DFAD Immersion time influence on bycatch rate for tropical tuna PS fishery – Preliminary results

21st Working Party on Ecosystems and Bycatch (WPEB21)

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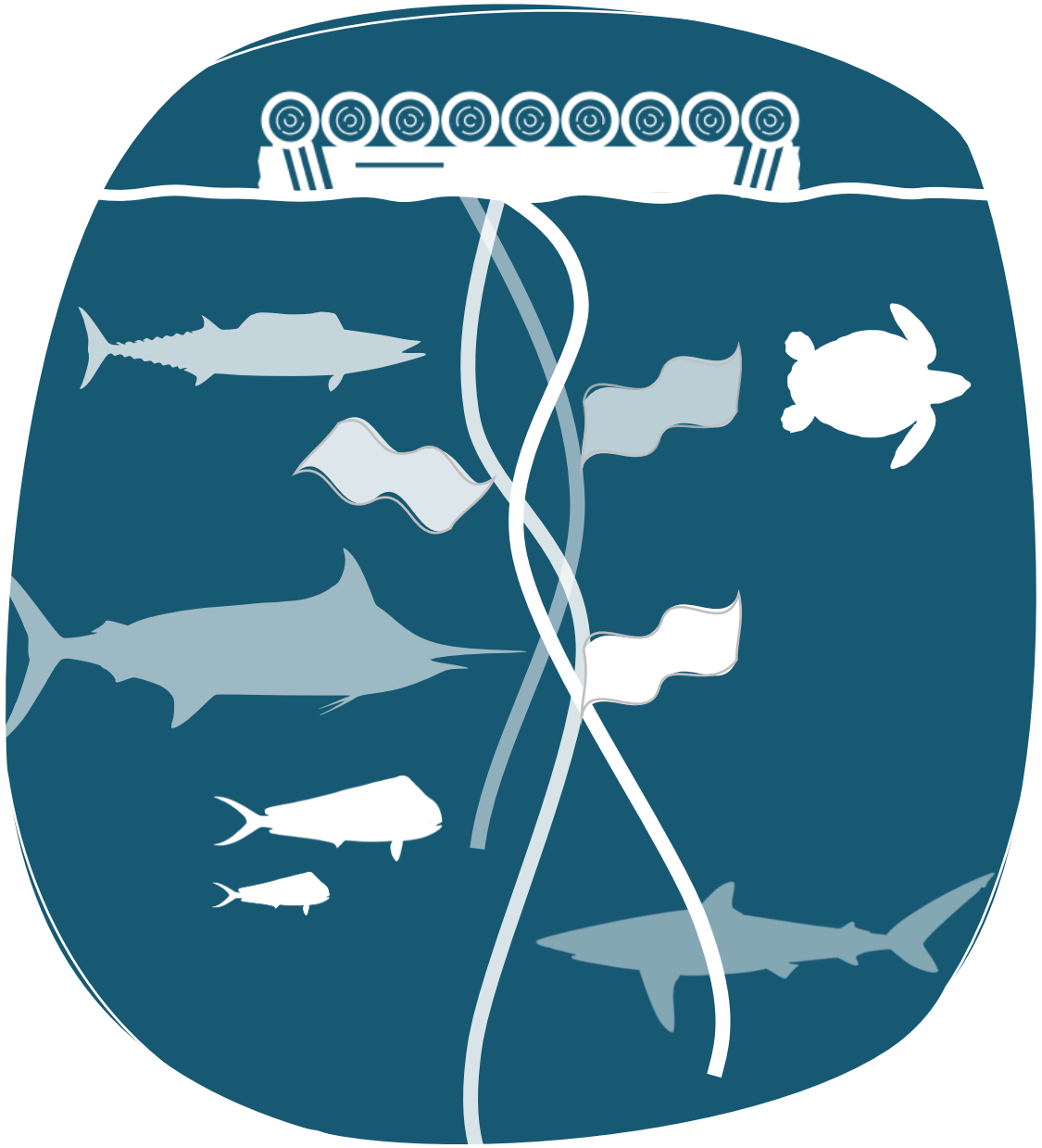

Drifting fish aggregating devices (dFAD)

Increasing the productivity of tropical tuna fisheries

Higher bycatch levels compare to FSC sets

Vulnerable sensitive taxa like:

- Sharks
- Sea turtles
- Billfishes

Commercially valuable bony fishes

Bycatch : Here defined as all non-target species that are unintentionally captured and brought on board, **excluding non-target tuna species.**

Understand how dFAD immersion time influences bycatch rate

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Bycatch data

Logbook data between 2014 and 2024

50 species in logbook (on FOB)

5 species or families (63% all bycatch)

- Rainbow runner (*Elagatis bipinnulata*)
- Triggerfishes (*family Balistidae*)
- Dolphinfishes (*family Coryphaenidae*)
- Silky shark (*Carcharhinus falciformis*)
- Billfishes (family *Istiophoridae)*

Some selected species-level records aggregated into the corresponding family group

Rough triggerfish (*Canthidermis maculata*), Grey triggerfish (*Balistes capriscus*)

Common dolphinfish (*Coryphaena hippurus*)

Black marlin (*Istiompax indica*), Blue marlin (*Makaira nigricans*), and Atlantic sailfish (*Istiophorus albicans*)

30,8% of recorded bycatch in logbooks are **`Unknown`**

To improve the reliability of bycatch information, logbook data will be merged with observer data.

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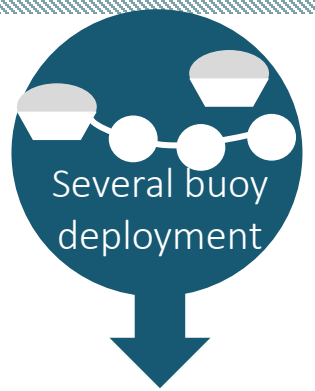
Immersion time calculation

Logbook data between 2014 and 2024

Immersion time is defined as the period between **the deployment of a floating object** and **the first time it is fished**.

Immersion time



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Statistical approach

Logbook data between 2014 and 2024

Hurdle model/two-part model

- Zero inflation Model (Did bycatch occur?): Model the probability of having bycatch.
- Conditional Model (What quantity?): For non-zero cases, model the actual weight of bycatch.

Splines use (GAM)

- Months cyclicity: Treat months as a cyclic spline, not a factor
- Spatial correlation (Lat/long): Lat and long are 2D spatially structured
- Immersion time: assess potential non-linear effects on bycatch

Tweedy model

Model selection AIC + residual diagnostics (DHARMa)

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Selected model – zero-inflated Gamma GAM

Did bycatch occur?

Bycatch presence ~ s(immersion time) + deployment longitude + deployment latitude + cc(month) + factor(year)

If bycatch occurred, what quantity?

Bycatch_weight ~ s(immersion time) + deployment longitude + deployment latitude + cc(month) + factor(year)

→ Model used for both Indian and Atlantic oceans

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Atlantic Ocean

Immersion time non-linear effect on both bycatch event and bycatch weight

Seasonal variations (bycatch weight varying significantly acoss months)

Year effect (more recent years)

Indian Ocean

No signifiant effect of immersion time or seasonality

No seasonal variation

Deployment latitude effect (higher latitude = higher bycatch weight)

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Initial ideas for the discussion

- **Year effect:** better declaration of bycatch in recent years/ interannual effect
- **Seasonal variations:** seasonal migration, high concentrations of recruits in specific seasons and areas
- **Latitude effect:** highest production in the north

Next steps

- Link logbook records with observer data to improve the reliability of bycatch information
- Exclude visits and fishing activities by foreign vessels to avoid false zeros
- Conduct a more detailed comparison between the Indian and Atlantic Oceans
- Refine the analysis of bycatch composition
- Assess potential differences in bycatch between natural and artificial floating objects, as well as among different dFAD designs.

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