Using FADs to derive fishery independent indices for monitoring ecosystem impacts from industrial fishing

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# Poor knowledge on the pelagic biodiversity

- Very few studies due to the difficulty to access pelagic ecosystems
- Main studies use fisheries data (e.g. longliners, Worm et al. 2003)
- Need for new methods to assess the pelagic biodiversity



#### **CPUE of purse seiners (FADs) is not used as an index of abundance**





#### No fishery-independent indices of abundance of tropical tunas and other species



No acoustic surveys (e.g. small pelagics)

No aerial surveys (e.g. bluefin tuna)

#### FADs are used to fish Easy access to fish for fishermen → Easy access to fish for scientists





# FADs for monitoring the biodiversity



Multispecies aggregations around floating objects Can be used to characterize the pelagic biodiversity (see Gaertner et al. 2008)



#### **Underwater Visual Census (UVC) & Observers**



Comparisons of numbers of species observed by UVC or an observer (fishing set) on a same aggregation (Indian Ocean ISSF cruise Torre Giulia)

#### Underwater visual censuses around FADs could provide reproducible indices of diversity (Gaertner et al. 2008)



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#### 22 UVCs on drifting FADs in 2003-2005 (FADIO, Taquet et al. 2007) 50 UVCs on drifting FADs in 2011-2012 (ISSF & MADE cruises)



### FADs can provide fisheryindependent indices of abundance



#### **Fishery-independent indices on populations**



#### Measure of the probabilities: Times of residence



## CRTi: Continuous Residence Time at FADiQi = 1/CRTiCATi: Continuous Absence Time before FADiRi = 1/CATi



#### **Factors affecting CRTs and CATs**



**Species** 





#### Numbers of floating objects



Environment

#### What do we need?

- To measure times of residence (CRTs) at FADs and absence times (CATs) of species of interests (tunas, sharks, etc.) using electronic tagging
- To monitor the number of floating objects (see ISSF FADTrack) and their trajectories (see French PS providing all data to IRD)
- To collect data from echosounder buoys attached to FISHERS floating objects (Xi)
- To improve the data of these echosounder buoys (abundance of species of interest) MANUFACTURERS

## Fishermen deploy and maintain large arrays of instrumented buoys

- The GOOS (Global Ocean Observing System) is maintaining roughly 1250 drifting buoys and 200 moorings to collect oceanographic data (high cost)
- Purse seine vessels maintain approximately 10 to 20 times more drifting objects than this (cost covered by the industry)
- Many coastal countries maintain an array of anchored FADs to support local fisheries





#### Think on a large scale! Fishermen as Observers of the ocean

Thousands of echosounder buoys collecting data useful for monitoring the abundance of pelagic species