),**

RESEARCH PROGRAMS AND PROJECTS

First reintroduction of *Patella ferruginea* (EN) across Tunisian MPA

- Translocation from Zembra to la Galite acclimatation, Transport, monitoring





RESEARCH PROGRAMS AND PROJECTS

.....OTHER RESEARCHS AXIS

- Valorisation of fishery and aquaculture products
- Seafood quality and Traceability
- Fish population genetics
- Microplastics
- Water pollution
- ....

Fisheries and aquaculture vs. research needs ?.

MAIN OBJECTIVES OF THE NATIONAL STRATEGY FOR FISHERIES AND AQUACULTURE (2016-2026)

☑ **Strategic Objective 1:**
Preservation and efficient exploitation of fisheries resources

☒ **Strategic Objective 2:**
Improving the competitiveness of fisheries and aquaculture products

☒ **Strategic objective 3:**
Promotion of services to professionals

☑ **Strategic Objective 4:**
Promotion of aquaculture activities

Thank you