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ISSF SUBMITTED PAPER – TOWARDS ACOUSTIC DISCRIMINATION OF TUNA SPECIES AT FADs

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TOWARDS ACOUSTIC DISCRIMINATION OF TUNA SPECIES AT FADS

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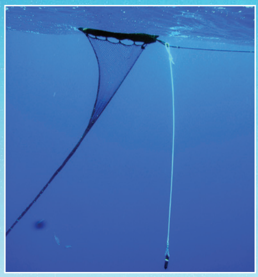

ISSF INTERNATIONAL SEAFOOD SUSTAINABILITY FOUNDATION

Recent stock assessments for bigeye tuna indicate that overfishing is occurring for this species in western Pacific and Atlantic Oceans. Taking action to avoid catching undesired tuna species while exploiting healthy stocks of tunas around FADs is important for the sustainability of these tuna stocks. One of the potential measures to avoid undesired catches of tuna and non-tuna species is to provide information to fishers about the species composition beneath the FADs before they set the purse seine net.

FADs are geo-located with buoys that in recent years have been equipped with echo-sounders that provide fishers with rough biomass estimates remotely. Increasing the accuracy of remote species biomass estimates from FADs would allow fishers to avoid undesired catches while giving scientists direct observations of tuna schools at FADs (Moreno et al 2015). However fishers and scientists are not able to acoustically discriminate between the three main tropical tuna species found at FADs. One of the prerequisites to discriminate species using acoustic technology is to know the target strength (TS) of the observed species. Currently there is no TS for skipjack tuna, the species that represents 60% of global tuna catch, and there are few observed TS values for bigeye and yellowfin tunas at FADs.

ISSF is sponsoring research to develop a methodology to achieve acoustic selectivity of tropical tuna species, exploring the frequency response of tunas with and without swim-bladder. Given that, when present, the highest contribution to the TS comes from the swim-bladder, there is a typically contrasting different frequency response between swimbladdered and non-swimbladdered species (Foote, 1980; Korneliussen, 2010). It is possible that this research could be applied to distinguish skipjack (non swimbladdered fish) from bigeye and yellowfin tunas (swim–bladdered fish) during FAD fishing operations and therefore avoid catching undesirable tuna species in FAD sets.

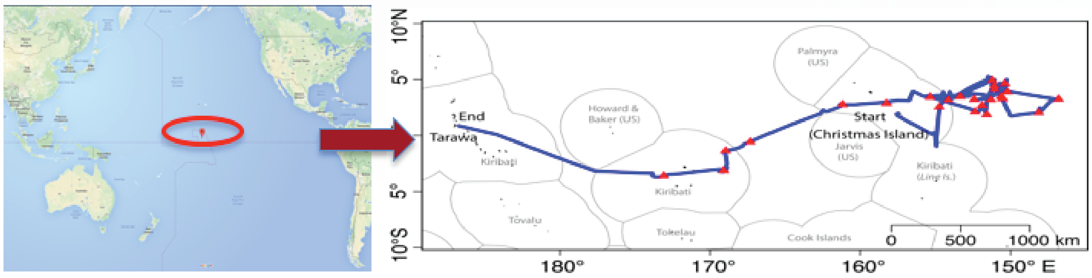

Fig 1. Study area

To test the potential of multi-frequency acoustics to discriminate tunas and to get TS values for the three species, a research cruise was organized in central Pacific Ocean (Fig 1) where 20 acoustic surveys were conducted around FADs using a Simrad EK60 scientific echo-sounder operating at three different frequencies simultaneously (38 kHz, 120 kHz and 200 kHz). Acoustic surveys were conducted just before

[1] The TS is a number used to scale hydro-acoustic data into biological units such as abundance.

fishing at FADs followed by intensive spill sampling to compare acoustic data and species composition caught (Fig 2).

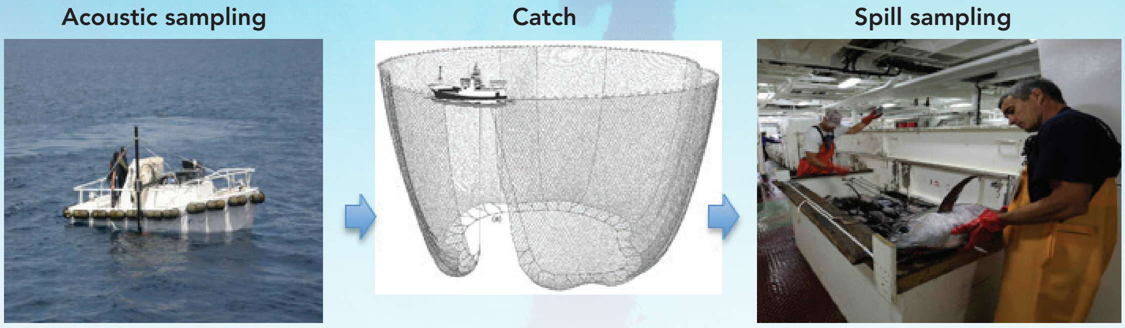

Fig 2. Protocol at sea: Acoustic sampling before the catch and species and sizes sampling after the catch.

The study obtained first Skipjack tuna and consistent Bigeye tuna TS-length relationships for the three different frequencies used. Also, given the clearly distinct frequency responses found between Skipjack and Bigeye tuna species (Fig 3), the potential of multi-frequency acoustics for tropical tuna discrimination is confirmed. This positive result encourages further research to obtain the acoustic mask needed for tropical tuna discrimination, which would allow, in the near future, informing fishers on the proportion of tuna species at FADs before setting.

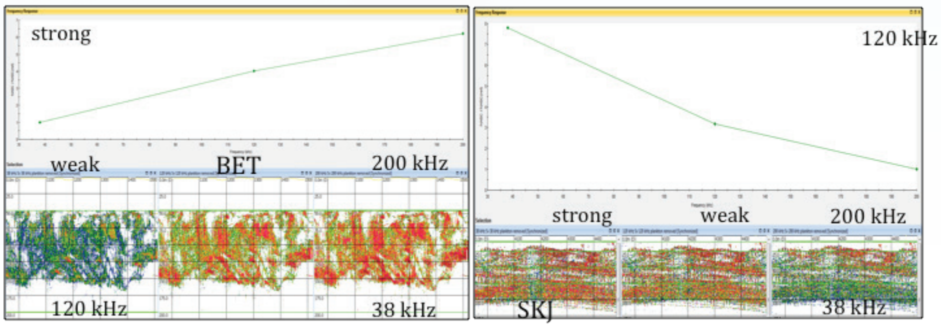

Fig 3. Example of frequency response of skipjack (non-swimbladdered fish, left) and bigeye (swimbladdered fish, right) tunas during the survey.

Next steps towards acoustic discrimination:

- Measure TS values for Yellowfin tuna
- Build the discrimination mask using multiple frequencies
- Share this knowledge with fishers, scientists and buoy manufacturers
- Work with managers to develop management measures using these outcomes.

References

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