7th *Ad hoc* working group on FADs
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The Jelly-FAD: new results on its performance

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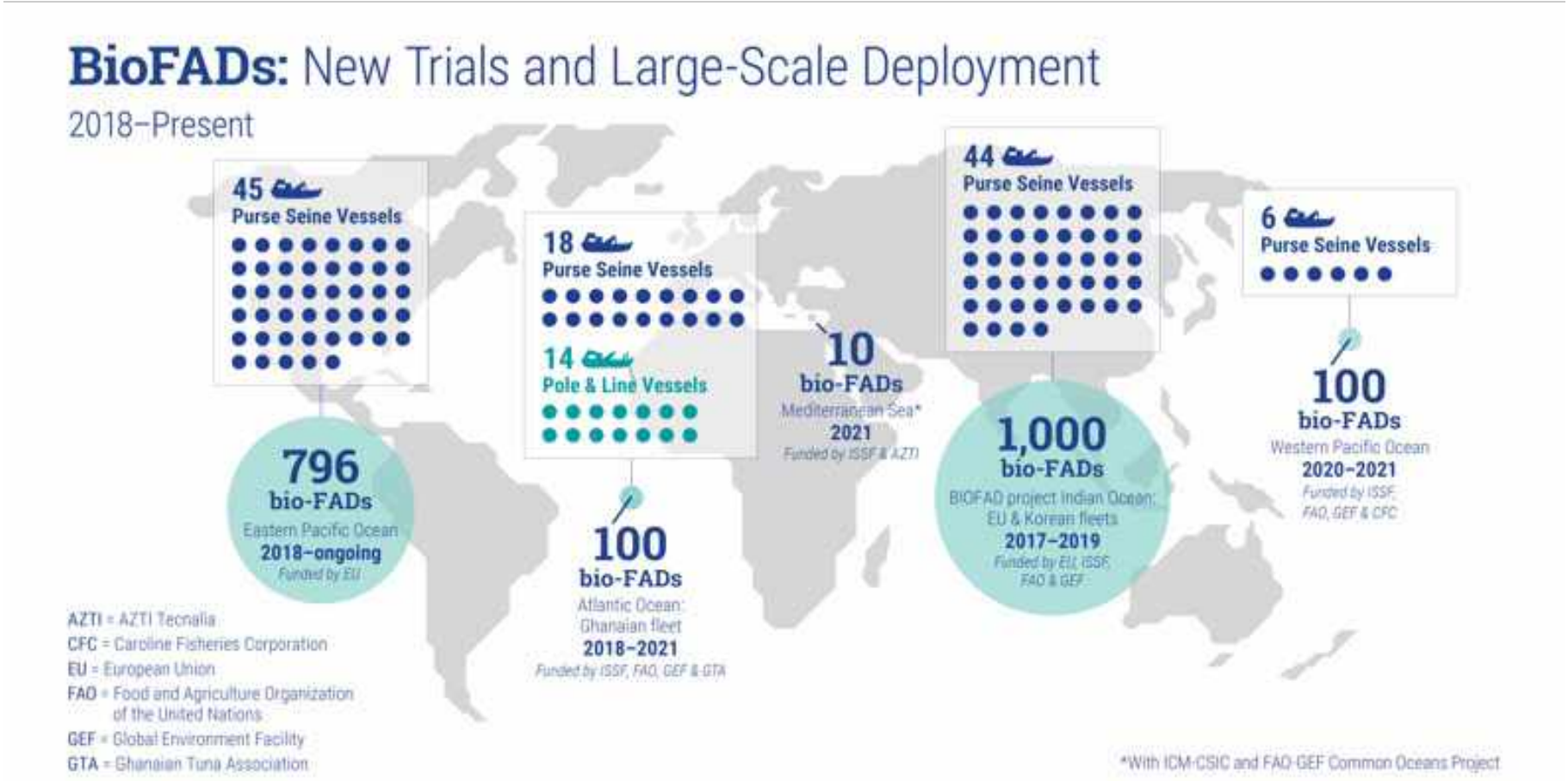
Photo: David Hano

BIO-FAD TRIALS



Paradigm shift: The jelly-FAD design

Nature inspired innovation:

- Neutral buoyancy
- Reduces structural stress
- Provides slow drift decreasing its size
- Reduces the need for plastic flotation

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The Jelly-FAD: A paradigm shift in the design of biodegradable Fish Aggregating Devices

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Paradigm shift: The jelly-FAD design

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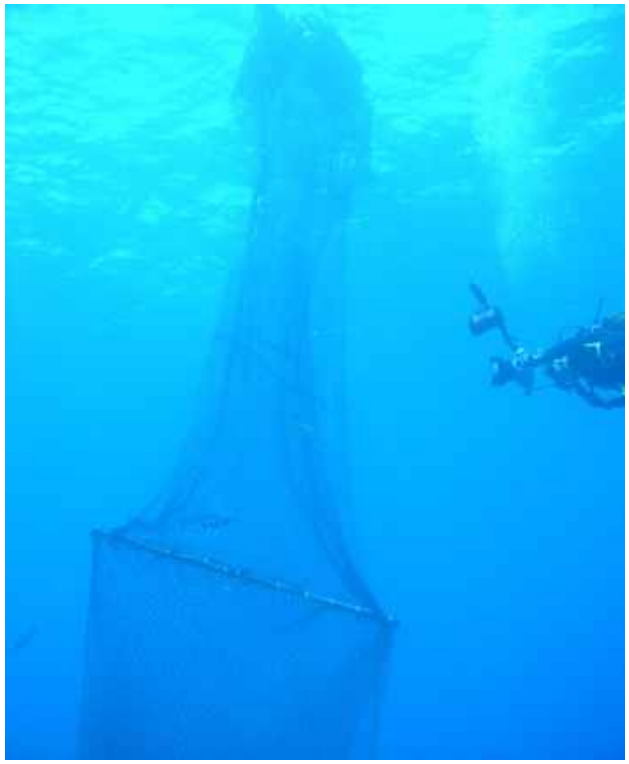
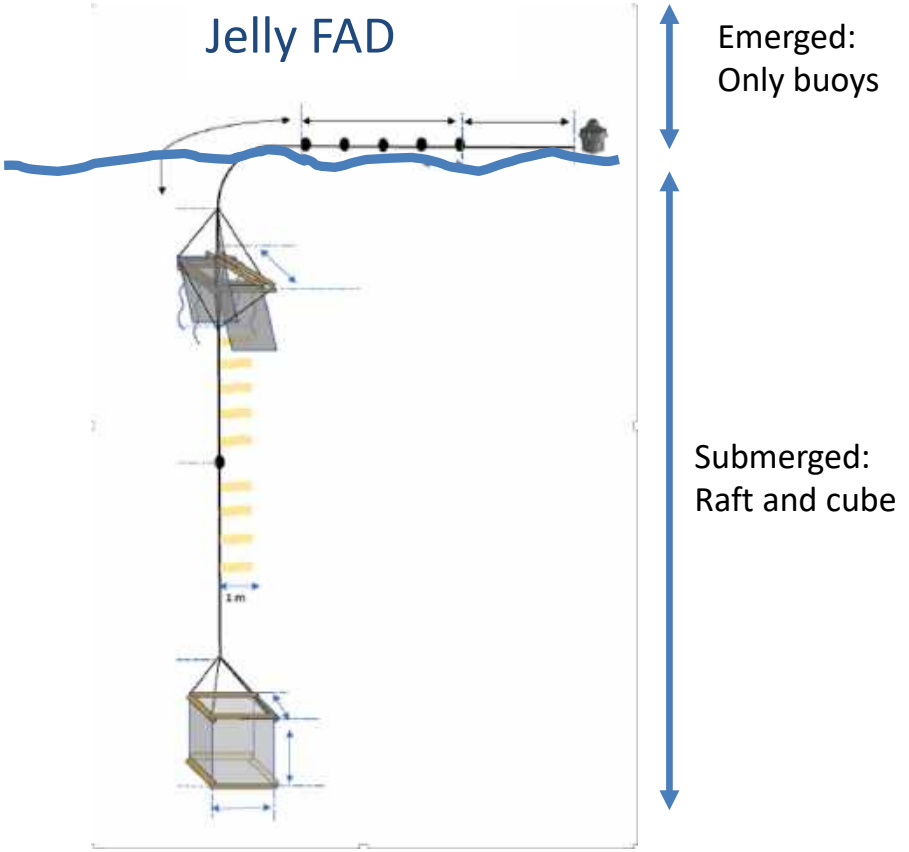
Conventional FAD



Jelly FAD



- 2D FAD
- From 30 to 150 Kg extra flotation (plastic buoys or corks)
- Raft, burrito, or synthetic structure on sea surface
- Strong structural stress

- 3 D structure to create the drag,
- Maximum of 30 kg flotation
- Sub-Surface raft
- Minimum structural stress

Jelly-FAD design

Surface buoy

Submerged raft at about 5-10 m (shade effect)

Submerged buoy

Main rope (cotton)

Cube (drogue)

Plastic only for flotation: corks or plastic buoys

Category II. *The FAD is made of 100% biodegradable materials except for plastic-based flotation components (e.g., plastic buoys, foam, purse-seine corks). (This definition do not apply to electronic buoys attached to FADs to track them).*

Jelly-FAD tests

Ongoing trials with the following fleets:

- **Ugavi**: + 500 jelly-FADs (Pacífic O.)
- **Caroline Fisheries Corporation** (FSM): 150 FSM (WPO)
- **USA**: 260 jelly-FADs (East & West Pacific)
- **Nirsa** (Ecuador): 100 jelly-FADs (EPO)
- **Silla** (Korea): 34 jelly-FADs (WCPO)
- **FCF** (Taiwan): 50 jelly-FADs (WCPO)
- **Pevasa** (Anabac, Spain): +100 jelly FADs (Atlantic O.)
- **Via Ocean** (France): 60 Jelly-FADs (Atlantic Ocean)

Past trials with the following fleets:

- **Opagac** (Spain): 188 jelly-FADs (WCPO)
- **Ghanaian** (Ghana): 147 jelly-FADs (Atlantic O.)

JellyFADs tests in the Atlantic and Pacific Oceans

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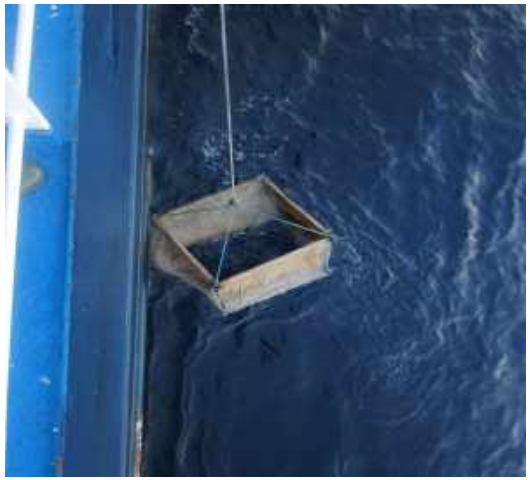



RESULTS from UGAVI fleet in the EPO

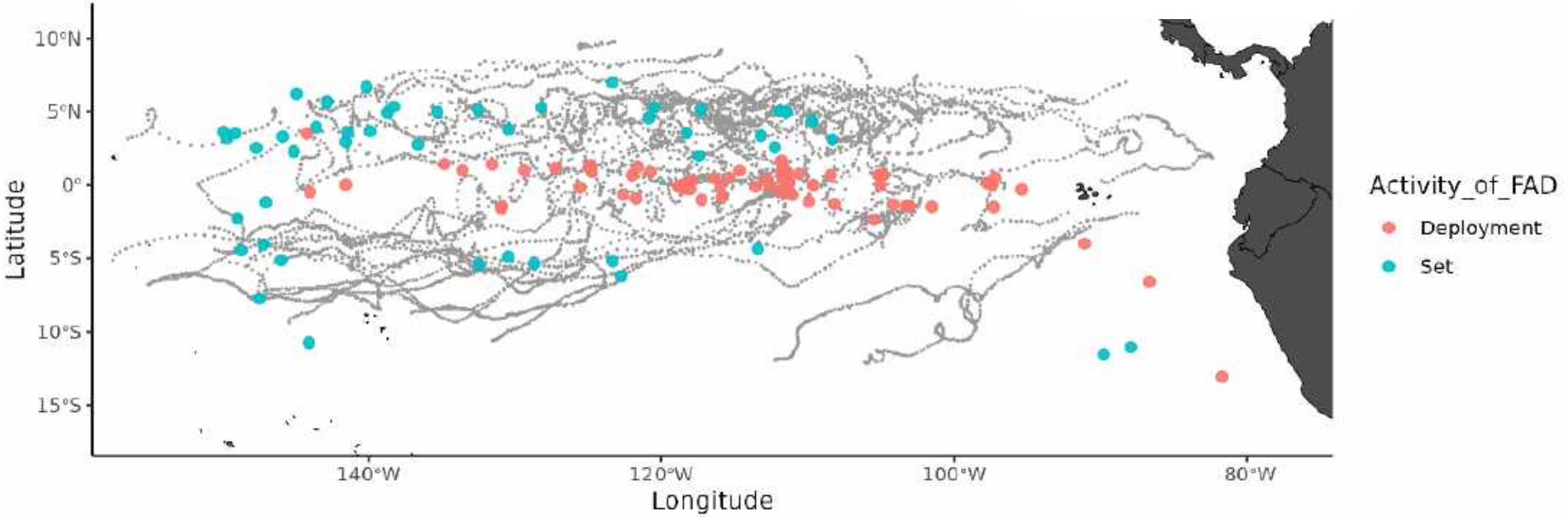
71 visits / sets on Jelly-FADs reported by the fleet

FAD type	Prototype	N
BIO	Jelly-FAD (Category 2)	35
BIO	JellyFAD_mix*	29
BIO	Jelly-FAD unknown	7
CON	2D with sails	63

*Jelly-FAD with main rope of polypropylene

1. Catch performance of the pairs

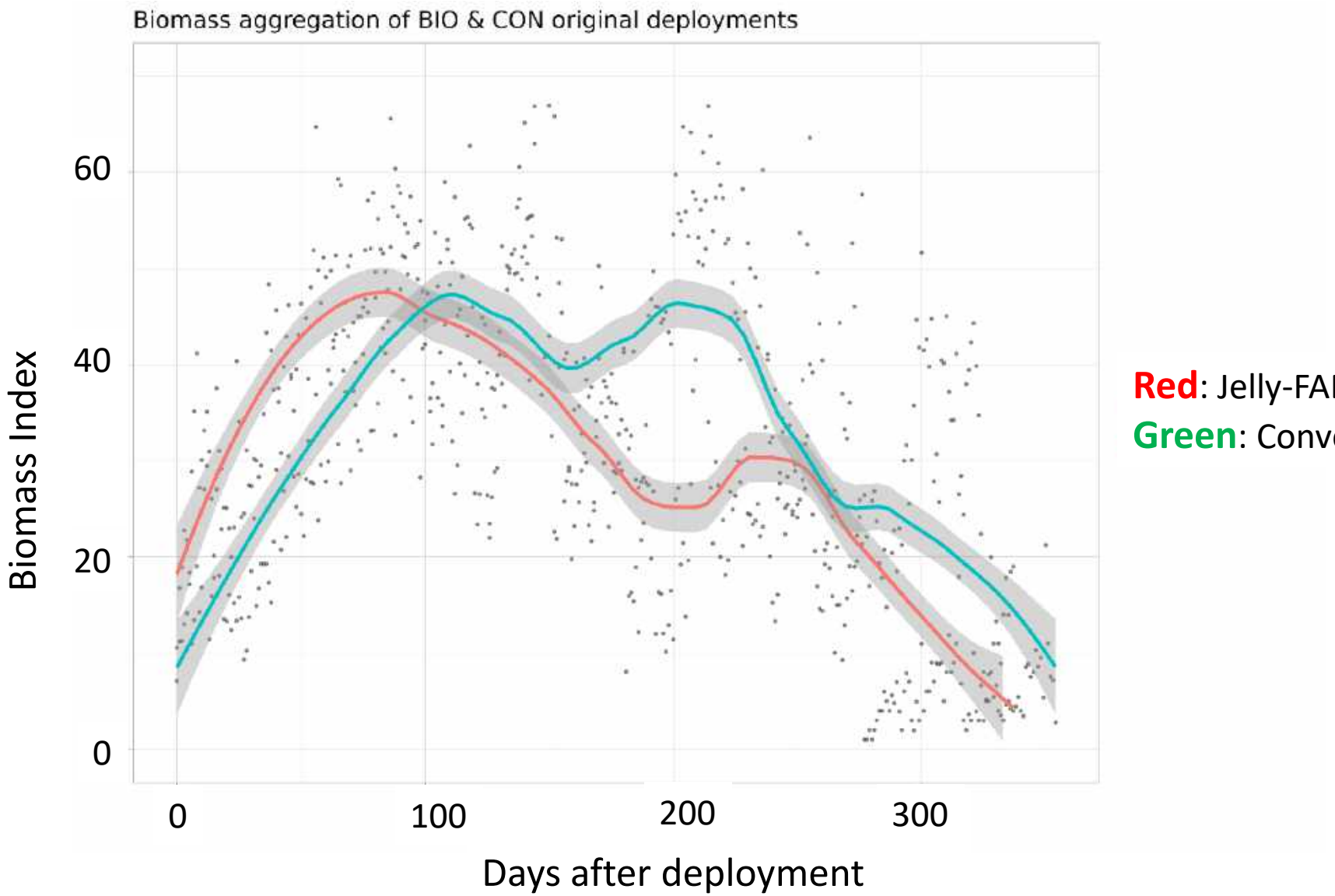
Red: Deployments
Green: Sets



Jelly-FAD= 50 sets total tonnes **2205 t, average 44.1 t**

Conventional= 5 sets total tonnes **130 t**, **average 26 t**

2. Tuna Biomass aggregation from echosounder buoys



Red: Jelly-FAD

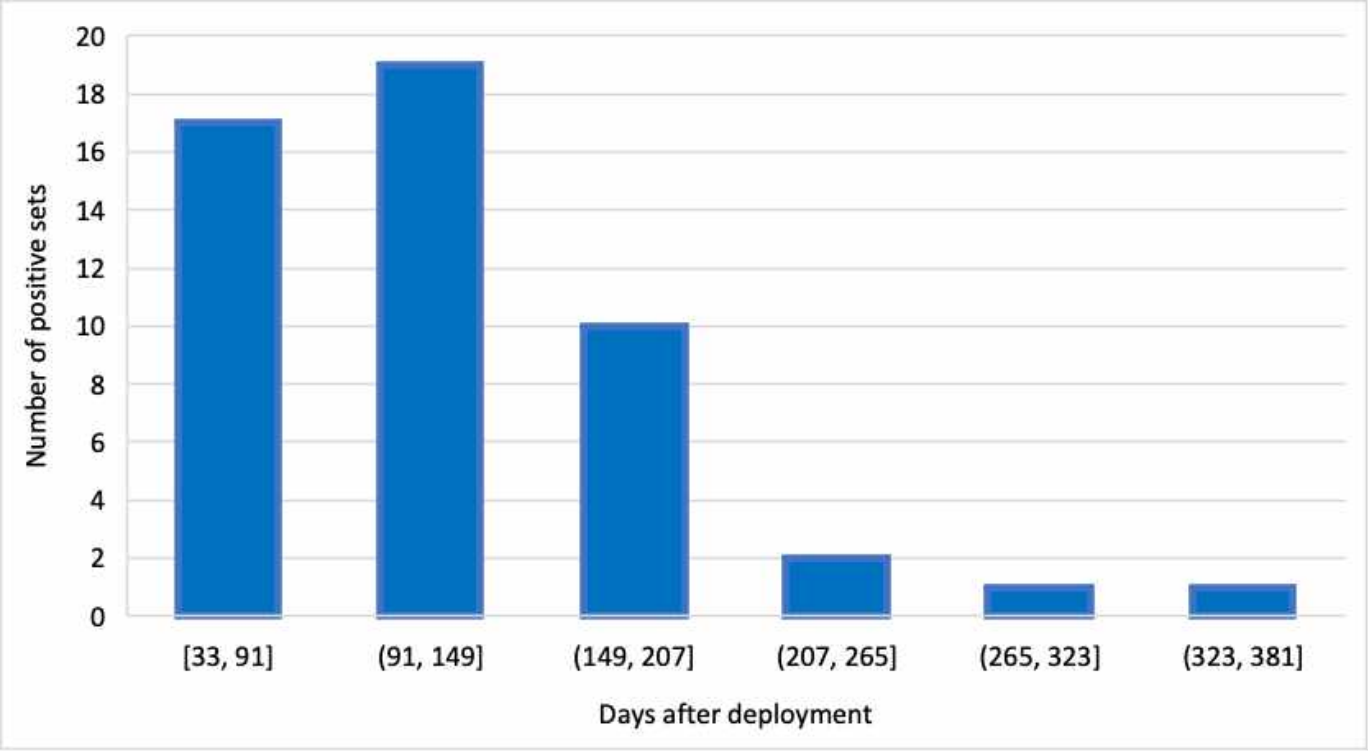
Green: Conventional

3. Drift performance

Both dFAD types (Jelly-FAD and conventional) showed similar average and maximum speed values

FAD type	Prototype	N	Records	mean (knots)	max (Knots)
BIO	Jelly-FAD_unknown	4	437	1.0	3.1
BIO	Jelly-FAD_mix	25	292	0.9	3.9
BIO	Jelly-FAD	23	354	0.9	3.7
CON	2D with sails	59	225	0.9	4.0

4. Lifespan from visits and sets



- The maximum monitored lifespan in working condition and with a successful set on a Jelly-FAD was 335 days (11 months).

- Some of those Jelly-FADs were redeployed and were not visited anymore, so their lifespan in working conditions will likely be longer.

4. Degradation of the materials

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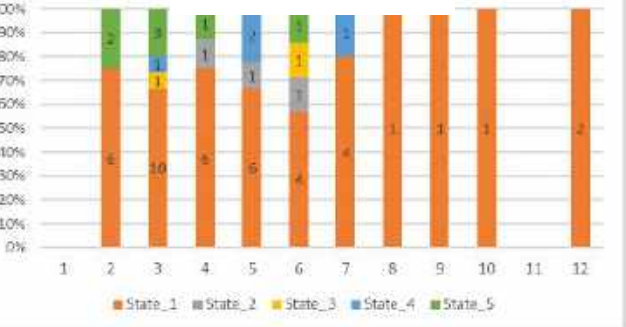
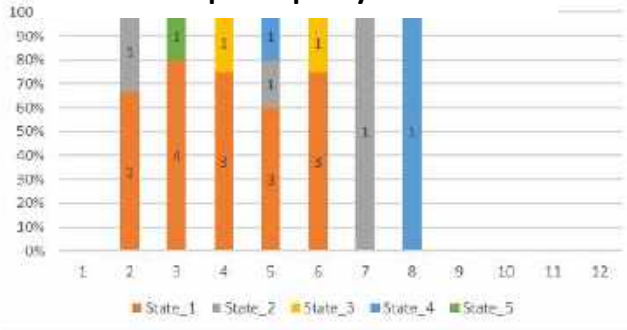
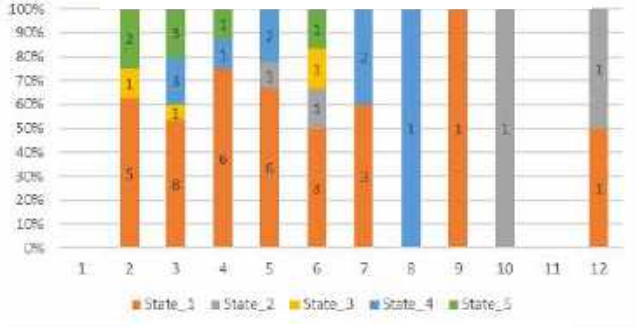
Bamboo raft



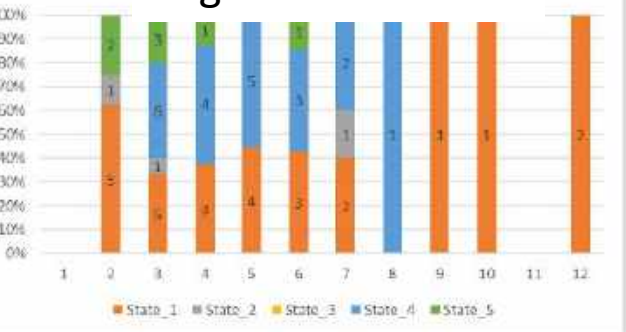
Main rope= polyethilene



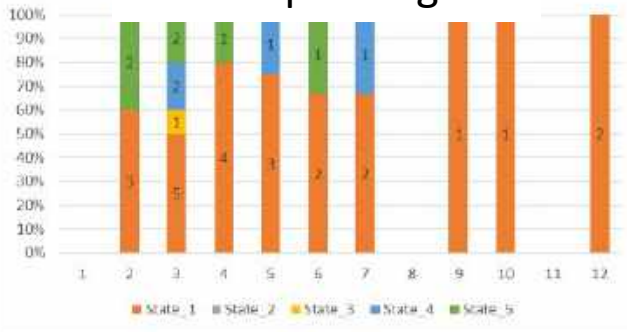
Bamboo cube (drogue)



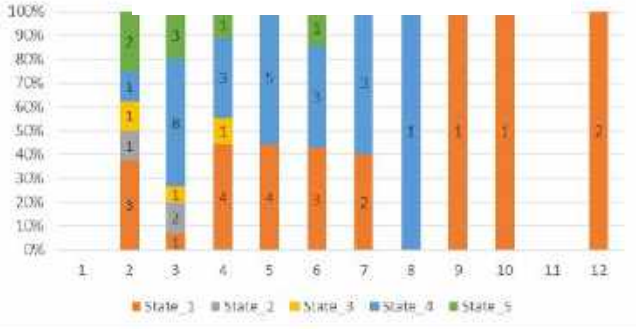
Organic canvas raft



Main rope= Organic



Organic canvas cube



Orange = good condition
Grey = starting to degrade
Yellow = bad state need of repair
Blue= component not present
Green= unknown

4. Degradation of the materials

- ✓ In the case of the **bamboo structure** both in the raft and the cube, the condition was in **good condition (state 1)** in a high percentage of the observations **7 months after deployment**.

- ✓ Both cotton and polyethylene **ropes** showed high percentages of observations in **state 1 (good condition) until month 12** after deployment. There were not differences between cotton and polyethylene ropes for the observed period.

- ✓ Half of tested jelly-FADs´**canvas** were found in **state 4 (absence of the element**) from the **third month onwards.** However, the other half were found in **state 1 (good condition)** until month 12.

Conclusion from Ugavi trials

- JellyFADs **aggregate tuna** as conventional FADs do.
- JellyFADs **drift** as slow as conventional FADs or slower.
- **Lifespan**: sets were made after 11 months at sea, and many occurred after 5 months with the FAD being in perfect condition and re-deployed at sea. **This meets fishers´ needs for dFADs lifespan.**
- The **success** relies on the **number of Jelly-FADs deployed** which should be systematically tested supported by the shipowner and with the feedback from fishers at sea.

Other useful information

- **COST: JellyFAD cost** $180 – $450 (depending on the depth) + Geolocating Buoy.

- **Conventional FADs costs** from $250 to $900 depending on the depth and design + Geolocating Buoy.

- **Replacement of JellyFAD components**: The cube or canvas, if damaged after the set, could be replaced by another cube that fishers could have ready onboard for the JellyFAD to be re-deployed, (as fishers do with the tail and raft of conventional structures).

- This is not the last design of the Jelly-FAD, we are working to make it lighter, less weight, less material, less impact.

Recommendations

1. Only dFADs **without netting** can completely eliminate ghost-fishing.

2. The design of the dFAD is crucial to reduce stress on the structure and increase their lifespan. We recommend the **Jelly-FAD concept**.

3. Fishers supported by shipowners should start trialing bioFAD design in a **continued effort**, **deploying systematically a percentage of their FADs made of biodegradable materials**.

Thanks! Gracias!

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