Biodegradable FAD Lifetimes: Impacts and Adaptations

IATTC FAD Working Group
June 2024

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Moving to Biodegradable FADs

Recommendations from all tuna RFMOs to move towards **FAD constructions** with increasing **biodegradable components**

Research and development of designs is ongoing, with **recent trials showing 4-month lifetimes** for bio-FADs with conventional designs, and **10 months+ for JellyFAD designs**

Fishers have indicated that the ideal lifetime of a FAD is one year, enabling time to drift and fishing operations to occur

The **shorter lifetimes** of these bio-FADs will **reduce marine pollution** and related impacts, but also **result in a reduction of potentially operational FADs** when they breakdown within the fishing zone

Passive Drift Simulations

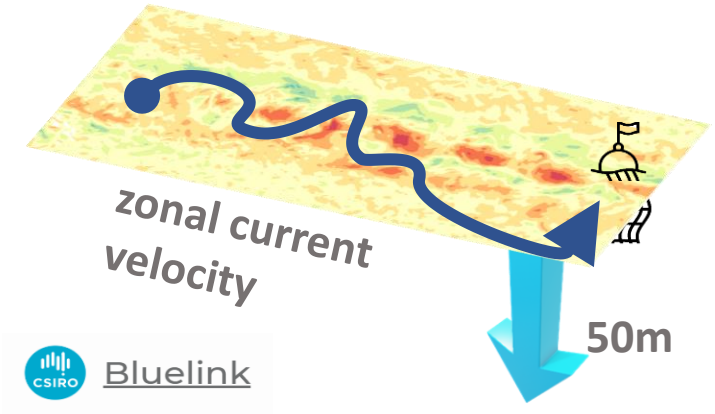
When real life FAD **trajectory data are limited**, Lagrangian **simulations are a useful tool** to examine the passive drift of objects under physical ocean forcing

We aim to answer **three questions**:

1. What are the **likely exit areas** in the equatorial Pacific where FADs become lost marine debris?
2. How **will this reduce** under different **bio-FAD physical lifetimes**?
3. **Which areas** of the fishing ground will **suffer from premature loss** of FADs due to breakdown under bio-FAD constructions?

Passive Drift Simulations

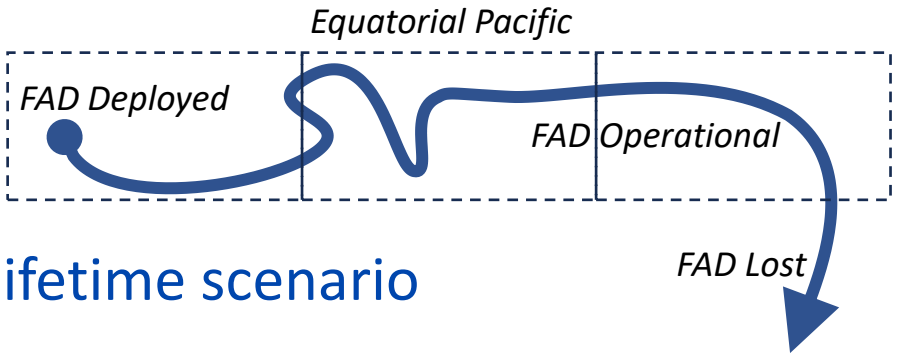
- A 1/10 degree, **high-resolution physical ocean** model (BRAN2020)
- 'Virtual FAD' particles seeded over ten years, with a **spatial distribution calculated from observed FAD deployments** in the WCPO and EPO
- Particles **drift for a maximum of two years** (a *status quo* scenario for non-biodegradable FADs)
- Forced using the **top 50m of current velocity** data (typical FAD-tail length in the Pacific ocean)
- Track their trajectories **across and out of 16 equatorial zones**



Passive Drift Simulations

Assumptions

1. **Bio-FAD scenarios** with *physical lifetimes* of **4-, 9- and 12-months**
2. **FADs that remain** anywhere in the **equatorial Pacific** (10°N to 10°S) are considered ***operational*** **(fishable) by any vessel**
3. **FADs that exit** this equatorial fishing ground before the end of their physical lifetime are **considered *lost***
4. FADs that **end their physical lifetime within the equatorial ground**, i.e. when still operational, ***prematurely breakdown***



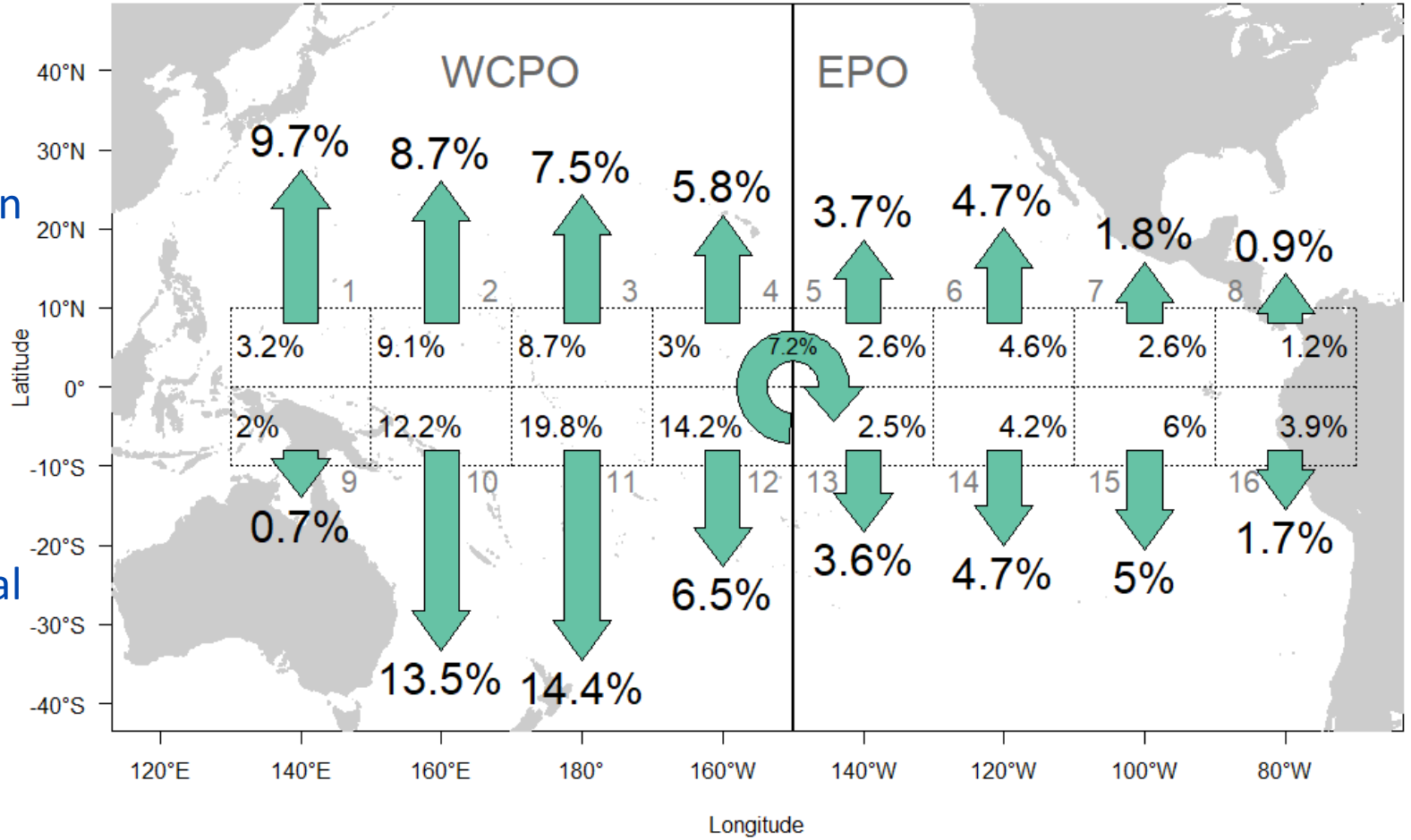
All results are compared to the *status quo*, two-year lifetime scenario

Results

Status Quo Scenario

- Greatest number of FAD deployments in southern WCPO
- Greatest EPO deployments in central regions

- Largest exit of *lost* FADs out of southern WCPO
- Only 7.2% of FADs still *operational* within equatorial fishing ground after two years

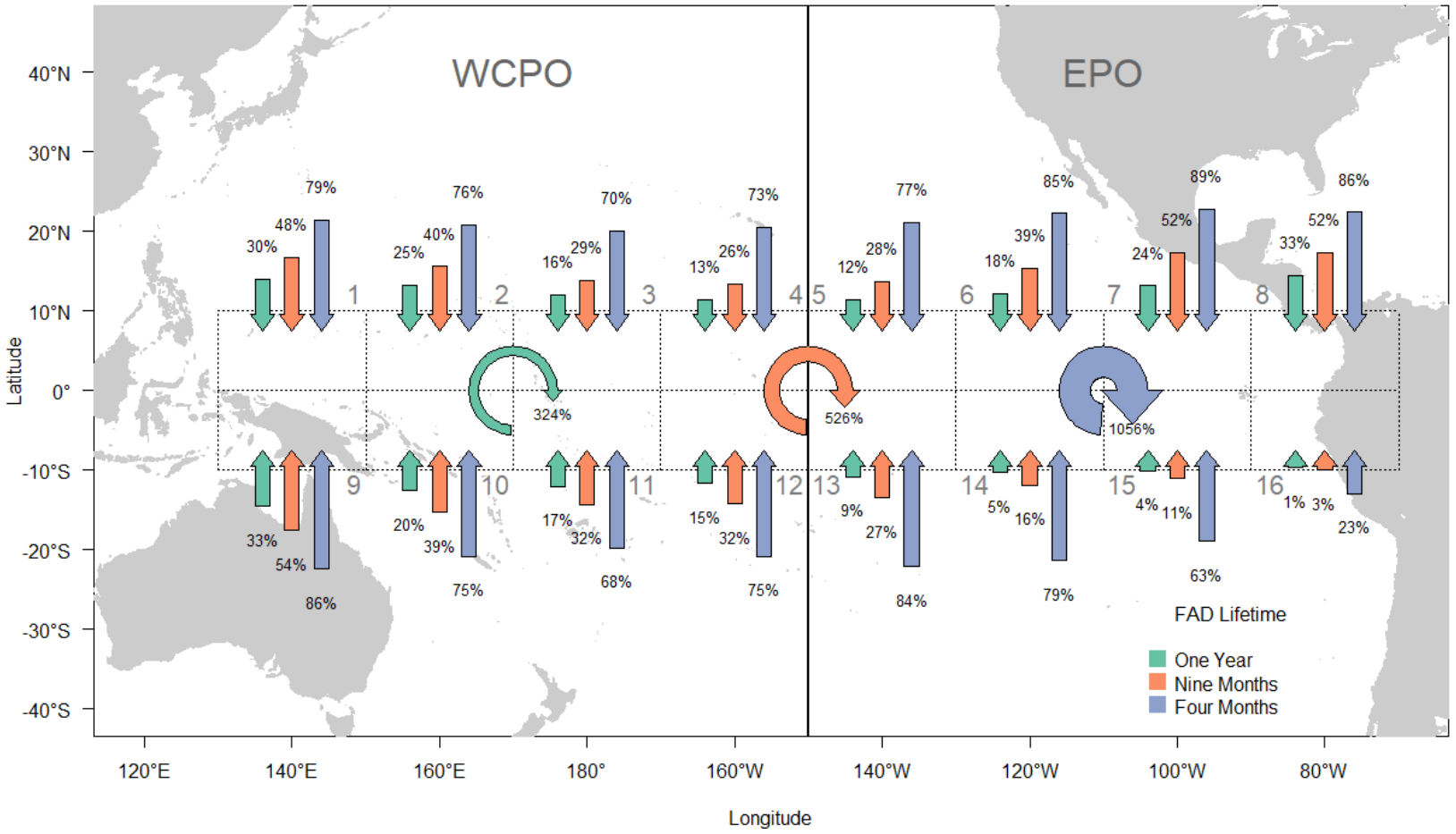


Results

Reduction in *Lost* and *Operational* FADs under bio-FAD scenarios

When considering bio-FADs with 4- to 12-month lifetimes:

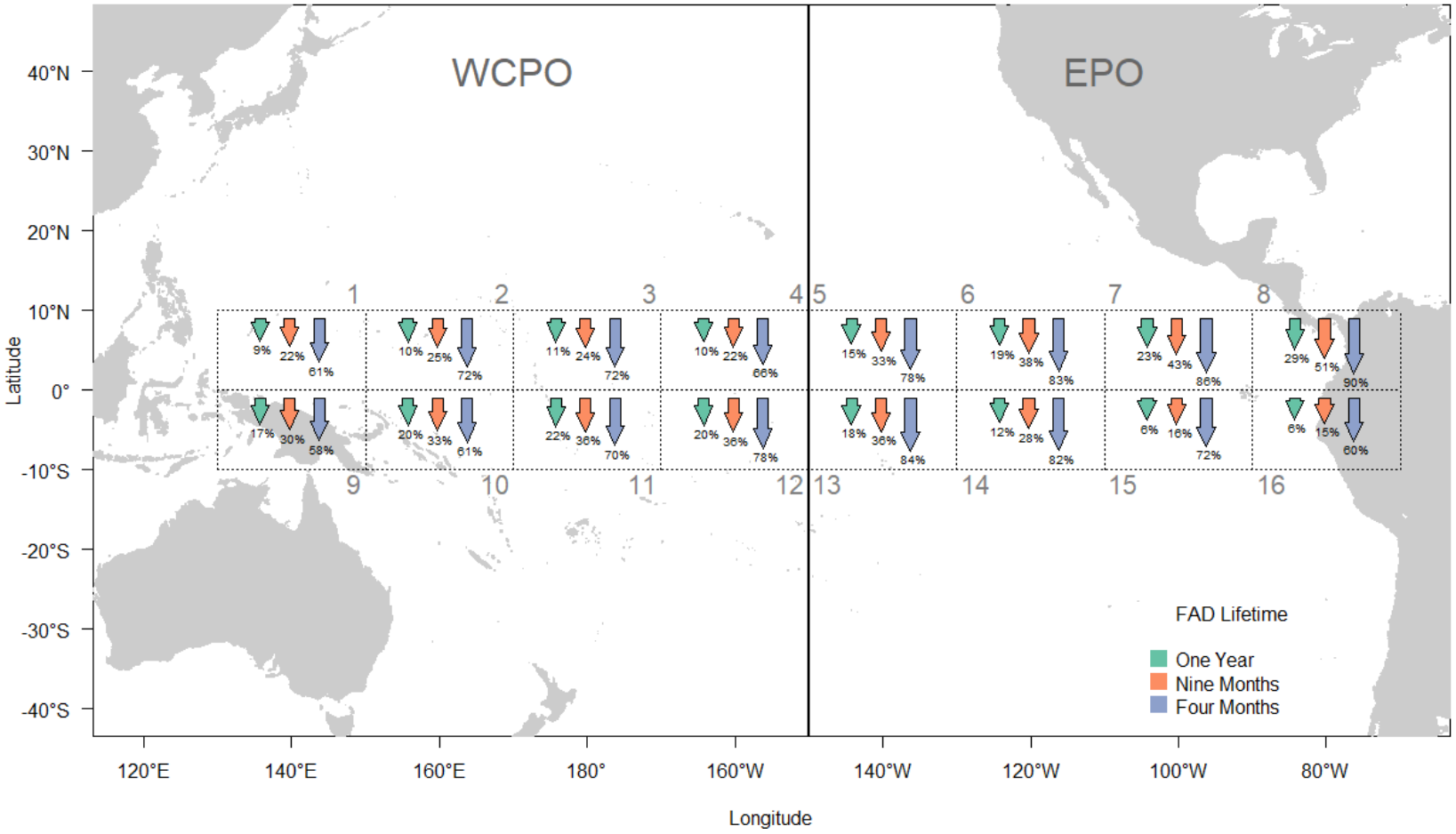
- Largest reduction in *lost* FADs in EPO
- Large reduction out of far western WCPO
- Results in necessary increase in *operational* FADs that prematurely breakdown
- 4-month bioFAD lifetime results in 324% more FADs that prematurely breakdown
- One year lifetime results in 1056% increase



Results

Reduction in *operational* FADs by *deployment* region

- Greatest reduction in *operational* FADs deployed in EPO
- Also considerable reduction for southern WCPO deployed FADs
- Assuming a one-year bio-FAD lifetime, most regions experience a ~10-30% reduction in the number of operational FADs still drifting in the equatorial fishing ground



Implications

The uptake of **biodegradable FADs will cause a clear and widespread benefits** in the reduction of lost FAD marine debris and its associated impacts.

This will be **most apparent** for regions south of the **Solomon Islands**, north of **Palau and FSM**, and along the **coast of central America**.

However, this will **also result in a significant loss** in potentially operational bio-FADs **due to breakdown whilst in the fishing zone**

The **biggest loss** will be for bio-FADs **deployed in the northern EPO**, and the **central Pacific** from 130°W to 150°E

Adaptations

In light of premature bio-FAD loss, there is **potential for a compensatory deployment effort** by some purse seine fleets.

Such **an increase in deployments will have implications** for fishing operation **costs**, vessel active **FAD limits** and **ecological impacts** within the fishing ground (e.g. beaching on equatorial reefs).

However, **not all FADs** that drift in the equatorial zone are **operational**. When FADs drift out of an owner's fishing range, if they are not passed on to other fleets, they are effectively no longer operational.

Increased coordination of passing FADs on to other fleets, and **repairing still operational bio-FADs** before they breakdown may mitigate against these losses

More **work required** on **spatial FAD-fishing operation** dynamics, and **influence of sea-state on bio-FAD lifetimes**