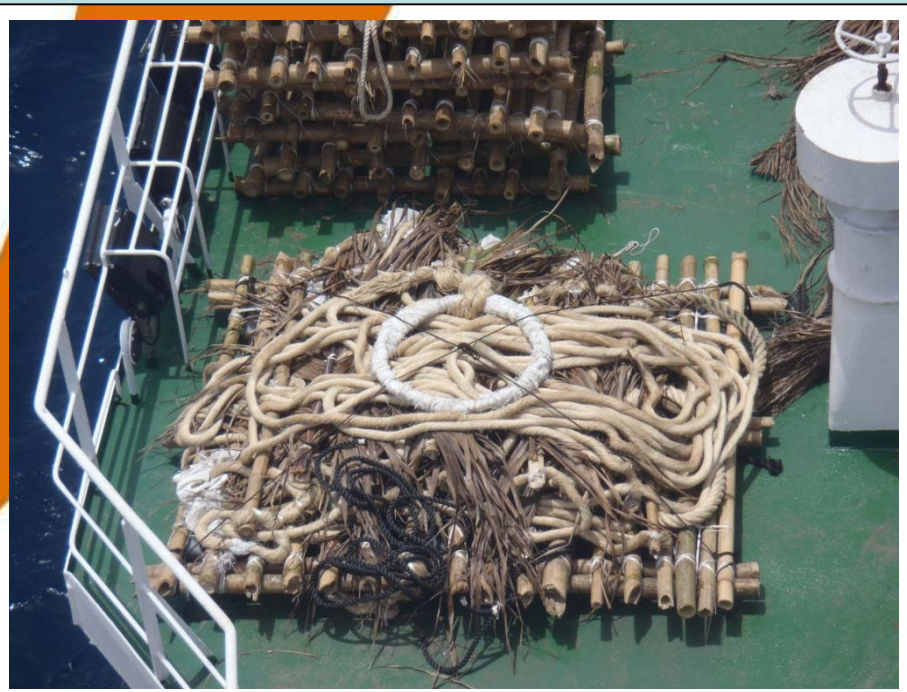
AN ALTERNATIVE DRIFTING FAD FOR REDUCING TURTLE AND SHARK MORTALITY IN ATLANTIC OCEAN



Jose Franco, Jon López, Gala Moreno, Igor Sancristobal

Montpellier 2012

CONTENTS

- Introduction
- Design of the prototypes
- Testing at sea of the prototypes
- Some results
- Conclusions and next steps

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INTRODUCTION

- **Tens of thousands of drifting FADs are estimated to be in use by industrial purse seiners worldwide.**

- **Sea turtles and sharks are slow-reproducing species caught in FAD fishing.**

- **Although incidental catch of sea turtles and sharks in purse seining are low compared with other fishing gears, efforts must be carried out to reduce that incidental catch.**

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EFFECTIVE BY-CATCH MITIGATION MEASURES

The by-catch issues for sharks and turtles can be considered in three scenarios:

Sharks

Marine Turtles

- **Before setting the net** → **ALTERNATIVE FADs**
- **After setting the net** → **SELECTIVE PURSE SEINE**
- **After hauling the net** → **CAREFUL RELEASE PROTOCOLS**

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INTRODUCTION

OBJECTIVE:

Design and test, in the Atlantic Ocean, an alternative DFAD to prevent the entanglement of sea turtles and sharks, being as much as biodegradable as possible and as efficient in aggregating fish as the traditional one.

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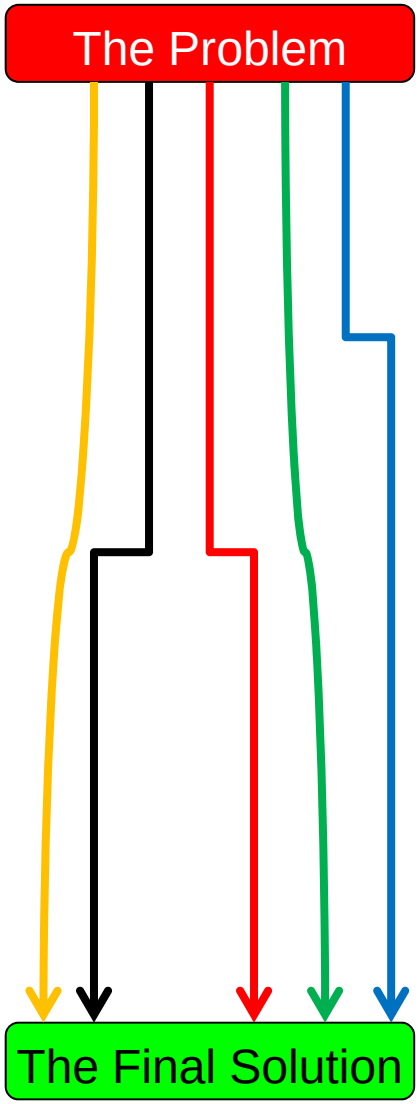
INTRODUCTION



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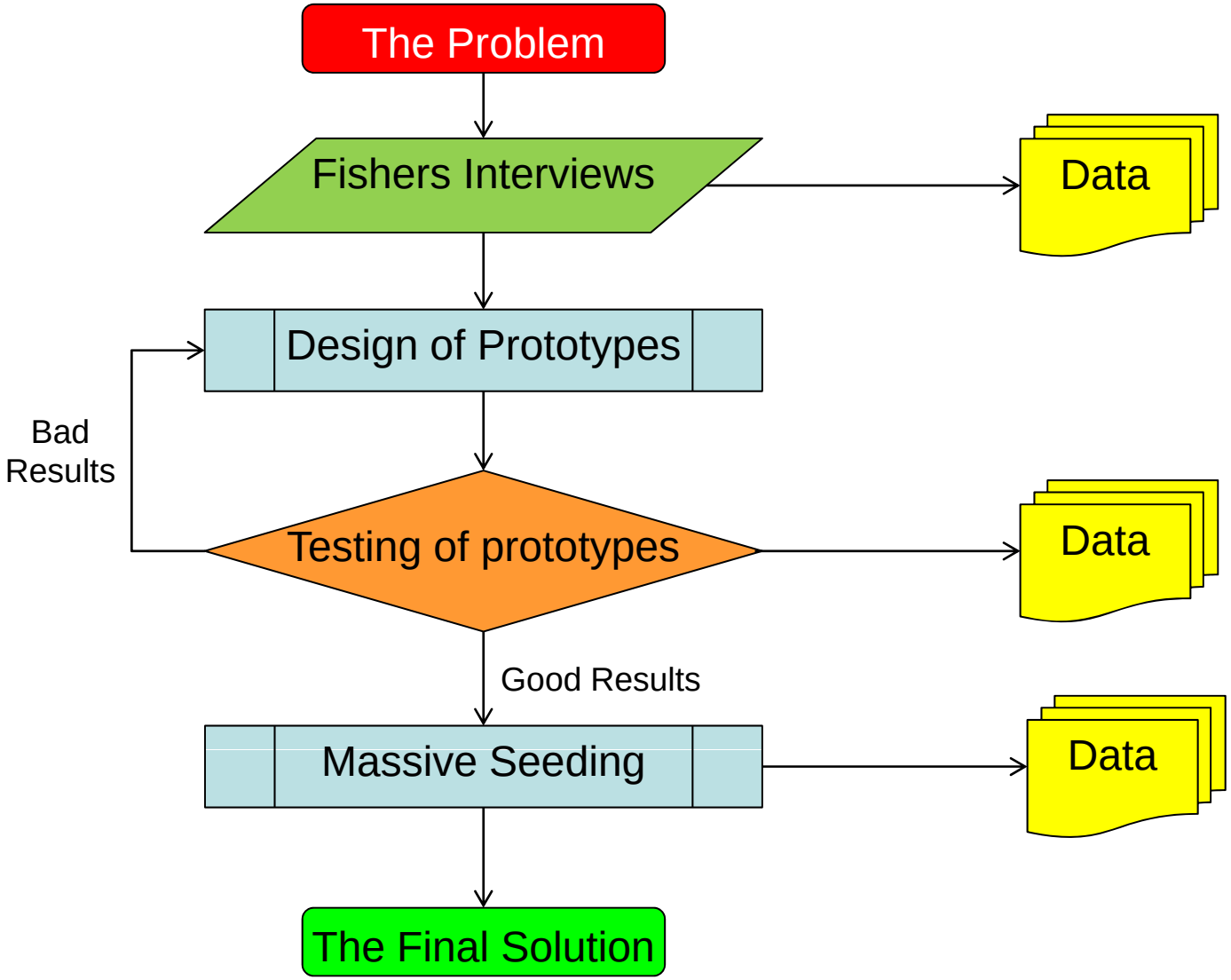
INTRODUCTION



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BASIC CRITERIA

- **FADs should not have hanging panels of nets that can cause entanglements of animals (and eventually some ghost fishing)**
- **The rafts of FADs should not be covered by nets where turtles can be trapped**
- **FADs should be made of biodegradable materials as much as possible**

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FISHERS CRITERIA

- Efficiency to aggregate tunas
- Not detectable by other vessels
- Availability and low cost of materials
- Ease to construct onboard

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DFAD Design

DESIGN (Things to take into account)

- DFADs are ocean-specific
- Fisher's information (MADE 2008 interviews)
- Previous tests (fishers and scientists)
- Skipper's oppinion

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DFAD Design

To replace the polyamide netting with natural fibres:

- **Abacá (Manila hemp), Ramis, Coir, Cotton…**

  PRICE, AVAILABILITY…

- **Jute** **VERY SOFT**

- **Sisal** ✓

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DFAD Design

DFAD MATERIALS:

In the raft:

Raw bamboo poles

In the submerged structure:

Sisal ropes (50 mm Ø)

Sisal ropes (30 mm Ø)

Palm leaves

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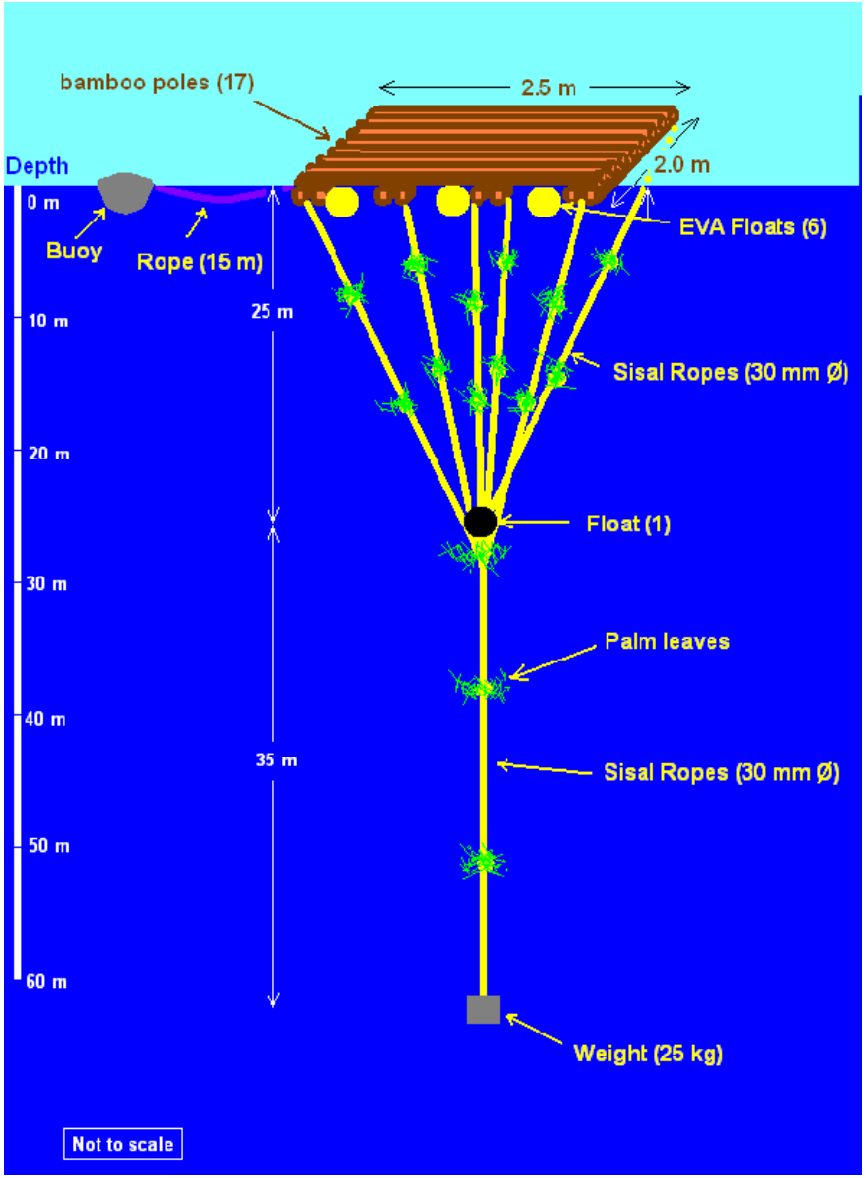
DFAD Design

Design of DFADs:

The EXP1 prototype :

Raft: (2.0 m x 2.5 m) made by bamboo poles (17 - 23).

Underwater structure: 6 sisal ropes slightly twisted that ends together at 25 meters deep and from here to 60 meters deep there is a sisal rope that ends in a weight of 25 kg. Palm leaves attached to give shadow.



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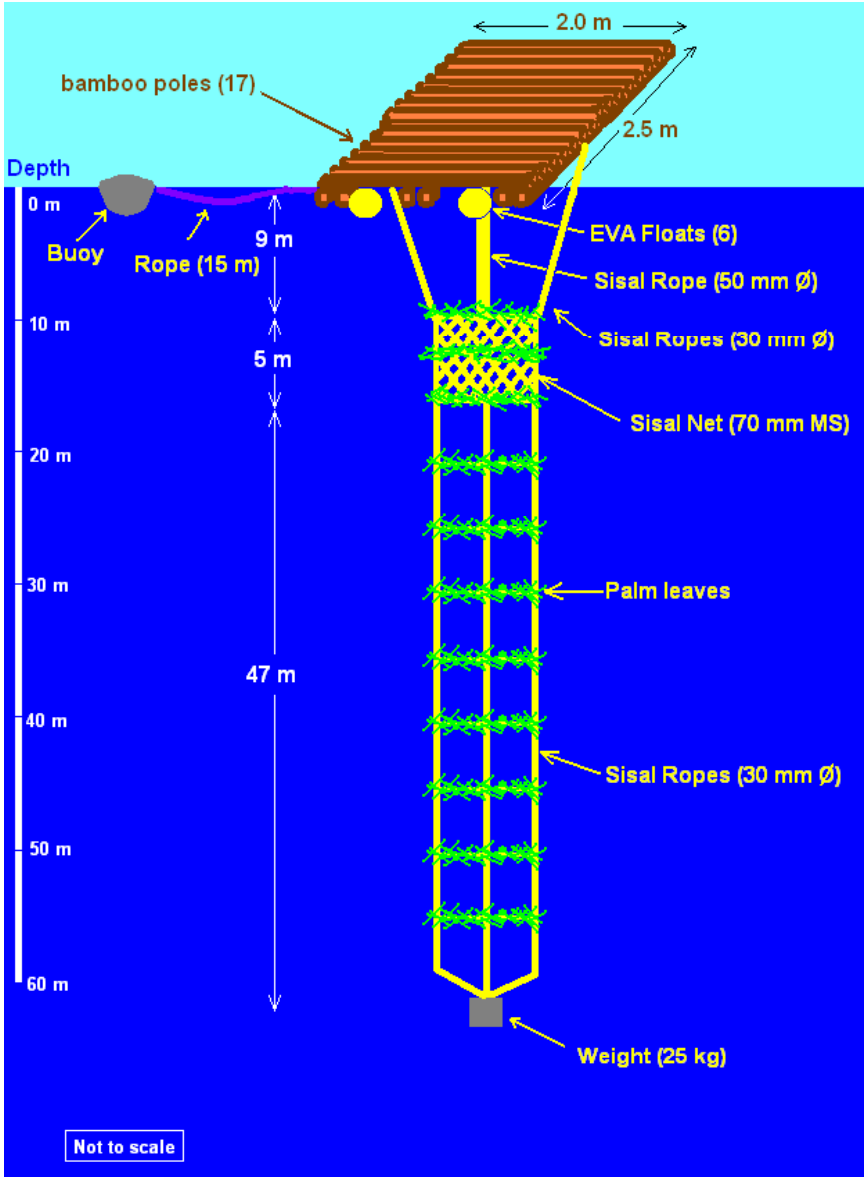
DFAD Design

Design of DFADs:

The EXP2 prototype :

Raft: same bamboo rack than EXP1.

Underwater structure: a 9 meters thick sisal rope (50 mm diam.). At the end of this rope the sisal netting and 3 sisal ropes with palm leaves every 5 meters are attached as far as 60 meters deep.



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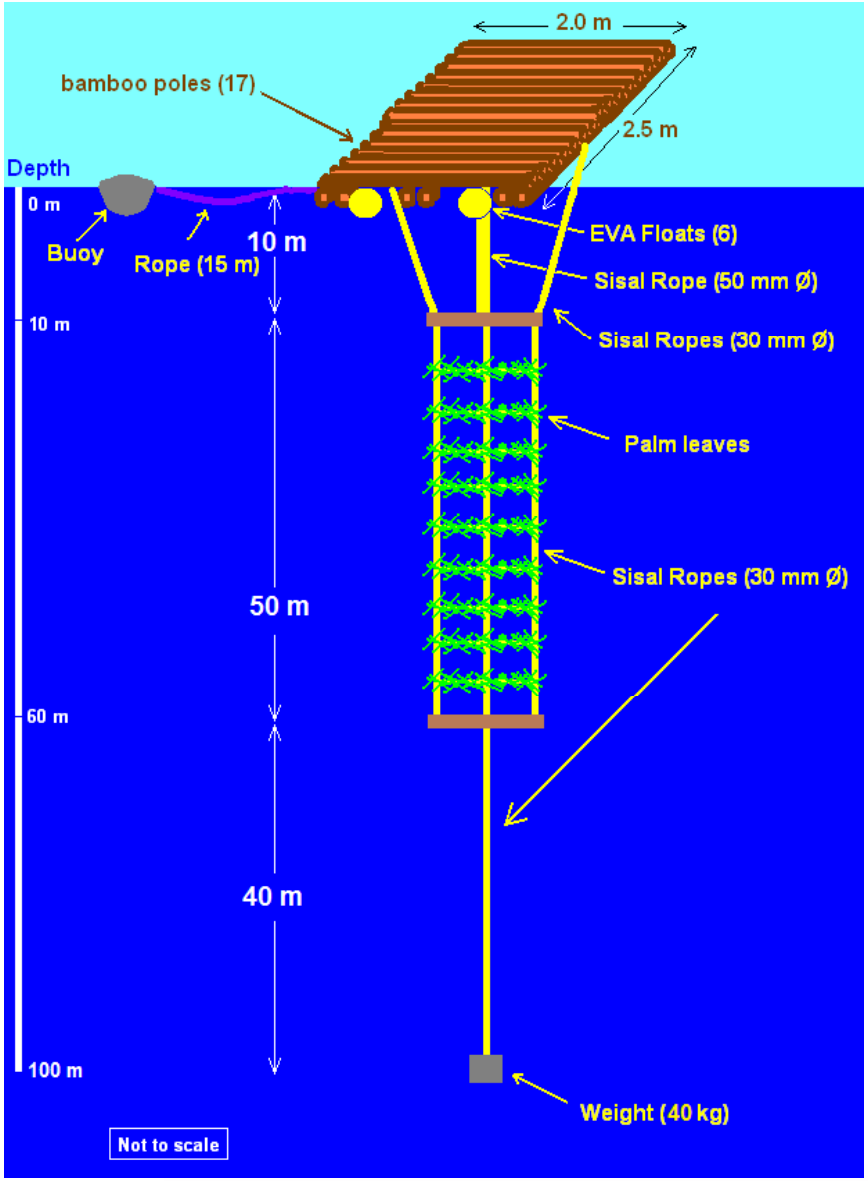
DFAD Design

Design of DFADs:

The EXP3 prototype :

Raft: same bamboo rack than EXP1 and EXP2.

Underwater structure: a 9 meters thick sisal rope (50 mm diam.). At the end of this rope 3 sisal ropes with palm leaves attached every 5 meters. The prototype ends at 100 meters.



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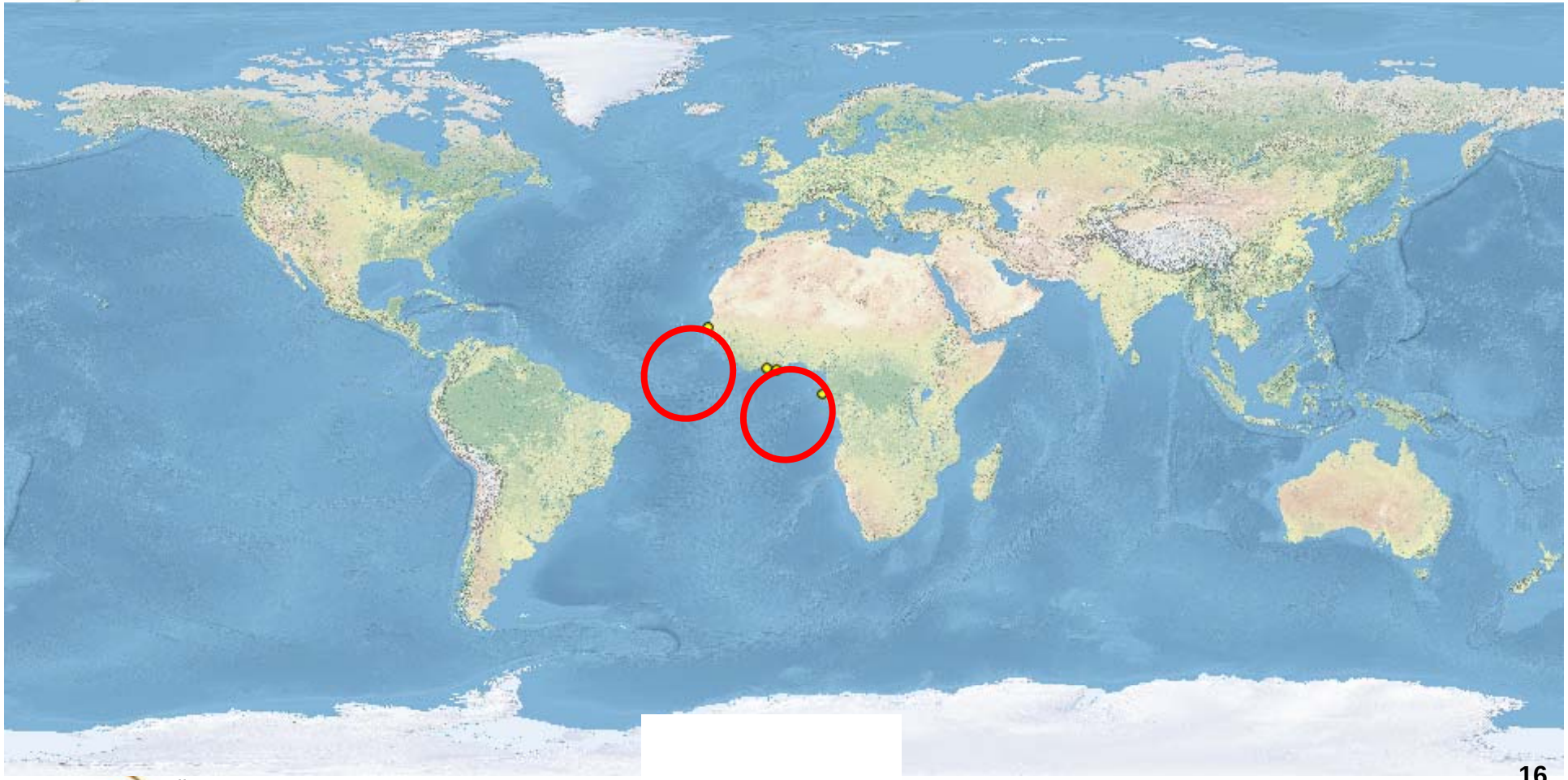
GEOGRAPHICAL LOCATION OF RESEARCH

Two main areas of seeding:



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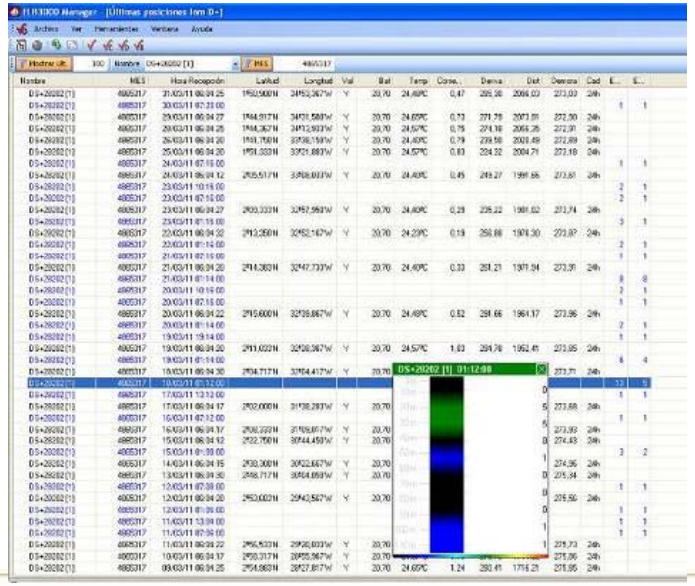
DFAD Test at sea

Deployment of DFADs:

- 1 Fishermen association (ANABAC)
- 1 fishing company (ATUNSA)
- 3 cruises
- 55 Alternative DFADs with Echosounder
- Buoys tracked by software

Position, estimated biomass (10 layers), seawater temperature, travelled distance, speed and other parameters are registered.



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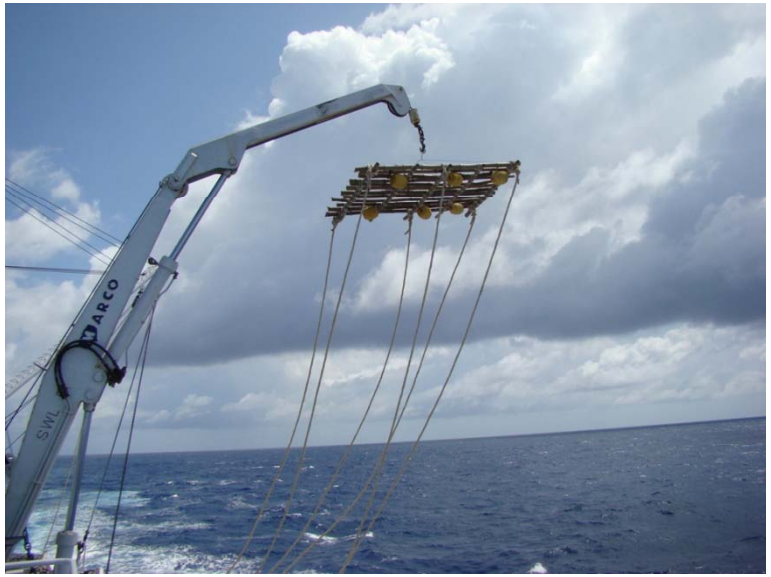
DFAD Test at sea

Deployment of DFADs:

1st Cruise (Nov-Dic 2010)

Prototype: EXP1



ID Buoy	Name	Seeding Date	Seeding LAT	Seeding LONG	Tª
1	DS+ 28202	17/11/2010	00º22 S	20º09 W	27,4
2	DS+ 28210	14/11/2010	03º22 N	25º48 W	28,2
3	DS+ 28292	18/11/2010	00º01 S	19º45 W	27,2
4	DS+ 28323	17/11/2010	01º26 N	20º50 W	28,7
5	DS+ 28336	17/11/2010	01º05 N	20º47 W	28,5
6	DS+ 28401	14/11/2010	03º16 N	26º05 W	28,3
7	DS+ 28466	14/11/2010	03º14 N	24º32 W	28,0
8	DS+ 28477	17/11/2010	00º16 N	20º34 W	27,8
9	DS+ 28653	18/11/2010	01º16 S	18º22 W	27,1

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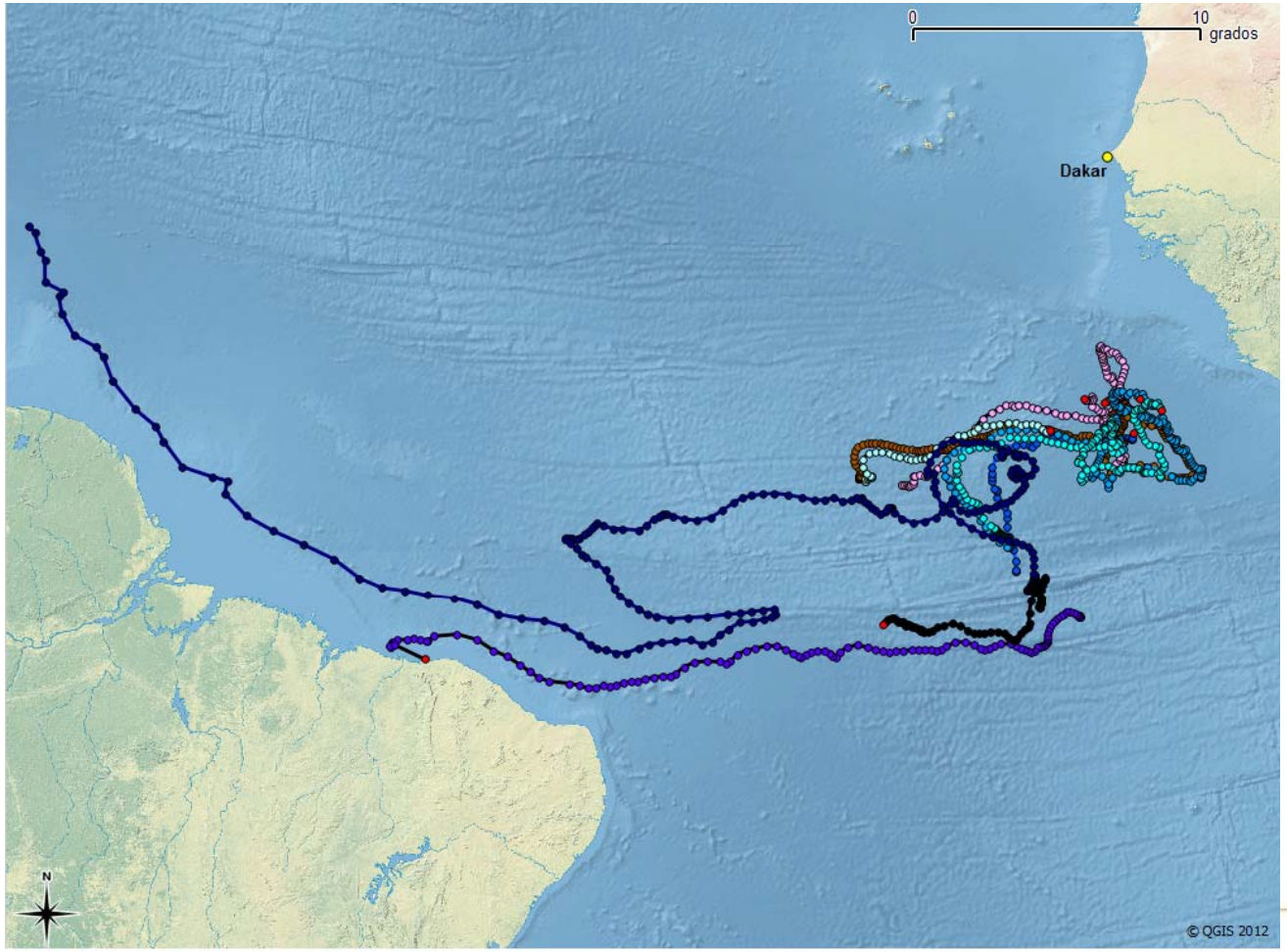
DFAD Test at sea

Deployment of DFADs:

1st Cruise (Nov-Dic 2010)



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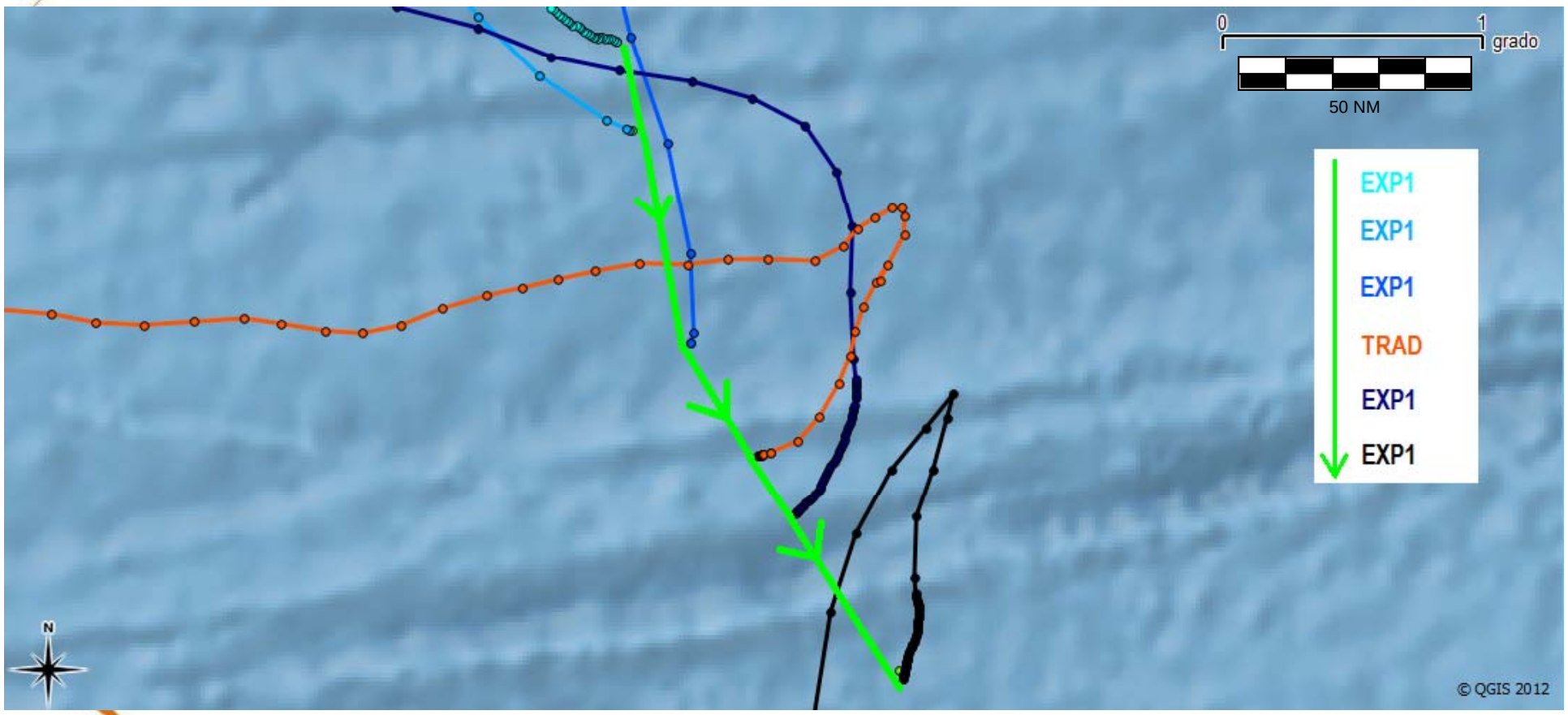
DFAD Test at sea

Deployment of DFADs:

1st Cruise (Nov-Dic 2010)



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DFAD Test at sea

Deployment of DFADs:

2d cruise (Apr-May 2011)

Prototype: EXP2

ID Buoy	Name	Seeding Date	Seeding LAT	Seeding LONG	Tª
10	DS+ 28570	26/04/2011	01º00 S	07º00 E	27,4
11	DS+ 30435	26/04/2011	01º22 S	07º22 E	27,2
12	DS+ 30442	26/04/2011	01º44 S	07º44 E	26,6
13	DS+ 30453	26/04/2011	02º06 S	08º07 E	26,5
14	DS+ 30456	27/04/2011	02º29 S	08º29 E	26,3
15	DS+ 30504	27/04/2011	02º53 S	08º52 E	26,2
16	DS+ 30749	27/04/2011	03º15 S	09º14 E	26,6
17	DS+ 30767	27/04/2011	03º43 S	09º43 E	26,7
18	DS+ 30768	27/04/2011	04º06 S	10º06 E	26,1
19	DS+ 30770	28/04/2011	04º28 S	10º29 E	26,3
20	DS+ 30771	28/04/2011	04º51 S	10º51 E	25,9
21	DS+ 30773	28/04/2011	05º19 S	11º04 E	25,3
22	DS+ 30775	28/04/2011	05º50 S	11º12 E	26,1
23	DS+ 30778	28/04/2011	06º21 S	11º20 E	26,1
24	DS+ 30822	28/04/2011	06º52 S	11º28 E	27,3
25	DS+ 28407	03/05/2011	09º38 N	22º06 W	24,7
26	DS+ 28661	03/05/2011	09º48 N	21º41 W	24,8
27	DS+ 30687	03/05/2011	09º56 N	21º17 W	25,5
28	DS+ 28443	03/05/2011	09º56 N	20º50 W	25,6
29	DS+ 28466	29/05/2011	03º00 S	09º00 E	22,5º
30	DS+ 30824	29/05/2011	03º20 S	09º19 E	23,8º
31	DS+ 30829	29/05/2011	04º00 S	10º00 E	23,5º
32	DS+ 31188	30/05/2011	04º33 S	10º34 E	23,9º
33	DS+ 31190	30/05/2011	05º09 S	11º04 E	23,6º
34	DS+ 31191	30/05/2011	05º35 S	11º13 E	26,1º
35	DS+ 31192	30/05/2011	06º02 S	11º21 E	23,8º
36	DS+ 31193	30/05/2011	06º28 S	11º31 E	24,1º
37	DS+ 31199	30/05/2011	06º54 S	11º43 E	23,7º
38	DS+ 31212	31/05/2011	07º32 S	11º56 E	24,2º
39	DS+ 31215	31/05/2011	08º12 S	12º24 E	24,0º
40	DS+ 31216	31/05/2011	08º59 S	12º30 E	22,4º
41	DS+ 31217	14/06/2011	00º30 N	06º00 W	26,1º
42	DS+ 31262	14/06/2011	00º42 N	07º31 W	22,6º
43	DS+ 31352	15/06/2011	00º49 N	09º02 W	22,4º

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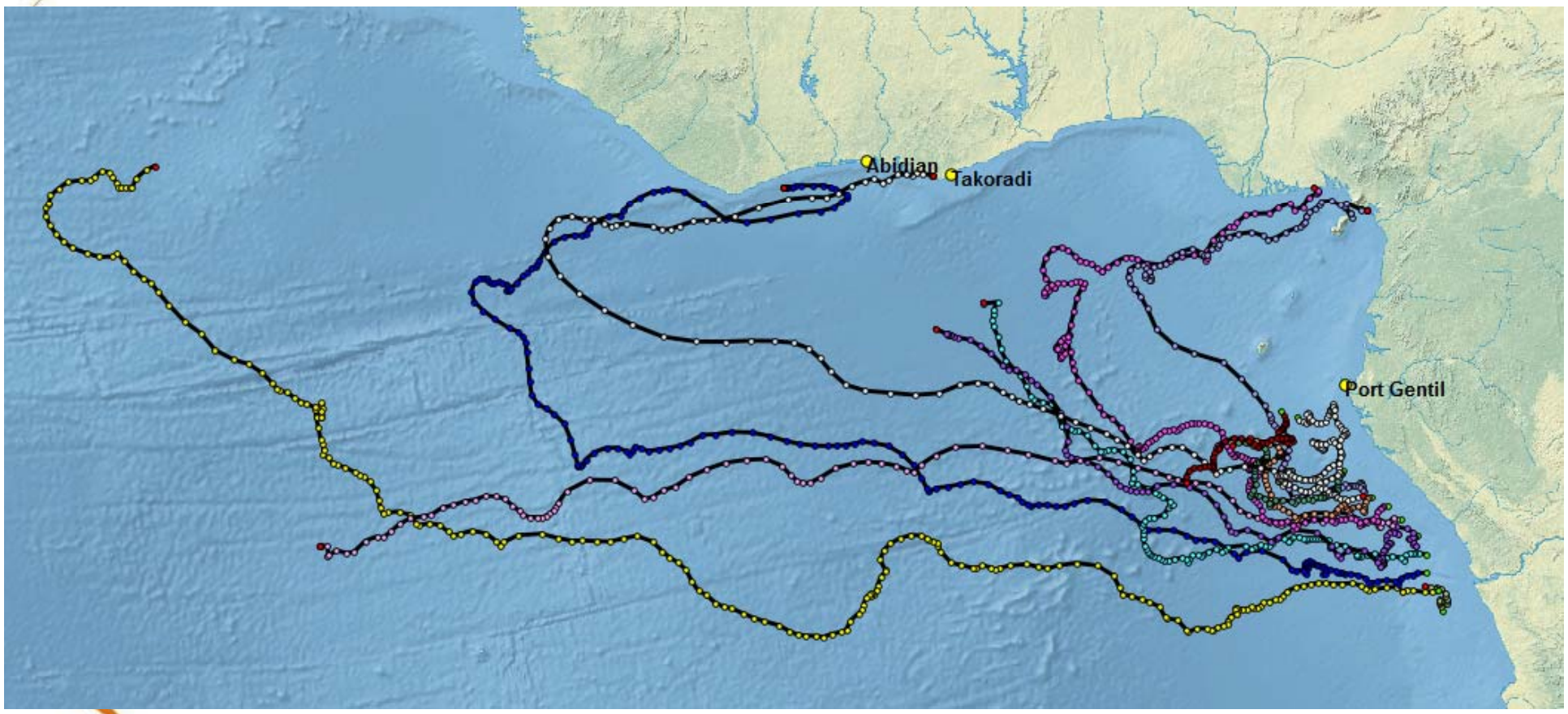
DFAD Test at sea

Deployment of DFADs:

2rd Cruise (Apr-May 2011)



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DFAD Test at sea

Deployment of DFADs:

3rd Cruise (May-July 2012)

Prototype: EXP3

ID Buoy	Name	Seeding Date	Seeding LAT	Seeding LONG	Tª
44	DS+ 28210	16/05/2012	08º48 N	21º24 W	25,9
45	DS+ 28401	16/05/2012	08º36 N	21º26 W	26,1
46	DS+ 28466	16/05/2012	08º12 N	21º33 W	25,5
47	DS+ 28477	16/05/2012	08º01 N	21º38 W	25,8
48	DS+ 30770	16/05/2012	07º38 N	21º46 W	25,8
49	DS+ 30775	17/05/2012	07º27 N	21º51 W	26,1
50	DS+ 31190	17/05/2012	07º04 N	22º00 W	26,3
51	DS+ 31354	17/05/2012	06º53 N	22º04 W	26,0
52	DS+ 31355	17/05/2012	06º29 N	22º01 W	26,8
53	DS+ 30778	24/07/2012	08º17 N	20º33 W	27,1
54	DS+ 30504	24/07/2012	08º11 N	20º51 W	27,1
55	DS+ 30767	24/07/2012	08º17 N	21º08 W	27,0

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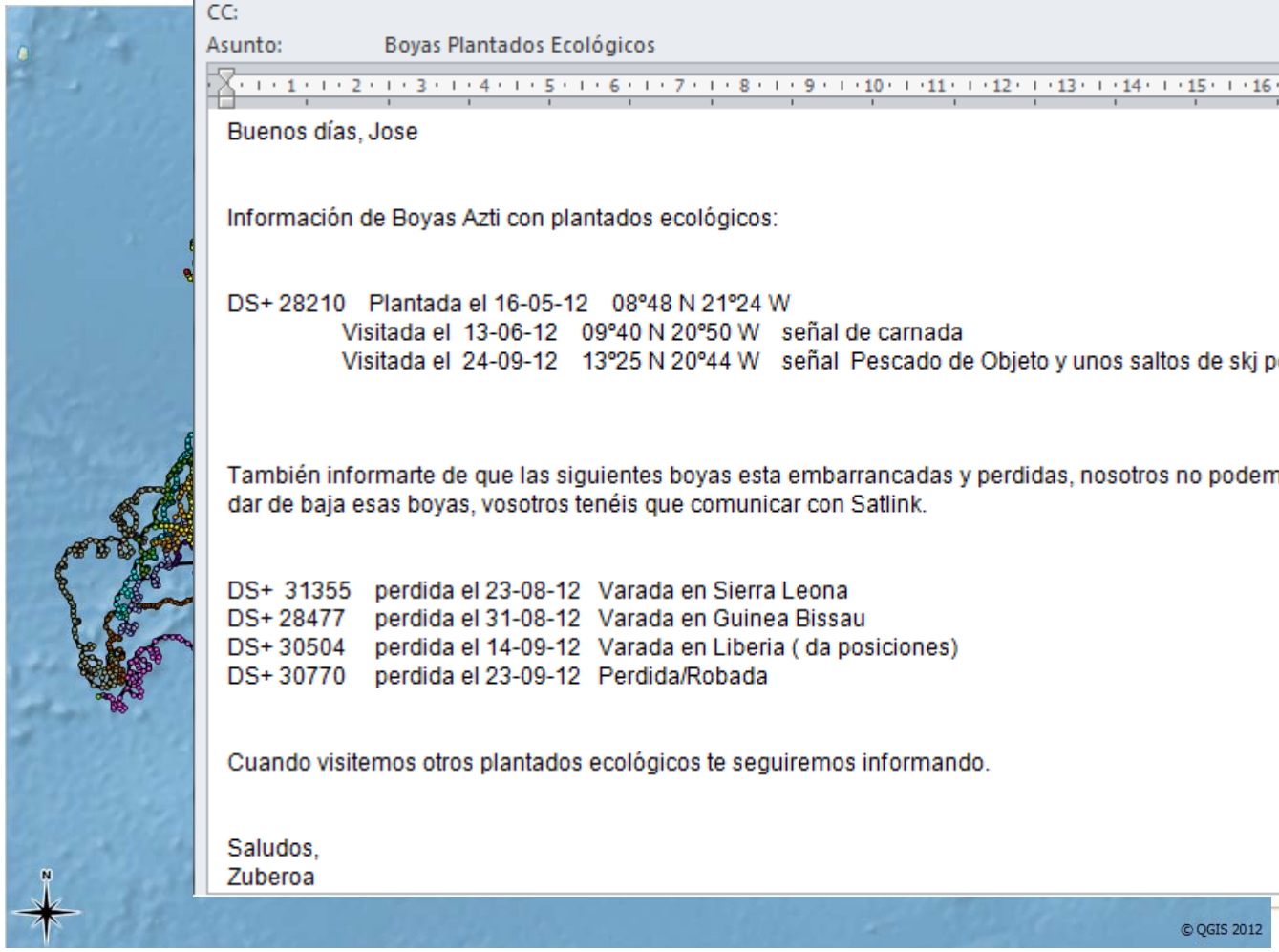
DFAD Test at sea

Deployment of DFADs:

3rd Cruise (May



Respondió a este mensaje el 27/09/2012 8:10.

De: ZUBEROA <zuberoa@atunsa.com> Enviado el: miércoles 26/09/2012 13:57

Para: Jose Franco; 'Jon Zulueta'

CC:

Asunto: Boyas Plantados Ecológicos

Buenos días, Jose

Información de Boyas Azti con plantados ecológicos:

DS+ 28210 Plantada el 16-05-12 08°48 N 21°24 W
Visitada el 13-06-12 09°40 N 20°50 W señal de carnada
Visitada el 24-09-12 13°25 N 20°44 W señal Pescado de Objeto y unos saltos de skj pequeño.

También informarte de que las siguientes boyas esta embarrancadas y perdidas, nosotros no podemos dar de baja esas boyas, vosotros tenéis que comunicar con Satlink.

DS+ 31355 perdida el 23-08-12 Varada en Sierra Leona
DS+ 28477 perdida el 31-08-12 Varada en Guinea Bissau
DS+ 30504 perdida el 14-09-12 Varada en Liberia (da posiciones)
DS+ 30770 perdida el 23-09-12 Perdida/Robada

Cuando visitemos otros plantados ecológicos te seguiremos informando.

Saludos,
Zuberoa

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Some Results

Comparison TRADITIONAL / ALTERNATIVE:

- Days of first colonization
- Speed of drifting
- Useful time at sea
- Construction time

No significant differences

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Some Results

USEFUL TIME AT SEA (Days):

	TRADITIONAL	ALTERNATIVE
Mean	83,95	84,04
SD	64,6	66,5
Nº	214	49
Max	248	227
Min	0	3

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Some Results

ESTIMATED BIOMASS (Buoy Echosounder, tonnes):

	EXP2	EXP3
Mean	**18,9**	**32,2**
SD	25,9	26,1
Nº	34	12
P	0,028 *	

EXP1 15,8 t → **EXP2** 18,9 t → **EXP3** 32,2t

Traditional FADs ~ 60 t ?

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Some Results

Cost of Traditional DFADs:

Item	Cost (€)
Bamboo canes	20
PA netting	0
Instrumented buoy	1790
Total	1810
% Buoy	98,9

Cost of Alternative DFADs:

Item	Cost
Bamboo canes	20
Sisal	102
Instrumented buoy	1790
Total	1912
% Buoy	93,6

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CONCLUSIONS AND NEXT STEPS

- **Alternatives FADs can be constructed with no mortality of sea turtles and sharks (avoiding netting in the raft and in the submerged structure).**
- **Alternatives FADs can be constructed with biodegradable materials.**
- **There can be multiple designs of alternative FADs matching the two previous conditions.**
- **A workshop will be carried out in ANABAC with skippers and fleet managers to decide next steps (redesign, subsequent massive seeding of FADs, etc.).**

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