EXPLORING TECHNOLOGIES FOR REMOTE IDENTIFICATION OF FADs

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Fishers have taken advantage of the aggregative behavior of tunas to fish around FADs.
- **Very efficient** (e.g., lower proportion of null sets, lower fuel consumption)
- Relatively **easy to plan and monitor** its location and fish aggregation

But present several **negative** ecological impacts (e.g. bycatch, juvenile tuna, stranding on sensitive coastal habitats)

Quantification of these impacts requires efficient collection methods for **high-quality data**.
- **Tracking individual FADs** throughout their lifetime (FAD ID through the buoy serial number is needed)
- **Buoys’ alphanumeric serial number** has been difficult for observers to collect accurately
- A system **to automatically and remotely detect and ID FADs** would improve the value and utility of all types of data.

**Objective**: Evaluate the suitability of an electronic technology to remotely identify FADs in real conditions.
Criteria for technology selection, it should:

i. perform efficiently under any environmental conditions and at a **reasonable distance** (i.e., ideally at a distance where the vessel has detected the FAD or is ready to conduct an activity with it);

ii. not be used for **remote/active searching and detection** of buoys (i.e., does not increase vessels’ buoy searching abilities);

iii. **be affordable** and not incur significant increases in the cost of production;

iv. be capable of **transmitting actively** (e.g., continuously) or **passively** (e.g., when called, intermittently);

v. be compatible with **external electrical power supply** (e.g., solar panels or the batteries of the buoy);

vi. be of **small** size (i.e., does not incur significant changes in current equipment designs);

vii. **not interfere with other equipment** of the vessel (i.e., does not create interferences);

viii. be **tamperproof** (i.e., made so that it cannot be interfered with or changed) and **not trackable**;

ix. be **portable and easy to deploy** (i.e., for the cases in which helicopters/speedboats are used to access the FAD); and

x. be able to be **mass produced**.
The LoRaWAN technology (Long Radio Digital system)
- Configurable at different intensities and gains
- Transmits both actively or passively
- Very low battery intensive.

Composed by 2 elements:
- Gateway or receptor (hub). Connects devices to the cloud or other communication systems
- Sensor device (transmitter). It sends radio frequency signals with sensed information (e.g., the FAD buoy ID) to be picked up by any hub in range.

In our experiment, the Hub passes the request and resulting information onto the cloud and to a reading computer program or app.

Experiment in 2 phases:
- Exploratory
- Real conditions
LoRaWAN trials, exploratory: Galicia - Spain

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LoRaWAN trials in at-sea conditions: Achotines Lab - Panama
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LoRaWAN trials in at-sea conditions: Achotines Lab - Panama

Results

Sensor 1
LoRaWAN trials in at-sea conditions: Achotines Lab - Panama

Results

Sensor 2
LoRaWAN trials in at-sea conditions: Achotines Lab - Panama

- The antenna significantly improves detection rates (150-300m)
- 75% - Location 100-350m (450-500 with antenna)
- 50% - Location 300-480 m (575-650 m with antenna)
- 75% - Status 500-550m (675-750m with antenna)
- 50% - Status 600-650m (775-850m with antenna)
Conclusions

- Significant information from evaluating the LoRaWAN technology at-sea:
  - Effectiveness for transmitting information (location) between the sensor and the hub within a specific range: **450-500 m (HUB with antenna), and 100-350 m (HUB without antenna).**
  - Potential communication between satellite buoys to nearby vessels/devices
  - Could enables data recording on various electronic devices (e.g., EM equipment, other technologies available at vessel bridge, helicopters(?))
  - Cost-effective, safe, and feasible to be seamlessly integrated with EM or other vessel electronic systems.

- Consider the LoRaWAN technology for the development of sensors transmitting the FAD buoys’ serial number to receivers located at distances no greater than 500 m.

- Consider exploring the LoRaWAN technology for applications with other fishing activities that require remote and automatic data collection (e.g., electronic scales for weight estimates).
Preguntas – Questions?