IATTC - TUNACONS WORKSHOP ON ANALYSIS AND IMPROVEMENT OF THE USE AND FUNCTION OF SORTING GRIDS FOR JUVENILE TUNAS AND BYCATCH SPECIES IN THE PURSE-SEINE FISHERY FOR TUNAS IN THE EASTERN PACIFIC OCEAN

Manta (Ecuador)
8 and 9 April 2019

WORKSHOP REPORT

Participating organizations: TUNACONES, CIAT, PROBECUADOR, ISSF, WWF.

Facilitator: Mauricio Salazar.

Attendees: Annex 1

Agenda: Annex 2

Models tested previously: Annex 3

Other models presented: Annex 4

Mr. G. Moran was elected president.

1. SUMMARY OF THE DISCUSSIONS:

Possible objectives for the use of sorting grids in sets on FADs: The sorting grids allow the escape of small individuals that can pass through the mesh of the grid in a purse seine. These may include: small tunas of all species and individuals of other species associated with FADs.

The size composition of the main species of tuna (skipjack, yellowfin and bigeye tuna) caught in one set can be very variable, as shown by two examples (Fig. 1). When the sizes are very similar, there is no possibility of selectively releasing any of the species. When there are differences in size, the grid can allow the smaller ones to escape. Due to the management needs of the fishery, there is an interest in releasing juvenile bigeye and yellowfin tuna alive (hereafter abbreviated as JBY). However, these species, even though juveniles are often the largest sizes present in the net (e. g., > 60 cm), so the problem becomes an "inverse" one: there is an interest in freeing the larger individuals in the net and the grid, as applied in a regular operation, cannot accomplish that task. Major changes in the regular operation of the set are needed to achieve this goal.

The attendees commented that the canneries buy everything, but that fish less than 3 pounds is paid at half the price of the other tuna. Therefore, there is some motivation to release smaller sizes of tuna. However, when fishing is poor and the set catches small fish, the grid can be taken out of the water to avoid fish loss. With large sets, there is a risk of damaging the net if the grid is raised, so it is left submerged. The possibility of installing the grid deeper, to ensure that it remains submerged was considered positively by several skippers, but there were some concerns about the risk of breaking the net in large sets. As an alternative, it was proposed and accepted by most of the skippers and net makers, to lengthen the grid in its vertical dimension, but to preserve its current vertical location.

The skippers were asked if they thought that the depth of the net affects the BET catches and most thought that, if the set was made at sunrise, the depth of the net would not make much difference.

A review of the sorting grid models in other fisheries in the world was presented to the audience. After discussing the pros and cons of the different options, most agreed that the current design was quite adequate and that perhaps with some modifications it could be improved.

An innovative idea of M. Román was well received and was considered a good approach to provide rigidity without hampering the passage through the power block. The idea is to frame the grid with a hose that can be filled with a fluid (air or liquid) under pressure when it is deployed and deflated at the end of the set. Many considered that this idea was worthy of some tests, to study its feasibility, in a separate experiment. Researchers explained that experiments with many changes can give results that are difficult to interpret.

To evaluate the effectiveness of sorting grids, we can think of an experiment divided into two phases:

a) Estimate which species and sizes leave the net.

b) Estimate the survival of those who escape.

For a), the main options are:

- to use a small net outside the grid to catch the fish that come out of the net, or

- to use visual records of observers or scientists located near the grid.

- to use video cameras focused on the net.

- to compare the captures in sets with and without the grid.

For b), things are much more complex. To estimate the survival of escapees, we need to track their condition over a period of several weeks. This requires keeping the fish alive in a cage and feeding them, while tracking all mortalities that occur after escaping. This should probably be done near the coast and in our case, the only options are the Galapagos Islands or some island in French Polynesia. Tagging escaped fish will be more expensive and will be less likely to get returned, but some long-term labels could be considered.

The estimation of the sizes and escape of species can be replicated in several sets, with different capture levels, species involved, types of sets and sea states, to build a model based on selected variables on the set.

2. PREVIOUS STUDIES.

The results of the previous tests were presented by TUNACONS, CIAT and the PROBECUADOR program. The data of the tests were difficult to interpret because the grid had been placed in a place where the skippers could choose, by lifting it partially or completely out of the water or leaving it submerged. Because these actions were often a response to the sizes present in the net (i.e., when the catch was composed of small fish, the grid was kept out of the water), there is no consistent database to make comparisons. In any case, we can conclude from these results that grids are very effective in releasing many of the small non-tuna species associated with FADs and, to a lesser extent small tuna. The results of the release of previous studies were not consistent. The data reported by the skippers showed escapes less than 2%, while others reported by observers were of the order of 10-15%. Most skippers believe that the last figure is more accurate, since the skippers are busy with other tasks during the fishing operations; this is especially noticeable in large sets, where grid release statistics are very low. Other explanations for this statistic low in large sets, it may be that with more weight in the bag there is less space to escape and the grid closes more. In addition, there may be more blood in the water in these sets and visibility is reduced. Many mentioned that leaks in the lower part of the grid may not be visible from the seiner. An obvious conclusion is the need for a precise methodology to estimate escapes.

The release of small mahi-mahi, yellowtail and other species is a very positive step towards reducing the impacts on pelagic communities associated with FAD, and is of interest to fishermen because it is believed that the persistence of these communities makes the floating object more attractive for tunas. The presentations with the results can be found in Annex 3.

In a separate test, the SALICA company used a grid made with hexagonal mesh, which has the property of remaining open even when under tension from any angle (unlike the diamond mesh that is closed under tension). This type of grid looked very promising, and there was interest in conducting more tests with this hexagonal mesh. Scientists suggested that it would add an additional source of variability to the planned test, however, encouraged the development of other tests with this mesh. It is not available in Ecuador, so it would require the purchase of material to perform these tests.

The first tests of sorting grids in Ecuador were made with a grid developed by Mr. Aurelio Arrúe. That system did not work well and a series of successive changes were made in its materials and configuration. The most common characteristics of the grids found in purse seiners today are:

shape: most are square; some are rectangular;

Dimensions: squares of 2.3 m to 2.5 m on the side, some rectangular of 4m x 3 m.

Mesh size 10cm x 10cm up to 8 cm wide x 12cm high.

Other issues discussed were the effect of the "mallon" (large mesh) of 6 to 8 inches in some sections of the purse seine net that acts as another escape route for small fish. Some skippers think that this is probably more effective than the grid, but there is no data to verify the statement.

It is quite clear that the grid, as it is designed and used today, is not an effective mechanism for releasing JBY of medium and large sizes that can measure more than 60 to 80 cm in length. In general terms, BET and YFT reach sexual maturity at 1 m in length or more, although YFT can mature within a wide range (80 cm - 160 cm). A common understanding among fishers is that, in large sets, the efficiency of the grid decreases significantly due to the tension in the net. This can be another advantage of the hexagonal mesh, keeping the shape of the openings under tension.

From the point of view of the escapes, the loss of YFT and BET of 10 lb or more is not desirable for fishers, as they are a major source of income. A quota per vessel for these species or other limitations could encourage their release.

Alternatives were presented to take the catch to the deck with a suction pump or a brailer full of water. Pumps are used in many fisheries for small pelagic species and in salmon aquaculture. They could improve the quality of the capture and the speed of loading and unloading. At present, this technology is not ready for use in tuna seiners, and tests are needed. The wet brailer is a simpler concept and could be easily testes. Once on deck, tanks with grids and gutters could be used to separate the small fish fraction to return to the sea alive.

An alternative approach with pumps would be to suck the individuals that die and fall to the bottom of the net. If this is the skipjack, as most fishermen believe, then after loading the skipjack, the ortza can be let go to release the rest of the fish and bycatch (e.g., sharks) that is still alive, hopefully including JBY. But other fishermen think that BET dies first and floats to the surface. Obviously, research is needed to clarify this point.

Another concept expressed by a participant was a backdown for small fish, with a rigid grid deployed within the net before that. An additional proposal was to use a large mesh in the backdown instead of the rigid grid. It would take more time to elaborate these ideas.

Time at which the new experimental grid design would be tested: it was generally agreed that the tests should be conducted during the closure period, exempting the participating vessels (volunteers) for these particular experimental sets

At the request of Eng. Morán, a brief review of the different alternative options to reduce the captures of JBY, the most critical problem for the administration, was added to the agenda of the workshop.

3. OPTIONS TO REDUCE THE TUNA BIGEYE AND YELLOWFIN SMALL CATCHES (JBY)

3.1. How to avoid or reduce the capture of JBY

Options based on technology or gear:

- Acoustics, like echo sounders, can be developed to help determine the biomass or the proportion of different species present in a FAD, but this technology is not available yet.
- Shorter nets or shorter "tails" have been considered in FADs.

Management options:

- Spatial-temporal closures (based on statistical data)
- "Habitat" closures (based on predictive models that define JBY's habitat)
- Dynamic closures (based on information provided by the fleet in real time)
- No sunrise sets when some limit is reached (based on JBY daytime patterns) was suggested by a skipper who believes that sets made at or after 9 a.m. would have less BET.
- Limits on numbers of FAD sets, total or by areas (areas with high JBY)
- Limits on numbers of FADs deployed (instead of limits of active buoys)

"Incentive options"

- Global quotas
- Individual vessel quotas (equal to all boats, or weighted by historical catches)

How to release fish from the net

- - Separation in the net (e.g., flashing lights have a different attraction effect in SKJ and BET, other technological changes in the net, such as vertical "choking", which separates the deepest part of the net with a horizontal net). could be tested.
- - Use of differential mortality (skipjack dies first and sinks, according to several skippers, but there are different points of view)

How to release from the deck (if the fish can be brought alive to the deck using pumps or wet brailers)

- - Tanks or hoppers with ramps.

4. PLANNING AN EXPERIMENT FOR SORTING GRIDS.

To ensure consistent results, the grids should be as similar as possible (materials, design, etc.) and that their location in the net and the mode of use be directly comparable, considering the differences between the vessels. It was proposed to carry out an experiment with 2 prototype models of grids defined at the meeting and involving 4 tuna vessels (2 boats per model). In addition, it was proposed to put some additional grids that could go in the section of the net before of the sack.

The skippers were asked about the conditions and changes that the experimental grid should have, and in the opinion of the majority, the characteristics of the grids, location and date of tests would be: (see figure 2)

- Materials: Frame of the grid (Cabo Samson of 7/8 "), the mesh of polyethylene rope (tenex plus) of 5/16"; The meshes are made, inserted and reinforced with nylon yarn and covered with organic resin.

- The dimensions (length and depth) of the 2 grid models would be the following: A grid of 4m x 4m and another of 5m x 4m. The simple grid model would be 4m x 4m.
- Mesh: (width - height) 9cm x 10cm.
- Vertical location of the grid: Under the valance, same position near the foredeck.
- Horizontal location of the grid: It will be defined once we know the configuration according to the maneuver of the participating boats.
- Test date: During the closure period.

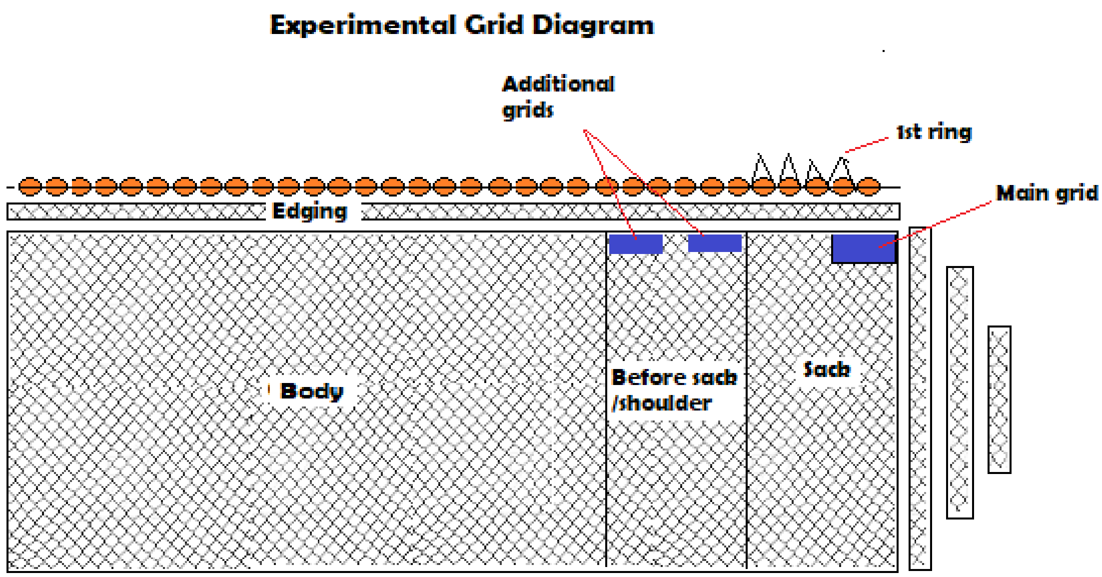


Figure 2

Experiment:

a) Single grid experiment in the area of the sack:

A grid of 4m x 4m with meshes of 9cm x 10cm in the current location.

b) Double grid experiment:

The grid from a) plus a grid of 4m x 2m in the part before of the sack, both with meshes of 9cm x 10cm.

As a first step, the escape of fish will be estimated with an auxiliary net placed outside the net, to recapture the fish that escaped. To prevent the auxiliary net from blocking the grid, it may be necessary to add floats and weights to keep this net open. Catches of other purse seiners fishing in the same time-area strata can be used as controls. The sets of the 4 purse-seine vessels over a period of months (which are suggested to be within the closed periods) will be analyzed to decide the need for an additional period.

The use of video cameras (e.g., Go Pro cameras) will be tested in some operations prior to the experiment to evaluate their possibilities.

Dr. J. Murua from ISSF led a workshop on other selectivity problems in purse seine fisheries. Key points included discussion with skippers on JBY mitigation options (e.g., acoustic selectivity, dynamic closures, FAD designs), as well as other fishery impact solutions such as biodegradable FADs and FAD recovery and method improvements of release of bycatch as hoppers and new release tools.

Eng. G. Morán thanked the participants, the facilitator and the staff of IATTC, TUNACONS, ISSF and WWF who participated in the event, and closed the workshop.

Annex 1: Attendees

TBA

Annex 2: Agenda

AGENDA

Monday, 8 April

0830: Registration of participants	
0900: Welcome and opening	(*Guillermo Morán - TUNACONS, Martín Hall - IATTC*)
0915: Workshop agenda and introduction of participants	(*Guillermo Morán*)
0930: Objectives of the workshop	(*Martín Hall*)

SESSION 1: Previous experience with the implementation of sorting grids

0950: Report on the use of sorting grids: IATTC (Project M.1.a)	(*Marlon Román*)
1015: Report on the use of sorting grids: SRP	(*José Luis García*)
1040: Monitoring the use of sorting grids: PROBECUADOR	(*Luis Torres N.*)
1105: Break	
1120: Experiences with the use of grids at sea	(*Invited captains*)
1210: Lessons learned from previous experiences with grids	(*Martín Hall*)
1210: Lunch	

SESSION 2: Operating the sorting grids

1330: Effect of installing grid(s) on the integrity of the net	(*Net technician*)
1350: Types of grids used in the past	(*Martín Hall*)
1420: Results in operation: TUNACONS	(*José Luis García*)

1440: Discussion: design, number, dimensions and materials in grid construction

1500: Break

SESSION 3: Species and sizes to be released

1515: Characteristics of the grids: exit spacing	(*Fisher, or grid designer*)
1545: Target species/size for release	(*Martín Hall*)
1615: Feasibility of release selectivity by target species/size	(*Fisher*)

1645: Discussion: Species and sizes to be released

1700: Close

Tuesday, 9 April

SESSION 4: Standardizing design, dimensions, materials, and monitoring results

0930: Discussion: achieving a single model from the models presented during the session

1030: Break

1100: Plan for experimental design and monitoring results	(*Marlon Román*)

1140: Discussion: experimental design and monitoring results

1230: Lunch

SESSION 5: Execution of experiment

1330: Progress in ISSF research on selectivity	(*Jefferson Murua*)
1530: Starting date for experiment	

1545: Construction of selected grids: place, date, number of participating vessels and future steps

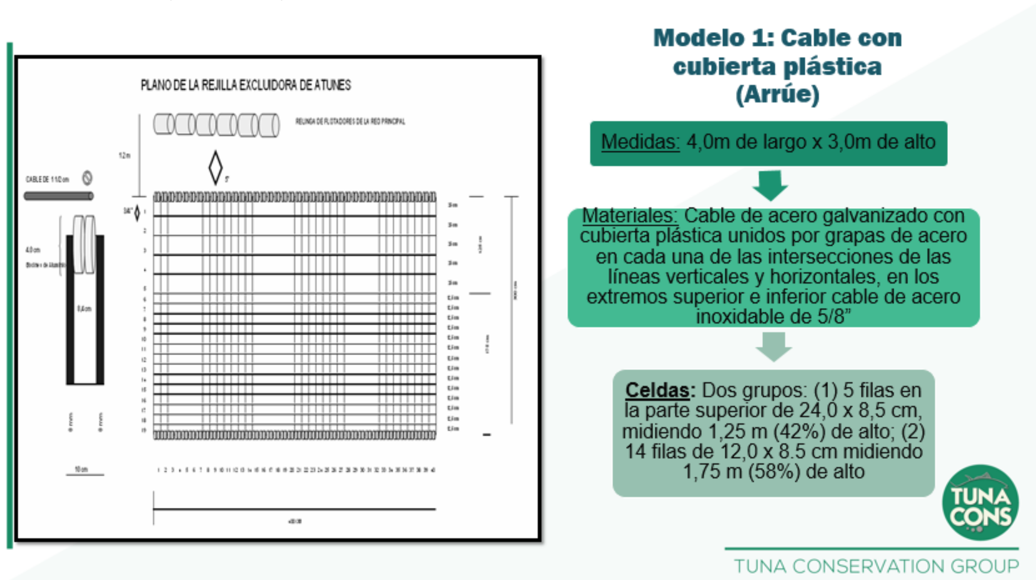
(*Martín Hall*)

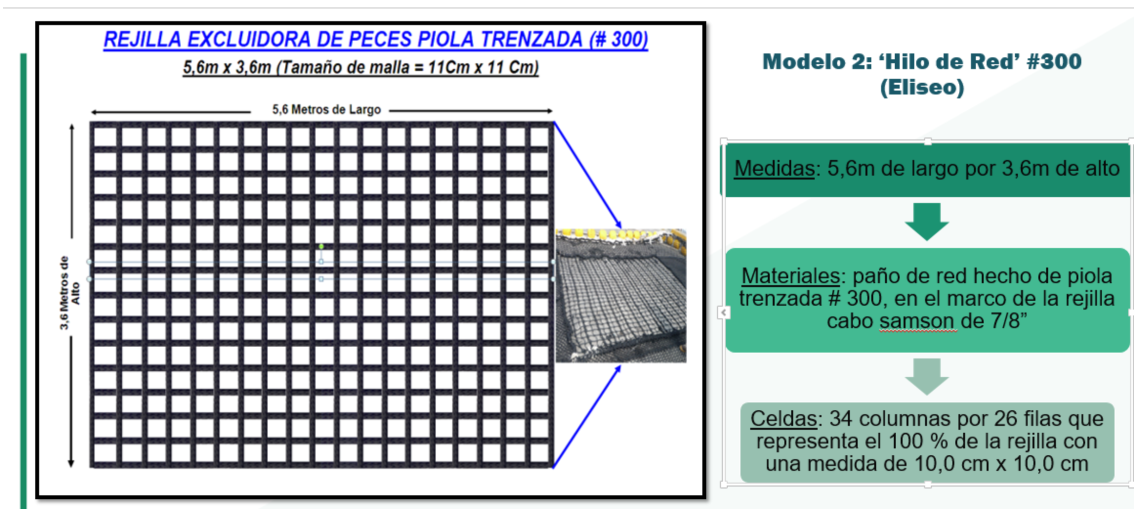
1545: Final considerations (*Guillermo Morán*)

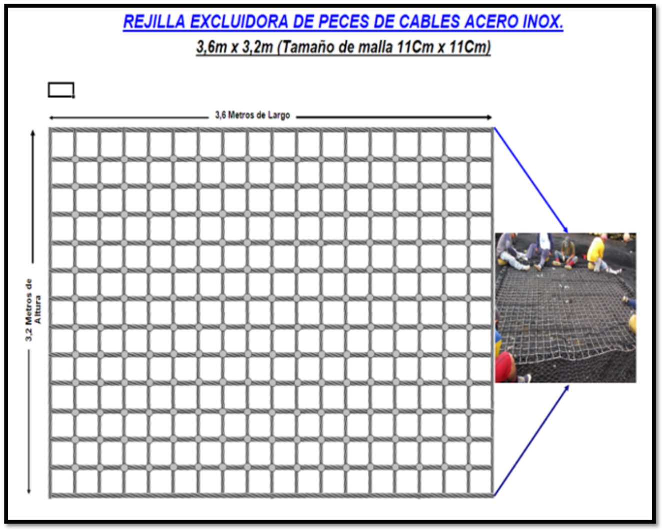
1645: Adjournment

LOCATION:
Balandra Hotel, Manta

Annex 3: Models tested previously





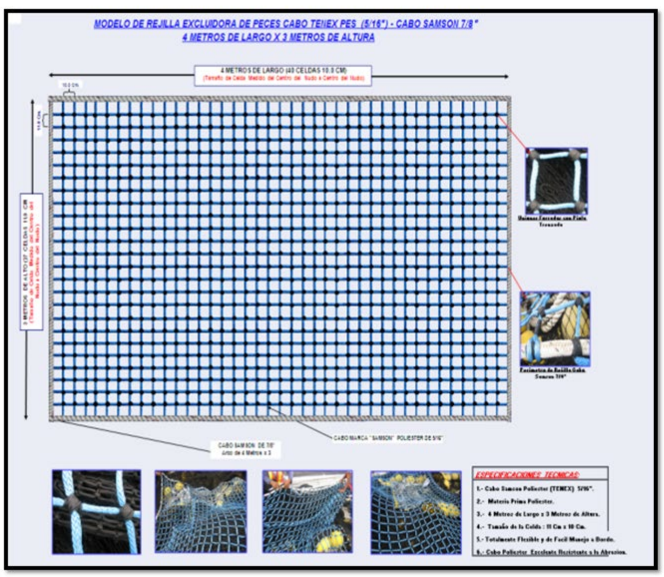


Modelo 3: 'Cable de Acero'
(Eliseo)

Medidas: 3,6m de largo por 3,2m de alto

Materiales: cable de acero inoxidable unidos por grapas de acero inoxidable en cada una de las intersecciones de las líneas verticales y horizontales, en los extremos superior e inferior no posee cable de acero inoxidable de 5/8"

Celdas: 30 columnas por 27 filas que representa el 100 % de la rejilla con una medida de 11,0 cm x 11,0 cm

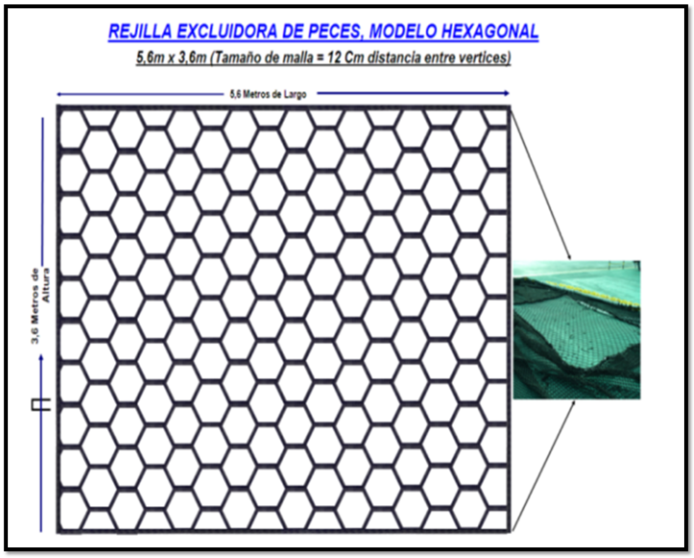


Modelo 4: 'Cabo Dyneema'
(PROBRISA)

Medidas: 4,0m de largo por 3,0m de alto

Materiales: cabo de fibra dyneema o cabo de poliéster (tenex) de 5/16", hilo de red # 42 uniendo las líneas verticales y horizontales, cabo samson de 7/8" en el marco de la rejilla

Celdas: 40 columnas por 27 filas que representa el 100 % de la rejilla con una medida de 11,0 cm x 10,0 cm

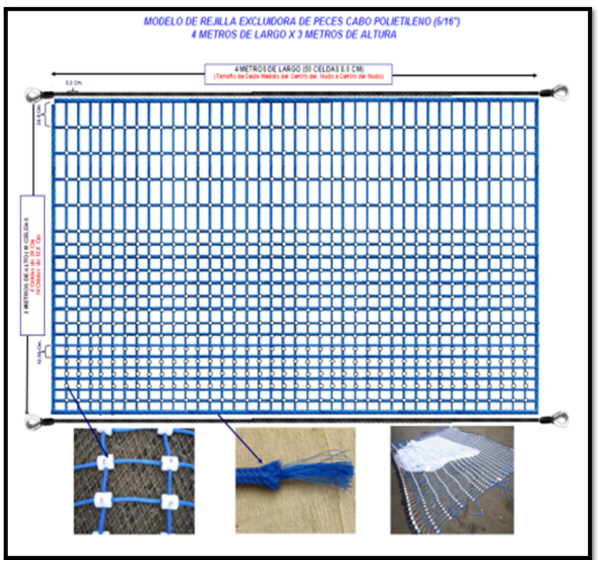


Modelo 5: Hilo de red/malla hexagonal (SALICA)

Medidas: 5,6m de largo por 3,6m de alto

Materiales: piola trenzada # 180, en el marco de la rejilla cabo samson de 7/8"

Celdas: Paño en forma de colmena (hexagonal) con celdas que representa el 100 % de la rejilla con una medida vértice-vértice de 12,0 cm



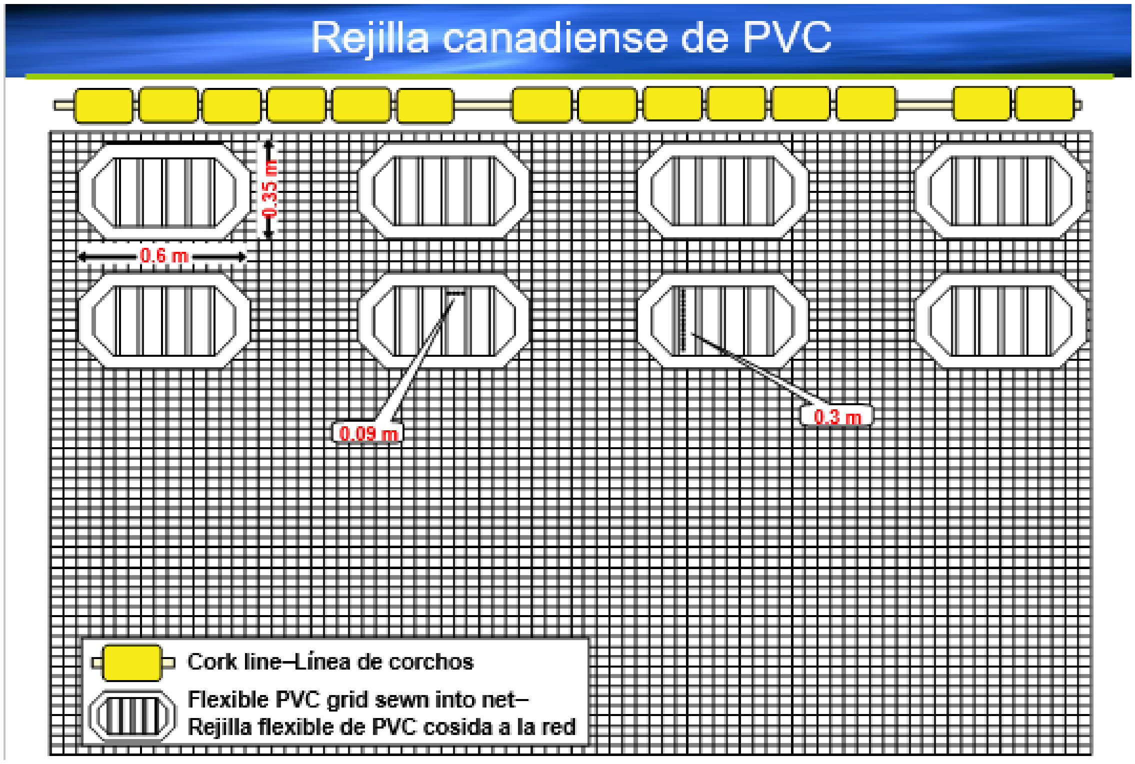
Modelo 6: Fibra de Polietileno (Arrúe modificado)

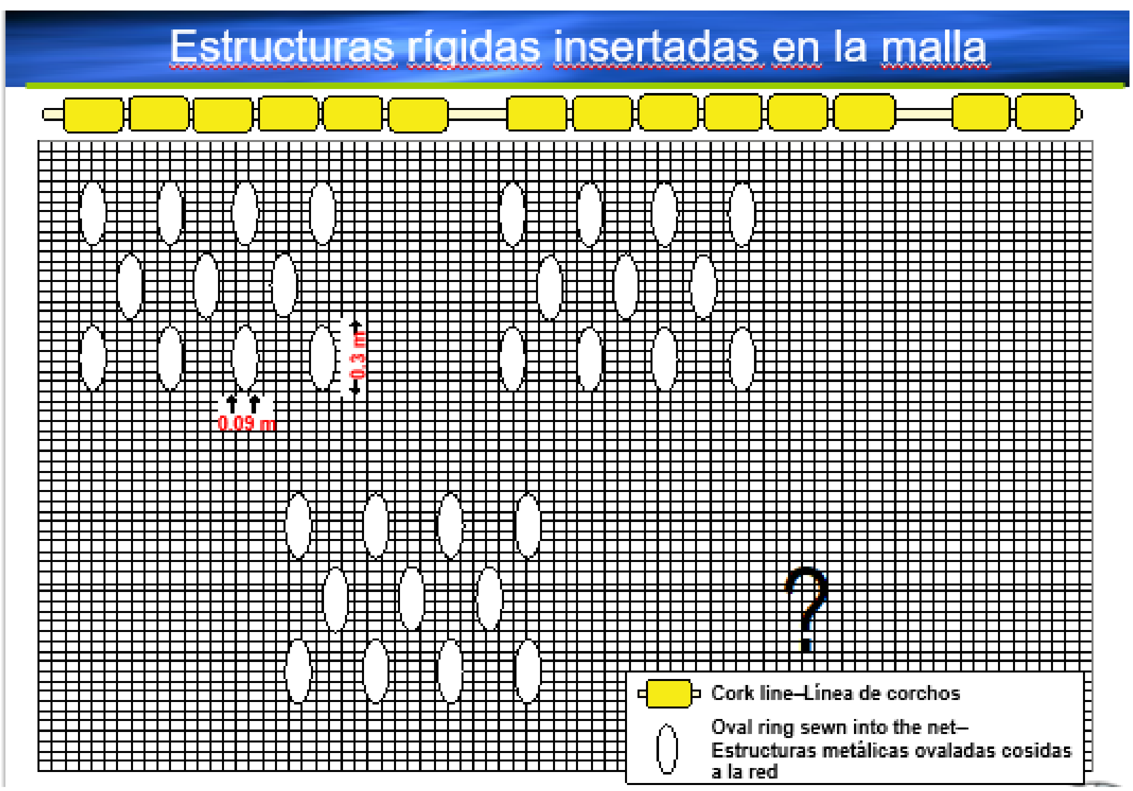
Medidas: 4,0m de largo por 3,0m de alto

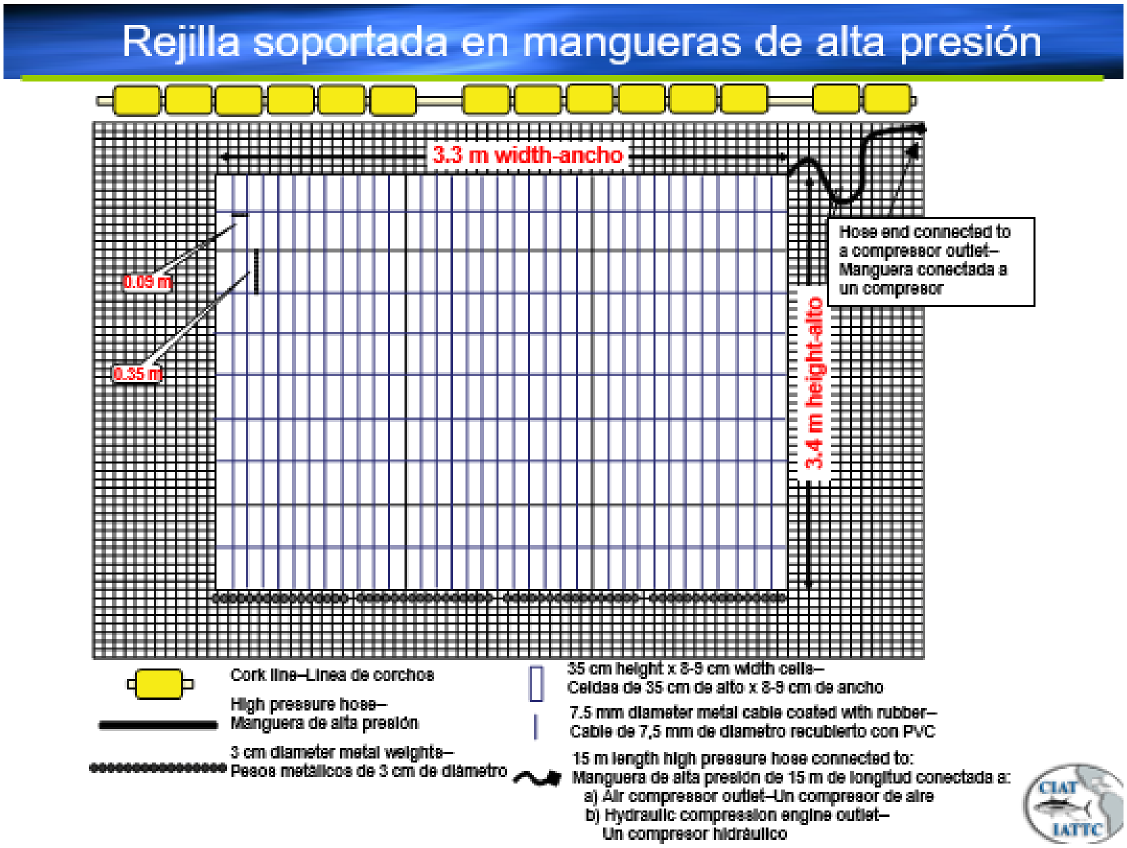
Materiales: fibras de polietileno unidos por grapas de resina en cada una de las intersecciones de las líneas verticales y horizontales, en los extremos superior e inferior cable de acero inoxidable de 5/8"

Celdas: Dos grupos: (1) 5 filas en la parte superior de 24,0 x 8,5 cm midiendo 1,25 m (42%) de alto; (2) 14 filas de 12,0 x 8.5 cm midiendo 1,75 m (58%) de alto

Annex 4: Other models presented






Rejilla soportada en mangueras de alta presión
3.3 m width-ancho
3.4 m height-alto
0.09 m
0.35 m
Hose end connected to a compressor outlet–Manguera conectada a un compresor
Cork line–Linea de corchos
High pressure hose–Manguera de alta presión
3 cm diameter metal weights–Pesos metálicos de 3 cm de diámetro
35 cm height x 8-9 cm width cells–Celdas de 35 cm de alto x 8-9 cm de ancho
7.5 mm diameter metal cable coated with rubber–Cable de 7,5 mm de diametro recubierto con PVC
15 m length high pressure hose connected to:
Manguera de alta presión de 15 m de longitud conectada a:
a) Air compressor outlet–Un compresor de aire
b) Hydraulic compression engine outlet–Un compresor hidráulico
CIAT
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