

# MEDITERRANEAN CAGE AQUACULTURE

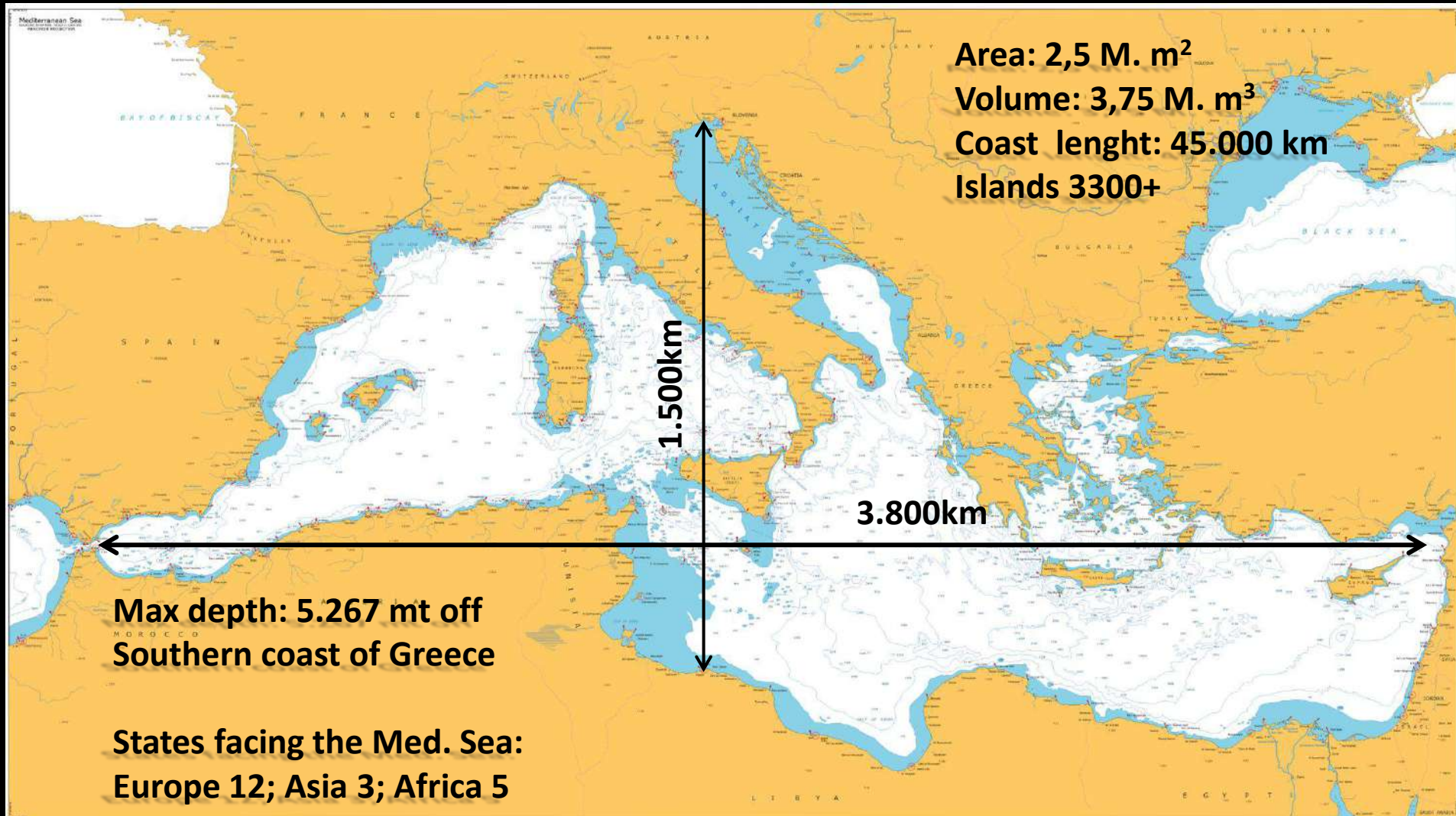
## Latest development and selected technical considerations in Seabass and Seabream farming

**Dr Alessandro Ciattaglia**

**BADINOTTI GROUP spa**



## MEDITERRANEAN SEA SHORT DATA FACTS

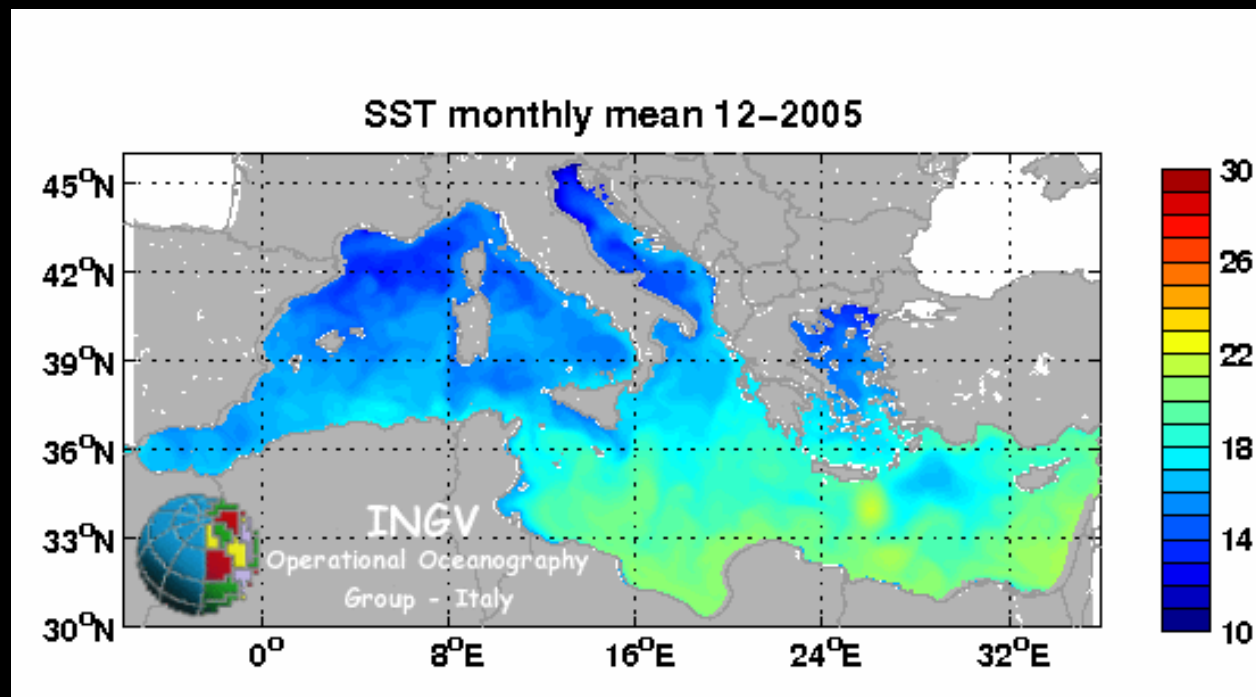


## MEDITERRANEAN SEA SHORT DATA FACTS

Source: INGV - Italy

Mediterranean sea is a closed basin.

According estimation, the entire water volume takes over a century to be completely renewed, through the 14 km wide and 300 mt deep Strait of Gibraltar.



The limited water inflow and high evaporation make the Mediterranean saltier than the Atlantic Ocean.  
Sea surface temperature:

- Minimum average 10°C in winter in North Adriatic Sea;
- Maximum average 28-30°C in summer around the south eastern shores.



# Cage farms locations along the Mediterranean coast line using Google Earth Images



Source: Fish Farms at Sea: The Ground Truth from Google Earth – 2012 - Fisheries Centre, University of British Columbia, Vancouver, British Columbia, Canada

## Example image from Google Earth showing a fish farm off the coast of Greece



Source: Fish Farms at Sea: The Ground Truth from Google Earth - 2012

“Google Earth satellite images were available for **91%** of the entire Mediterranean coast line.

**248** tuna cages (circular cages  $\varnothing$ 40 m diameter and **20.976** other fish cages have been identified and counted within 10 km offshore, the majority of which were off Greece (49%) and Turkey (31%).”

Country	N° of cages	The closest cage to the shore (mt)	The farthest cage from the shore (mt)	Average cage/net area (m <sup>2</sup> )	Estimated fish density (kg/m <sup>3</sup> )	Ratio of production Sea bream to Sea bass	Estimates of farming cycle Sea bream/Sea bass (months)	Production estimate assuming 50% of cages in production (ton)	Production estimate assuming 100% of cages in production (ton)	Production estimate assuming 75% of cages in production (ton)	Reported production to FAO for 2006 (ton)	Difference between Production estimate 75% and FAO 2006 (%)
Greece	10.422	25	316	130	15	1,3 : 1	13/15	69.213	138.426	103.819	79.534	23,39
Turkey	6.512	12	393	205	15	0,7 : 1	12/14	54.588	109.115	81.836	69.071	15,60
France	1.213	67	988	55	12	0,5 : 1	16/18	1.339	2.678	2.008	5.130	-155,48
Italy	912	20	2.300	217	12	0,9 : 1	15/18	4.691	9.383	7.037	12.740	-81,04
Croatia	751	28	440	240	12	0,4 : 1	16/18	2.912	5.133	3.850	3.422	11,12
Spain	573	240	7.023	700	15	2,2 : 1	16/20	14.125	28.251	21.188	21.350	-0,76
Cyprus	129	450	1.326	405	15	3,2 : 1	13/15	1.915	3.831	2.873	2.470	14,03
Tunisia	92	500	560	298	12	1,3 : 1	13/15	697	1.395	1.046	1.140	-8,99
Malta	52	115	460	142	12	5,9 : 1	13/15	373	746	559	1.096	-96,06
Bosnia Herz.	52	30	47	94	12	1,2 : 1	16/18	126	253	190	183	3,68
Slovenia	38	750	950	60	12	0,0 : 1	16/18	48	96	72	30	58,33
Albania	148	25	230	72	12	1 : 0	16/18	305	611	458	370	19,21
Libya	21	500	580	193	12	0,4 : 1	13/15	183	365	274	230	16,06
Montenegro	28	110	135	29	12	1 : 1	16/18	45	89	67	-	-
Israel	18	20	30	254	12	73 : 1	13/15	262	525	394	2.725	-591,62

Note: Lack of Imagery : 40% of Southern French Coast and Corse and some of the Israelian coast

Source: Fish Farms at Sea: The Ground Truth from Google Earth - 2012



# EUROPEAN SEABASS

*Dicentrarchus labrax*

COUNTRY	PRODUCTION (tons)									
	YEAR									
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Algeria	10	3	3	3	-	1	1.34	14.69	50.5	85.31
Bosnia and Herz.	85	85	47	86	84	100	100	80	80	84
Croatia	1.800	1.500	1.800	1.850	2.000	2.500	2.700	3.000	3.200	2.775
Cyprus	422	447	698	583	590	740	752	703	1.237	1.500
France	3.536	3.700	4.000	4.300	5.585	4.764	3.968	3.204	2.779	3.000
Greece	23.860	42.000	34.000	35.000	45.000	48.000	50.000	45.000	45.000	43.000
Israel	346	251	169	6	36	6	11	1	-	-
Italy	9.000	9.600	9.700	9.100	9.300	9.900	9.800	9.800	9.800	8.700
Libya	-	-	170	170	170	170	170	170	170	170
Malta	50	101	129	205	153	75	97	93	50	50
Montenegro	-	-	-	-	25	39	50	60	60	60
Morocco	325	389	370	845	36	79	29	40	1.8	64
Slovenia	25	55	78	25	30	15	50	64.6	41.6	56.2
Spain	3.179	4.529	4.700	5.492	8.930	10.480	9.840	13.840	12.495	14.370
Tunisia	649	457	466	633	492	793	788	1.370	1.466	2.832
Turkey	14.339	20.982	26.297	37.490	38.408	41.900	49.270	46.554	50.796	43.200

Fonte: FEAP , FAO - FishStat



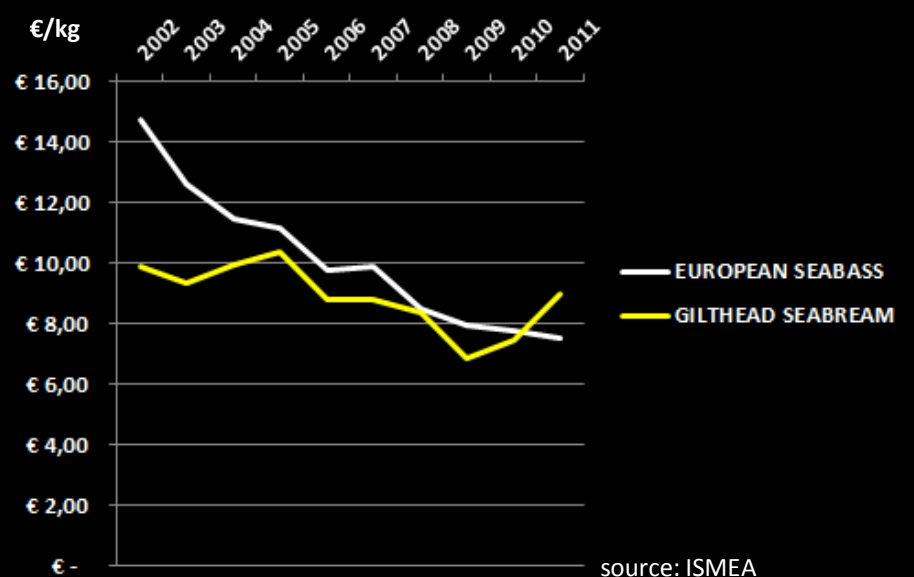
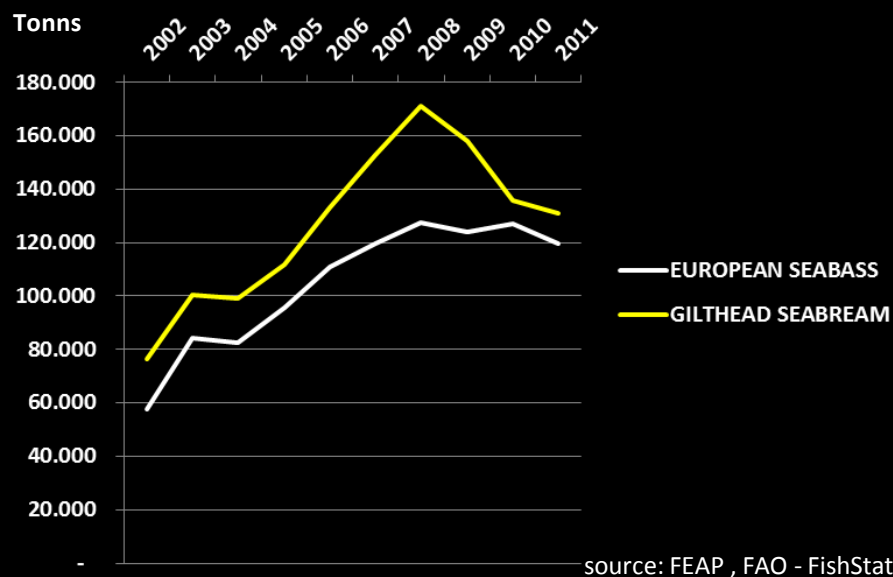
# GILTHEAD SEABREAM

*Sparus aurata*

Country	PRODUCTION (tons)									
	YEAR									
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Albania	200	250	400	250	370	402	343	370	467	375
Bosnia and Herz.	85	85	45	95	99	100	100	100	100	118
Croatia	700	923	1.200	1.200	1.500	1.500	1.800	2.000	2.000	1.719
Cyprus	1.266	1.181	1.356	1.465	1.879	1.404	1.500	2.572	2.799	3.065
France	1.361	1.100	1.600	1.900	2.200	1.392	1.636	1.648	1.377	1.500
Greece	37.944	55.000	48.000	50.000	66.000	79.000	94.000	90.000	74.000	60.000
Israel	2.561	2.546	2.860	3.185	2.641	2.187	2.208	932	1.100	1.300
Italy	8.000	9.000	9.050	9.500	8.900	9.800	9.600	9.600	9.600	9.700
Libya	-	-	61	61	60	60	60	60	60	60
Malta	1.066	827	784	645	894	1.097	1.574	1.984	2.000	2.000
Montenegro	-	-	-	-	25	38	45	55	60	60
Morocco	378	378	350	332	-	-	-	-	35	-
Slovenia	12	16	31	2	-	-	-	-	-	-
Spain	10.964	12.442	13.034	15.577	20.220	22.320	23.930	23.690	20.360	16.930
Turkey	11.681	16.735	20.435	27.634	28.463	33.500	34.000	25.000	22.000	34.000

Fonte: FEAP , FAO - FishStat

	TOTAL PRODUCTION (Tons)									
SPECIES	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
EUROPEAN SEABASS	57.626	84.099	82.627	95.788	110.839	119.562	127.625	123.915	127.133	119.805
GILTHEAD SEABREAM	76.218	100.483	99.206	111.846	133.251	152.800	170.896	158.011	135.958	130.827
	PRICE Euro/kg (Italians Gross Markets: Average values) - source : ISMEA									
EUROPEAN SEABASS	€ 14,77	€ 12,63	€ 11,47	€ 11,14	€ 9,77	€ 9,91	€ 8,48	€ 7,94	€ 7,78	€ 7,55
GILTHEAD SEABREAM	€ 9,88	€ 9,37	€ 9,97	€ 10,39	€ 8,80	€ 8,81	€ 8,36	€ 6,87	€ 7,46	€ 9,01



Crisis in EU started in 2007 generates a drop from 2008 also joined by the rise in supply of bream from Greece and Turkey, the 2 major producing countries.  
 Since 2011 most producers scaled back production, leading to high prices that still now in being.

## OTHER SPECIES IN MEDITERRANEAN CAGE AQUACULTURE



### MEAGRE

*Argyrosomus regius*

High Performing fish:  
1kg/year growth



### ATLANTIC BLUE FIN TUNA

*Thunnus thynnus*

One of the most expensive fish in  
the international market.  
Sea ranching.

# CAGES MODELS USED IN MEDITERRANEAN CAGE AQUACULTURE

## FLOATING CAGE



**WOODEN  
WALWAYS  
ON STILTS  
SYSTEM**



**RIG-SIMILAR  
CAGES  
SYSTEM**



**JET FLOATS  
MODULAR  
SYSTEM**



# CAGES MODELS USED IN MEDITERRANEAN CAGE AQUACULTURE

FLOATING CAGE

HDPE CAGE



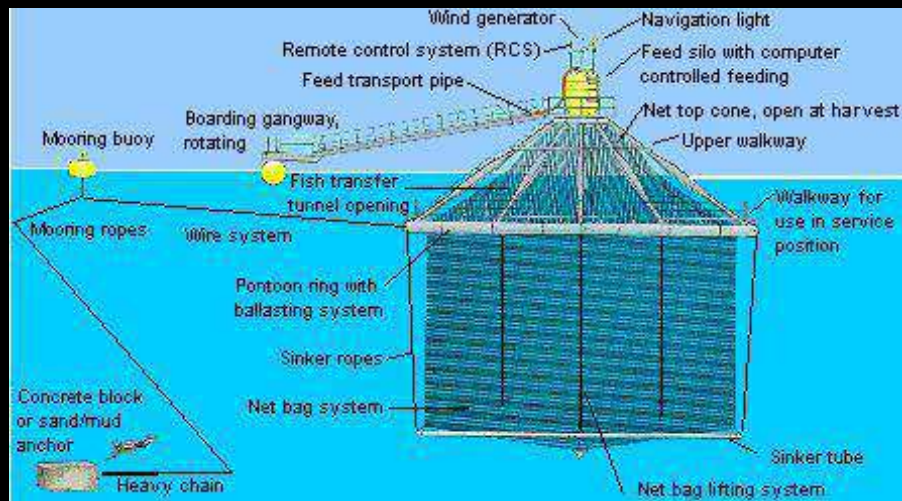
Main suppliers:

Adaq - Italy  
AkvaGroup - Norway  
Aqualine - Norway  
Badinotti - Italy  
Cakir - Turkey  
Fusione Marine - UK  
Hvalpsund - Denmark  
Proteus - Greece  
Stamatiou - Greece  
Pensito Adriatic - Croatia  
Smola - Croatia  
Technosea - Italy



# CAGES MODELS USED IN MEDITERRANEAN CAGE AQUACULTURE

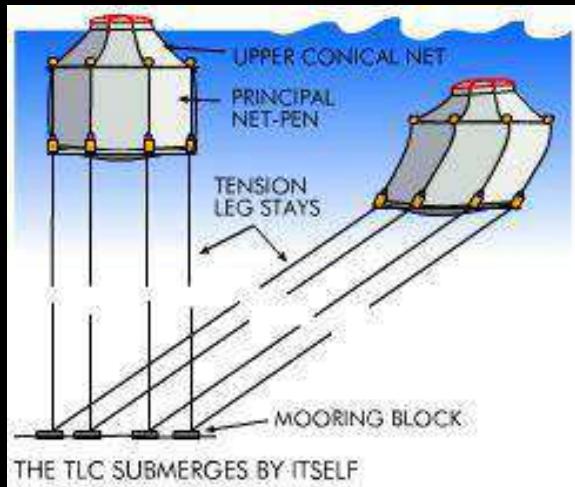
## SEMI-SUBMERSIBLE CAGE



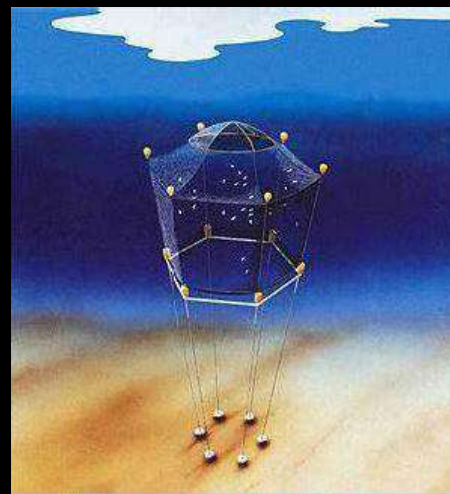
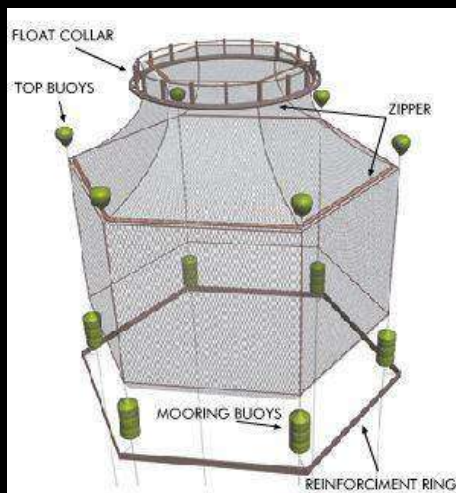
Main suppliers:

Farmoceano – Italy

# CAGES MODELS USED IN MEDITERRANEAN CAGE AQUACULTURE



## SUBMERGED CAGE



Main suppliers:

REFA Med

## CAGES MODELS USED IN MEDITERRANEAN CAGE AQUACULTURE



Main suppliers:

Sadco Shelf – Russian Fed.



# CAGES MODELS USED IN MEDITERRANEAN CAGE AQUACULTURE

SUBMERSIBLE CAGE



HDPE



Main suppliers:

AkvaGroup - Norway  
Badinotti – Italy  
Technosea - Italy

# CAGES MODELS USED IN MEDITERRANEAN CAGE AQUACULTURE

## TUNA CAGES



# GENERAL LAYOUT OF THE MOST COMMON FLOATING CAGE

Circumference (mt)	N° of Brackets
32	12
40	16
50	24
60	24
70	32
80	36
90	48
120	60
160	72



**ROTOMOULDED PE BRACKET**  
8 kg -> 20 kg

**HANDRAIL HDPE PIPES PE100**

**MAIN HDPE PIPES PE100**

Pipe Diamater (mm)	PN UNI EN 12201	Wall pipe thickness (mm)
110	10	6,6
110	16	10

Pipe Diamater (mm)	PN UNI EN 12201	Wall pipe thickness (mm)
200	10	11,9
250	16	14,8
250	16	22,7
315	16	28,6
400	16	36,3



**EXTRA FEATURE: MOORING BRACKET**

## BRACKET MODELS ALTERNATIVES



**ROTOMOULDED PE BRACKET  
2 FLOATING PIPES MODEL**



**INJECTED PP + PE BRACKET  
2/3 FLOATING PIPES MODEL**



**WELDED BRACKET  
2 FLOATING PIPES MODEL**



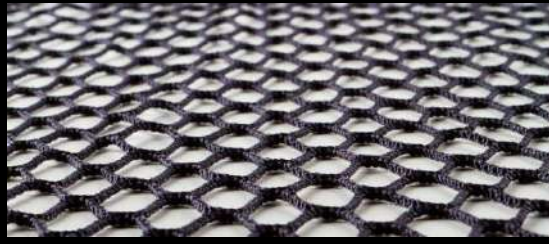
**INJECTED PE BRACKET  
2/3 FLOATING PIPES MODEL**



**HOT DIP STEEL BRACKET  
2 FLOATING PIPES MODEL**



# MOST COMMON NET CAGE MATERIALS



**KNOTLESS  
 NYLON (POLYAMIDE)**



**KNOTLESS  
 NYLON + POLYETHYLENE**



**KNOTTED  
 POLYETHYLENE**



**KNOTLESS  
 POLYPROPYLENE**

# MESH SIZE/FISH SIZE/ B.L.

FISH AGE	FISH SIZE	HALF MESH SIZE DIMENSION	BREAKING LOAD (KG)
Fingerlings	3-5 gr	8-10mm	45kg
Pre-ongrowing Juvenile	10-40 gr	12-13mm	67kg
Intermediate	100-150 gr	15mm	86-93kg
Adult	250-400 gr	18-20mm	94-114kg
AAA	800- 1000 gr	22-25mm	114-132kg

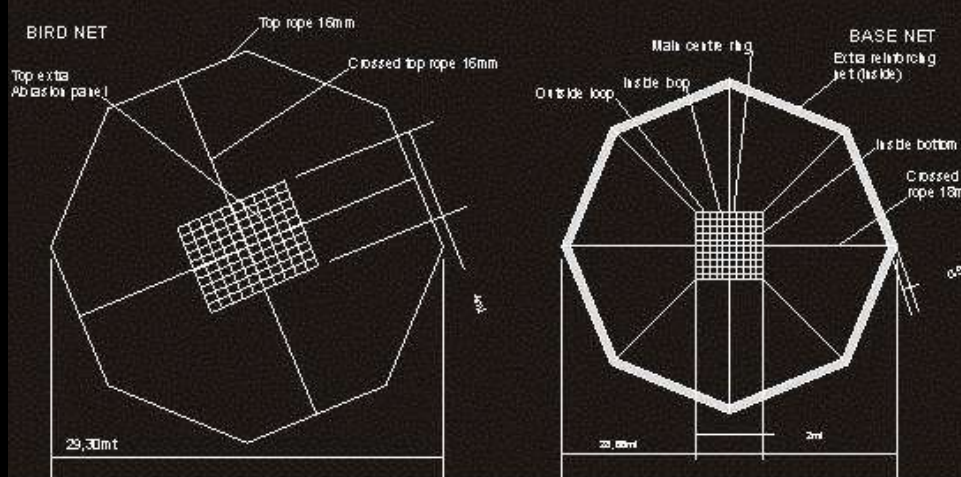
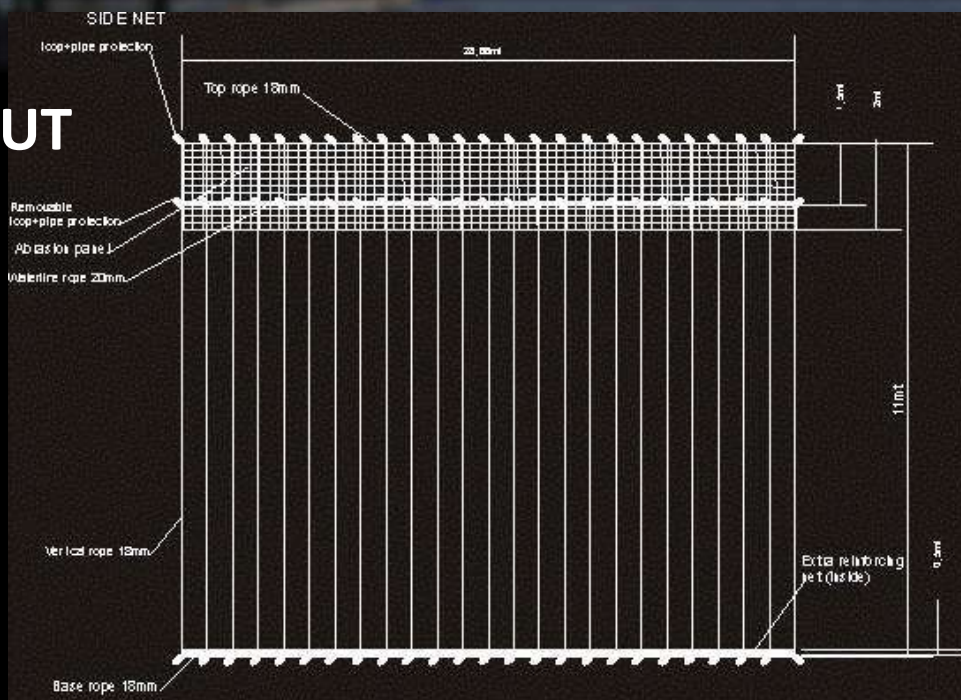
# NEW NET CAGE MATERIALS



**KNOTLESS or KNOTTED  
 HIGH PERFORMANCE POLYETHYLENE  
 (Dyneema®/Spectra®)**



# MOST COMMON NET CAGE LAYOUT



**HAND SEWING**



**DOUBLE SEWING BY MACHINE**



## MOST COMMON NET CAGE FEATURES



Rope looped + pipe protection



Plastic Thimble



Central Ring



Plastic Ring

Base rope + Leadline

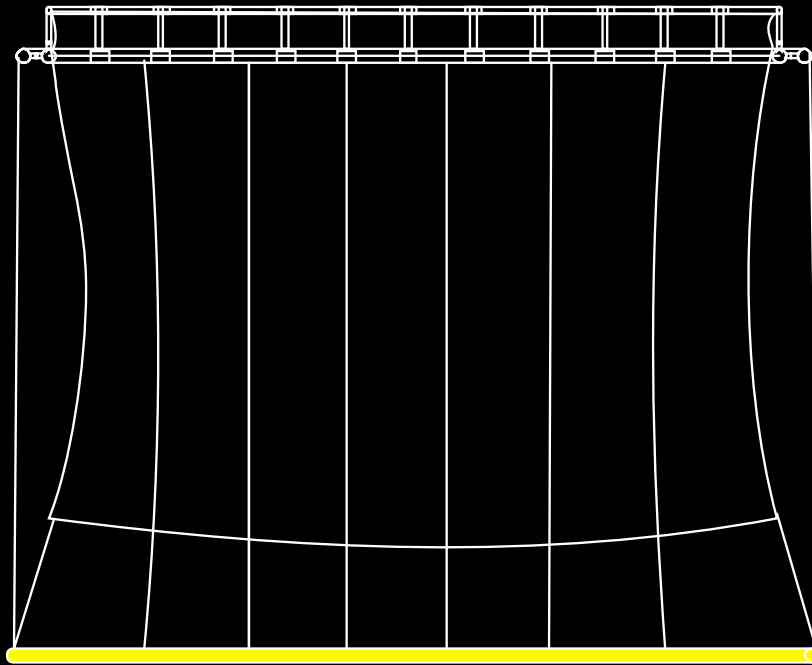


Simple rope looped



## MOST COMMON NET CAGE FEATURES

### SINKER TUBE



↑ Sinkers Tube Ø180-200mm HDPE pipe, filled with steel chain 15-30 kg/mt

## MOST COMMON NET CAGE FEATURES



### MARINE ZIP



Each Teeth 20-40 kg B.L.



## MOST COMMON NET CAGE FEATURES

### BIRDNETS

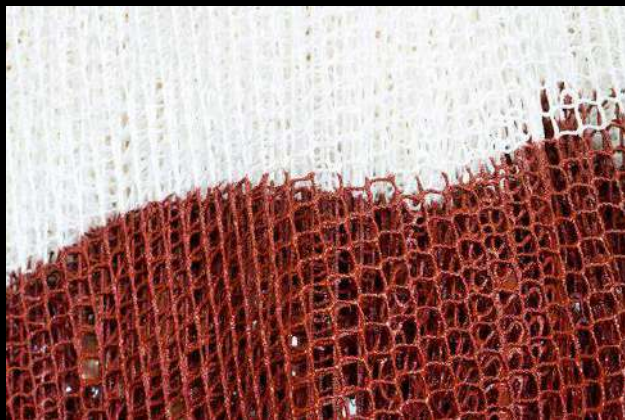


CENTRAL HDPE SUPPORT

### TOP NET



## NET COATINGS: ANTIFOULING



Generally used to prevent them from drying, to protect them from UV rays, Sea Bream biting and abrasion, to reduce bio-fouling and facilitate maintenance.

All the products are water soluble, contain copper oxide in compliance with the current regulations (< 50 micrograms/cm<sup>2</sup>/day).

They are all easily applied, fast dry and the net is left soft and elastic since the product penetrates in depth.

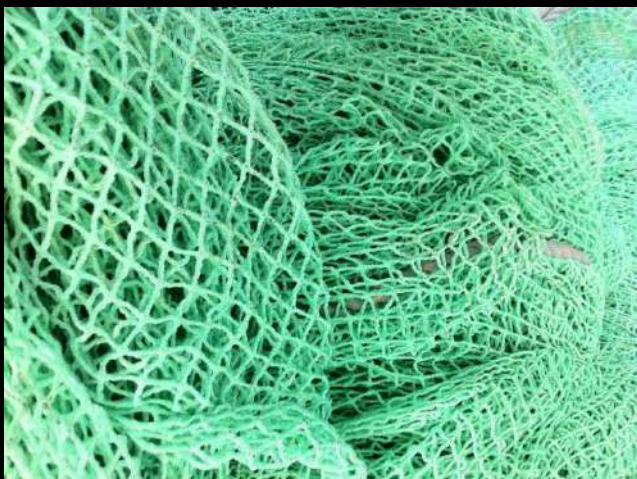


Generally 1 liter of treatment covers 1/1.5 kilo of net, 10/15% dilution. Treatment must be repeated every new farming cycle.

Breaking Load reduction of the net up to 20-25%.

Popular Brands: Flexgard, Netwax, Aquaguard.

## NET COATINGS: CUPPER-FREE RESINS



These new coating are based on resin formulas .  
The treatment with this coatings gives a good  
protection against an UV- break-down of the fibers  
of the netting.

In addition the strength of the netting is improved  
and the nets keep their shape better in the sea.

These coatings contain no biocides, metals or any  
form of poisons of environment.

The nets treated with Net Coating are easier to  
clean.

Popular Brands: Netpolish, Flexdip, Enviro Net.



## MAIN TECHNICAL ISSUES IN THE MED. SEA CAGE FARMING

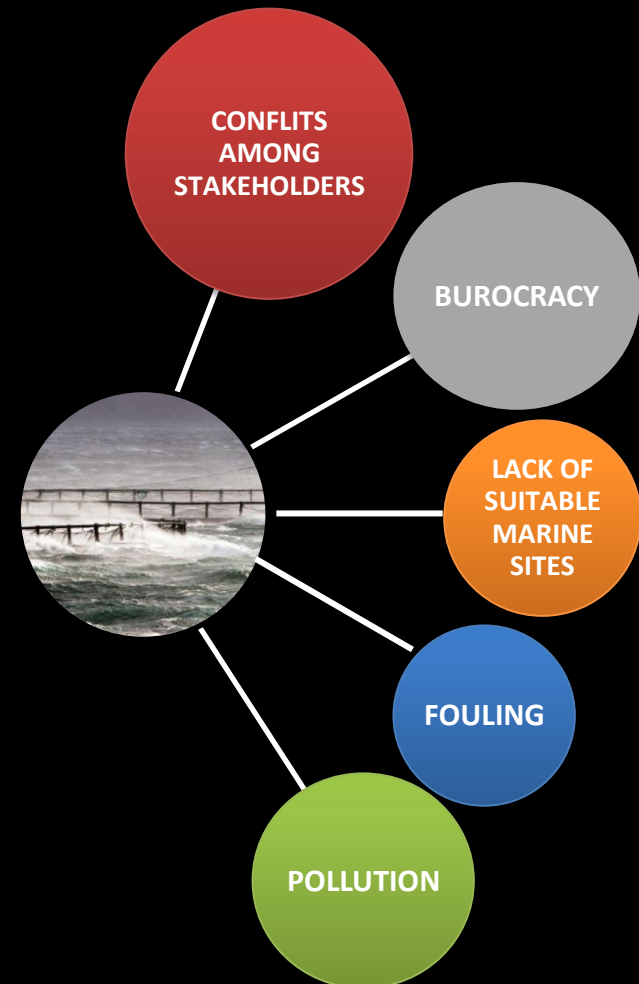
- ✓ CONFLITS AMONG MARINE AREAS STAKEHOLDERS
- ✓ LACK OF SUITABLE NEW SITES
- ✓ POLLUTION
- ✓ FOULING
- ✓ FISH BITING BEHAVIOR



## MAIN TECHNICAL ISSUES IN THE MED SEA CAGE FARMING



← OFFSHORE



# OFFSHORE CAGE FARMING EXPERIENCES IN MEDITERENNEAN SEA

## LARGE DIMENSION FLOATING CAGES



Advantages	Disadvantages
Easier maintenance	Visual Impact
Automatic Feeding	Sea/Wind Turbulences
Intensive Production	UV radiation
Visual Fish Control	High Financial Risk

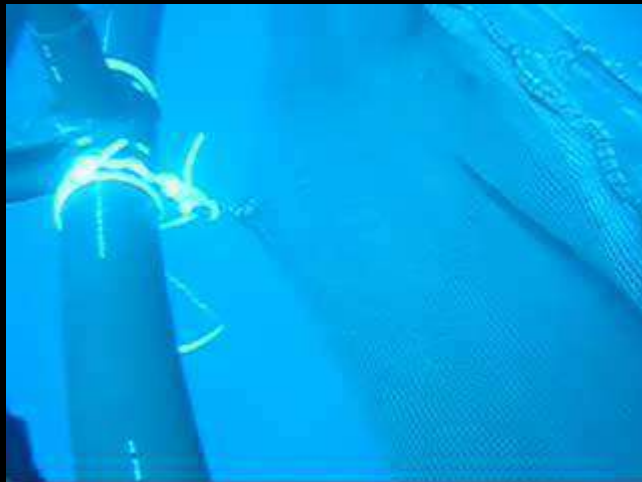
## SUBMERSIBLE CAGE



Advantages	Disadvantages
Escape from turbulences	No Visual Fish Control
Stable temperature	Pressure problem in seabass swim bladder
Dark fish skin colour	+20% expensive
Multiple use: floating/underwater	Difficult Feeding control
Less robbery events	Sea depth -35mt at least

## OFFSHORE CAGE FARMING - SUBMERSIBLE CAGES

The technology applied to produce submersible cages combines the typical features of floating cages, such as the easy access and management during the farming cycle, with safety in terms of resistance to wave-motion allowed by a totally submersed cage.



The outcome is then a “submersible” cage . It can be used mostly as a floating cage then submerged in 5 minutes when storm weather’s coming. In Mediterranean sea there are approx 60 days/year of bad weather condition, mainly in winter.

## OFFSHORE CAGE FARMING - SUBMERSIBLE CAGES

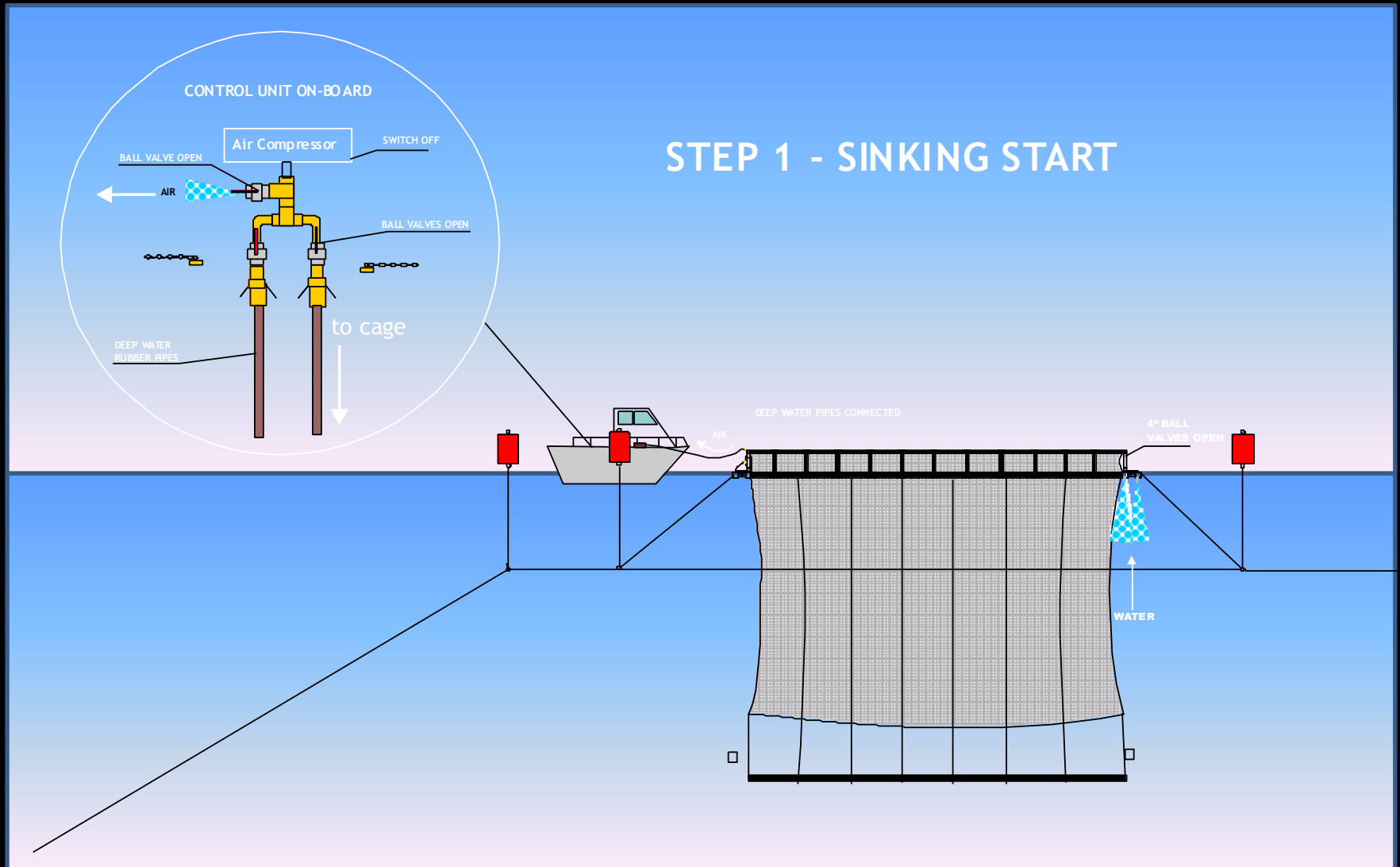


The cage sinks by opening the air and water valves. The water pressure pushes the air contained in the HDPE pipes out. To make the structure floating it is necessary to carry out the reverse procedure. The inflow of air through the valves in the pipes pushes water which was inside the HDPE pipes, out

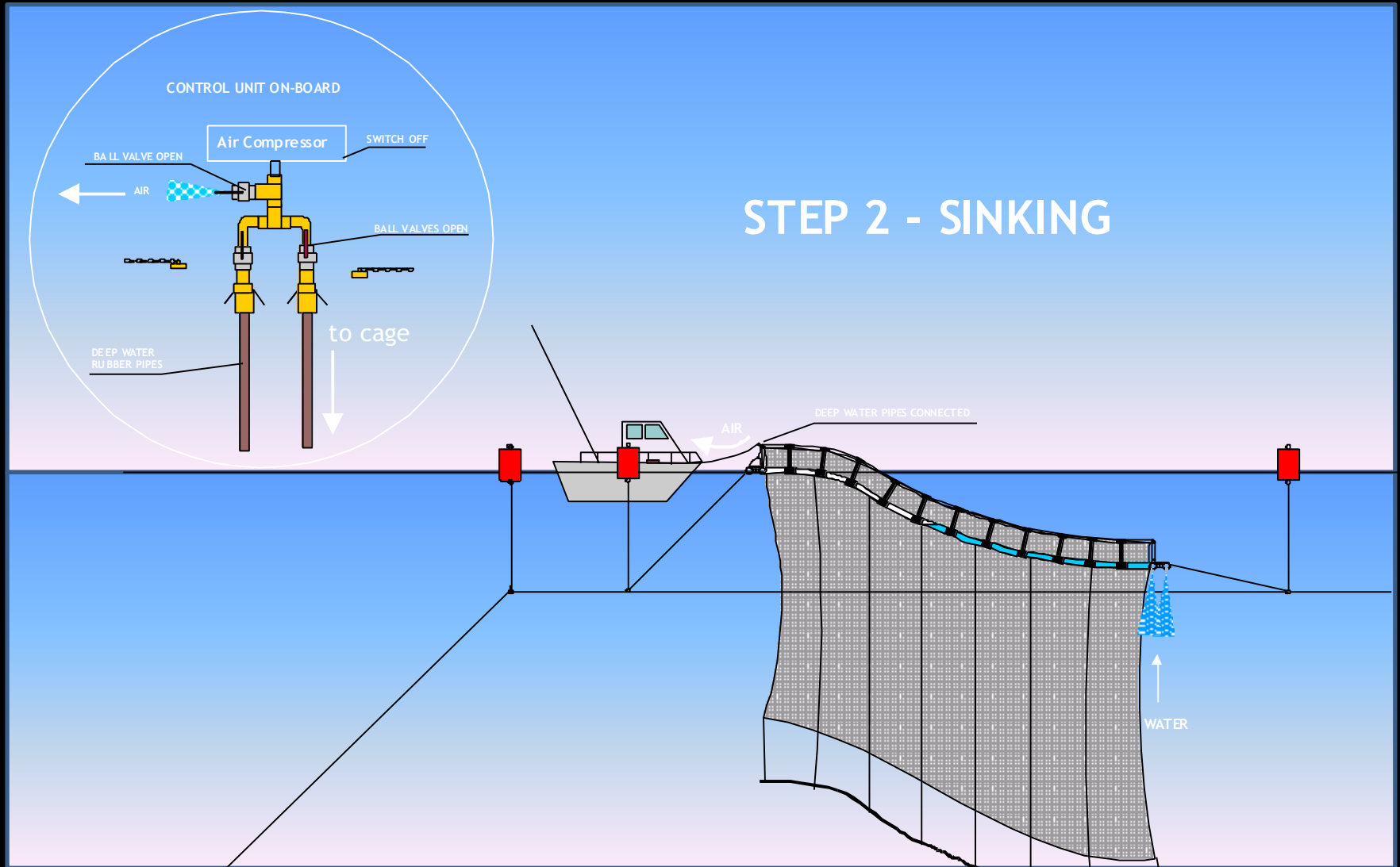
The air pressure can be supplied with underwater bottles and or low pressure compressor of at least 300 lt/min. in outflow, with tank of at least 100 lt approx.

The cage floats by closing of all air valves. It is important to highlight that when the cage is on the water surface it has the same characteristics of a plastic floating cage.

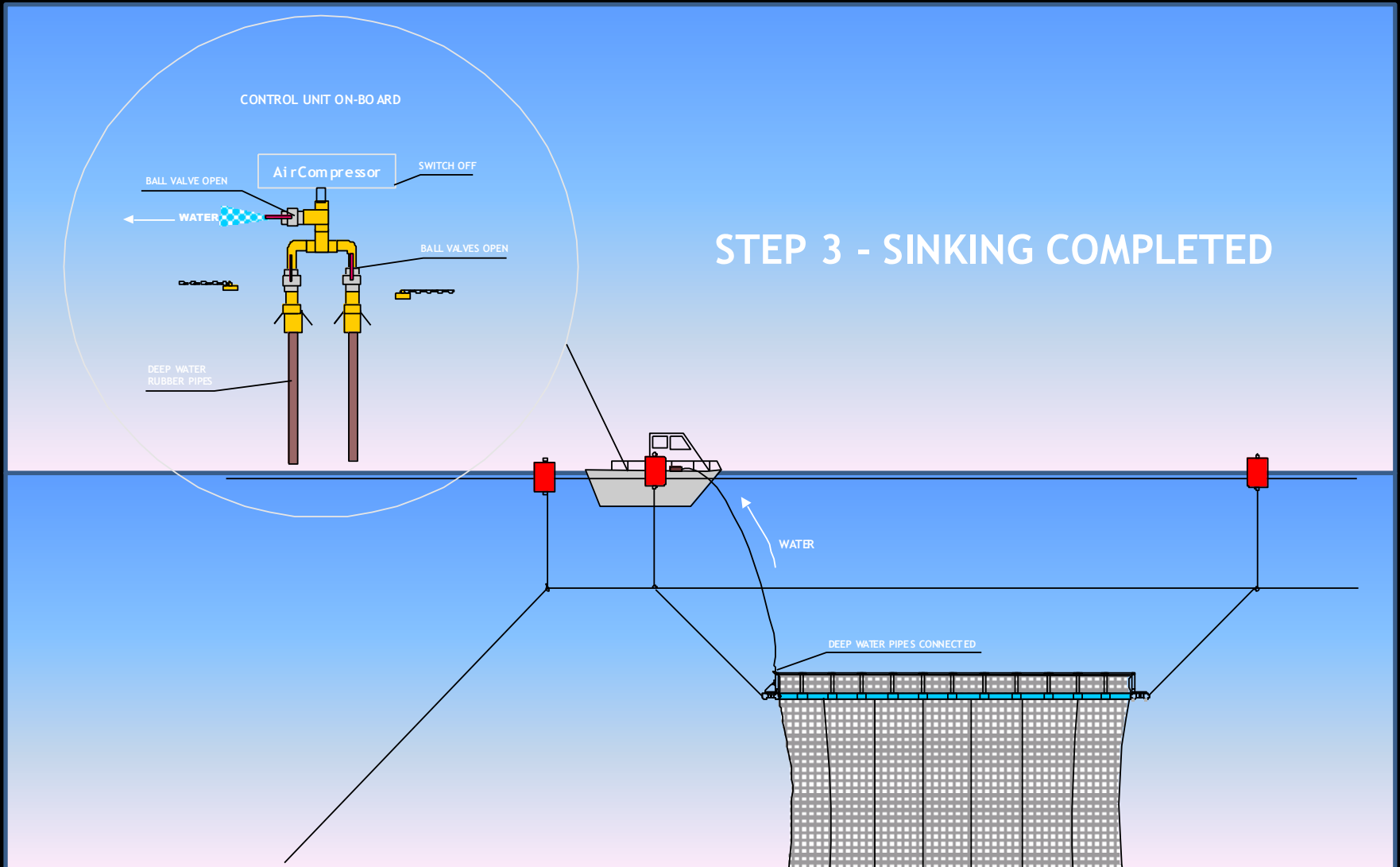
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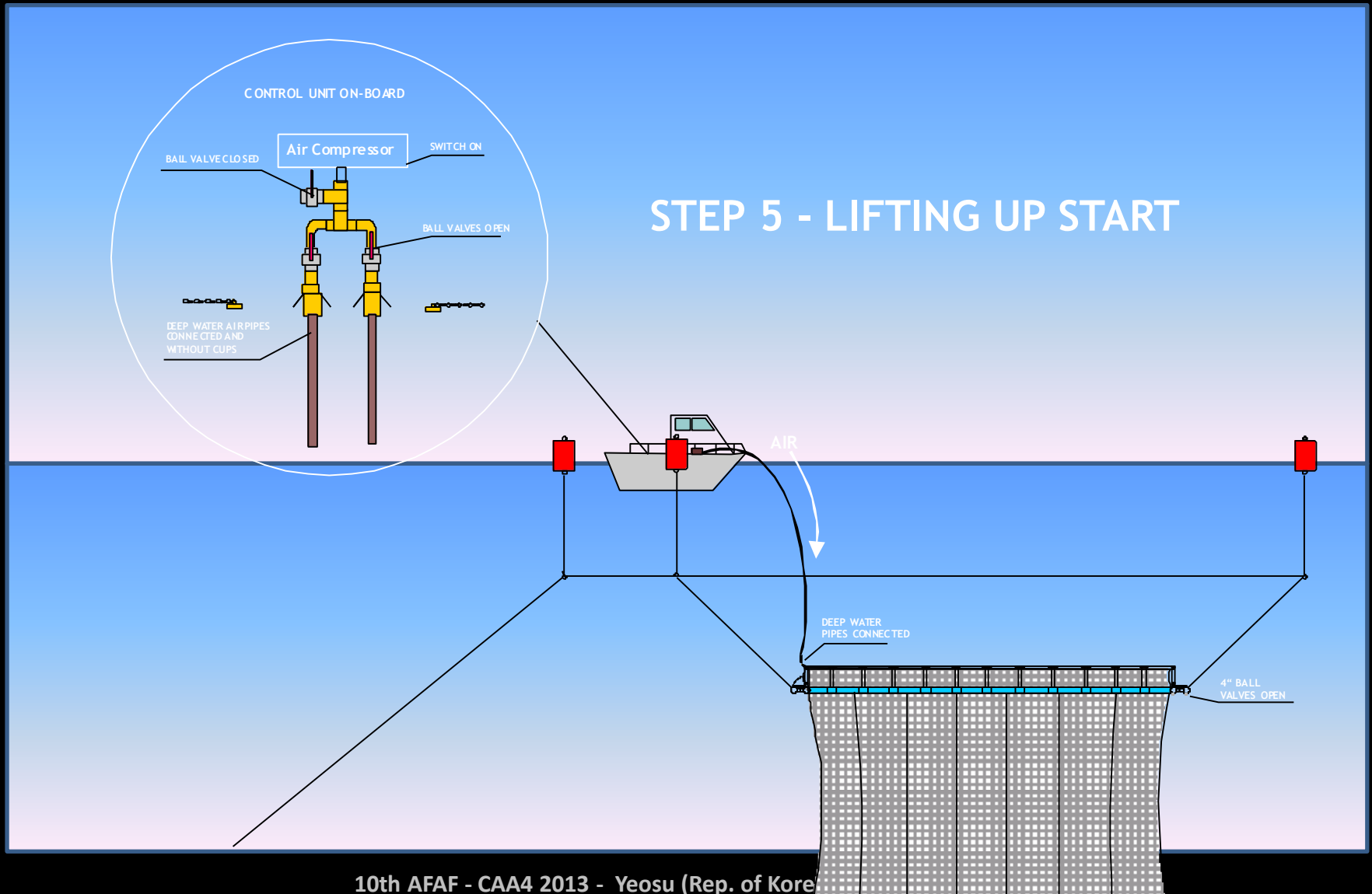
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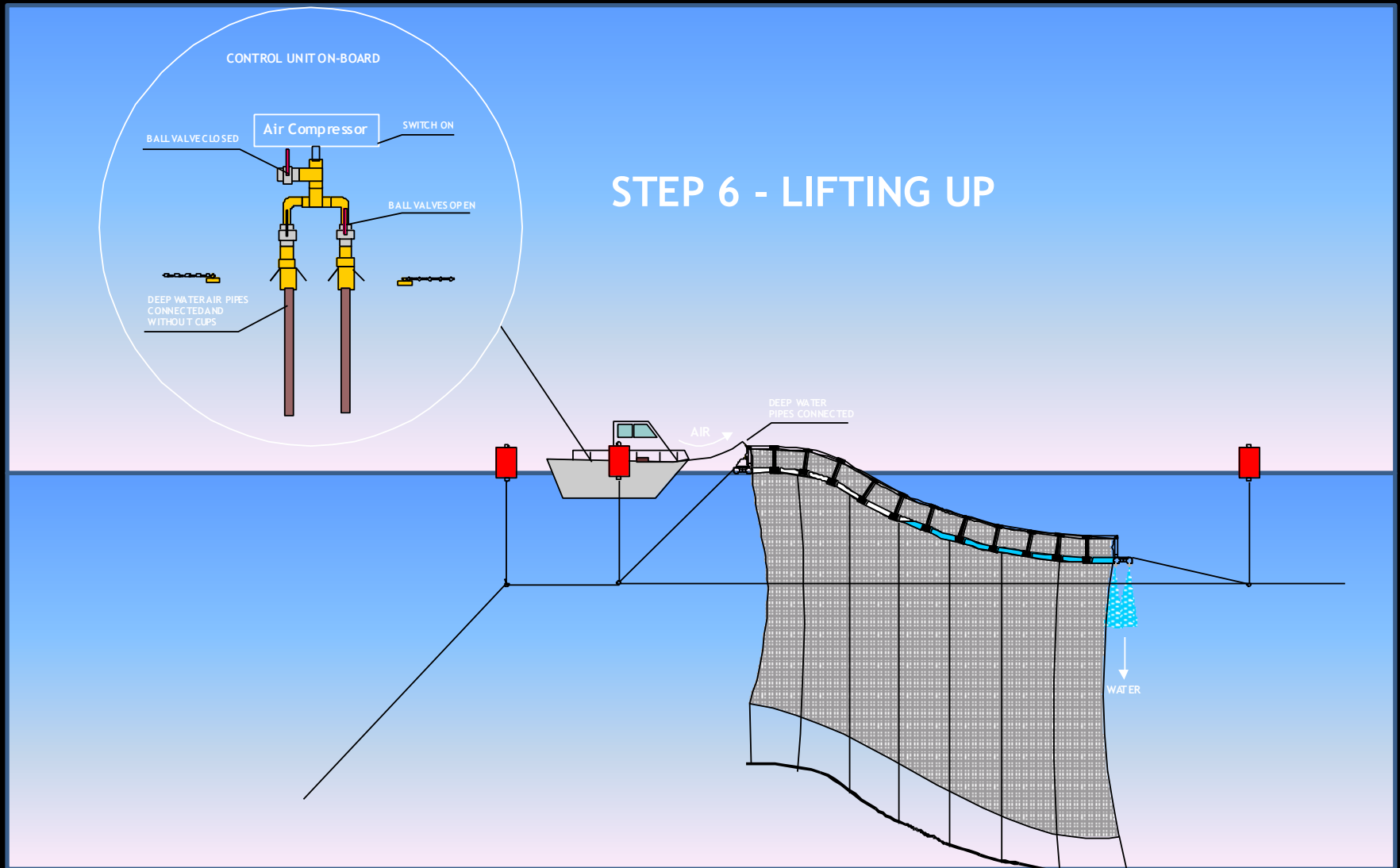
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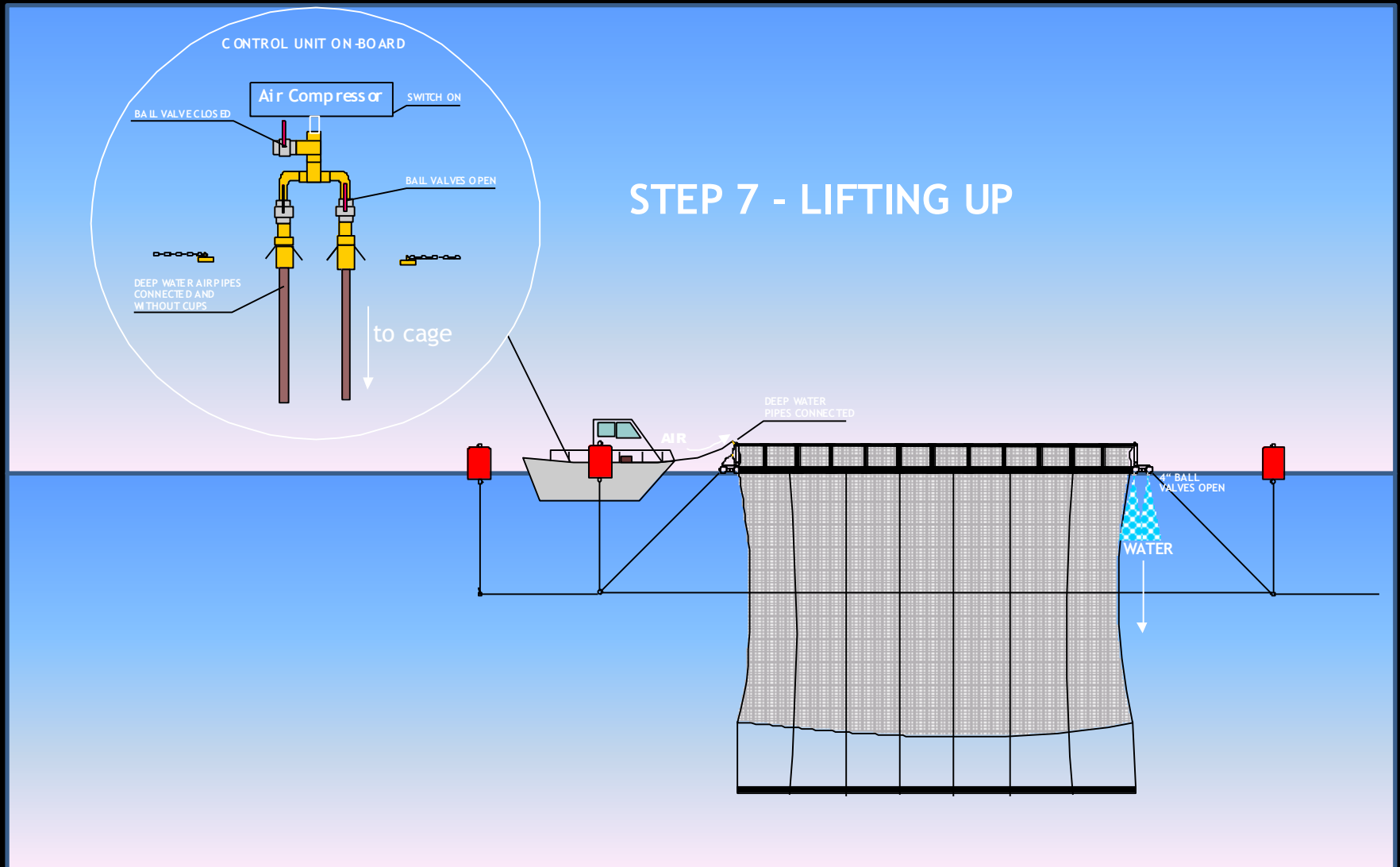
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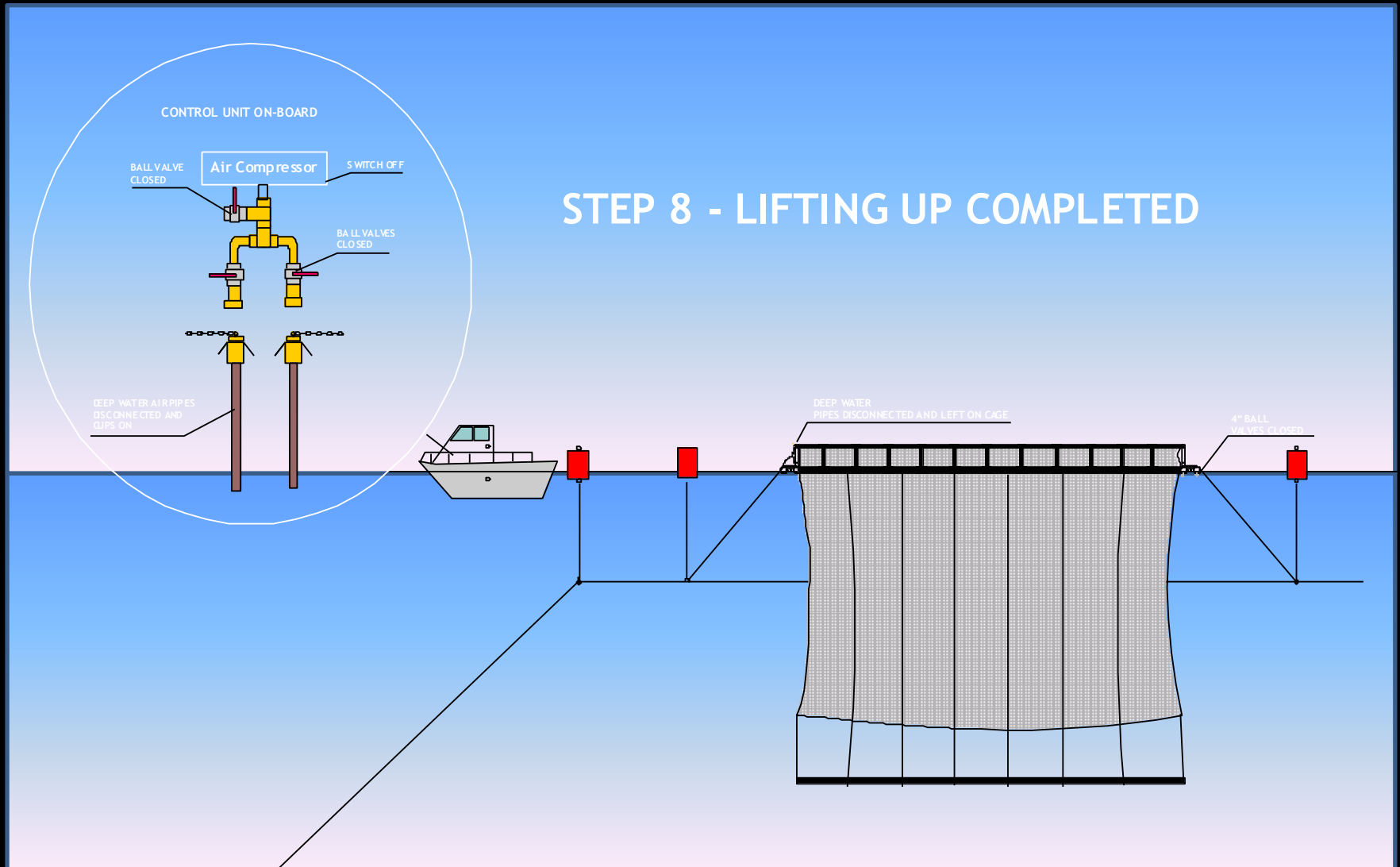


# OFFSHORE CAGE FARMING - SUBMERSIBLE CAGES



# OFFSHORE CAGE FARMING - SUBMERSIBLE CAGES

## STEP 8 - LIFTING UP COMPLETED

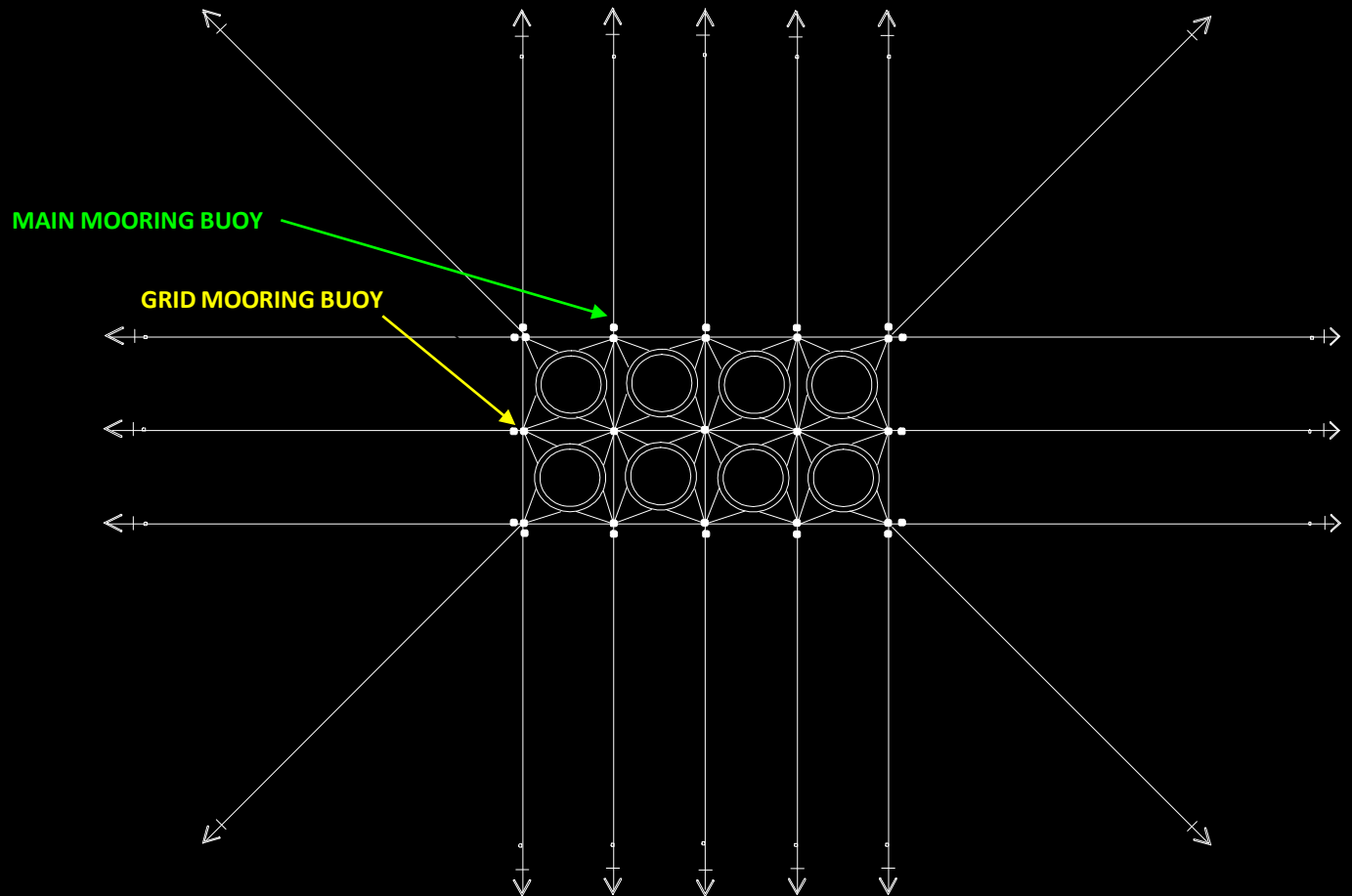


## OFFSHORE CAGE FARMING - SUBMERSIBLE CAGES

The mooring system used is the common “RETICULAR” type, same of floating cage.

Difference is a double buoys line:  
main mooring buoys withstand the forces by the anchors;

grid mooring buoys support the cage weight while submersed



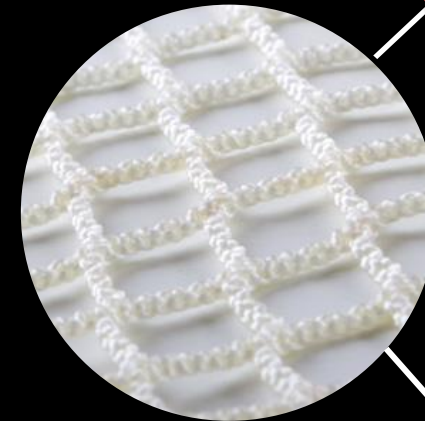


# MAIN TECHNICAL ISSUES IN THE MED SEA CAGE FARMING



**HIGH PERFORMANCE POLYETHYLENE (HPPE)**  
(popular brands: **DYNEEMA®** or **SPECTRA®**)

**RELIABLE  
NETS**



**LARGE  
DIMENSIONS  
CAGES**

**OFFSHORE**

**BITING  
BEHAVIOR**

## NEW FIBERS FOR BIG CIRCUMFERENCE CAGES



- ✓ **15 times stronger than steel on an equal weight;**
- ✓ **4 to 5 times stronger than polyamide on an equal weight;**
- ✓ **Lighter than water;**
- ✓ **Extremely durable**

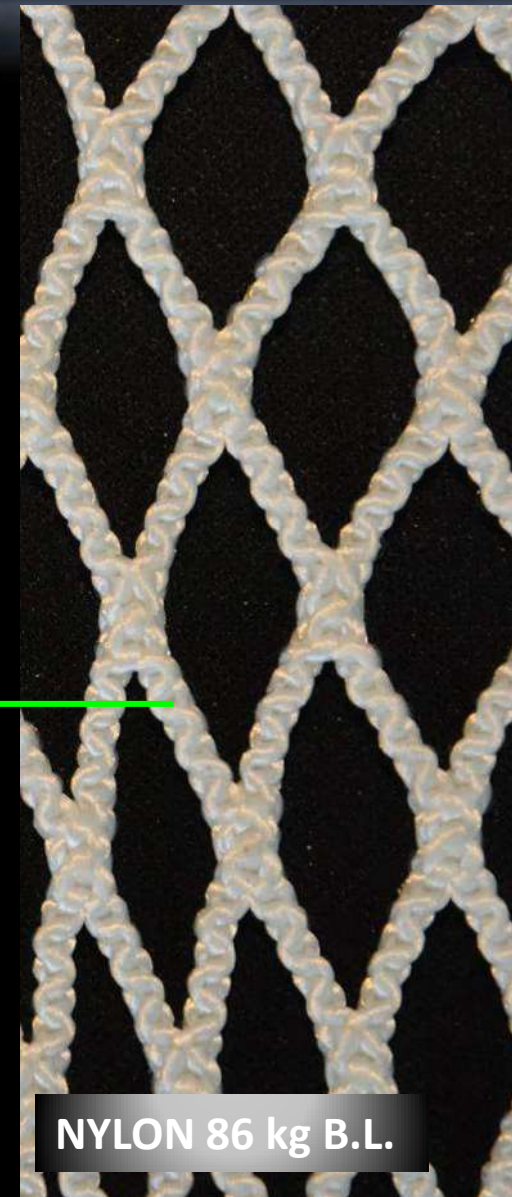
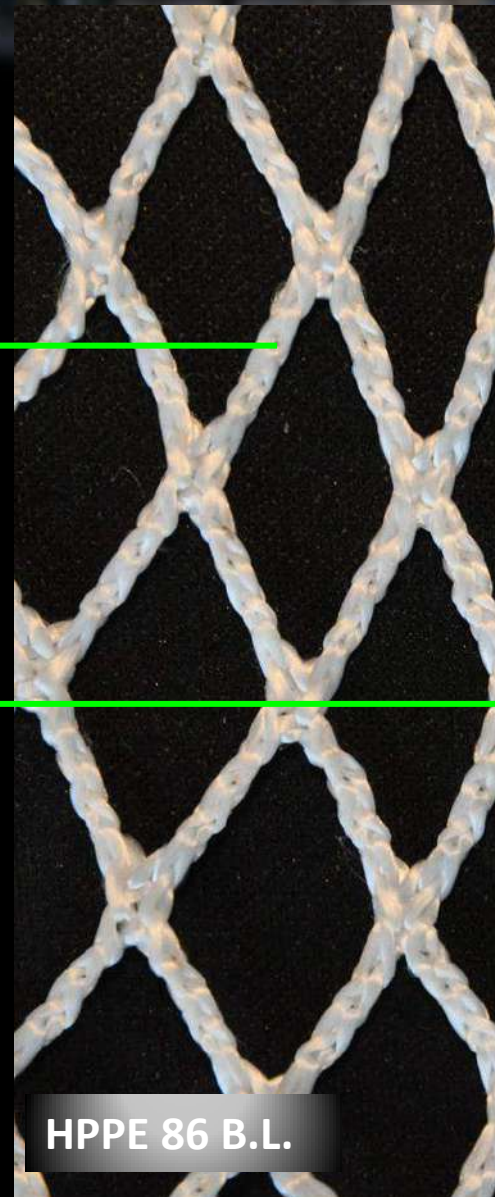
In the Mediterranean area, HPPE or UHMWPE® is becoming the standard material for bity fish as sea-brems, and now it is very popular in Greece and Turkey. These countries buy generally the 80% of the total of the HPPE fiber produced and since 2005.

## NEW FIBERS SUITABLE FOR BIG CIRCUMFERENCE CAGES

- ✓ The strength of the HPPE® fibers, enables much smaller twines compared to traditional materials for equal strength;
- ✓ Smaller twines, means less surface for fouling to grow on;
- ✓ Smaller twines also increase water flow through the cage, improving the water exchange and available oxygen;

1,8mm  
Twine  
thickness

2,6mm  
Twine  
thickness  
(+45%)



## NEW FIBERS FOR BIG CIRCUMFERENCE CAGES

### Simulations of cage behavior

Simulations comparing nets made with nylon and HPPE® fiber, were performed by Aquastructures AS(Norway):

#### ▶ Set up

- ✓ net breaking force of 95 kg;
- ✓ 45 mm full mesh;
- ✓ 90 meter circumference;
- ✓ weights: 35 kg/m;

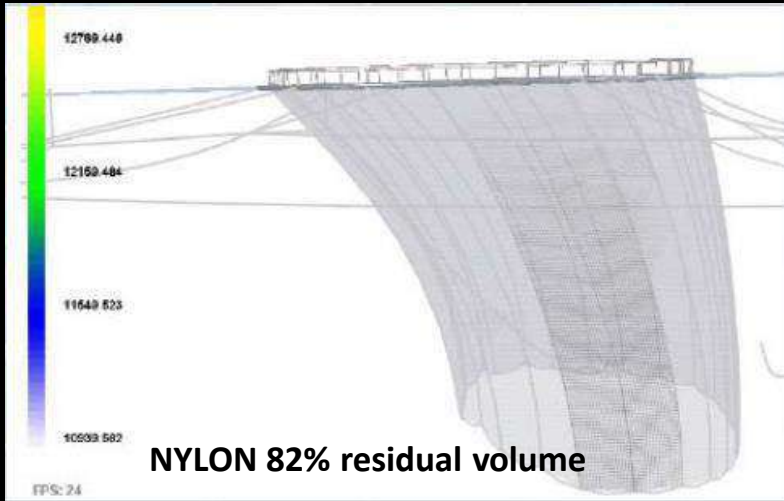
#### ▶ Simulations to compare

- ✓ strain on the mooring/cage system;
- ✓ tensions in the netting;
- ✓ shape stability of the netting.

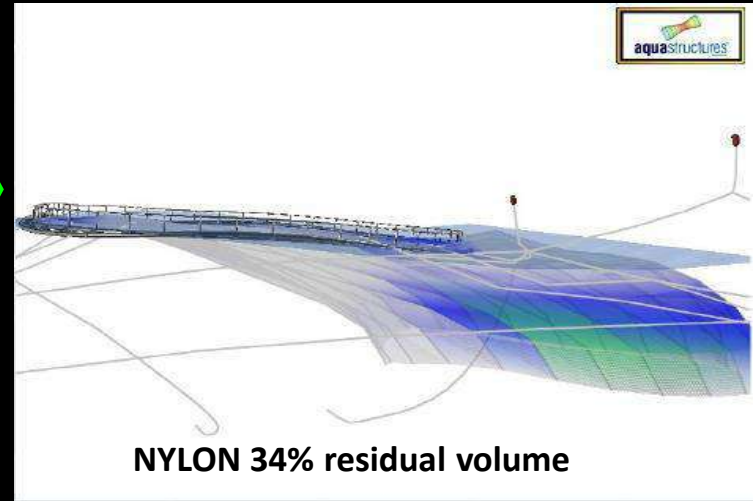


## SIMULATION OF CAGE BEHAVIOR

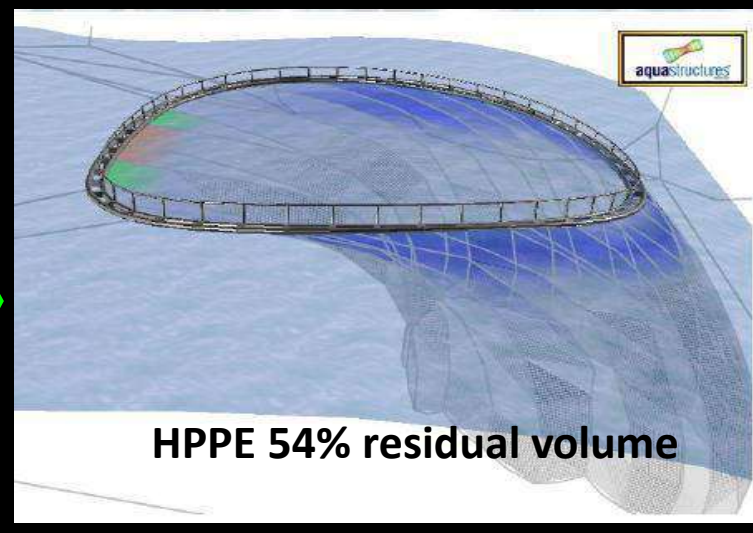
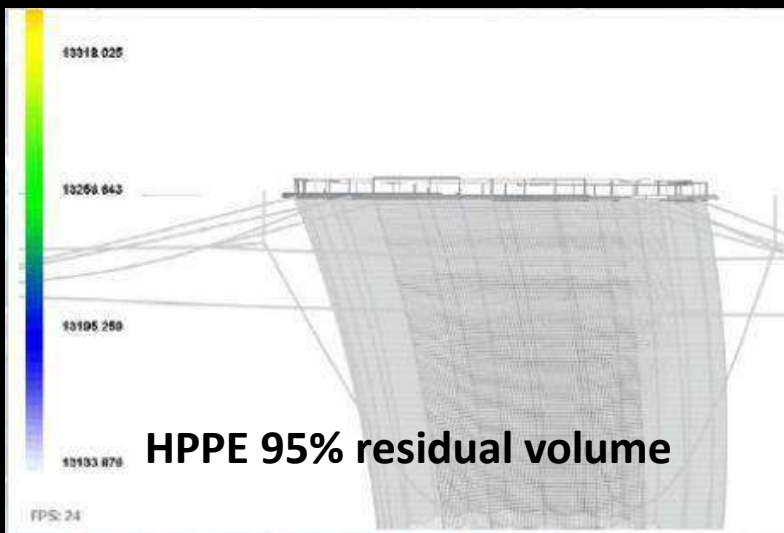
Current 0,3 mt/sec



Current 0,7 mt/sec



Current 0,3 mt/sec

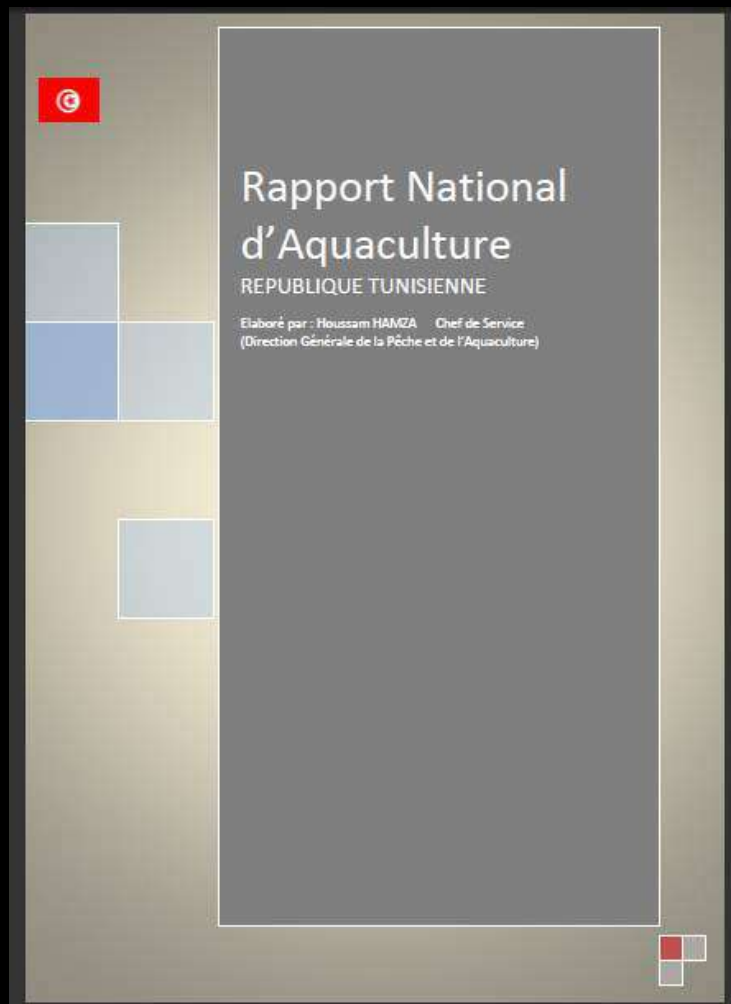


## COSTS COMPARISON

<b>90mt circumf. Nylon Net</b> H 10+1,5mt, 15mm 210/72 (B.L. 86kg), 36 Vertical ropes, including AF	<b>90mt circumference Net with HPPE</b> H 10+1,5mt, 15mm 100/86 (B.L.86kg), 36 Vertical ropes, including AF
<b>Dry Weight in air: 1.015 kg</b>	<b>Dry Weight in air: 530 kg</b>
<b>Approx price: 10.000€</b> <b>Approx 14.200.000 KRW</b>	<b>Approx price: 17.000€</b> <b>Approx 24.145.000 KRW</b>
<b>Net Lasting:</b> 1 cycle seabream + 1 cycle seabass (eventually another cycle seabass)	<b>Net Lasting:</b> 2 cycle seabream + 2 cycle seabass (based on 8 years of data recording)

Source: Badinotti Group

## CASE STUDY: TUNISIA



Source: Rapport National d'Aquaculture

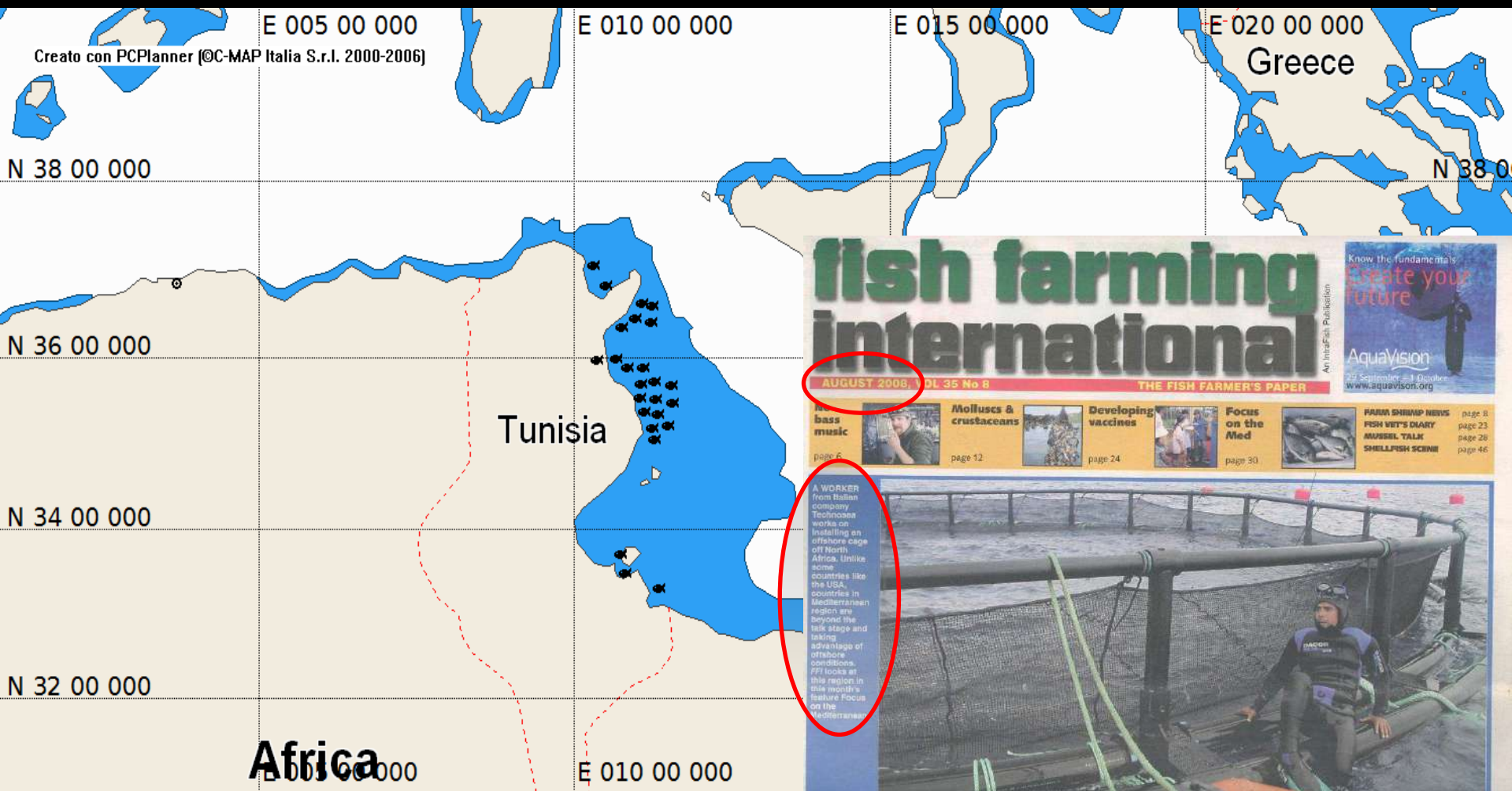
Even if aquaculture started in the '80 as an artisanal pioneer sector thanks also a support by MEDRAP – FAO Projects, this activity was quite abandoned up to 2003 when some Tuna fattening farms in cages started in offshore site along the Tunisian coast.

The cage technology used in Tuna farming become a background experience for new investors.

Currently cage farming in Tunisia is growing up at a rate of +25%/year, the fastest in the Mediterranean Area.



# TUNISIA: FISH FARMS LOCATIONS



**fish farming international**  
 An IntraFish Publication

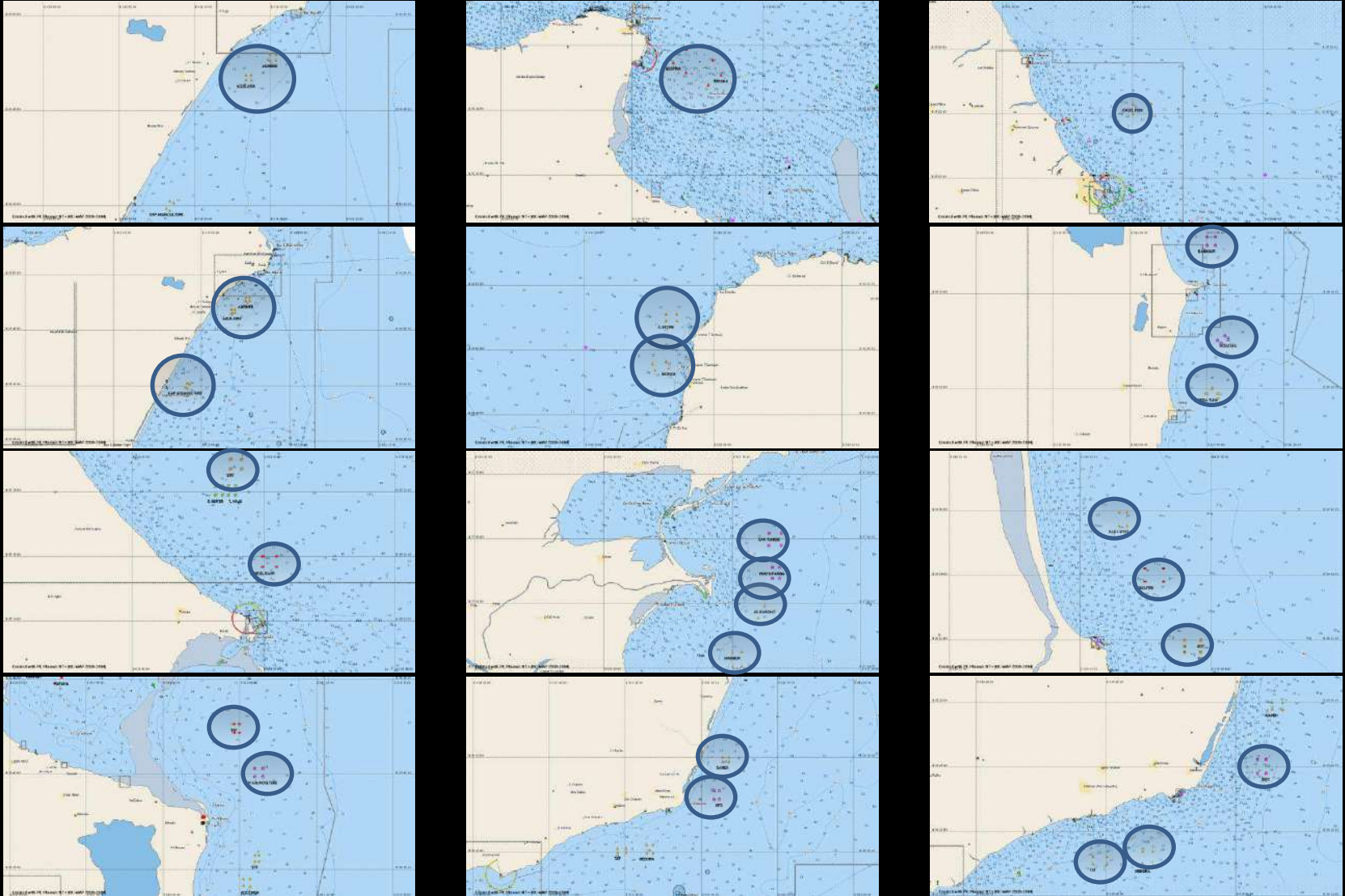
Know the fundamentals  
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 AquaVision  
 29 September - 1 October  
 www.aquavision.org

**AUGUST 2008 VOL. 35 No 8 THE FISH FARMER'S PAPER**

<b>bass music</b> page 6	<b>Molluscs &amp; crustaceans</b> page 12	<b>Developing vaccines</b> page 24	<b>Focus on the Med</b> page 30	<b>FARM SHIMP NEWS</b> page 8	<b>FISH VET'S DIARY</b> page 23	<b>MUSSEL TALK</b> page 26	<b>SHELLFISH SCENE</b> page 46
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**A WORKER** from Italian company Technocea works on installing an offshore cage off North Africa. Unlike some countries in Mediterranean region are beyond the talk stage and taking advantage of offshore conditions. FFI looks at this region in this month's feature Focus on the Mediterranean.

# TUNISIA: SOME FISH FARMS LOCATIONS



## TUNISIA: FISH FARMS LIST

	COMPANY	LOCATION (North->South)	N° CAGES	DIMENSION (∅)	START UP (Date)	CAPACITY (Fingerlings / year)	CAPACITY PRODUCTION (tons /year)
1	PORTO FARINA	Ghar El Melh	16	25 m	August 2010	3.000.000	800
2	SAMAKA	Béni Khiar	24	22 m	September 2010	3.200.000	850
3	MEDITERRANEAN FISH COMPANY (MFC)	Béni Khiar	12	22 m	June 2010	1.600.000	420
4	MEDORA	Béni Khiar	12	29 m	March 2011	2.800.000	750
5	TUNISIAN SEA FISH (TSF)	Béni Khiar	12	25 m	September 2011	2.000.000	530
6	BIOFISH	Korbous	8	29 m	October 2010	2.000.000	530
7	AQUAFISH TUNISIE	Hergla	16	19 m	May 2007	1.600.000	530
8	AQUACULTURE TUNISIENNE(*)	Hergla	150 RECEWAYS		1989	5.000.000	1.350
9	EXCEL FISH	Sousse	16	29 m	October 2011	4.000.000	1.050
10	FREH FISH	Sousse	8	29 m	September 2012	2.000.000	530
11	RUSPINA	Monastir	84	22 m	April 2008	5.500.000	1.450
12	RAFAHA	Monastir	36	22 m	April 2009	3.600.000	960
13	AQUACULTURE DU SAHEL	Monastir	24	25 m	July 2010	4.000.000	1.050
14	PRIMA FISH	Teboulba	24	25 m	September 2010	4.000.000	1.050
15	TEBOULBA TUNISAN FISH (TTF)	Teboulba	24	22m	November 2010	3.200.000	850
16	TEBOULBA SEA FISH	Teboulba	12	22 m	March 2011	1.600.000	420
17	MEHADI AQUACULTURE	Bekalta	8	29 m	July 2010	2.000.000	530
18	AQUA BANNOUR	Mahdia	24	25 m	July 2010	4.000.000	1.050
19	ESSAFA	Mahdia	8	29 m	October 2010	2.000.000	530
20	AQUASEA	Mahdia	12	29 m	May 2010	2.800.000	750
22	EMIR EL BAHR	Chebba	112	22 m	May 2008	6.000.000	1.600
23	TUNI PECHE(*)	Jerba	RECEWAYS		1988	500.000	130
24	SUD AQUACULTURE (SAT)(*)	Boughrara	RECEWAYS		1987	1.000.000	260
25	SEPAT	Zarzis	60	10 and 14 m	1997	800.000	220
	<b>TOTAL</b>		<b>552</b>			<b>68.200.000</b>	<b>18.190</b>

Source: SMEC

# TUNISIAN CAGE AQUACULTURE



**Fish Farming production increased from 600 tons in 2000 to 6.000 tons in 2011 to an average growth rate over the period of +81.80%.**

**Since 2009 marine fish farming speedily improved thanks to the incentives and to the cage technology**

Source: Rapport National d'Aquaculture

## TUNISIAN CAGE AQUACULTURE



**The fingerlings market increases from 1 Million unit in 2006 to 52 Million in 2011.**

**This year the forecasted fingerlings needs will reach 65 Millions.**

**2/3 of them are Sea breams.**

**France, Italy, Turkey and Greece are the main exporters.**

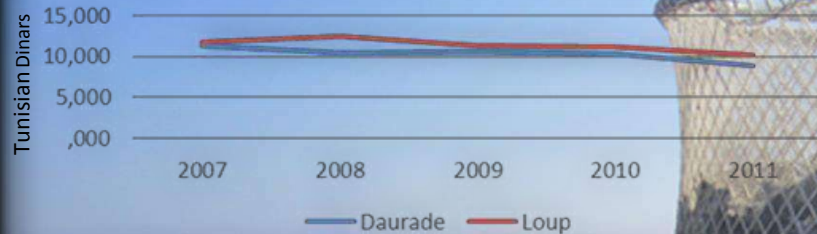
# TUNISIAN CAGE AQUACULTURE

FISH FOOD SOURCE	2007	2008	2009	2010	2011
FISHERY (%)	83	75	54,5	17,4	18,3
AQUACULTURE (%)	17	25	45,5	82,6	81,7

Aquaculture in Tunisia contributed to the alleviation of pressure on marine resources through continuous production throughout the year and during the stop fishing periods

# TUNISIAN CAGE AQUACULTURE

Evolution des prix du Loup et de la  
Daurade (2007-2011)



Seabass and Seabream  
are mainly consumed  
locally (90%).

The local market  
absorbs the rest of the  
production through  
conventional  
distribution channels,  
the wholesale market  
of Tunis, Sousse and  
Sfax, or through  
supermarkets and fish  
shops.

# TUNISIAN CAGE AQUACULTURE

The main constraints are:

- The lack of sheltered sites to use with traditional floating cages.
- The hard competition with the Mediterranean countries.
- The availability of live food (Artemia) and inert (pellet) that are imported products, limited fingerlings production in hatcheries.
- The comparatively high cost of some production cost relative to competitors.
- The European market for sea bass and sea bream is characterized by an abundance of supply due to the very rapid growth of aquaculture production. The growth in supply has caused a significant drop in price: the equivalent of € 11 in 1989 to € 4.5 in 2010.
- The high cost of air freight is also a factor affecting the competitiveness of Tunisian products .
- The lack of specific Laws an appropriate legal instrument as a basis for the development of aquaculture activities.

Source: Rapport National d'Aquaculture

# THANK YOU FOR YOUR ATTENTION

## MEDITERRANEAN CAGE AQUACULTURE

Latest development and selected technical  
Considerations in Seabass and Seabream farming

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