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ISSF Meeting on mitigation of by-catches in the Tuna Purse seine Floating Object fisheries: *Sukarrieta, Spain 24-27 November 2009*

WCPFC-SC6-2010/FT-IP-02

Summary of Meeting Report

International Seafood Sustainability Foundation[1]

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Summary of Meeting Report by ISSF

1. Background

The International Seafood Sustainability Foundation[2] (ISSF) is a global partnership among scientists, the tuna industry and the World Wildlife Fund (WWF). Its stated mission is to undertake science-based initiatives for the long-term conservation and sustainable use of tuna stocks, with an emphasis on bycatch reduction and the promotion of responsible fishery practices and ecosystem health. On the industry side, participating companies include some of the world's largest tuna processors and a global trader.

2. Introduction

A meeting to discuss and review potential mitigation measures related to by-catch in purse seine fisheries was convened by the ISSF, and held at the AZTI- Tecnalia laboratory, Sukarrieta, Bizkaia, Spain, 24-27 November 2009. The meeting concentrated on bycatch (including undesirable catch of target species) resulting from fishing effort on floating objects, including artificial FADs, by purse seine fleets targeting skipjack and yellowfin tuna worldwide. The objective of the meeting was to gather experts in the fields of gear technology, acoustics, shark, and tuna behavior, fisheries, and physiologists, to discuss with the skippers of purse seine vessels methods that could be used to minimize the bycatch of small tunas, sharks, marine turtles and pelagic finfish (mahi-mahis, wahoos, rainbow runners, etc.) in purse seine floating object fisheries. Although not classically considered a bycatch species, the issue of reducing fishing mortality of bigeye tuna on floating object sets was included as an important topic of the workshop/meeting.

The meeting was opened by Dr. Josu Santiago, Director of the Tuna Research Department from AZTI, who gave all a warm welcome, and by Susan Jackson, president of the ISSF. Dr. James Joseph, at that time the Scientific Advisory Committee Chair of the ISSF could not attend for health reasons, but his closing address is available in **Appendix A**.

Dr Martin Hall (IATTC) served as meeting chairman assisted by a steering committee consisting of Gala Moreno (AZTI), Javier Ariz (IEO), Laurent Dagorn (IRD), David Itano (PFRP) and Peter Williams (SPC). Participants in the meeting were not meant to represent countries or organizations and their opinions reflected only their views as scientists and technicians. This meeting did not aim to produce recommendations endorsed by meeting participants, but rather aimed at gathering a list of ideas, which could then be considered by the ISSF for funding potential research projects. The list of participants is available in **Appendix B**, and the Agenda in **Appendix C**. The meeting presentations titles and presenters are included within the Agenda.

3. Meeting structure

The formal meeting was preceded by an introductory session on November 24th, where the technical aspects of purse seine fishing on FAD were presented to the meeting participants. The purpose of this presentation was to familiarize experts in various disciplines (i.e. acoustics, shark behavior) that were not familiar with purse seining, and to provide a quick comparison between purse seine fisheries from the different regions. The emphasis was in highlighting the aspects of the fishing operations or environmental conditions that could influence bycatch levels.

[2] http://www.iss-foundation.org/home

The general meeting began with reviews of purse seine fisheries and bycatch issues characteristic of each major region:

- Easter Pacific Ocean (EPO)
- Western and Central Pacific (WCPO)
- Indian Ocean (IO)
- Atlantic Ocean (AO)

It was noted that variation in thermocline depth, net depth, fishing techniques, local productivity, trophic structure, species composition and bycatch utilization occur between these regions that can significantly alter levels of bycatch and small tuna catch. It was further recognized that concern over bigeye take in purse seine fisheries varies widely between global regions due to several factors of relative abundance, catchability and localized resource condition. However, many aspects of bycatch and bycatch mitigation remain highly consistent between all regions.

3.1 Biological taxa examined

The meeting considered four main categories of bycatch or undesirable catch that need to be mitigated:

- Bigeye and small tuna
- Sharks
- Marine turtles
- Miscellaneous finfish

However, it was recognized that the relative impact of purse seining on shark and turtle populations is very low compared to longline and some coastal gillnet fisheries. Still, it was recognized that reduction in take of all bycatch taxa must be advanced by all harvesting sectors.

Seabird bycatch issues in tropical purse seine fisheries were not considered to be significant in comparison to the other categories and were not discussed by the meeting. Likewise, marine mammal interactions were not addressed as they are mainly relevant in the eastern Pacific where a large and well administered bycatch reduction program has been in effect for many years.

Bycatch of miscellaneous pelagic fish species (i.e. mahi-mahi, wahoo, rainbow runner, pelagic triggerfish, etc.) cannot be put in perspective relative to population abundances because those are not known, but most of the species involved are extremely prolific, fast growing, and with early sexual maturation. These incidental mortalities may be sustainable, however, since these species are relatively high level predators, and contribute to important artisanal and recreational fisheries; the ecosystem, and the socio-economic impacts of their removal should be considered.

Bycatch of billfishes, primarily blue and black marlin, where robust estimates exist, were noted to be very small compared to the directed catches, or bycatch by other gear types in the region, and they should not have a noticeable impact on the trajectories of those populations.
It was noted that discards of small tunas below marketable sizes and discard of the small tuna-like species (Auxis spp., Euthynnus spp.) are always undesirable for the fishermen and ecosystem. The catches of bigeye tuna on floating object sets has become a major management concern in the Pacific, and avenues to avoid, or exclude bigeye from purse seine

sets were explored. As stated before, this is not a classic bycatch issue, but it was included because of its significance for the fisheries.

Reduction in the incidental fishing mortality of whale sharks and manta rays taken in association with tuna schools was also addressed. This situation was considered a separate category best addressed by the development and training in best practices for non-lethal removal of large marine organisms from the net as have already been self-adopted by many fleets.

3.2 Purse seine processes when mitigation can occur

The meeting considered that the mitigation of bycatch and undesirable catch on tuna schools found in association with floating objects can occur during four main stages of the purse seine process:

- **Avoidance of bycatch**: prior to encirclement of the net
- **Release from the net**: after encirclement but prior to brailing to the catcher vessel (or carrier vessel in the case of group seine operations)
- **Release from the deck**: live release of bycatch from the catcher vessel prior to entering fish holds
- **Utilization**: retaining and sale of miscellaneous finfish species (converts bycatch into non-target retained catch)

The final day of the meeting was set aside to present a summary of presentations and discussions arising from the scientific portion of the meeting to a large audience of purse seine captains and industry representatives to seek their opinions and suggestions for further work.

4. Potential mitigation techniques and technology

4.1 Avoidance

4.1.1 Bigeye and small tuna

Excluding bycatch or undesirable catch from encirclement while retaining targeted skipjack and yellowfin is considered the most desirable approach as it eliminates the difficult process of separating and releasing bycatch in a viable condition. In order to avoid the encirclement of bigeye or small tuna, the meeting discussed the need for:

- an understanding of the horizontal movements and behavior of tuna species by size around floating objects in relation to time of day;
- Defining the vertical behavior of different sized tuna and bycatch species around floating objects in relation to time of day;
- Ability to remotely discriminate the size and species of fish on floating objects using acoustic instruments (echo sounders, sonar, biomass estimating GPS buoys) and visually (drop cameras, ROVs), or through image enhancement software and remote imaging;
- Understanding the influence of the construction, depth and added components of drifting FADs;

The possibility of setting on skipjack schools after sunrise if they move away from the floating object was proposed as a way to avoid encirclement of bigeye and bycatch that tend to remain with the floating object. The use of shallower nets was another approach to avoid bigeye if they exhibit significant depth segregation. Another possibility discussed was the use

of "double FADs", with two FAD floats separated vertically. If the bigeye aggregate to the deeper float it may be possible to separate the floats prior to the set and target the shallower skipjack and yellowfin. All of these approaches require the information listed above in conjunction with a great deal of experimentation and field studies.

The fishermen agreed that bigeye generally stay deeper in the day on FADs and acoustic discrimination of bigeye tuna was favorable when the bigeye were large (> about 65 cm) and made up a good proportion of the school. However, they felt that it was difficult to discriminate small bigeye from similar sized yellowfin and that it would be difficult or impossible to separate bigeye in the net for live release. Others felt that most of the tuna had already suffocated by the time tuna were crowded enough to exit sorting grids, but changing the position of the grid may correct this to some extent.

4.1.2 Sharks

The avoidance of sharks was discussed in detail during the meeting and centered on methods to attract sharks away from the drifting object or cause them to be repulsed by proximity to the object. Two species, the silky (*Carcharhinus falciformis*) and the pelagic white tip (*C. longimanus*) were considered the priority species to evaluate at this time. The sensitivity of elasmobranchs to electrical stimuli was noted as well as their well known olfactory sense. Potential means to attract or repulse sharks away from the area of a drifting object set included the use of:

- Electrical and electromagnetic stimuli,
- Chemical stimuli (blood, amino acids, pheromones);
- Sound

It was recognized that all of these methods will require a great deal of experimentation and evaluation and run the risk of also attracting or repulsing tuna.

4.1.3 Marine turtles

Spatial techniques are useful to avoid turtles, especially in the vicinity of nesting beaches, but this was considered outside the scope of this workshop.

Two general issues with release or avoidance of turtle interactions and purse seine gear were discussed. The first is direct entanglement of turtles in the purse seine net during the fishing operation. This occurs when their fins and carapace become entangled in the webbing as it is drawn up toward the power block when the net is retrieved. It was recognized that fishermen want to release all turtles before they rise above deck level as they can cause serious injury or fatalities to crewmen if they fall from the height of the power block. It was noted that this situation has been well mitigated in the EPO by having a small skiff positioned in the net where it rises to the power block that can release any turtles as they appear. It is also standard practice on purse seine vessels to back down the net and release objects (turtles, sharks, large tuna) that have become enmeshed in the net.

The second turtle interaction issue has to do with turtles and other marine life becoming tangled in the drifting FAD. This can occur through entanglement with the sub-surface appendage suspended beneath a drifting FAD or when turtles climb on top of a drifting FAD and get tangled in rope or webbing. The problem has to do with the fact that most drifting FADs are constructed with surplus webbing that would normally be discarded and is available at no cost to the fishermen. These nets can act like gillnets and tangle turtles, sharks and other finfish. Studies testing the use of alternative FAD materials and "ecological" FADs using biodegradable materials were described and presented.

4.1.4 Miscellaneous finfish

Avoidance of high proportions of other finfish on FAD sets is currently on a lower priority than solving the small tuna and bigeye problem. However it was recognized that the impact of large-scale fisheries on small-scale fisheries and the common stocks should be better defined. Interactions with these other species may be mitigated through a combination of techniques discussed for the other taxa but more information is required on their spatial behavior, seasonality and aggregative characteristics.

4.2 Release from the net

Several techniques or ideas for releasing bycatch after encirclement and pursing of the net were presented and discussed. Potential methods for releasing bycatch discussed by the meeting included the use of:

- Sorting grids to remove bigeye tuna, small tuna and bycatch;
- Increasing the mesh size of the seine;
- Altering mesh type (knotless) or material to reduce damage of escaping fish;
- Altering net sink rates, pursing speed or other operational parameters;
- Use of light or sound stimulus to lure or herd species out of the net;
- Use of chemical stimulus to lure species out of the net;
- Improving conditions inside the net to improve condition of fish such as aeration;

The use of drop cameras or ROVs with video output to the ship was noted as an important component to evaluate the efficacy of avoidance or release techniques. It was also noted that some means to evaluate the post release condition of tuna, sharks, turtles and bycatch needs to be incorporated into release experiments.

The potential use of sorting grids to release bycatch and unwanted tuna was discussed in detail. It was noted that their use for tuna purse seine gear is currently being evaluated in Ecuador. Currently, it appears that sorting grids are most effective in releasing the hardier finfish species that do not require forward motion to aerate their gills such as rainbow runner, triggerfish, jacks, etc. Sorting grids have been observed to be quite effective for releasing some of these species but their post release condition needs to be evaluated in relation to how many of the same species do not escape.

It was noted that the use of sorting grids to release bigeye tuna and undersize tuna was problematic due to:

- the reluctance of tuna to exit a sorting grid when the net is open and they are still in good condition;
- the fact that skipjack that are desirable catch may escape due to the fact that they are smaller than most of the bigeye that intended for release;
- the need to adjust the position of a sorting grid to maximize its efficiency depending on the size of the set;
- the fact that sorting grids positioned near the sack need to be strong enough to sustain huge weights during the sacking up process while remaining flexible to allow hauling through the power block.

Experiments to herd tuna out of the net using light or sound were described. The problem noted was the fact that tuna can become overly stressed during herding or become gilled in the net if over-stimulated.

Currently, it was recognized that some fleets routinely tow the FAD or floating object slowly out of the net prior to the commencement of net hauling. A portion of the associated bycatch leaves the net at this time. However, there is a need to document which species leave in this manner and what proportion actually goes with the FAD which can be done by careful enumeration of bycatch during the brailing process.

4.3 Release from the deck

Releasing bycatch after brailing, either from the brail, sorting hopper or from the chutes on the wet deck is clearly the least desirable option. Theoretical options for improving fish condition prior to their release included aeration of the sack, wet brailing catch, use of sorting conveyors with quick access to the sea and improved handling procedures were discussed. The size of brailer, position in brail, bycatch species, timing during brailing and set size were considered. Ways to assess condition of bycatch released from the deck included the use of popup satellite archival tags, analysis of blood chemistry and holding of released fish in observation pens or a purse seine held open by work boats.

4.4 Utilization

In some cases, utilization of some bycatch species can convert a bycatch into a desirable landed component of the fishery. However, currently this only occurs in special cases where large domestic markets exist that desire and can absorb large quanties of low grade, brine frozen finfish. Expansion of direct utilization in most cases will require onboard modifications to processing and frozen storage space coupled with market development.

5. SUMMARY

Discussion with the skippers and industry representatives proved very useful in establishing a dialogue between fishermen and scientists. It was generally recognized that mitigation techniques for avoidance or removal of bycatch from purse seine gear must be species-specific and tailored to the environmental conditions that exist in each fishery region. In order to expand the scope of any bycatch mitigation study it will be of utmost importance to improve species specific catch and bycatch data from observer and port sampling programs.
The fishermen welcomed the idea of assisting in the development of guidelines for “best practices” for the release and handling of bycatch species such as sharks, turtles, whale shark, manta ray and finfish. It was noted that guidelines for bycatch mitigation should be region specific and disseminated to fishermen in the appropriate languages. Incorporation of these best practices in FAD management plans and access agreements would be the next step in the process.

6. FUTURE PLANS

ISSF is launching an ambitious research project using a dedicated purse seine vessel to test various bycatch mitigation techniques (see document FT-WP4). The Sukarrieta workshop was very useful to the shaping of the research plan for the vessel in that it helped identify promising mitigation techniques that require scientific tests. Over the course of the next year, ISSF will be conducting additional workshops with skippers in the various oceans. The aim of these additional workshops will be to further exchange views with skippers in order to identify other techniques that should be tested, or refinements to the ideas that came out of the Sukarrieta workshop.

APPENDIX A – Closing address by Dr Jim Joseph, SAC Chair

Please accept my apologies for not being able to join in this important workshop.

Thanks to Gala and her AZTI team, Martin and the steering committee, and to all of you who are making presentations and joining in the discussions.

The issue of bycatch is becoming increasingly important for tunas. There is a great deal of attention being directed to the bycatch issue, particularly as a result of fishing on FADs. There are efforts to prohibit the use of FADs by attempting to restrict market access for fish taken in association with FADs, and to replace purse-seine fishing with pole-and-line. Obviously, to replace the catch of purse-seine vessels with catch taken by a pole-and-line fleet is impossible. A pole-and-line vessel is about a tenth as efficient as a purse-seine vessel. Even if this were possible the carbon footprint for a pole-and-line fleet would be enormous relative to a purse-seine fleet. Supplies of natural bait would not be sufficient to support such a fleet. In addition, any major harvests of bait would impact the ecology of the delicate ecosystems where baitfish are usually found, particularly in tropical waters, and could have adverse impacts on small coastal fishing communities.

For most bycatch species, with the exception of such endangered animals as marine turtles, sea birds, and sharks which are of low fecundity and slow growing, we do not understand the impact of removals on the stock from which they are harvested, nor how their role in the ecosystem might be altered as a result of removals. On the one hand, it has been argued that selectively harvesting one or two species from an ecosystem might alter the dynamics of that system, so therefore the fishery should be removing other associated species, while on the other hand, not knowing these impacts, caution would dictate reducing the removal of all non target species. However, we do understand that if the bycatch of very small tunas can be averted, productivity of the stock would increase in terms of increased biomass and potential catch.

Notwithstanding this gap in our knowledge, governments and the tuna industry has taken the decision to reduce the bycatch of unwanted non-target species and under-sized tunas to as low levels as possible, and the objective of this meeting is to examine various research options that can facilitate accomplishing this objective. What has resulted from this meeting is 1) a review of the research that is currently underway in various parts of the world directed to identifying and developing gear and fishing strategies that might lead to reduced bycatch, 2) identification of which areas of research might hold the greatest promise of success in terms of mitigating bycatch, and 3) setting priorities on that research. The next step we must consider is how to facilitate the carrying out of that research, which will obviously entail taking it to sea. A number of promising research projects already have been carried out at sea aboard operating purse-seine vessels by scientists from nations working in cooperation with their governments and industry. This research has however been hindered by the fact that it is so difficult to have ship time available.

There is an urgent need to expand this research and this will require the availability of a dedicated at-sea-platform. ISSF is prepared to address this problem of at-sea research and to initiate efforts to facilitate the availability of such a research platform and in that respect will strive to acquire a purse-seine vessel or vessels that will be devoted to this work for a period of two years. This dedicated vessel will be made available to scientists who are working on bycatch mitigation research. ISSF will contribute to, and lead fund raising efforts for the acquisition of the dedicated vessel and will work to make available funding for specialized gear aboard the vessel and support of the sea-going scientists. Funding for the individual research projects that will be carried out aboard the vessel will be expected to derive mostly from the scientists proposing the research. A steering committee of experts will be established to provide guidance and advice with respect to how the vessel will be utilized,

which research projects will be selected, and in which ocean or oceans it will operate. Decisions will have to be made as to whether it should be the same vessel moving from ocean to ocean, or a different vessel for different oceans. Not all fishing captains have the same success fishing in different oceans; some are more expert in one ocean than in another. The steering committee will need to seek the advice of fishing captains when making decisions on, the size and specifications of a vessel, its acquisition and deployment, and how this project should move forward.

Once the program is underway, and promising mitigation techniques or gear types are identified, the next step will be to encourage the captains of a number of purse-seiners to test the techniques and gear. To do this properly and test the efficacy and practicality of the methods will require a proper experimental design that will involve a specific number of vessel fishing in selected strata throughout the various tuna fisheries. The steering committee in conjunction with national scientists and RFMOs will be responsible for initiating these studies and designing such experiments, and will call on the advice, help, and cooperation of WPTO and other national fleets.

We have already initiated efforts to obtain funding for a vessel for a two year period. There is no guarantee that we will be successful. If we are successful, which I think we will be, it will be a least a year before a vessel would be available. In the intervening period, the steering committee will continue to work on formulating how this project can move forward. It will likely be necessary to hold additional small workshops to key on specific issues. Likewise, it will be necessary to have the full cooperation of the scientific community involved in bycatch research, and particularly fishing captains. Scientists are able to do many things, but are at sea for short periods of time, so the chance of observing situations that might lead to solutions to bycatch mitigation are limited. Fishing captains are the best observers of fish behavior and gear performance. They are at sea everyday, observing and experimenting. We need their experience, expertise and ideas if we are to be successful. In this context, ISSF is considering holding a series of small workshops/interviews with fishing captains to discuss "best practices" regarding bycatch mitigation. It is envisioned that a small team of experts, say a scientist and a fishing captain, will meet with small groups of fishing captains in various key ports around the world to discuss these issues and to iterate towards a series of "best practices." In fact, one such small meeting was held recently in San Diego, California at the offices of the American Tuna Boat Association. Dr. Martin Hall and Dr. Peter Williams met with several skippers to discuss "best practices" and general ideas for developing "best practices." The meeting was quite encouraging.

This meeting in Sukarrieta is the first step in a concerted international effort to address the issue of bycatch mitigation, and its conclusions allow us to formulate a plan for moving forward. Hopefully, we'll be successful in having a research platform to support this plan and that within a year the current at sea research can be expanded.
Thanks to you all for your efforts to make this workshop successful and we look forward to the future.

JJ

APPENDIX B – List of participants

Name	Organisation	Role/expertise
Susan Jackson	ISSF	Secretariat
Robin Davies	WWF	Observer
Konstantinos Kalamantis	ISSF	Observer
Martin Hall	Inter-American Tropical Tuna Commission (IATTC)	Steering Committee Chair
Javier Ariz	Instituto Español de Oceanografia (IEO)	Steering Committee
Laurent Dagorn	Institut de Recherche pour le Development (IRD)	Steering Committee
David Itano	Univ. Hawaii, Pelagic Fisheries Research Program (PFRP)	Steering Committee
Gala Moreno	AZTI	Steering Committee
Peter Williams	Secretariat of the Pacific Community, Oceanic Fisheries Programme	Bycatch data coordinator
Thierry LeGuennec	Tri-Marine fleet manager	industry representative
Patrick Helies	Skipper, Indian – Atlantic – Pacific	French purse seine
Taro Kawamoto	Kyokuyo Suisan Co.	Japan purse seine industry
John Cabral	Skipper, EPO – WCPO	USA purse seine
Frank Reier Knudsen	SIMRAD	Acoustics, biology, fisheries research
Takashi Shimizu	FURUNO ELECTRIC CO.	Electronic equipment
Magdalena Iglesias	IEO	Acoustics, research
Francois Gerlotto	IRD	Acoustics, research
Jacques Sacchi	IRD Sete	Scientist, purse seine expert
Aurelio Arrue	(NIRSA, Ecuador	fleet manager, sorting grids,
Ole Misund	Institute of Marine Resources, Norway	Acoustics and gear expert
Chris Glass	Univ. New Hampshire	fish behavior, gear expert
Eliseo Villar	UGAVI	net expert
Tatsuki Oshima	JAMARC	Research, tuna behavior in net
Yoshinori Nomura	NITTO SEIMO Co	net expert
Sean Newsome	SeaBotix	ROV expert
Peter Klimley	Uinversity of California at Davis, USA	Shark behavior, telemetry
Rich Brill	Virginia Inst. Of Marine Sci. NOAA	Shark and tuna physiology, survival, behavior
Diego Bernal	University of Massachusetts, USA	Shark physiology, behavior
Jimmy Martinez	SRP Ecuador	shark biologist
Bernard Seret	IRD, Paris	Shark expert
Kurt Schaefer	IATTC	Tuna biology, behavior
Miki Ogura	NRIFSF, Japan	Tuna biology, behavior
Alicia Delgado	IEO	Research, Spanish purse seine

APPENDIX C – Agenda - List of presentations and presenters at the meeting

November 24

Agenda Item	Presenter	Presentation title
Introduction to FAD fishing	David Itano	Introduction to FAD fishing Powerpoint A
Studies in Fishing depth (Ariz et al.)	David Itano	Included in Powerpoint A

November 25

Agenda Item	Presenter	Presentation title
Welcome	Josu Santiago	
Introduction	Susan Jackson	Objectives of workshop in ISSF program Text available
Introduction	Martin Hall	Scope of WORKSHOP Powerpoint 1
Review of regions		
Eastern Pacific	Martin Hall	Powerpoint 2
Western and Central Pacific	David Itano	Powerpoint 3
Atlantic Ocean	Javier Ariz	Powerpoint 4
Indian Ocean	Laurent Dagorn	Powerpoint 5
Small tunas/bigeye		
Acoustics	Gala Moreno	Powerpoint 6
FURUNO	Shimizu	Powerpoint 7
SIMRAD	Frank Knudsen	Powerpoint 8
Acoustic selectivity	Magdalena Iglesias	Powerpoint 9
Net modifications		
Sorting grid	Martin Hall	Video 1 and Powerpoint 10 (Aurelio Arrue)
Mesh sizes	Miki Ogura	Powerpoint 11
Attraction fish	Tatsuki Oshima	Video 2 and Powerpoint 12
Mesh Size	Taro Kawamoto	Powerpoint 13
Instruments	Sean Newsome	Powerpoint 14

November 26

Sharks		
Introduction Sharks	Laurent Dagorn	Powerpoint 15
Attraction	Peter Klimley	Powerpoint 16
Survival in net	Diego Bernal/ Rich Brill	Powerpoint 17
Sea Turtles		

Alternative models for FADs	Alicia Delgado	Powerpoint 18
Turtles Ecological FADs	Gala Moreno Javier Ariz	Powerpoint 19
Sheet FAD	Tatsuki Oshima	Powerpoint 20
Underwater video	David Itano	Powerpoint 21
Pelagic species	Martin Hall	Powerpoint 22

November 27

Agenda		
Welcome	Josu Santiago	
Introduction	Susan Jackson	Objectives of workshop in ISSF program Text available
Introduction	Martin Hall	Scope of WORKSHOP Powerpoint 1
Review of regions	Javier Ariz	
Acoustics	Gala Moreno	Powerpoint 6
Sorting grid for tunas and other species	Martin Hall	Video 1 and Powerpoint 9 (Aurelio Arrue)
Sharks	Gala Moreno	Powerpoint 14
Turtles Ecological FADs	Javier Ariz	Powerpoint 17
Sheet FAD & Attraction	Tatsuki Oshima	Powerpoint 18
Attraction	Peter Klimley	Powerpoint 15
Discussion		
Closing address ISSF	James Joseph	Text available
Closing Address AZTI	Josu Santiago	