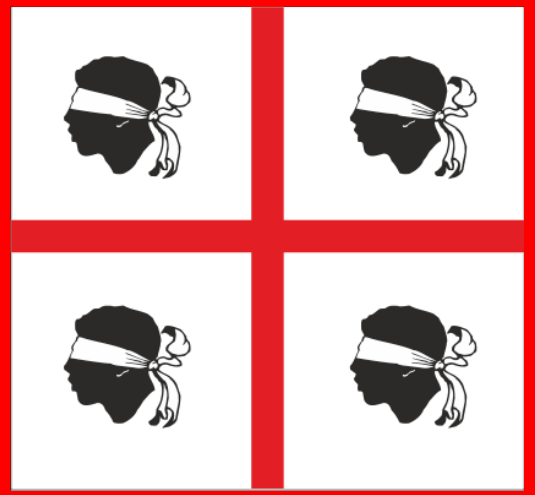
# MONITORING OF THE RED CORAL HARVESTING IN SARDINIA BY ON-BOARD SCIENTIFIC OBSERVERS

Cannas R., Follesa M.C., Sacco F., Cau Al., Pesci P., Porcu C., Cau A.

Department of Life and Environmental Sciences University of Cagliari, Italy

Com. Bio. Ma.
Centro di Competenza sulla Biodiversità Marina

REGIONE AUTÒNOMA DE SARDIGNA
REGIONE AUTONOMA DELLA SARDEGNA



# BACKGROUND INFORMATION

***Corallium rubrum* (common name Sardinia coral)**

**Local management plan (specific laws enacted by the Autonomous Government of Sardinia)**

**Since 1979**

Follesa MC, Cannas R, Cau Al, Pedoni C, Pesci P, Cau A. (2013). Deep water red coral from the island of Sardinia (NW Mediterranean): a local example of sustainable management. Marine and Freshwater Research, 64(8): 706-715.

*MCS= Monitoring Control Surveillance

Background

MCS* system

+

Management measures

Management plan

FAO 2002 A fishery manager's guidebook. Management measures and their application. Cochrane, K.L. (ed.) FAO Fisheries Technical Paper. No. 424. Rome, FAO

Background

# Management measures

- **Technical m.**
  - **Gear**
    - **type**
      - Allowed: SCUBA with hammer
      - Not allowed: ROV
  - **Closure**
    - **spatial**
      - Interdicted areas
      - From 0 to -80 m of depth
    - **temporal**
      - From 16 November- To 14 May

Interdicted areas 2013

- **controls**
  - **Input (effort)**
    - **licenses**
      - Max 25 authorized divers
    - **size**
      - >=10 mm basal diameter (+-20% tolerance on undersized)
  - **Output (catch)**
    - **quotas**
      - 2.5 kg/day/diver

2012

**DECRETO N. 761 GAB /DecA/42 del 21.05.2012** (L.R. 5 .7.1979, n. 59. – Art. 4, Disposizioni sulla pesca del corallo per l'anno 2012 nelle acque territoriali prospicienti il territorio della Regione Autonoma della Sardegna)

Background

MCS system

## Before fishing

Certificates (equipment, diver, boat) (local administration)

## During fishing

## At landing

Designated ports

Catch control (coast guard)

## After landing

Traceability system (local administration)

First time implementation
Harvesting season 2012

2012

**DECRETO N. 761 GAB /DecA/42 del 21.05.2012** (L.R. 5 .7.1979, n. 59. – Art. 4, Disposizioni sulla pesca del corallo per l'anno 2012 nelle acque territoriali prospicienti il territorio della Regione Autonoma della Sardegna)


Background

## Resolution GFCM/35/2011/2

- Prohibition of the use of the Remotely Operated underwater Vehicles (ROVs) in the GFCM Competence Area for the exploitation of red coral (Paragraph 1)
- Until 2015 derogation for the use of ROV
- only for reasons of observation and prospection (not equipped with manipulator arms or any other devise for cutting and harvesting red coral) (Paragraph 3a)
- Within the framework of scientific experimental campaigns both for observation and harvesting, under the supervision of research institutions (Paragraph 3c)

# WHY THE OBSERVERS? (1)

Background

# RAS (Regione Autonoma della Sardegna)

Art1f **DECRETO N. 585 GAB/DecA/27 del 24.04.2013**)

- Authorization for the use of ROV only for prospection of coral banks, exclusively within the framework of scientific research programs carried out by the Universities of Sardinia, only when on board is present a scientific observer designated by the University.
- NB Participation of divers on a voluntary basis.

**NO OBSERVERS = NO ROV on board**

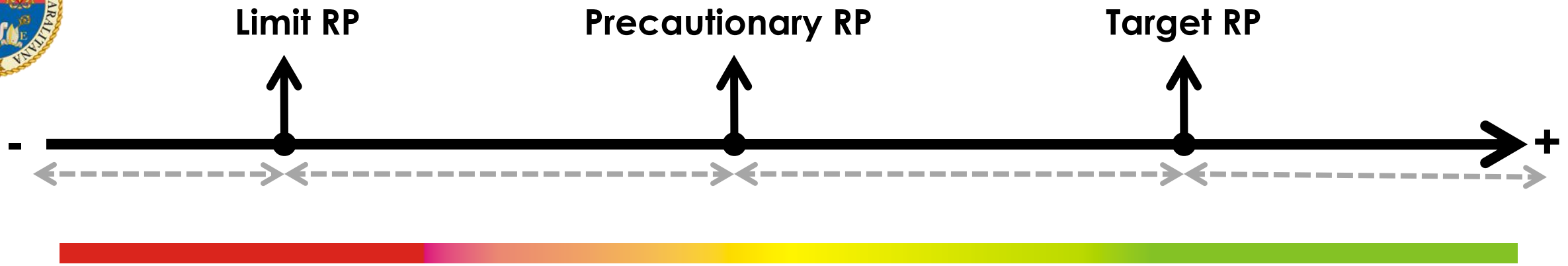
## WHY THE OBSERVERS? (2)

Methods

1. Control that the ROV is used for 'prospection only'
2. Acquire geo-referentiated images and data on the investigated banks (mapping of the commercial banks)
3. Verify the respect of the management measures (depth, total weight and size) provided for by the local management plan
4. Record of biological data on catches
   - Total weight for each dive
   - weight of alive and dead fractions
   - Measures of basal diameter, and maximul height of each harvested colony (on board)
   - Take photos of each colony for branching pattern determination (at the lab)
   - Sampling for scientific studies (age, reproduction, genetics,..)

# THE ROLE OF OBSERVERS ON BOARD

**DECRETO N. 761 GAB /DecA/42 del 21.05.2012** (L.R. 5 .7.1979, n. 59. – Art. 4, Disposizioni sulla pesca del corallo per l'anno 2013 nelle acque territoriali prospicienti il territorio della Regione Autonoma della Sardegna)




**Reference points:**
**Target reference point (TRP), corresponding to a situation considered as desirable and to be achieved on average;**
**Limit reference point (LRP), indicating a situation that is undesirable and to be avoided at all costs;**
**Precautionary reference point (PaRP): providing a threshold at which initial actions can be taken to reduce the risk that the limit may be broken.**

**To monitor the progress of the fishery and to measure the performance of management in achieving the objectives, "indicators" and "reference points" should be calculated by each country.**

***COUNCIL REGULATION (EC) No 1967/2006 + GFCM Guidelines for management plans***

# Why the observers? (3)

Document GFCM:XXXVII/2013/Inf.17


Methods

2012 SOS Scientific Observers Sardinia coral

20 august-15 november 2012

3 institutions involved

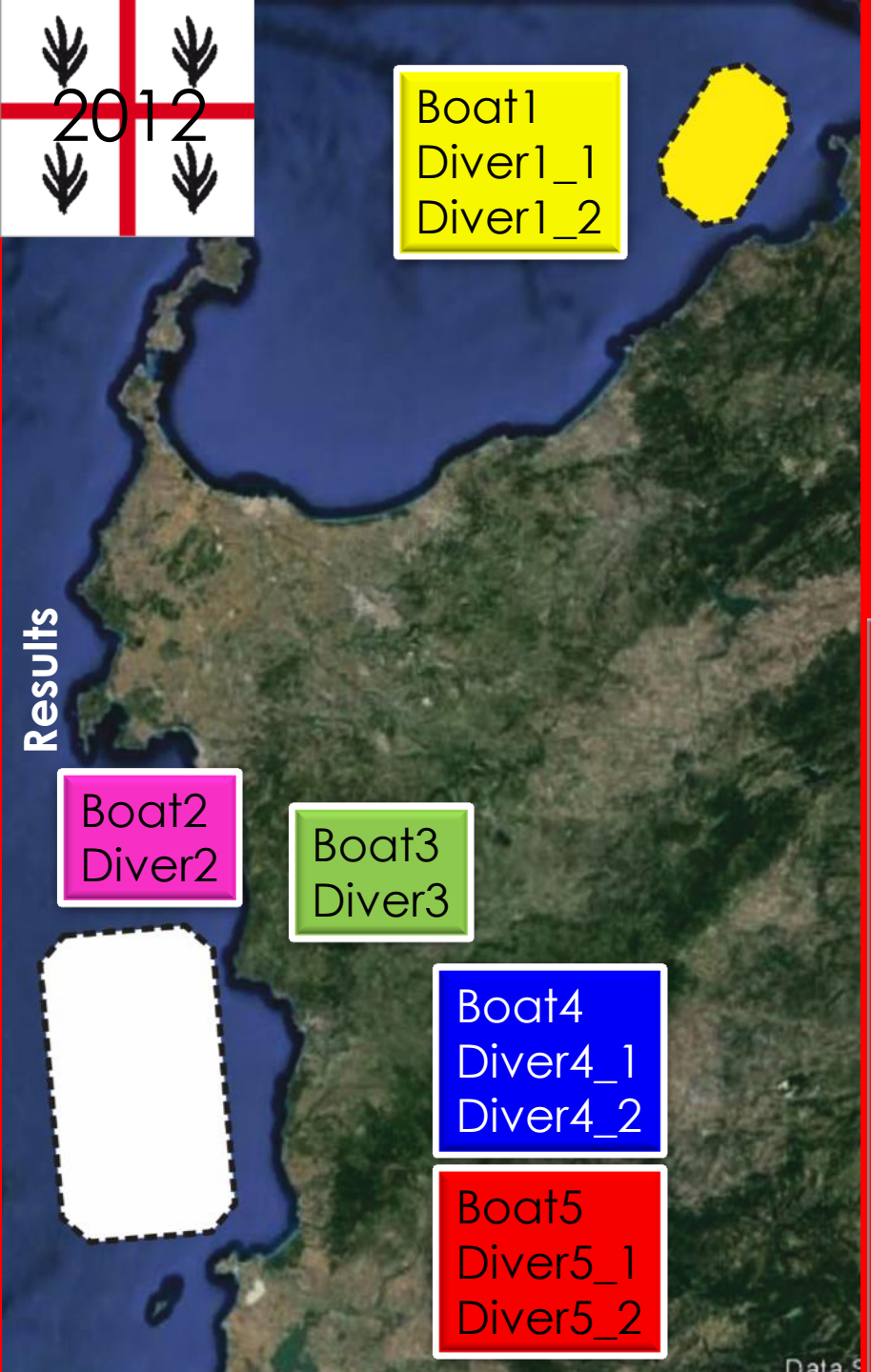
1. Corpo Forestale e di Vigilanza Ambientale
2. Agenzia regionale Laore Sardegna
3. Università di Cagliari – DISVA

20 (out of 25 authorized) applied for the experimental campaign

Data effectively collected from 2 areas:

North (Santa Teresa)

North West (Bosa)




# 5 boats, 8 divers monitored

| | area | port | days at sea | prospection | harvesting |
|---|---|---|---|---|---|
| boat1 | North | SantaTeresa | 15 | | 15 |
| boat2 | Northwest | Bosa | 26 | 6 | 20 |
| boat3 | Northwest | Bosa | 21 | 7 | 14 |
| boat4 | Northwest | Bosa | 22 | 9 | 13 |
| boat5 | Northwest | Bosa | 28 | 3 | 25 |
| subtotal | Northwest | Bosa | 97 | 25 | 72 |
| total | N+NW | | 112 | 25 | 87 |

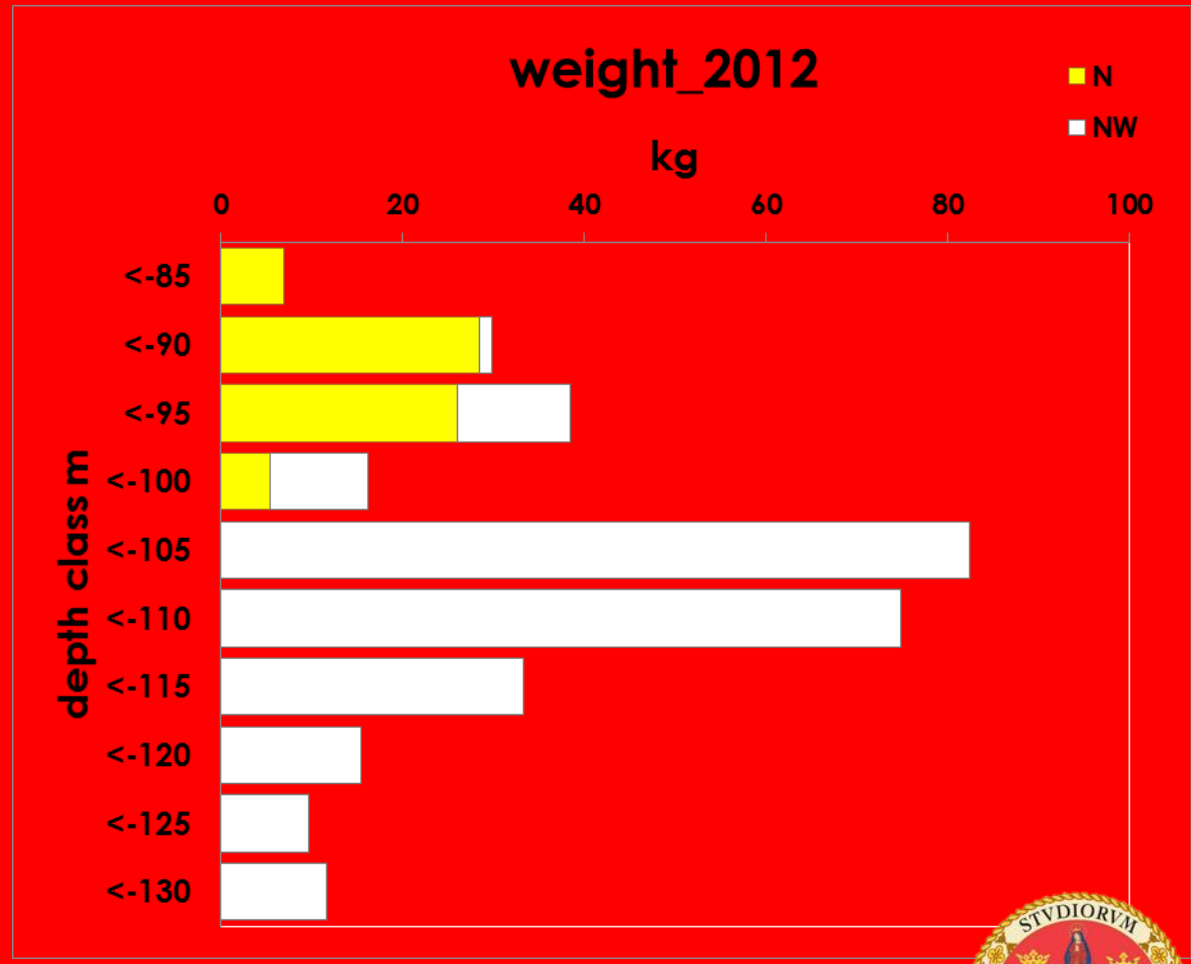
Results

| | | kg/dive | | |
|---|---|---|---|---|
| | total kg | min | max | mean |
| **boat1** | **72,8** | **0,30** | **4,5** | **2,4** |
| diver1_1 | 36,7 | 1,12 | 3,74 | 2,4 |
| diver1_2 | 36,1 | 0,30 | 4,5 | 2,4 |
| **boat2 diver2** | **48,4** | **0,4** | **5,8** | **2,4** |
| **boat3 diver3** | **34,2** | **1,0** | **3,9** | **2,4** |
| **boat4** | **54,6** | **1,5** | **4,0** | **2,5** |
| diver4_1 | 31,8 | 1,5 | 4,0 | 2,7 |
| diver4_2 | 22,8 | 1,5 | 3,1 | 2,3 |
| **boat5** | **116,3** | **0,5** | **6,6** | **3,4** |
| diver5_1 | 60,2 | 0,5 | 5,3 | 3,0 |
| diver5_2 | 56,1 | 1,5 | 6,6 | 4,0 |
| **Total** | **326,2** | **0,3** | **6,6** | **2,7** |

NOT compliance with the legal limit

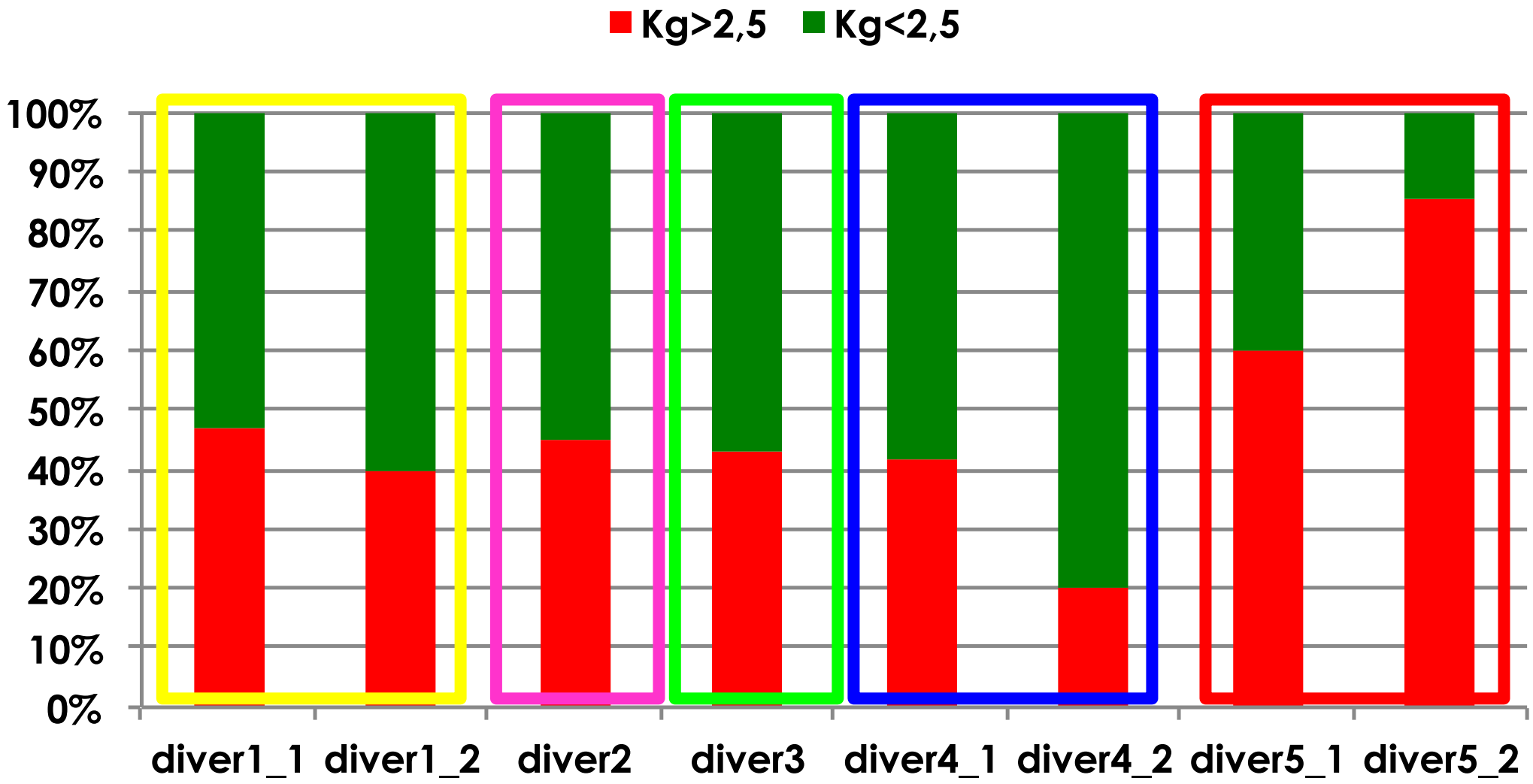
weight limit

2012



# number of dives 2012

2012




boat1
boat2
boat3
boat4
boat5

In compliance with the legal limit

NOT In compliance

Results

| | | basal diameter | | |
|---|---|---|---|---|
| colonies measured | | Min | Max | mean |
| **boat1** | **2275** | **4,2** | **22,5** | **8,5** |
| diver1_1 | 1180 | 4,2 | 22,5 | 8,3 |
| diver1_2 | 1095 | 4,3 | 17,8 | 8,8 |
| **boat2 diver2** | **552** | **4,6** | **34,6** | **10,9** |
| **boat3 diver3** | **383** | **6,1** | **19,0** | **9,8** |
| **boat4** | **1042** | **4,3** | **29,1** | **10,4** |
| diver4_1 | 559 | 4,3 | 27,3 | 10,4 |
| diver4_2 | 483 | 5,8 | 29,1 | 10,3 |
| **boat5** | **1555** | **5,7** | **38,7** | **9,9** |
| diver5_1 | 837 | 6,2 | 23,0 | 9,8 |
| diver5_2 | 718 | 5,7 | 38,7 | 10,0 |
| **Total** | **5807** | **4,2** | **38,7** | **9,5** |

**Size limit**

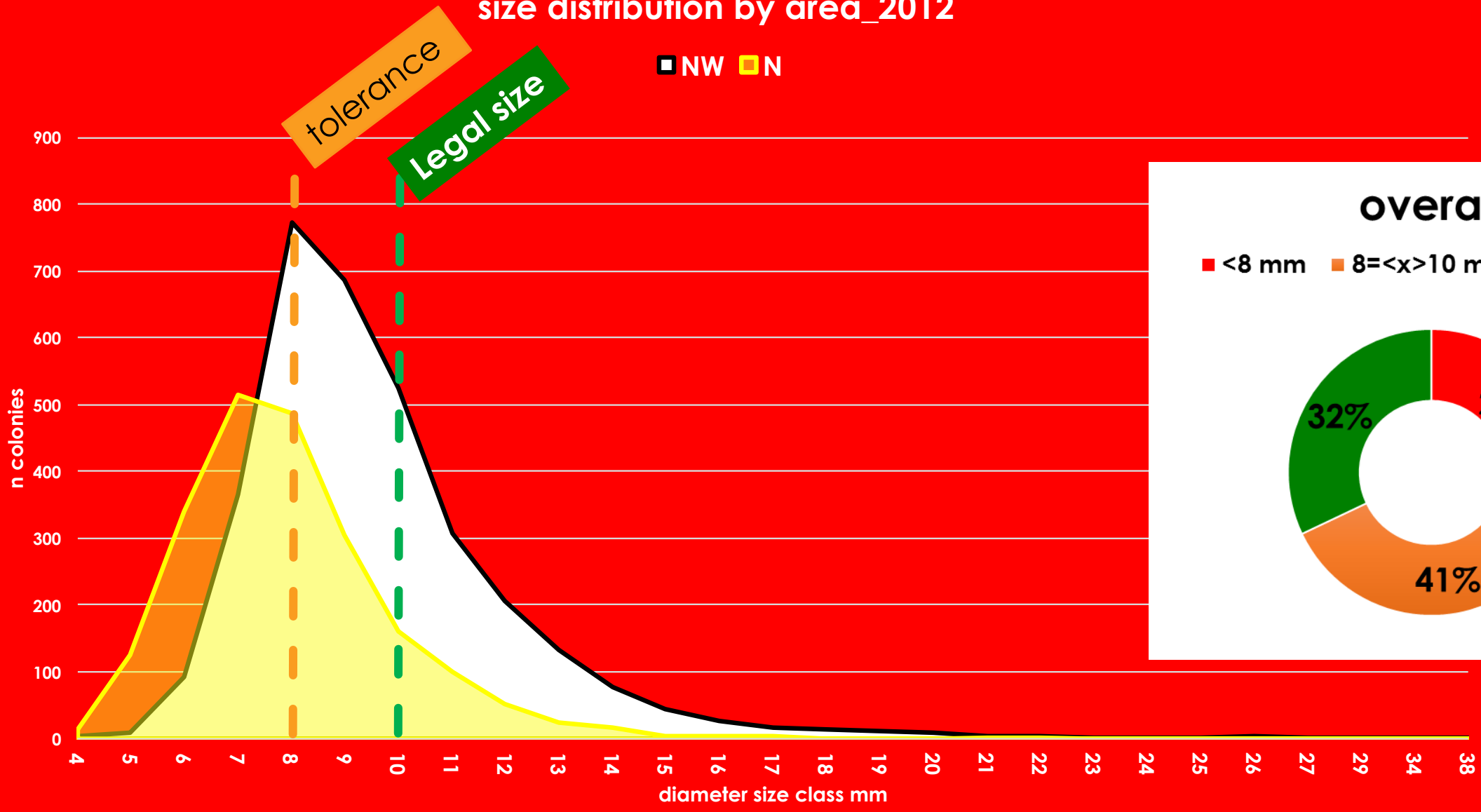
2012

In compliance with the legal limit (10 mm)

In compliance with the legal limit (10 mm) considering the allowed 20% tolerance in size

2012

# size distribution by area_2012



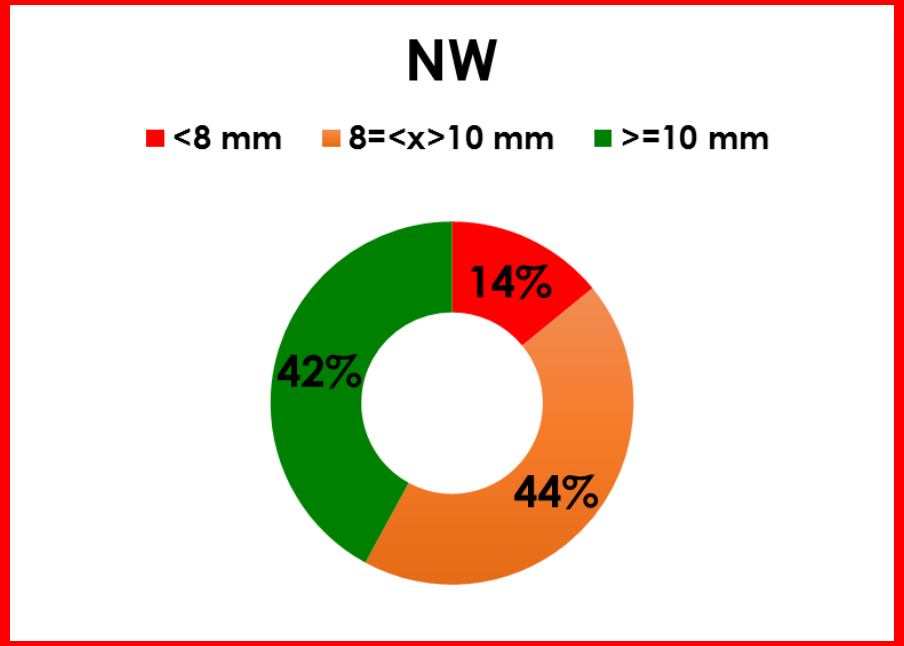

## overall

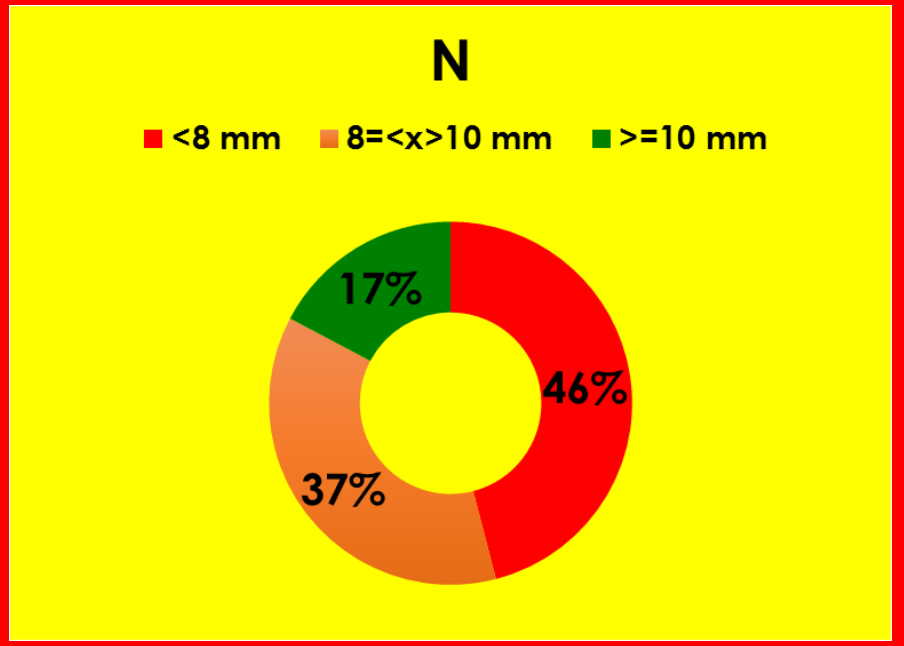
# Size limit

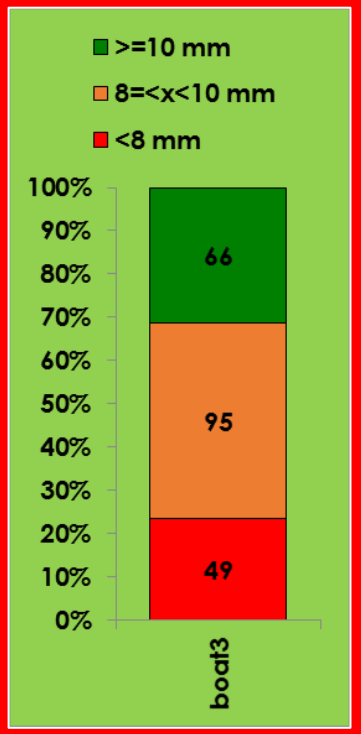
below the legal size

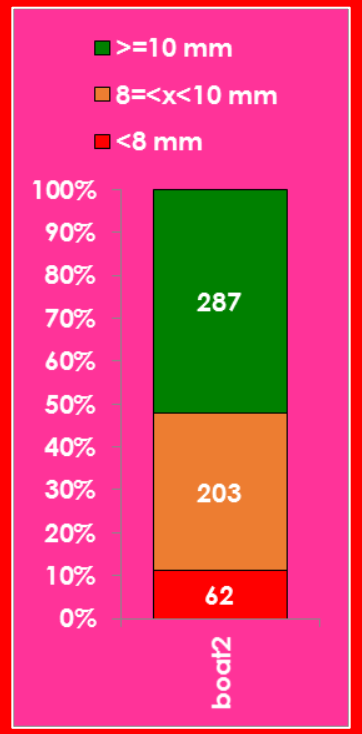
below the legal size (tolerance)

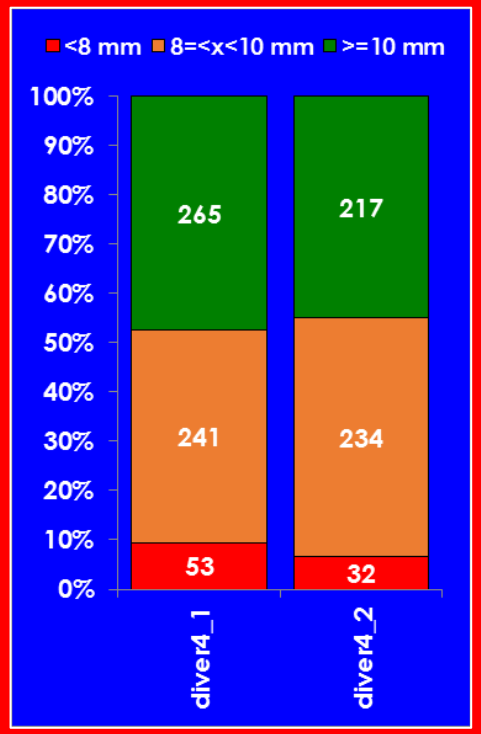
above the legal size

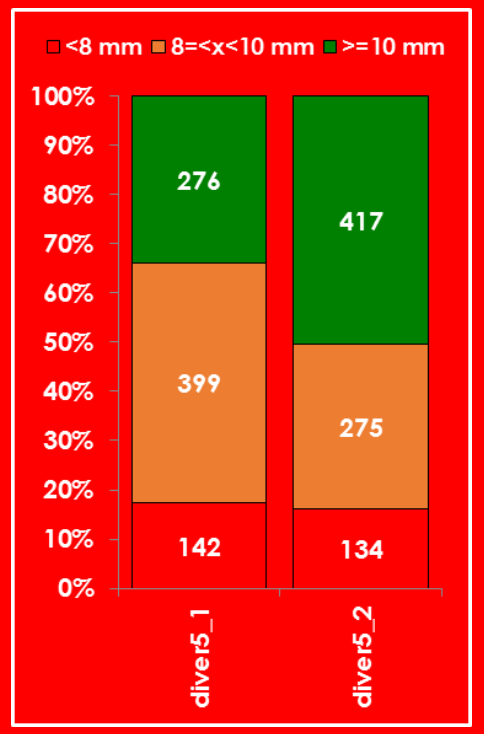


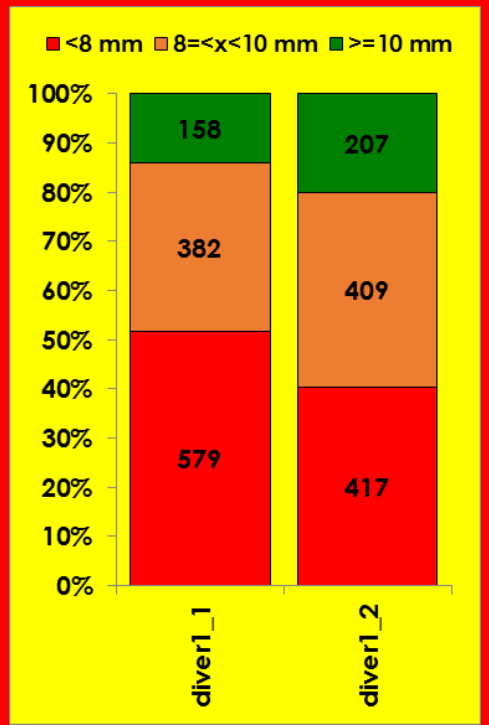





Results

2013 SOS Scientific Observers Sardinia coral

13 june-15 october 2013

1 institution involved

**Università di Cagliari – DISVA**

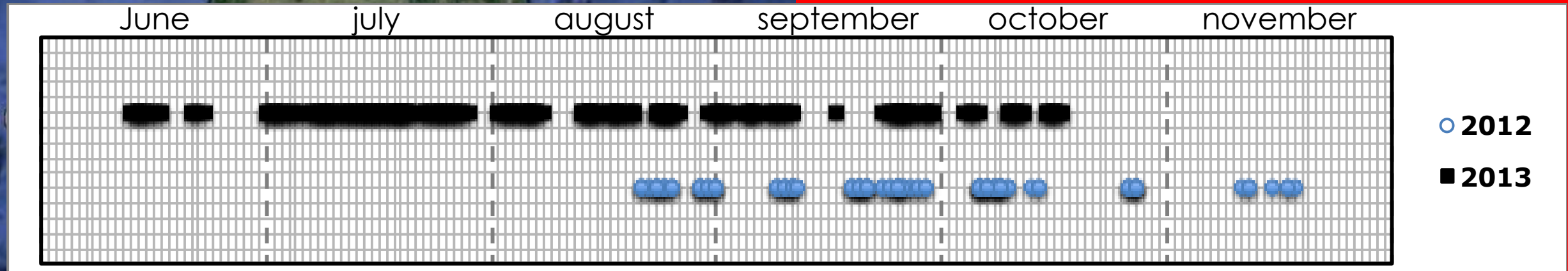
7 divers out of 17 authorizations

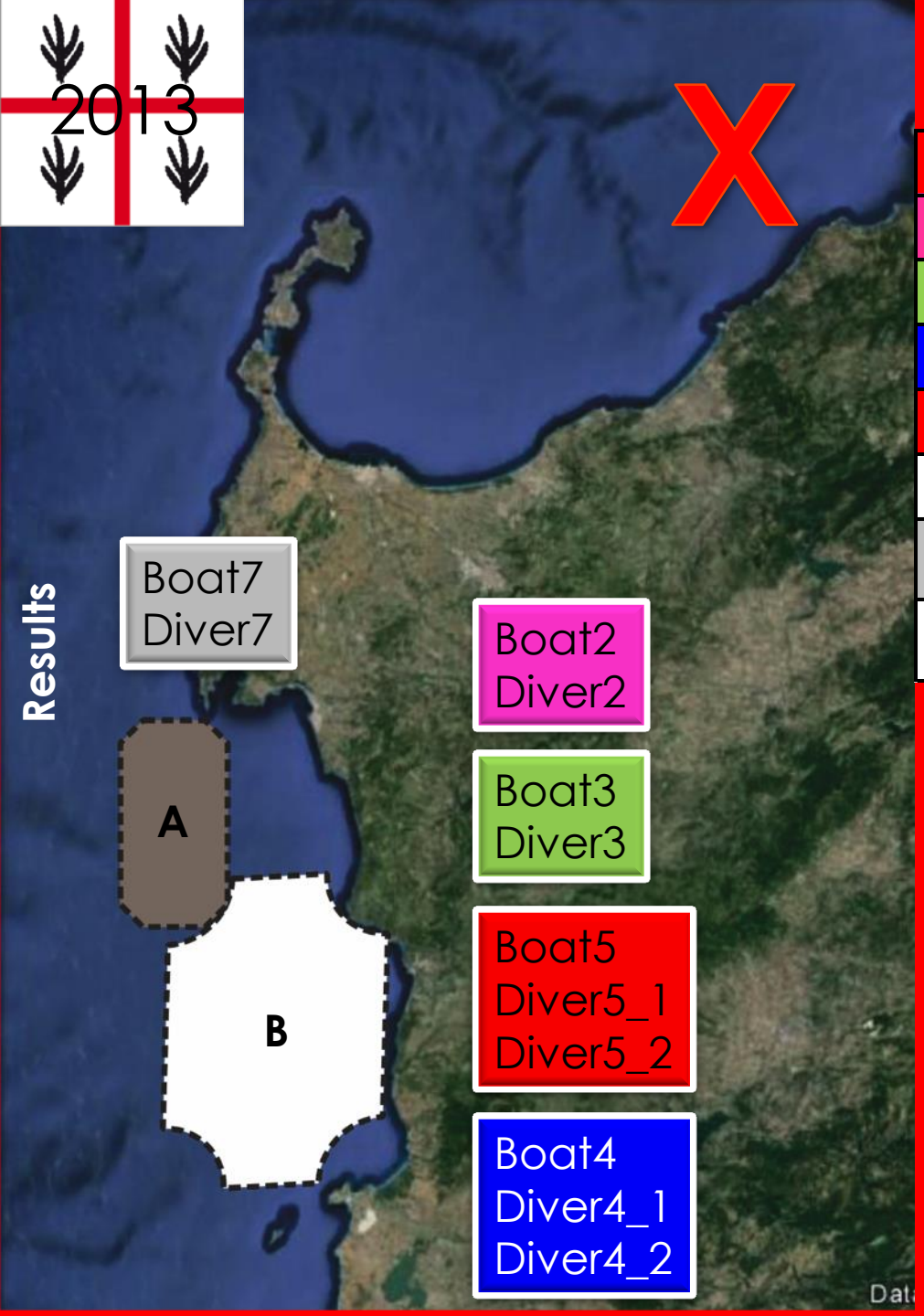
1 area investigated (NW)

2 ports:

Bosa

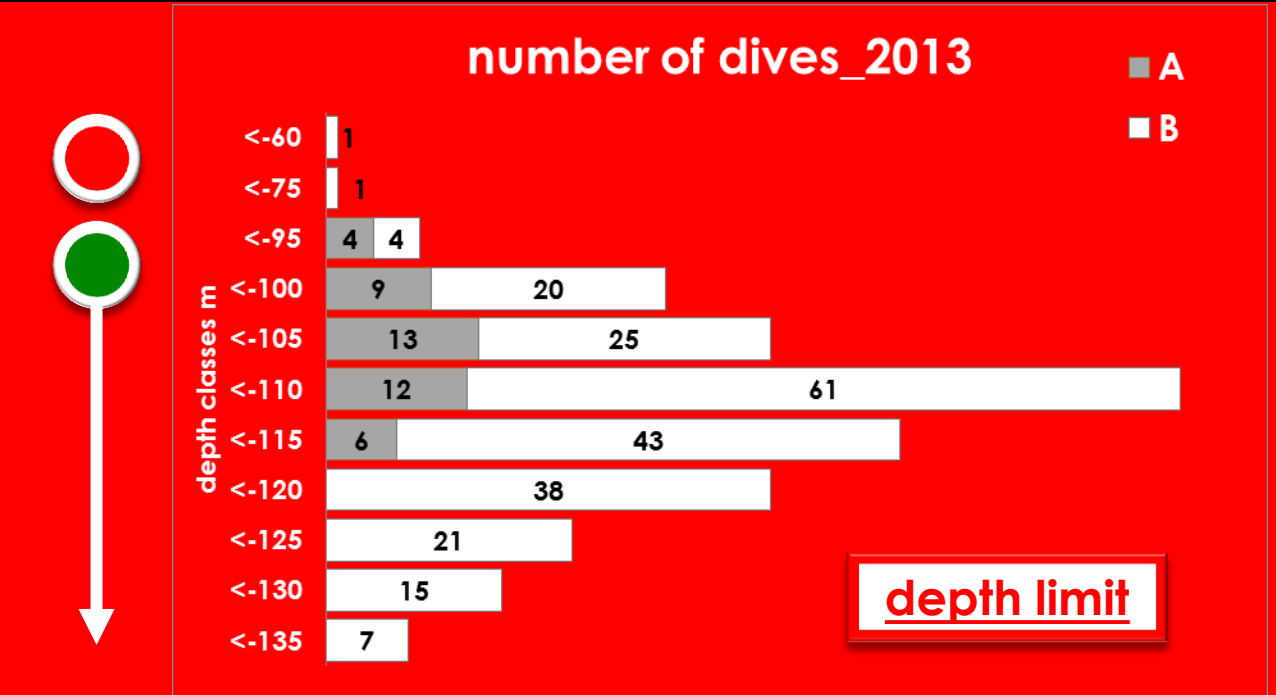
Alghero





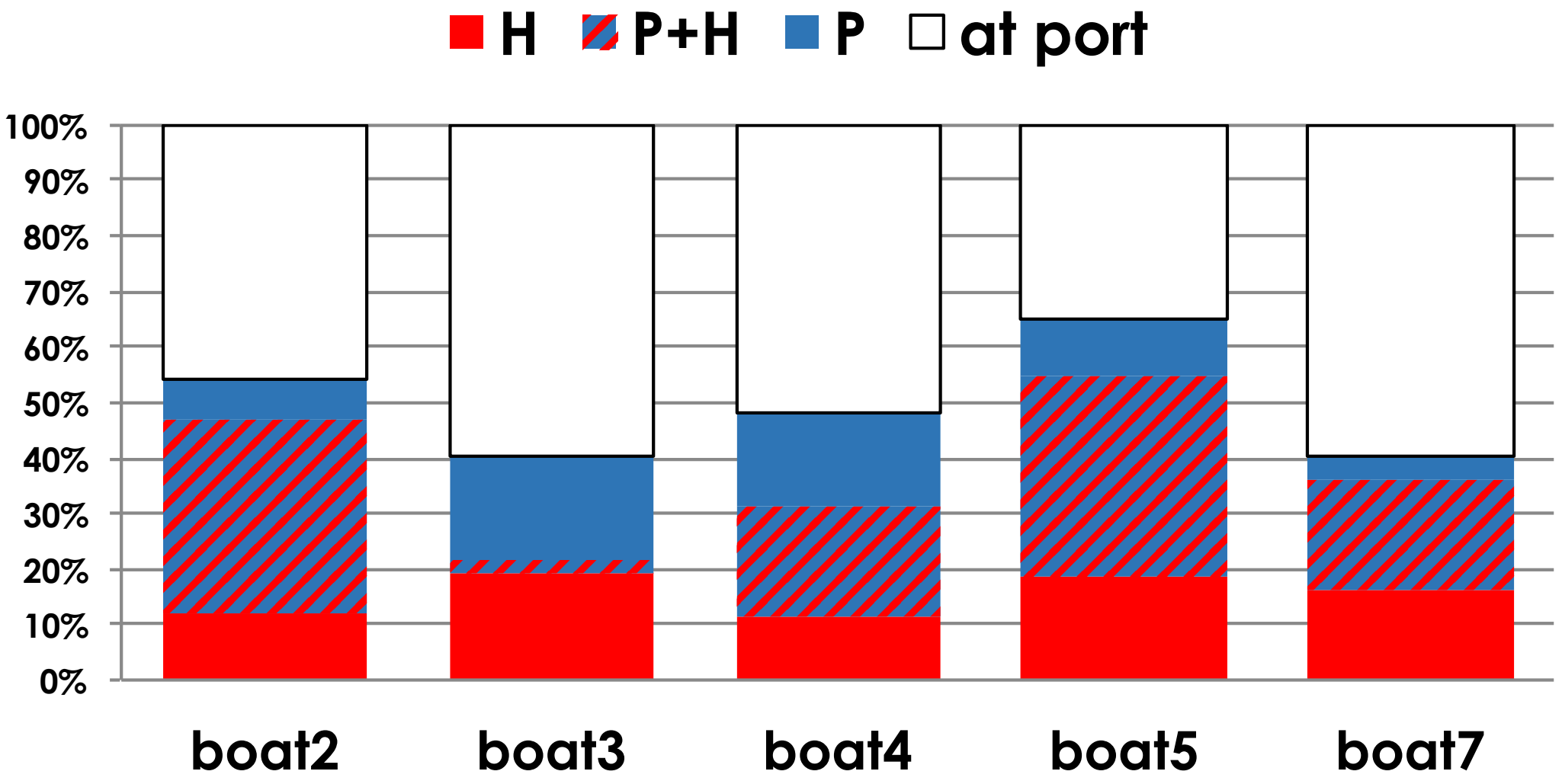

# 6 boats, 8 divers monitored

| | area | port | days at sea | dives |
|---|---|---|---|---|
| boat2 | Northwest | Bosa | 67 | 58 |
| boat3 | Northwest | Bosa | 50 | 28 |
| boat4 | Northwest | Bosa | 59 | 51(26+25) |
| boat5 | Northwest | Bosa | 81 | 106 (66+40) |
| boat6 | Northwest | Bosa | 5 | |
| boat7 | Northwest | Alghero | 50 | 45 |
| **total** | **NW** | | **312** | **288** |



# Monitoring:13 june-15 october 2013 (125 days)

2013



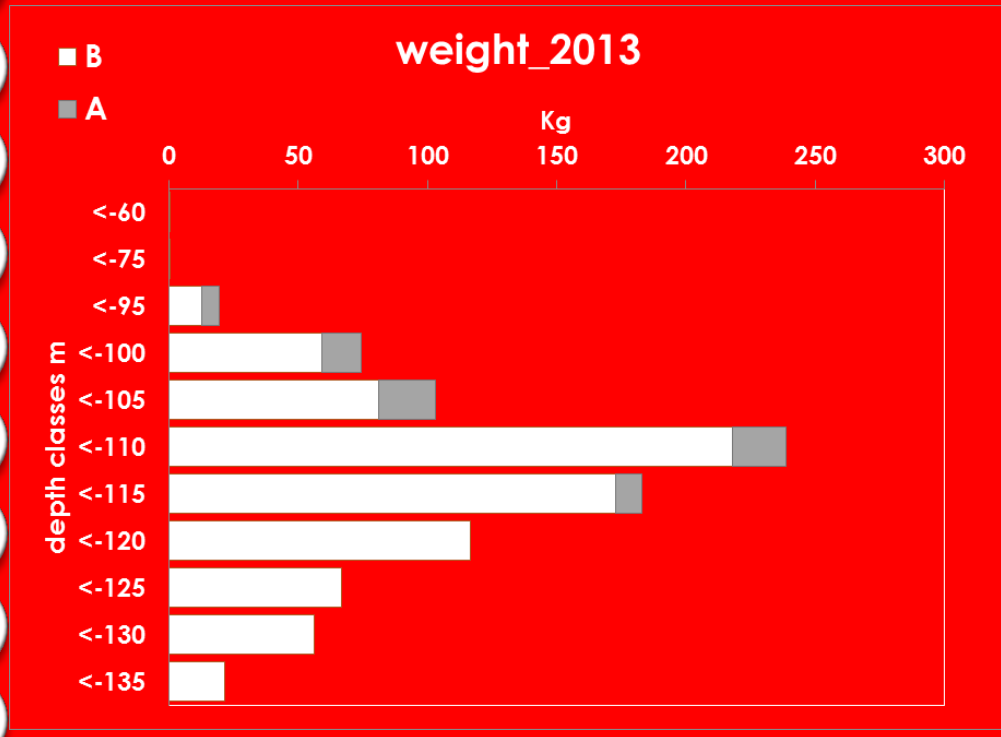

P prospection, H harvesting, P+H prospection and harvesting

# weight limit

2013

Results

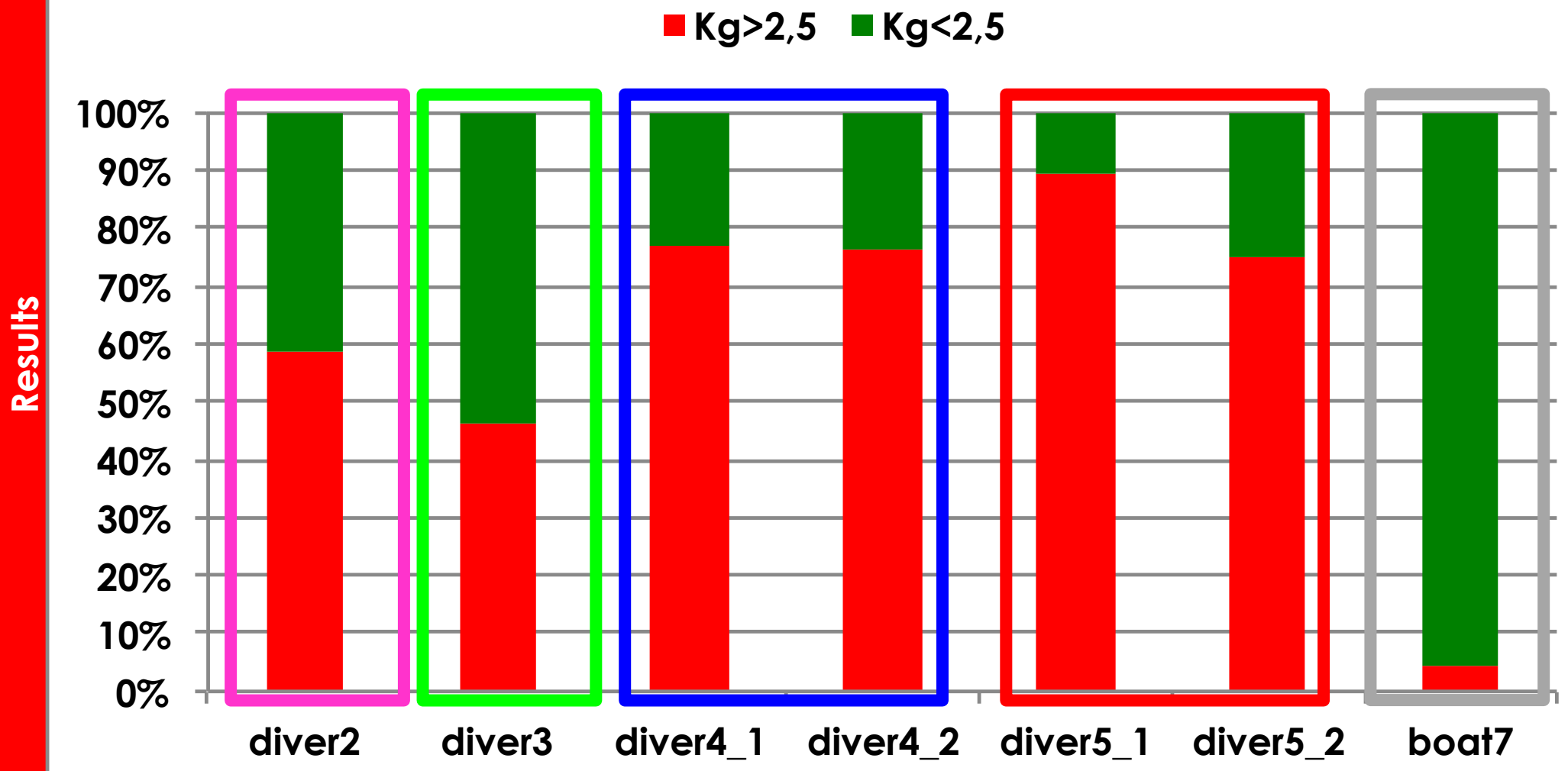
| | kg/dive | | | |
|---|---|---|---|---|
| | total kg | min | max | mean |
| **boat2 diver2** | **160,2** | **0,2** | **5,2** | **2,9** |
| **boat3 diver3** | **78,8** | **0,5** | **5,1** | **2,8** |
| **boat4** | **238,8** | **0,8** | **11,1** | **4,7** |
| diver4_1 | 125,3 | 1,6 | 9,6 | 4,8 |
| diver4_2 | 113,5 | 0,8 | 11,1 | 4,5 |
| **boat5** | **337,5** | **1,0** | **5,7** | **3,2** |
| diver5_1 | 223,3 | 1,0 | 5,7 | 3,4 |
| diver5_2 | 114,1 | 1,0 | 3,8 | 2,9 |
| **boat7 diver7** | **74,5** | **0,2** | **3,0** | **1,7** |
| **Total** | **889,8** | **0,2** | **11,1** | **3,1** |




NOT In compliance with the legal limit of 2,5 kg/day

# number of dives 2013

2013




weight limit

boat2
boat3
boat4
boat5
boat7

In compliance with the legal limit

NOT In compliance

# Size limit

2013

Results

| | | basal diameter | | |
|---|---|---|---|---|
| colonies measured | | Min | Max | mean |
| boat1 diver2 | 1808 | 3 | 35,2 | 11,3 |
| boat3 diver3 | 917 | 4 | 28,0 | 9,2 |
| boat4 | 2474 | 4,6 | 41,2 | 10,7 |
| diver4_1 | 1075 | 5,3 | 41,2 | 11,3 |
| diver4_2 | 1399 | 4,6 | 33,0 | 10,3 |
| boat5 | 4591 | 3 | 35,4 | 9,6 |
| diver5_1 | 3002 | 3 | 29,7 | 9,5 |
| diver5_2 | 1589 | 3 | 35,4 | 9,8 |
| boat7 diver7 | 1517 | 3,1 | 33,0 | 10,1 |
| Total | 11307 | 3 | 41,2 | 10,2 |

In compliance with the legal limit

NB in 2013 the legal size limit is fixed at 8 mm (+5% of tollerance in weight for undersized colonies /dive)

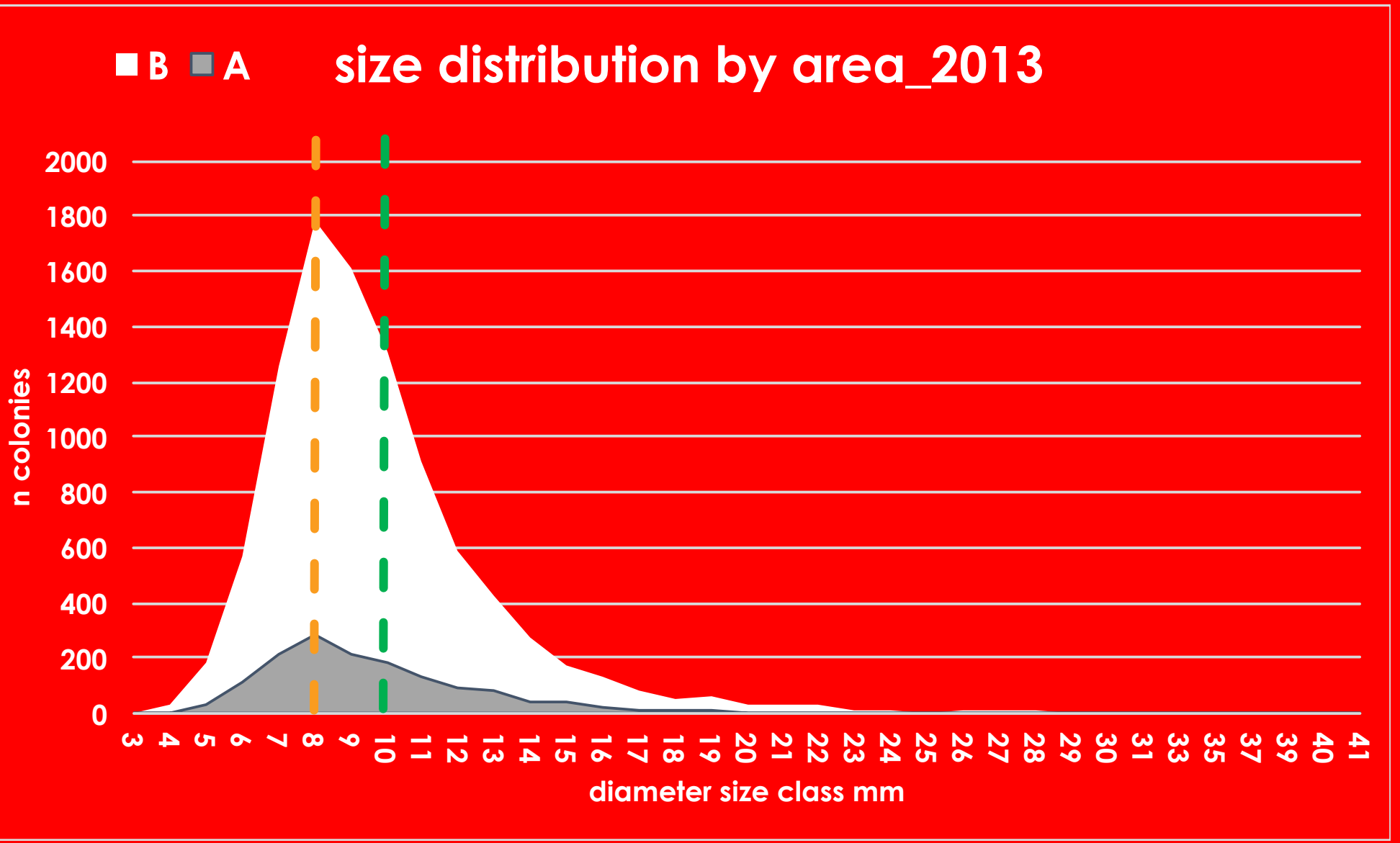
# Size limit

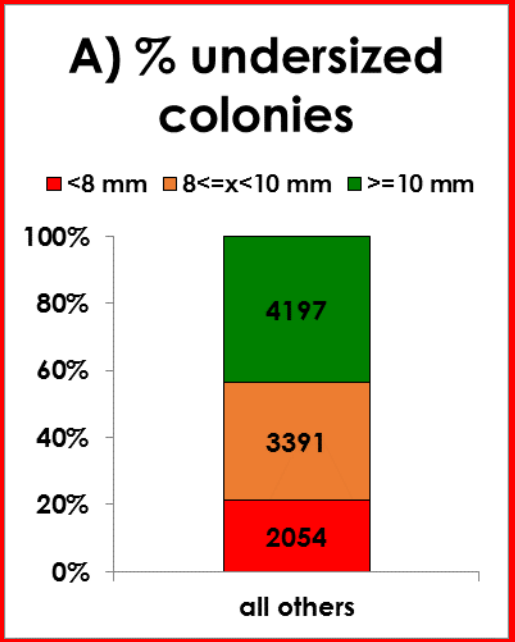
2013

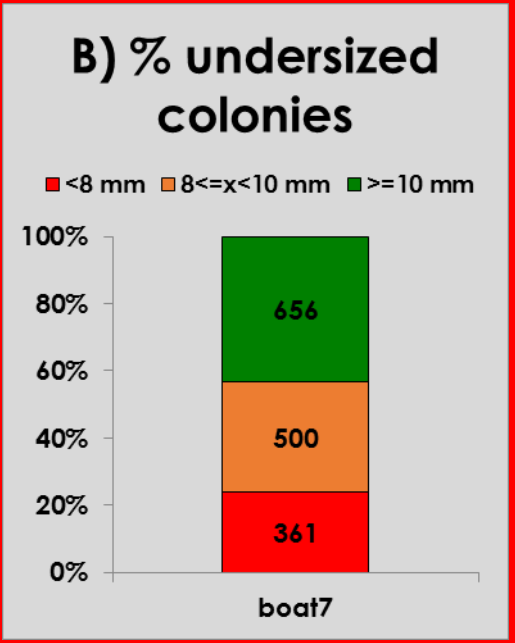
below the legal size

above the legal size (2013)
below the legal limit ù2012)

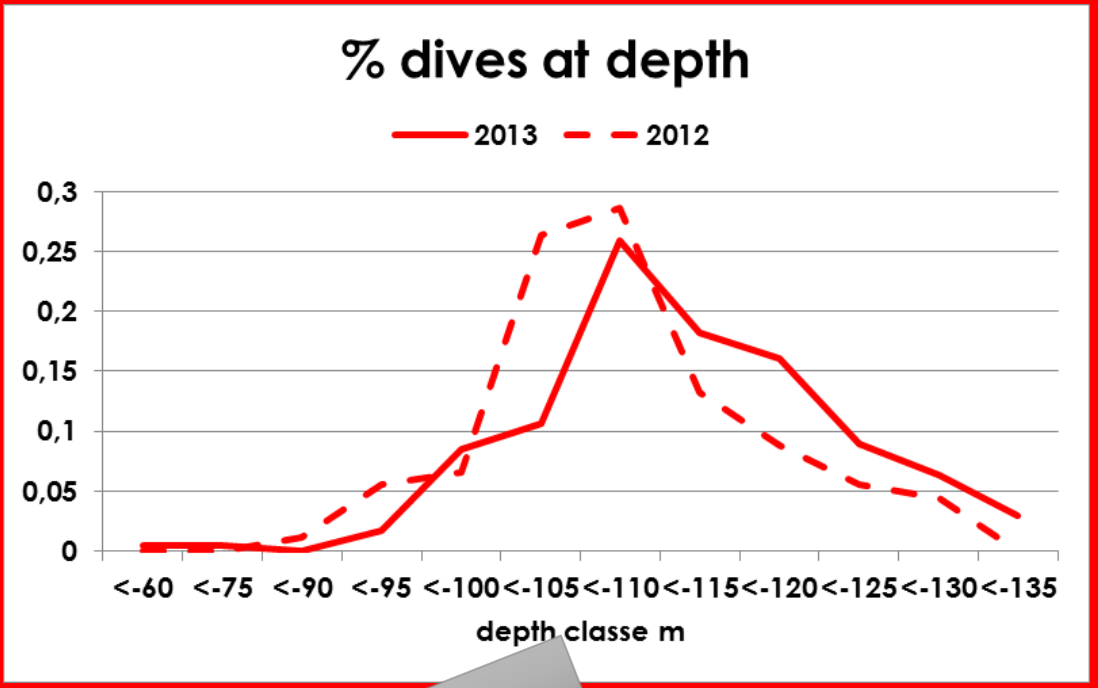
above the legal size



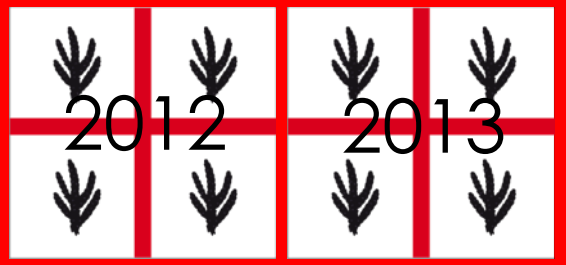



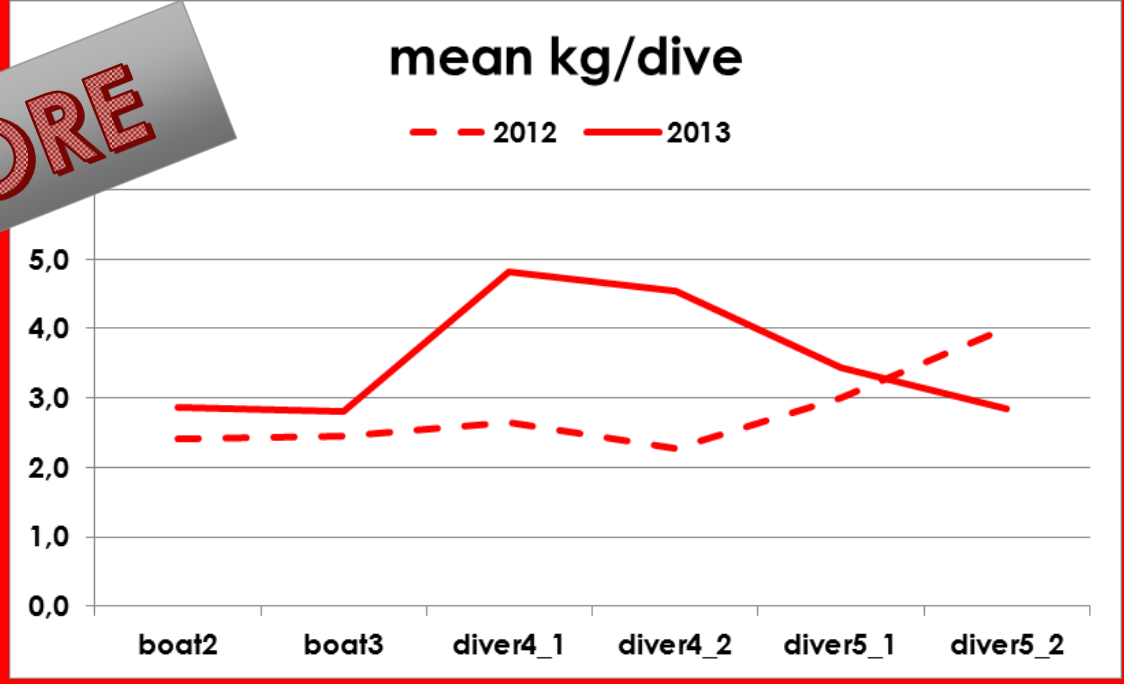
conclusions

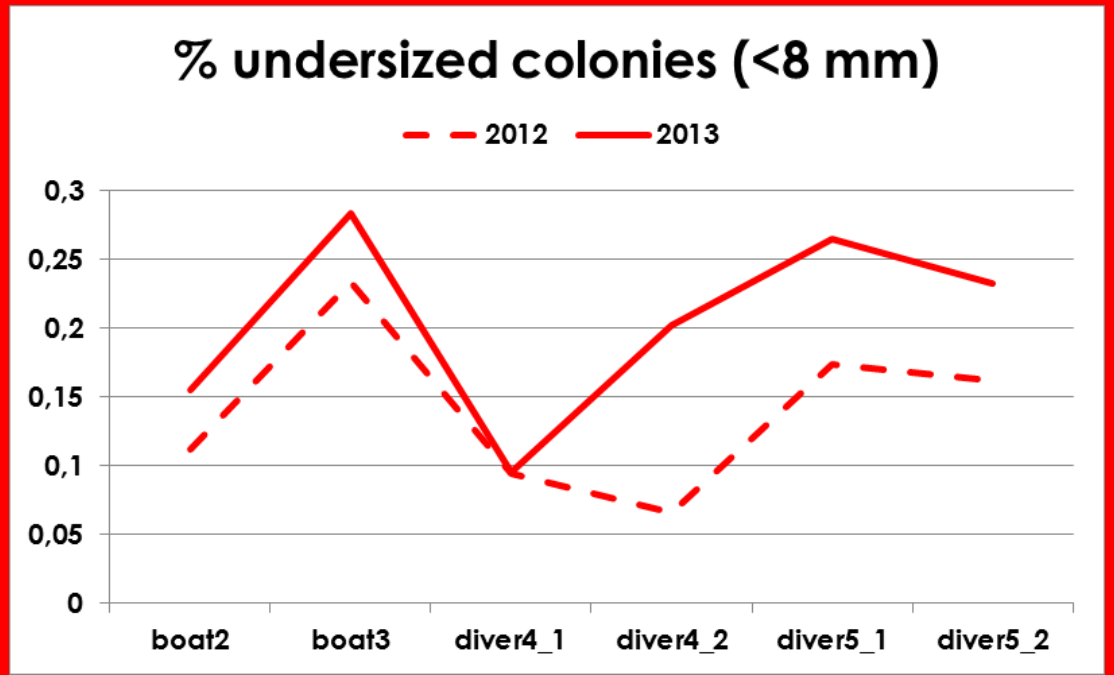



DEEPER




MORE




SMALLER

| GOAL | OBJECTIVE | INDICATOR | REFERENCE POINTS | Precautionary RP |
|---|---|---|---|---|
| TO KEEP RED CORAL STOCKS AT A SUSTAINABLE LEVEL | Control that the size limits | SIZE=S | Target= $S_{tg}$ …s at size = …) …% of landings is at size = legal size limit LS) | Threshold= $S_{pa}$=(85% of landings is at size = legal size limit LS) |

ALARMING TREND!!!

Boat7

% colonies >=8 mm … 80% … 85% … 90%

bo

bo

bo

bo

bo

bo

Partial picture: not all divers/areas were monitored

'fishery independent data'

USEFUL FOR THE ADAPTIVE MANAGEMENT

2014: Political will and relative adequate fundings???

| | | |
|---|---|---|
| ○ | (Snow<Slim) | Recommend stricter controls<br>Surveys to evaluate the actual size structure<br>Evaluate the possibility to close the fishing |




# MORE DATA AVAILABLE…

(AGE, REPRODUCTION, DEMOGRAPHY, BRANCHING PATTERNS , GENETICS ETC ETC)

**MIPAAF** DM 04/07/2011 GU n.166 del 19/07/2011

Uso del ROV (Remotely Operated Vehicle) nella definizione applicativa di piani di gestione per il corallo rosso (*Corallium rubrum*). Strategie gestionali per la conservazione della specie e valutazione della compatibilità della risorsa con un potenziale sfruttamento commerciale lungo le coste italiane del Tirreno centro-settentrionale

**MIUR** PRIN 2010-2011

Biocostruzioni costiere: struttura, funzione, e gestione

**MIATTM** 2010-2012

Studi di popolazioni di corallo rosso profondo

**RAS** n.3189/DecA/108 del 19.12.2008

Misure gestionali volte al ripopolamento degli stock di corallo rosso (*Corallium rubrum* L., 1758)

**RAS** LR7 Agosto 2007

Struttura spaziale, di popolazione e genetica dei banchi di *Corallium rubrum* del Mediterraneo centro occidentale

# MANY THANKS TO

REGIONE AUTÒNOMA DE SARDIGNA
REGIONE AUTONOMA DELLA SARDEGNA

Ministero delle politiche agricole alimentari e forestali

## THE SCIENTIFIC OBSERVERS ON BOARD in particular to:

1. ALESSANDRO CAU
2. ALESSANDRO CONSOLO
3. ANTONELLO MULAS
4. CARLOTTA PANI
5. CECILIA BIANCACCI
6. FLAVIO SACCO
7. FRANCESCO PALMAS
8. GIUDITTA SOLDOVILLA
9. LUIGI ARBA
10. MARCO MEREU
11. MIRKO ATZENI
12. NICOLA FRIGAU
13. PAOLA ALTEA
14. SANDRO SARDU
15. SUSANNA CANNAS

Com. Bio. Ma.
Centro di Competenza sulla Biodiversità Marina