# Quality of FAD fishing products

## Preliminary results

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**CRFM-JICA-CARIFICO-WECAFC-IFREMER**

**MAGDELESA Workshop**

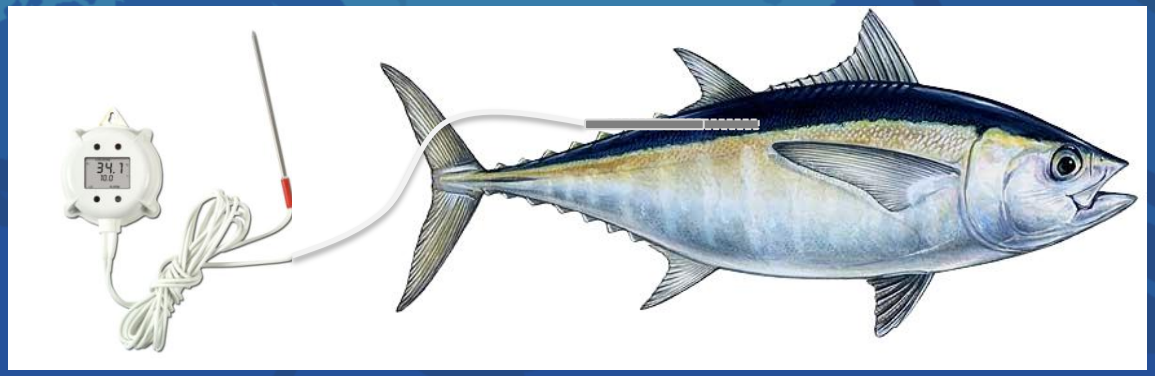
**Saint-Vincent & Grenadines**

- **Goals of this study**
  - Inventory of fish post-harvest and conservation practices on board fishing vessels from catch to landing
  - Characterization of conservation modes and their impact on product quality
  - Characterization of the chemical composition of large pelagic flesh
  - Characterization of chemical contaminants in the flesh of large pelagic
  - Propose recommendations to improve the quality on board fishing vessels

- **Implementation**

## On board fishing vessels

– Fish surface temperature follow-up from catch to handling (Subcutaneous)



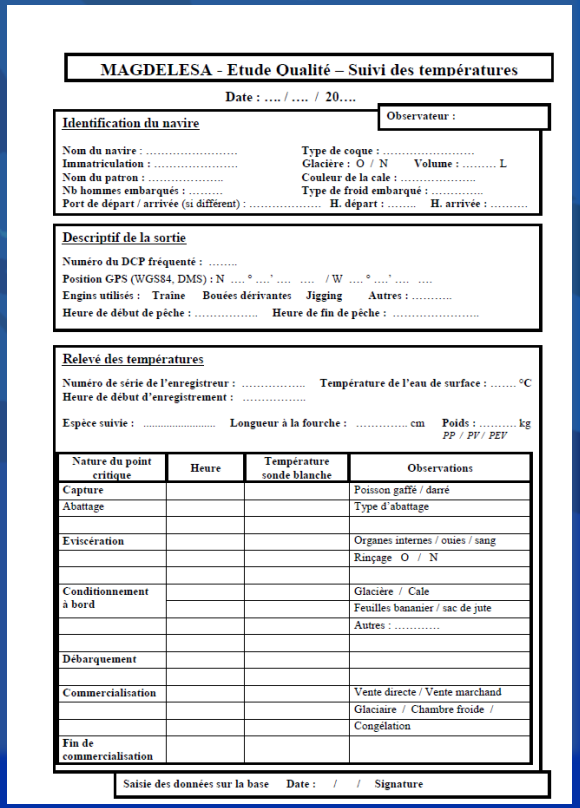
Blackfin tuna, Yellowfin tuna and Blue Marlin

# Quality of FAD fishing products, preliminary results
## Materials & methods

- **Implementation**

**On board fishing vessels**

- Fish surface temperature follow-up from catch to handling
- Description of each handling made by fisherman



**MAGDELESA - Etude Qualité – Suivi des températures**

Date : …. / …. / 20….

Observateur :

**Identification du navire**

Nom du navire : ……  Type de coque : ……
Immatriculation : ……  Glacière : O / N  Volume : …… L
Nom du patron : ……  Couleur de la cale : ……
Nb hommes embarqués : ……  Type de froid embarqué : ……
Port de départ / arrivée (si différent) : ……  H. départ : ……  H. arrivée : ……

**Descriptif de la sortie**

Numéro du DCP fréquenté : ……
Position GPS (WGS84, DMS) : N …. ° ….' ….  …. / W …. ° ….' ….  ….
Engins utilisés : Traine  Bouées dérivantes  Jigging  Autres : ……
Heure de début de pêche : ……  Heure de fin de pêche : ……

**Relevé des températures**

Numéro de série de l'enregistreur : ……  Température de l'eau de surface : …… °C
Heure de début d'enregistrement : ……

Espèce suivie : ……  Longueur à la fourche : …… cm  Poids : …… kg
*PP / PV / PEV*

| Nature du point critique | Heure | Température sonde blanche | Observations |
|---|---|---|---|
| Capture | | | Poisson gaffé / darré |
| Abattage | | | Type d'abattage |
| | | | |
| Eviscération | | | Organes internes / ouies / sang |
| | | | Rinçage O / N |
| | | | |
| Conditionnement à bord | | | Glacière / Cale |
| | | | Feuilles bananier / sac de jute |
| | | | Autres : …… |
| | | | |
| Débarquement | | | |
| | | | |
| Commercialisation | | | Vente directe / Vente marchand |
| | | | Glaciaire / Chambre froide / |
| | | | Congélation |
| Fin de commercialisation | | | |

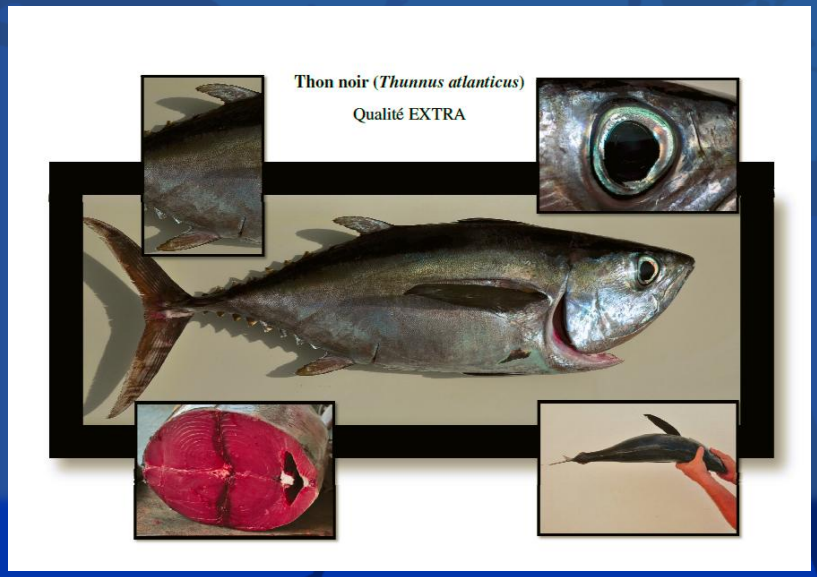
Saisie des données sur la base  Date : / /  Signature

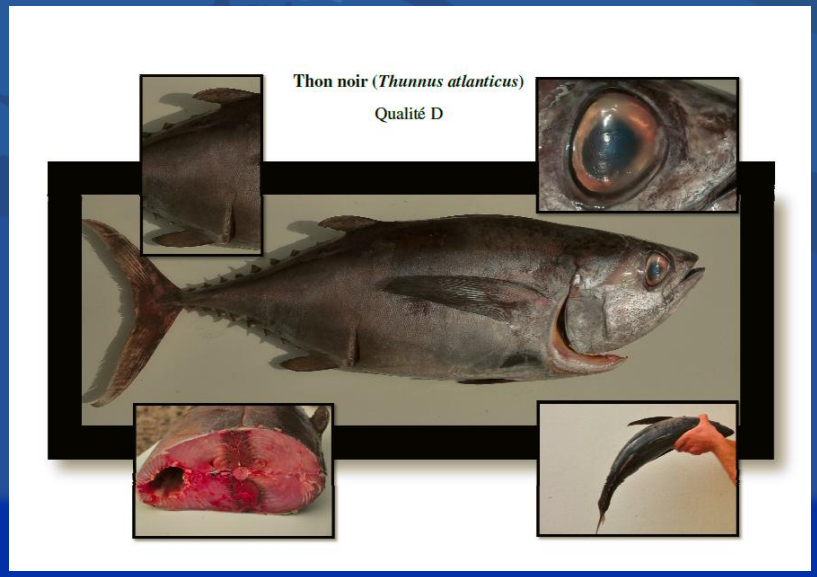
## Quality of FAD fishing products, preliminary results
## Materials & methods

- **Implementation**

**On board fishing vessels**

- Fish surface temperature follow-up from catch to handling
- Description of each handling
- Relation with le freshness standards



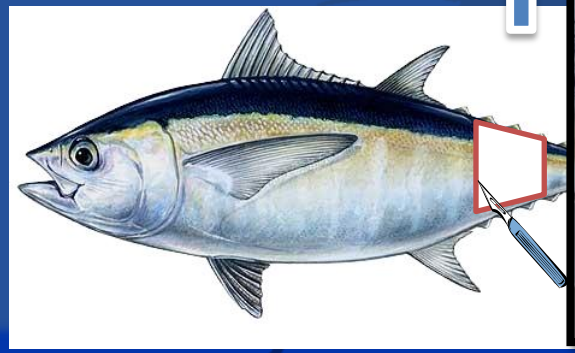
# Quality of FAD fishing products, preliminary results
## Materials & methods

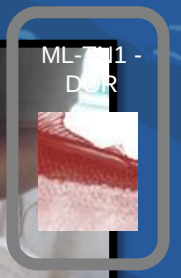
- **Implementation**

## Landing

– Sampling flesh for microbiological, freshness, chemical composition and chemical contaminants (PCB and Heavy metals) analyses

Sample preparation
- Cutting with sterile scalpel
- Skin and bones removal
- Packaging in sterile bags
- Freezing (-20°C)








# Quality of FAD fishing products, preliminary results
## Analyses

**PARM = Pôle Agroalimentaire Régional Martinique**
**Regional agri-food technical center**
Scientific and technical tool (created in 2003) that aims to contribute to the economic development of food-processing industry.

**OBJECTIVES**

- To develop new ways of valorization of primary productions (fruits, vegetables, fish & fish farming, meat, aromatic and medicinal plants)
- To strengthen the performance level of agri-food processing companies

**MISSIONS**

- **Research & development**
- **Sensory analysis**
- **Assistance & Technological consulting**

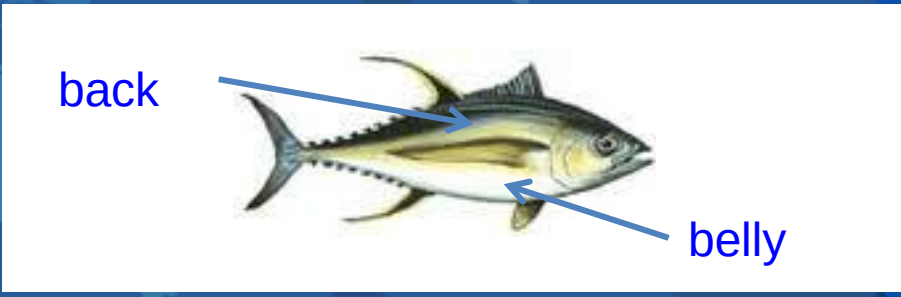
**RESOURCES**

- **A team of 16 employees including 7 ingenieers & 5 technicians**
- **1 technological hall 250 $m^2$ (pilot equipments)**
- **1 physico-chemical & microbiological laboratory 70$m^2$**
- **1 sensory analysis laboratory**

# PARM Intervention

## ANALYSIS OF THE QUALITY AND FRESHNESS

Microbiological analysis
Chemical analysis
Contaminants detection




## BIOCHEMICAL COMPOSITION

Chemical analysis (energetic value)

**Analysis performed according to standards**

## SHELFLIFE ANALYSIS

- Test of fish preservation under 3 different forms
- Microbiological analysis
- Chemical analysis
- Sensory analysis

# Microbiological analyses

⇨To evaluate the fish spoliage through microbial flora

| | |
|---|---|
| **Overall microbian load** | *Mesophilic flora* |
| **Hygiene indicator** | *Thermotolerant coliform 44°C*<br>*Salmonella*<br>Anaerobic sulfite-reducing germs |
| **Germs alteration** | *Pseudomonas* |

**Physico-chemical & microbiological laboratory of PARM**

# Chemical analyses

⇨To evaluate the fish flesh alteration through the chemical compounds breakdown

- **Determination of total volatile basic nitrogen (TVB-N).**
  - → determination of nitrogeneous molecules (ammonia, TMA-N, DMA, amines) resulting from nitrogenised products Breakdown (proteins, TMAO : trimethylamine oxide )
- **Determination of histamine**
  - → Determination of histamine resulting from histidine bacterial breakdown) **[large pelagic fishes contain a high amount of histidine].**
- **pH**

**Physico-chemical & microbiological laboratory of PARM**

# Contaminants detection

⇨To detect a contamination of the fish flesh by **environmental pollutants** due to bioaccumulation phenomenon in large aquatic predators, at the top of the food chain.

❖**Determination of**:

⇨**Heavy metals**: cadmium, lead, mercury

⇨**Persistents organic pollutants**: Dioxin and PCB-dioxin

Subcontracted analysis : two specialised laboratories (France)

- Laboratoire de Rouen (Heavy metals)
- LABERCA (PCB, Dioxines)

# Biochemical composition

⇨ Nutritionnal characterization of fish flesh

- ❖**Determination of moisture (dry matter)**
- ❖**Determination of ashes (mineral content)**
- ❖**Determination of protein**
- ❖**Determination of lipids**
- ❖**Calculation for energetic value (kcal/100g)**

Physico-chemical & microbiological laboratory of PARM

# Quality of FAD fishing products, preliminary results

## Analyses

⇨Shelflife evaluation of fish under three differents methods of preservation

**Eviscerated fish**

**cutting**

**Storage in ice**

**Vacuum packaging**

**Modified atmosphere packaging**
**40% $CO_2$ – 60% $O_2$**

**12 days preservation +4°C**

**16 days preservation +4°C**

**21 days preservation +4°C**

**sampling at regular intervals**

**Chemical Analysis**

**Microbiological Analysis**

# Sensory analyses

⇨To evaluate the impact of preservation process and lenght preservation on the fish sensory quality. Descriptive sensory analysis (Standard ISO 13-299) → sensory profiling

- **Analysis laboratory: Conditions of standardized test**
  Air-conditionned tasting room equipped with 16 individual cabins in accordance with standard NF V09-105 (ISO 8589) : *Uniform lightning, wall and cabin with neutral color, control of noise, of temperature, of smell and of moisture.*

- **Measuring instrument: panel of 16 specialized judges**, specifically trained to descriptive analysis of fish - Verified and validated perfomances.

- **Preparation/Presentation of the samples tasted:**
  - Baked fish portions encoded with 3 numbers (anonymous)
  - Randomized presentation under equal conditions (*temperature, container, quantity of fish*)

- **Sensory evaluation:**
  -scoring grid including a scoring range from 1 to 7 for each quality criterion (*visual appearance, olfactory and gustatory critera, texture in the mouth…)*

- **Sensory profiling:**
  To provide **descriptive sensory map**

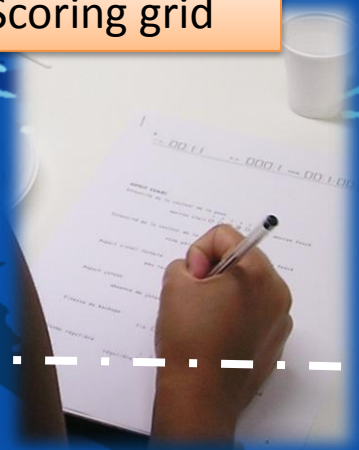
Quality of FAD fishing products, preliminary results
Analyses

# Shelflife analysis

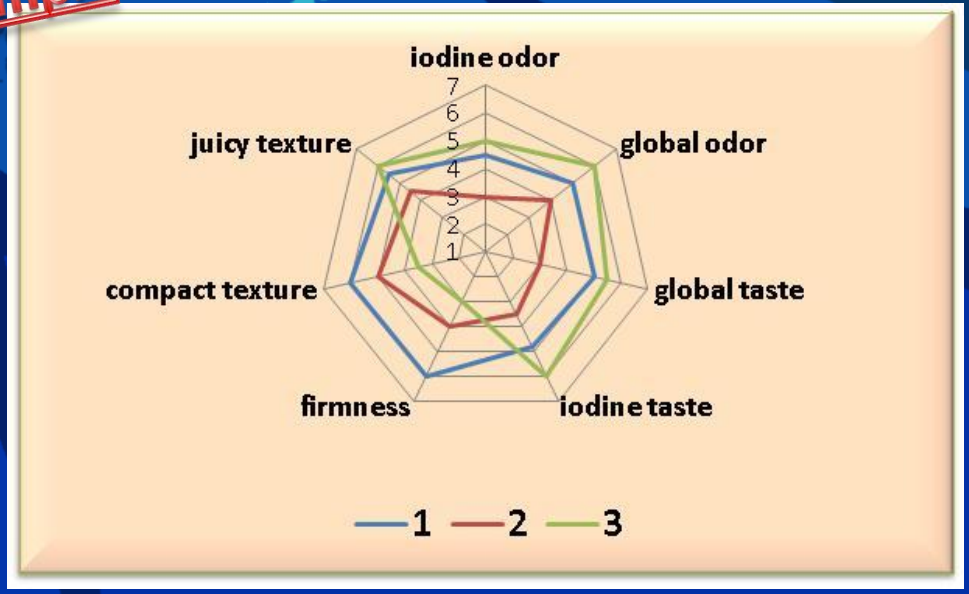
Specialized judges

Baked encoded sample

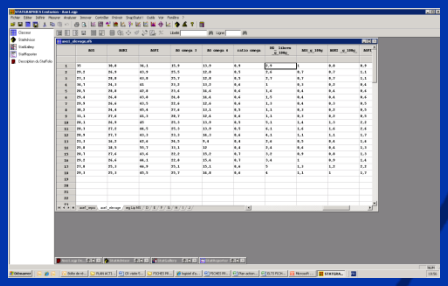

Scoring grid



Example of sensory card




Specific analysis software



FIZZ by BIOSYSTEMES

Quality of FAD fishing products, preliminary results
Analyses

# PARM's works

## PROCESSING

Tuna, marlin, red drum, cobia, red-tilapia

⇨Development of a range of processing products (high added-value):

- ❖First state processing : **dried salted fish or salted smoked fish**
- ❖Cooked products: **fish balls, steaks, soups, rillettes, terrines.**

## CHARACTERIZATION OF AQUACULTURE PRODUCTS

Red drum, cobia, Red tilapia

⇨Determination and valorization of **nutritionnals benefits and sensory** qualities of aquaculture products (high omega 3 fatty acid content, source of essential minerals,…)

## FAISABILITY STUDY OF SMALL FISH PROCESSING PLANT

⇨Determination of technical economic **conditions for the** implementation of a versatile processing plant . Optimal productive capacity : **150 t/year**

## THESIS : MICROBIAL ECOSYSTEM STUDY OF TROPICAL FISH AFTER SLAUGHTER AND INCIDENCES ON PRODUCTS SALUBRITY …..

**PhD student**
2013-2016

Guyane & West-Indies University

⇨Identification of the bacterial flora responsible for tropical fishes spoilage

Ifremer

pam

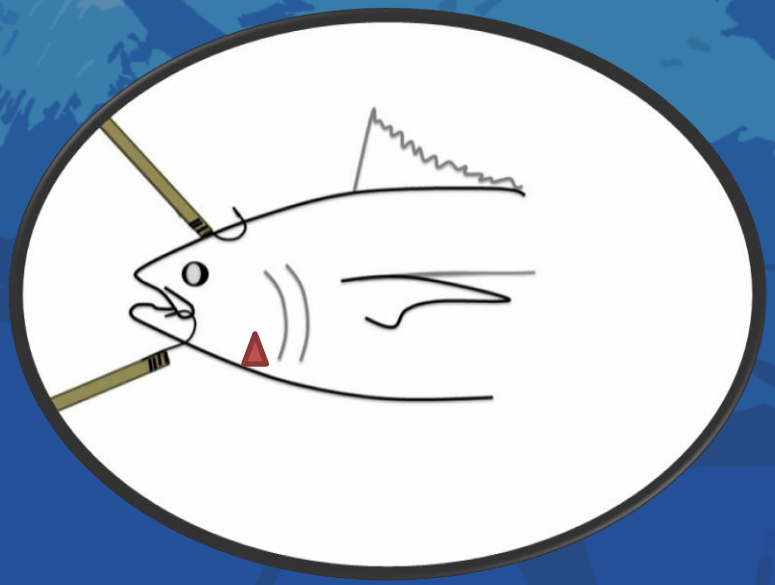
Région Martinique

UNION EUROPÉENNE

# Quality of FAD fishing products, preliminary results
## Results

- Results

- Post capture Handling
  - Gaffing



Tuna should be gaffed in head, never in body
Heart and throat should not be gaffed

According to Beverly, Chapman and Sokimi. 2003 Horizontal longline fishing methods and techniques, A manual for fishermen, SPC

- Post capture Handling

  – Spiking

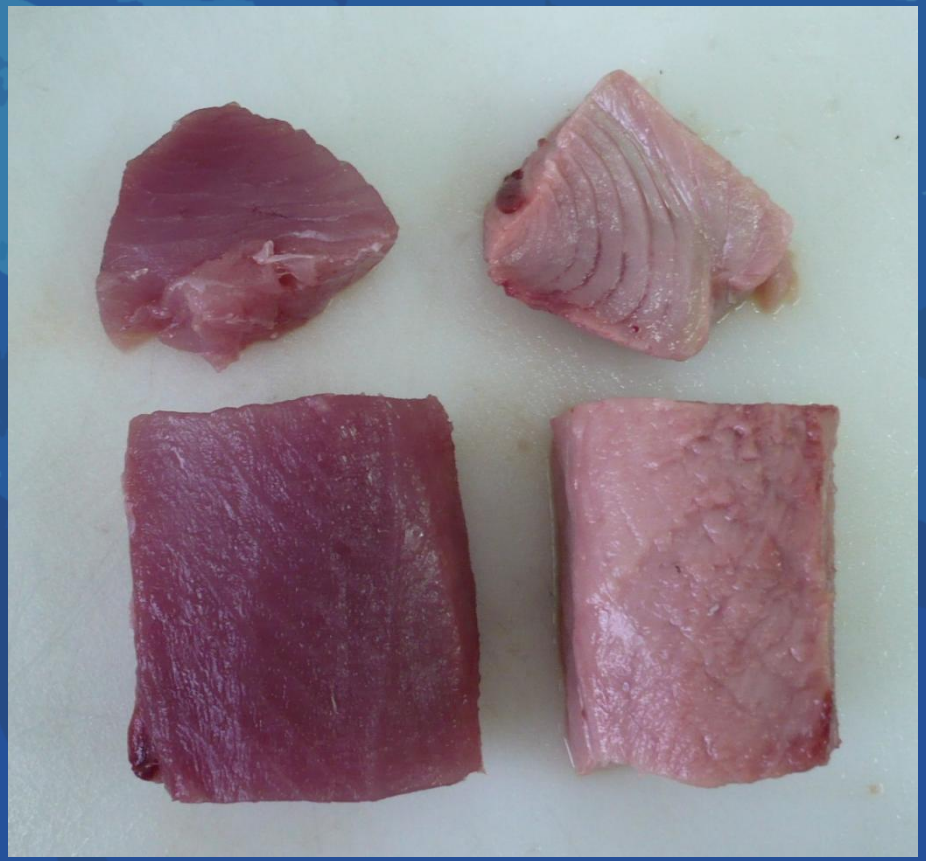
Tuna should be stunned with a blow just between the eyes
Nervous system must be destroyed by spiking
Spinal cord has to be destroyed with taniguchi method

Prevention of muscle movement and Burnt Tuna Syndrome (Yake)

## Quality of FAD fishing products, preliminary results
## Results

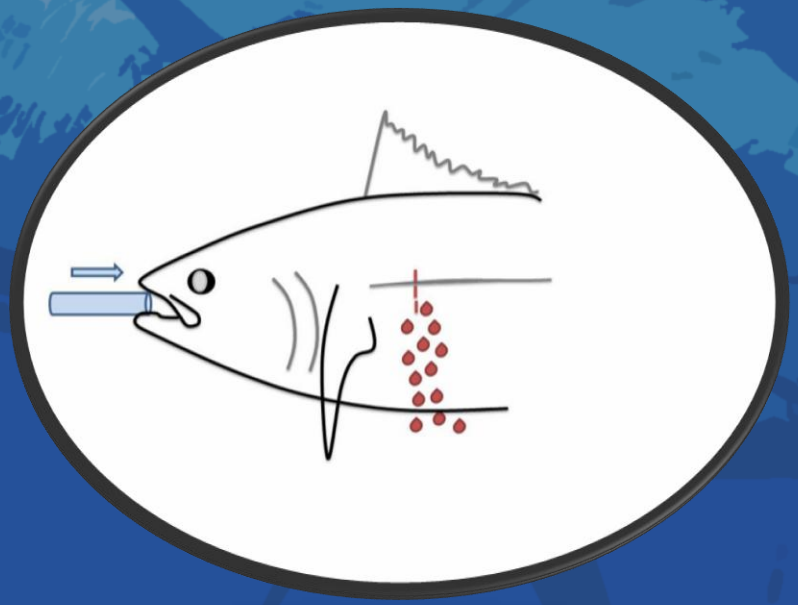
- Post capture Handling

Burnt Tuna Syndrome
(Yake)



- Post capture Handling

  – Bleeding



Tuna should be bled by a vertical cut made 6 cm back from pectoral fin on both sides

A seawater hose has to be inserted in the mouth to flush the blood out

Prevention of feshness and histamine formation

- Post capture Handling

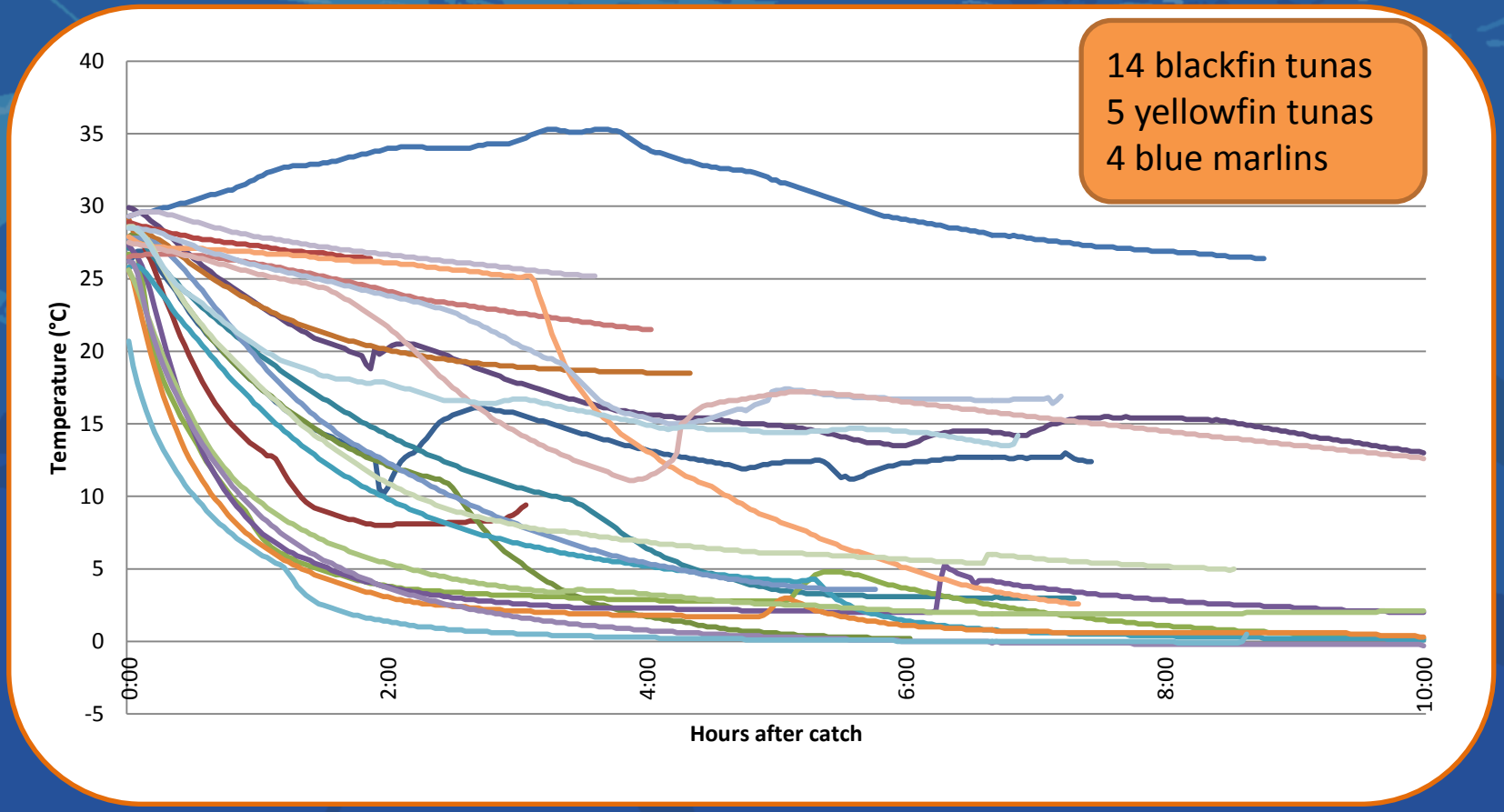
  – Eviscerating

Tuna should be eviscerated by cutting all gill attachment to the head
Then, a cut can be made in the belly to within 1 cm of the anus and the intestines cut free of the anus

The gills and guts can now be removed through the gill cover in one piece
The inside of the head cavity should then be trimmed of all loose tissue, the blood and kidneys and any gill membranes removed.

# Quality of FAD fishing products, preliminary results
## Results

- **Subcutaneous temperature follow-up**

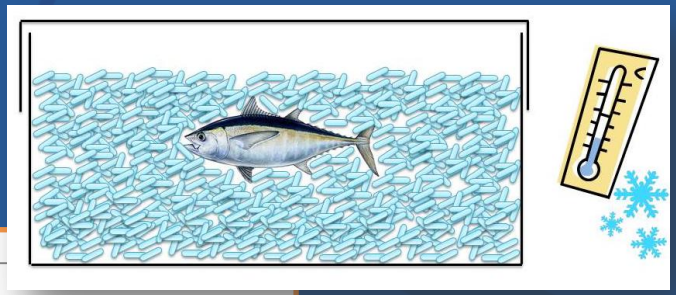


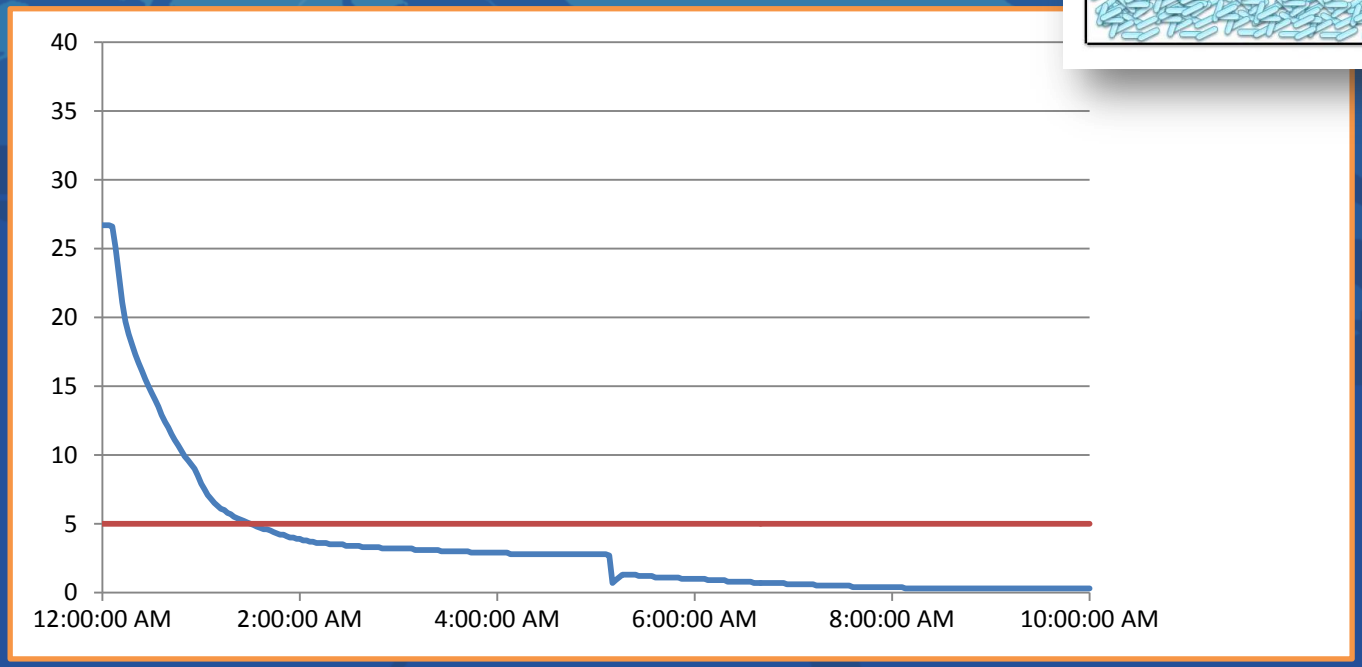

**High heterogeneity of data**

# Quality of FAD fishing products, preliminary results
## Results

- Surface temperature profiles

- Profile A :
  - Storage under ice

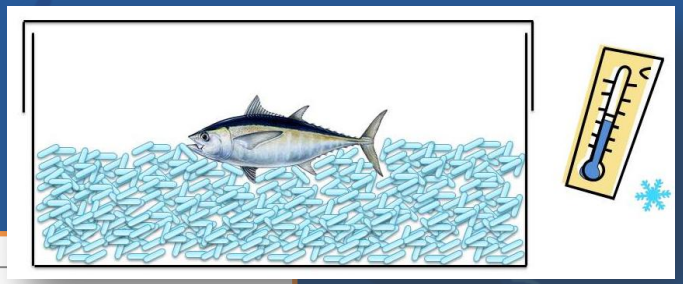


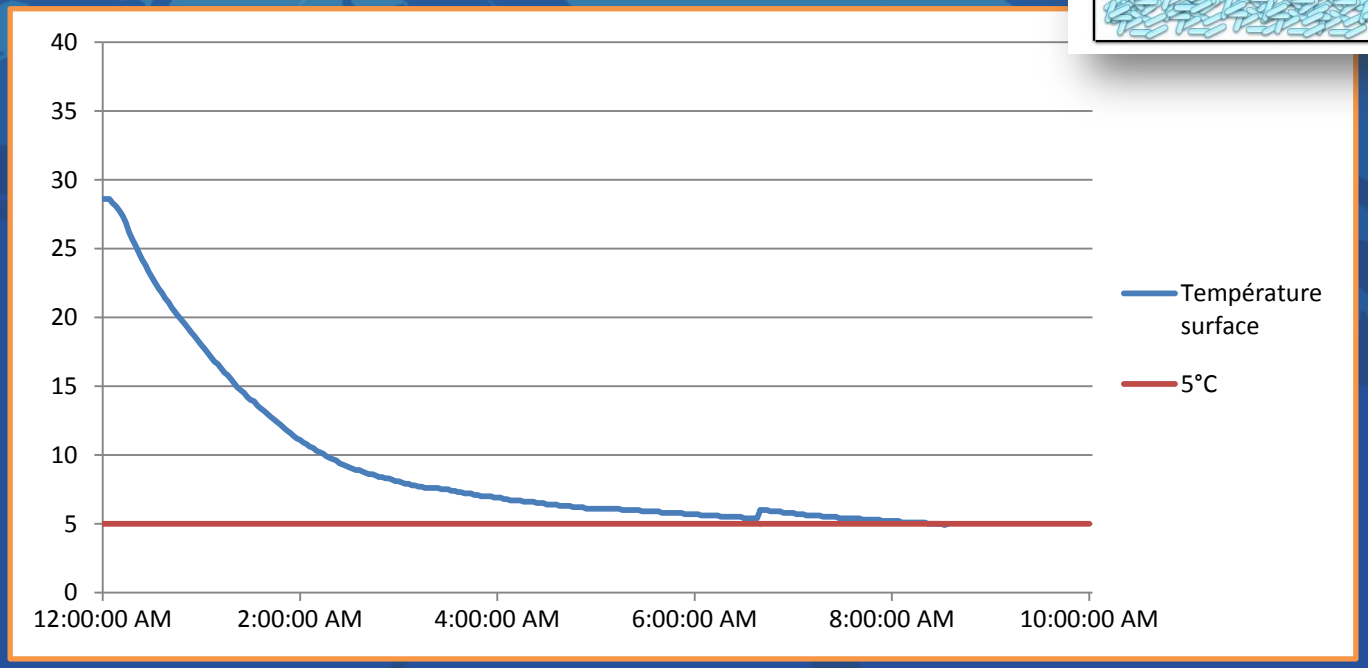


# Quality of FAD fishing products, preliminary results
## Results

- Surface temperature profiles

- Profile B :
  - Storage on ice

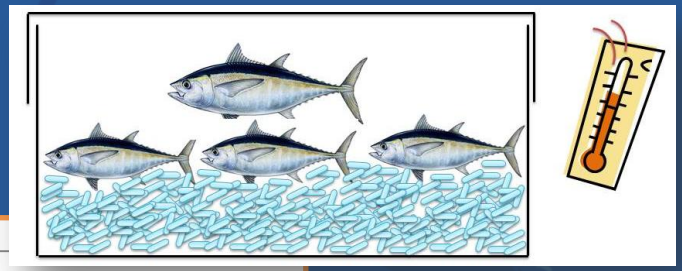


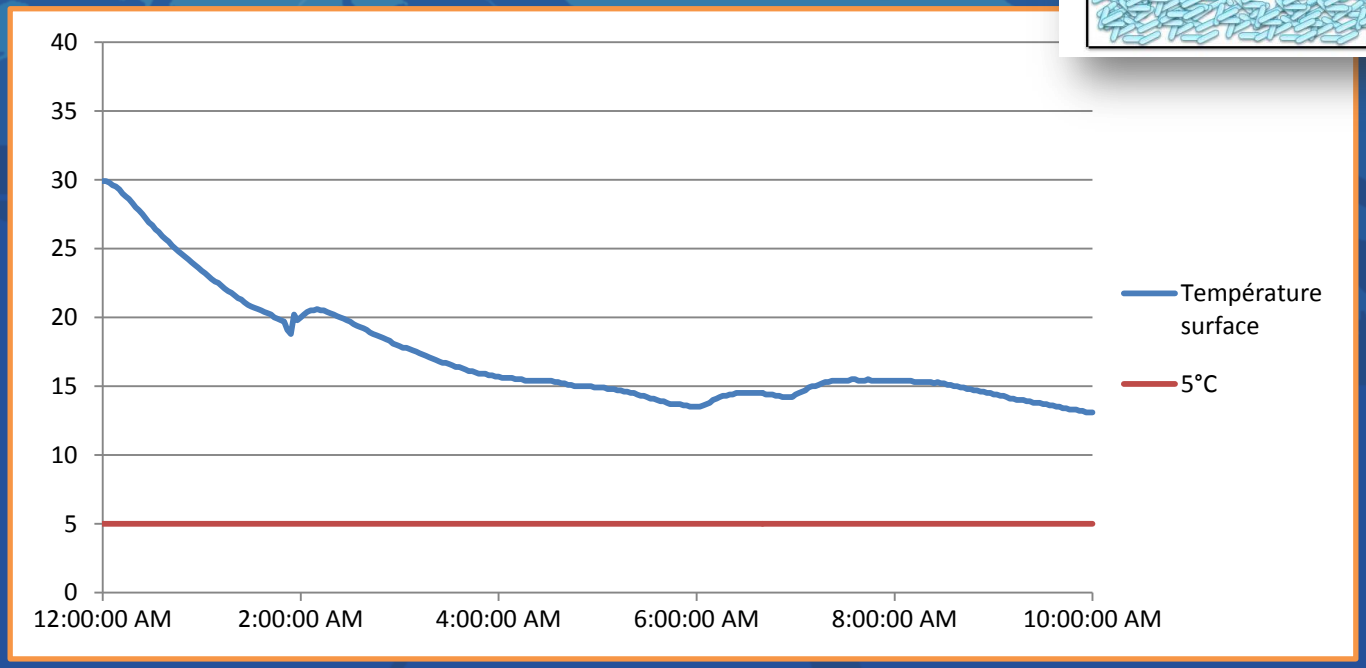


# Quality of FAD fishing products, preliminary results
## Results

- Surface temperature profiles

- Profile C :
  - Storage on a layer of fish

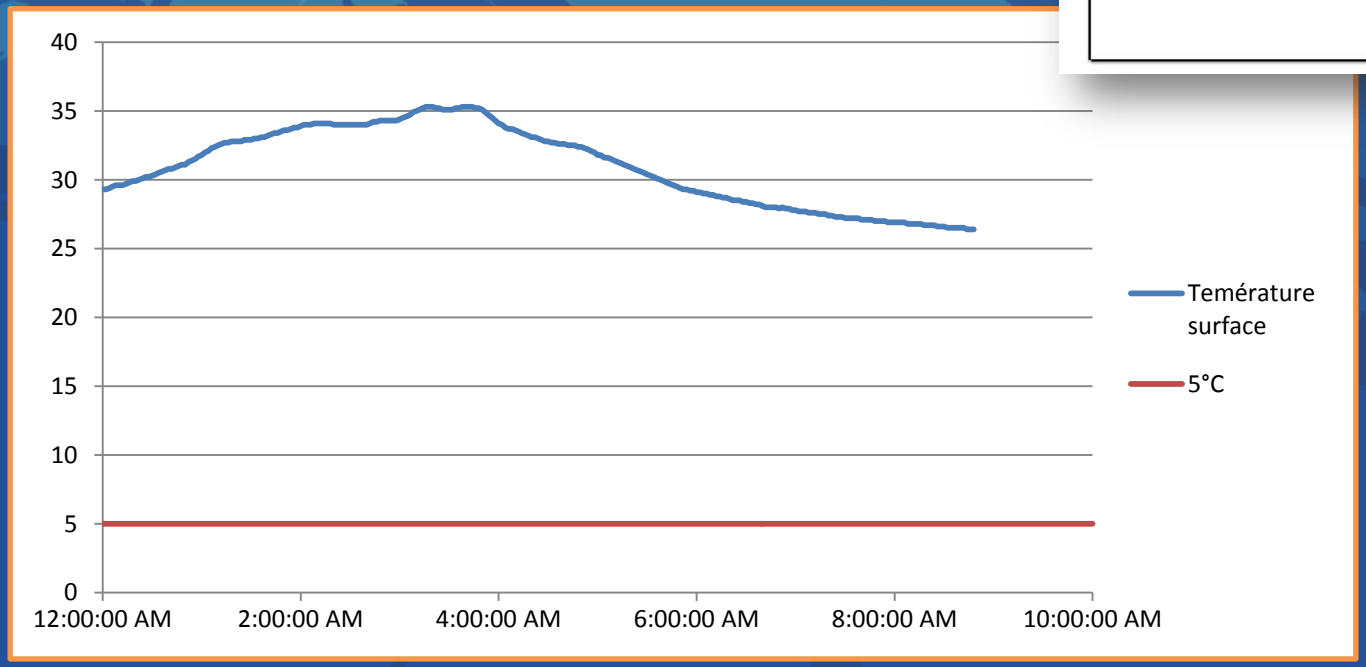




# Quality of FAD fishing products, preliminary results
## Results

- Surface temperature profiles

- Profile C :
  - Storage on the vessel deck



# Quality of FAD fishing products, preliminary results
## Results

| Species | Sampling reference | Date of catch | Net weight (kg) | Fork length (cm) | Vessel | Handling | | Temperature profiles |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Picking | Bleeding | |
| *Thunnus atlanticus* | TN1 | 15/05/2012 | 3,5 | 62 | Yole | N | N | C |
| | TN2 | 09/07/2012 | 1,2 | 46 | Yole | N | Partial | B |
| | TN3 | 09/07/2012 | 4,0 | 60 | Yole | N | Partial | B |
| | TN4 | 03/09/2012 | 6,8 | 74 | Yole | N | N | C |
| | TN5 | 21/10/2012 | 2,3 | 51 | Yole | N | N | A |
| | TN6 | 05/03/2013 | 6,4 | 76 | Ponté | Y | Complete | A |
| | TN7 | 06/03/2013 | 2,5 | 56 | Ponté | Y | Complete | A |
| | TN8 | 06/03/2013 | 5,0 | 69 | Ponté | Y | Complete | A |
| | TN9 | 28/03/2013 | 2,3 | 51 | Ponté | N | N | A |
| | TN10 | 28/03/2013 | 2,3 | 53 | Ponté | N | Complete | A |
| | TN11 | 29/03/2013 | 2,0 | 52 | Ponté | N | N | A |
| | TN12 | 19/6/2013 | 5,1 | 69 | Yole | N | Partial | C |
| | TN13 | 17/07/2013 | 6,6 | 69 | Yole | Y | Partial | C |
| | TN14 | 01/08/2013 | 3,3 | 58 | Yole | N | Partial | B |
| | TN15 | 04/09/2013 | 5,0 | 66 | Yole | N | Partial | C |
| *Thunnus albacares* | TJ1 | 05/12/2012 | 15,2 | 96 | Ponté | Y | Complete | C |
| | TJ2 | 06/03/2013 | 9,6 | 90 | Ponté | N | Complete | A |
| | TJ3 | 22/03/2013 | 60,3 | 156 | Yole | N | N | C |
| | TJ4 | 17/07/2013 | 41,2 | 139 | Yole | Y | Partial | C |
| *Makaira nigricans* | MB1 | 24/07/2012 | 65 | 190 | Yole | N | N | D |
| | MB2 | 04/10/2012 | 60 | 180 | Yole | N | N | D |
| | MB3 | 22/03/2013 | 84 | 210 | Yole | N | N | A |
| | MB4 | 01/08/2013 | 22 | 71 | Yole | N | N | D |

# Quality of FAD fishing products, preliminary results
## Results

| Species | Sample reference | Date of catch | Net weight (kg) | Fork length (cm) | Microbiology | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | FAMT | Coliformes Thermo. 44°C | ASR | Salmonella | Pseudomonas |
| *Thunnus atlanticus* | TN1 | 15/05/2012 | 3,5 | 62 | 1 000 | < 10 | < 10 | Abs. ds 25g | <100 |
| | TN2 | 09/07/2012 | 1,2 | 46 | 1 000 | < 10 | < 10 | Abs. ds 25g | < 100 |
| | TN3 | 09/07/2012 | 4,0 | 60 | 1 000 | < 10 | < 10 | Abs. ds 25g | < 100 |
| | TN4 | 03/09/2012 | 6,8 | 74 | 37 000 | < 10 | 10 | Abs. ds 25g | < 100 |
| | TN5 | 21/10/2012 | 2,3 | 51 | 3 300 | < 10 | < 10 | Abs. ds 25g | < 100 |
| | TN6 | 05/03/2013 | 6,4 | 76 | 500 | < 10 | < 10 | Abs. ds 25g | < 100 |
| | TN7 | 06/03/2013 | 2,5 | 56 | 500 | < 10 | < 10 | Abs. ds 25g | < 100 |
| | TN8 | 06/03/2013 | 5,0 | 69 | 100 | < 10 | < 10 | Abs. ds 25g | < 100 |
| | TN9 | 28/03/2013 | 2,3 | 51 | 500 | < 10 | < 10 | Abs. ds 25g | < 100 |
| | TN10 | 28/03/2013 | 2,3 | 53 | 400 | < 10 | < 10 | Abs. ds 25g | < 100 |
| | TN11 | 29/03/2013 | 2,0 | 52 | 200 | < 10 | < 10 | Abs. ds 25g | < 100 |
| | TN12 | 19/6/2013 | 5,1 | 69 | 16 000 | < 10 | < 10 | Abs. ds 25g | **100** |
| | TN13 | 17/07/2013 | 6,6 | 69 | 3 500 | **50** | < 10 | Abs. ds 25g | **500** |
| | TN14 | 01/08/2013 | 3,3 | 58 | 5 300 | **80** | < 10 | Abs. ds 25g | **600** |
| | TN15 | 04/09/2013 | 5,0 | 66 | | | | Abs. ds 25g | |
| *Thunnus albacares* | TJ1 | 05/12/2012 | 15,2 | 96 | 500 | 10 | < 10 | Abs. ds 25g | < 100 |
| | TJ2 | 06/03/2013 | 9,6 | 90 | 400 | < 10 | < 10 | Abs. ds 25g | < 100 |
| | TJ3 | 22/03/2013 | 60,3 | 156 | 2 000 | 10 | < 10 | Abs. ds 25g | < 100 |
| | TJ4 | 17/07/2013 | 41,2 | 139 | 1 800 | < 10 | < 10 | Abs. ds 25g | < 100 |
| *Makaira nigricans* | MB1 | 24/07/2012 | 65 | 190 | 9 000 | 10 | < 10 | Abs. ds 25g | < 100 |
| | MB2 | 04/10/2012 | 60 | 180 | 300 | < 10 | < 10 | Abs. ds 25g | < 100 |
| | MB3 | 22/03/2013 | 84 | 210 | 5 500 | < 10 | < 10 | Abs. ds 25g | < 100 |
| | MB4 | 01/08/2013 | 22 | 71 | 3 500 | **170** | < 10 | Abs. ds 25g | **100** |

The spoilage flora of tropical fish remains little known → Phd Thesis PARM/Ifremer

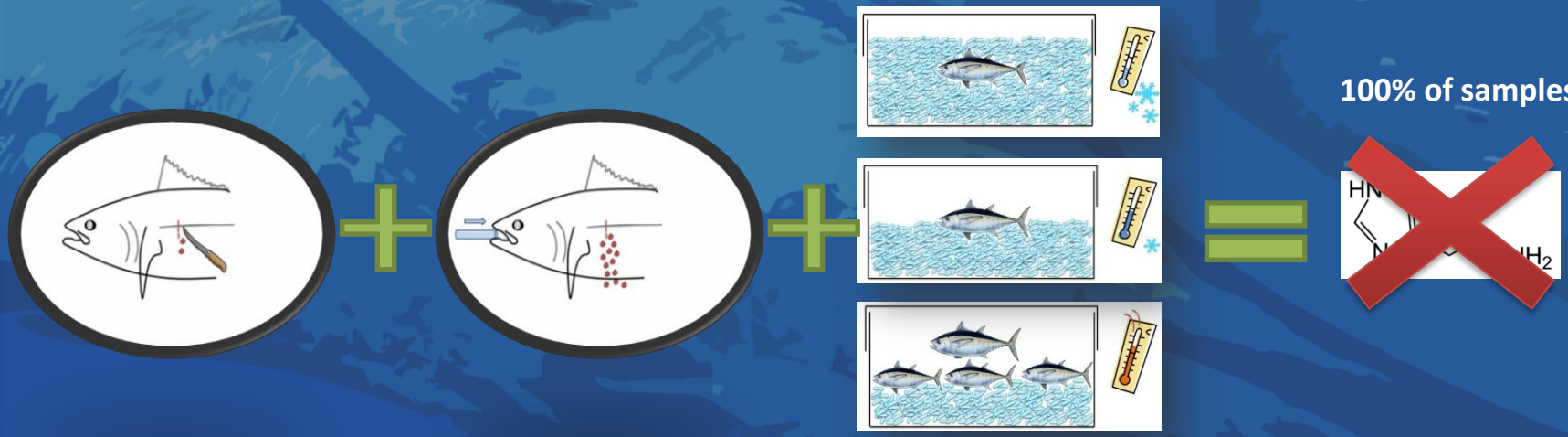
# Quality of FAD fishing products, preliminary results
## Results

| Species | Sample reference | Date of catch | Net weight( kg) | Fork length (cm) | Fraishness – Chemical analysis | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | TVB-N (mgN/100g) | TMA (mgN/100g) | Facteur P (%) | Histamine (ppm) | pH |
| *Thunnus atlanticus* | TN1 | 15/05/2012 | 3,5 | 62 | 20 | 3 | 14 % | < 2,5 | 5,82 |
| | TN2 | 09/07/2012 | 1,2 | 46 | 20 | 3 | 17 % | < 2,5 | 5,88 |
| | TN3 | 09/07/2012 | 4,0 | 60 | 23 | 4 | 18 % | < 2,5 | 5,76 |
| | TN4 | 03/09/2012 | 6,8 | 74 | 21 | 6 | 28 % | 73 | 5,66 |
| | TN5 | 21/10/2012 | 2,3 | 51 | 18 | 1 | 8 % | 88 | 5,69 |
| | TN6 | 05/03/2013 | 6,4 | 76 | 2 | < 0,1 | - | < 2,5 | 5,90 |
| | TN7 | 06/03/2013 | 2,5 | 56 | 7 | < 0,1 | - | < 2,5 | 5,90 |
| | TN8 | 06/03/2013 | 5,0 | 69 | 7 | < 0,1 | - | < 2,5 | 6,10 |
| | TN9 | 28/03/2013 | 2,3 | 51 | 14 | < 0,1 | - | 21 | 5,87 |
| | TN10 | 28/03/2013 | 2,3 | 53 | 5 | < 0,1 | - | < 2,5 | 5,86 |
| | TN11 | 29/03/2013 | 2,0 | 52 | 12 | < 0,1 | - | < 2,5 | 5,83 |
| | TN12 | 19/6/2013 | 5,1 | 69 | 19 | < 0,1 | - | 86 | 5,83 |
| | TN13 | 17/07/2013 | 6,6 | 69 | 20 | < 0,1 | - | 21 | 5,72 |
| | TN14 | 01/08/2013 | 3,3 | 58 | 14 | < 0,1 | - | 33 | 5,96 |
| | TN15 | 04/09/2013 | 5,0 | 66 | | | | | |
| *Thunnus albacares* | TJ1 | 05/12/2012 | 15,2 | 96 | 24 | < 0,1 | - | < 2,5 | 5,60 |
| | TJ2 | 06/03/2013 | 9,6 | 90 | 20 | < 0,1 | - | < 2,5 | 5,91 |
| | TJ3 | 22/03/2013 | 60,3 | 156 | 16 | < 0,1 | - | 94 | 5,78 |
| | TJ4 | 17/07/2013 | 41,2 | 139 | 22 | < 0,1 | - | 50 | 5,80 |
| *Makaira nigricans* | MB1 | 24/07/2012 | 65 | 190 | 22 | 6 | 26 % | 25 | 5,64 |
| | MB2 | 04/10/2012 | 60 | 180 | 25 | < 0,1 | - | < 2,5 | 5,57 |
| | MB3 | 22/03/2013 | 84 | 210 | 5 | < 0,1 | - | < 2,5 | 5,90 |
| | MB4 | 01/08/2013 | 22 | 71 | 15 | < 0,1 | - | 62 | 5,86 |

Freshness indicators do not react on artisanal FAD fisheries products which are relatively good considering the shelf life on board (usually less than 12h)

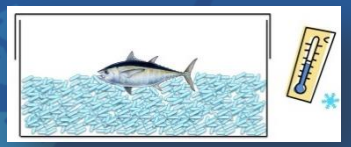
# Quality of FAD fishing products, preliminary results
## Results

- Histamine

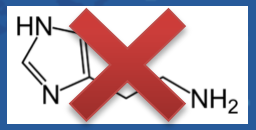


## Quality of FAD fishing products, preliminary results
## Results

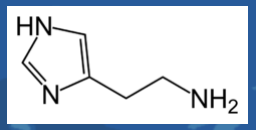
- Histamine

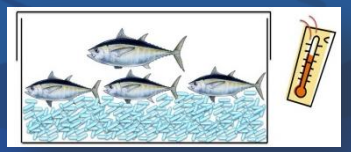


60% of samples

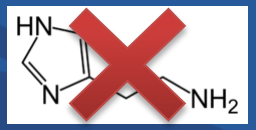



40% of samples

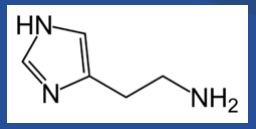


25% of samples

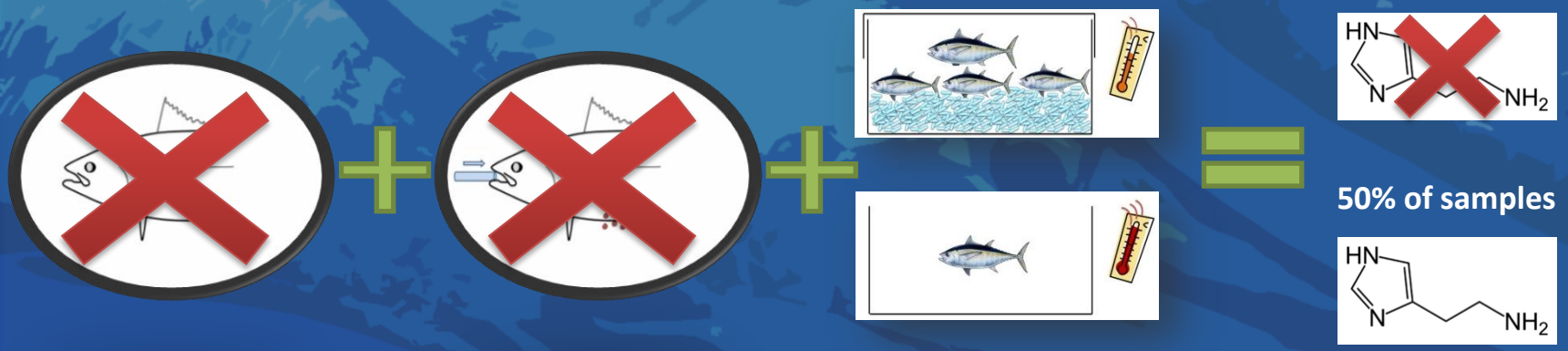



75% of samples



## Quality of FAD fishing products, preliminary results
## Results

- Histamine



- **Chemical composition of the flesh**
  - **Sampling**

| Species | n | Eviscerated weigh (kg) | | | Fork lenght (cm) | | |
|---|---|---|---|---|---|---|---|
| | | Mean | SD | Min - Max | Mean | SD | Min - Max |
| *Thunnus atlanticus* | **14** | **4,1** | 1,7 | 2,0 – 6,8 | **62** | 8,72 | 51 - 76 |
| *Thunnus albacares* | **4** | **31,6** | 20,39 | 9,6 – 60,2 | **120** | 27,99 | 90 - 156 |
| *Makaira nigricans* | **6** | **63,0** | 25,26 | 22 – 100 | **170** | 55,38 | 71 - 240 |

- **Chemical composition of the flesh**
  - **Results**

| Component | *Thunnus atlanticus* | | | *Thunnus albacares* | | | *Makaira nigricans* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Min - Max | Mean | SD | Min - Max | Mean | SD | Min - Max |
| **Humidity** | **71,3 %** | 1,1 | 68,5-72,5 | **72,3 %** | 1,6 | 70,2-74,3 | **72,9 %** | 2,1 | 69,6-75,6 |
| **Proteins** | **24,6 %** | 1,9 | 20,2-27,8 | **24,9 %** | 1,5 | 22,6-26,6 | **24,0 %** | 2,3 | 19,3-26,6 |
| **Fat** | **0,5 %** | 0,4 | 0,2-1,5 | **0,8 %** | 0,5 | 0,3-1,7 | **0,4 %** | 0,3 | 0,3-1,0 |
| **Ashes** | **1,4 %** | 0,1 | 1,2-1,5 | **1,3 %** | 0,1 | 1,2-1,4 | **1,2 %** | 0,1 | 1,1-1,4 |
| **Energy Value average** | 102,9 Kcal/100g | | | 106,8 Kcal/100g | | | 99,6 Kcal/100g | | |

**No difference between dorsal and ventral flesh**

**Hight protein content (24%) and low fat content (<2%)**

**Lean Fish**

- **Chemical contaminants of the flesh**
  - **Sampling**

| Species | Reference sample | Eviscerated weight (kg) | Fork lenght (cm) | Date of sampling | PCB/Dioxines matrix | Heavy metals matrix |
|---|---|---|---|---|---|---|
| *Thunnus atlanticus* | TN1 | 3,5 | 62 | 15/05/2012 | PCB-TN1-DOR | ML-TN1-DOR |
| | | | | | PCB-TN1-VEN | ML-TN1-VEN |
| | TN2 | 4,0 | 60 | 09/07/2012 | PCB-TN2-DOR | ML-TN2-DOR |
| | | | | | PCB-TN2-VEN | ML-TN2-VEN |
| | TN3 | 6,8 | 74 | 03/09/2012 | PCB-TN3-DOR | ML-TN3-DOR |
| | | | | | PCB-TN3-VEN | ML-TN3-VEN |
| *Thunnus albacares* | TJ1 | 15,2 | 96 | 05/12/2012 | PCB-TJ1-DOR | ML-TJ1-DOR |
| | | | | | PCB-TJ1-VEN | ML-TJ1-VEN |
| | TJ2 | 9,6 | 90 | 06/03/2013 | PCB-TJ2-DOR | ML-TJ2-DOR |
| | | | | | PCB-TJ2-VEN | ML-TJ2-VEN |
| | TJ3 | 60,0 | 156 | 22/03/2013 | PCB-TJ3-DOR | ML-TJ3-DOR |
| | | | | | PCB-TJ3-VEN | ML-TJ3-VEN |
| *Makaira nigricans* | MB1 | 65,0 | 190 | 24/07/2012 | PCB-MB1-DOR | ML-MB1-DOR |
| | | | | | PCB-MB1-VEN | ML-MB1-VEN |
| | MB2 | 100,0 | 240 | 24/07/2012 | PCB-MB2-DOR | ML-MB2-DOR |
| | | | | | PCB-MB2-VEN | ML-MB2-VEN |
| | MB3 | 60,0 | 180 | 04/10/2012 | PCB-MB3-DOR | ML-MB3-DOR |
| | | | | | PCB-MB3-VEN | ML-MB3-VEN |

# Quality of FAD fishing products, preliminary results
## Results

- **Chemical contaminants of the flesh**

| Species | Matrix | % Fat | Concentrations in pg/g of fresh matrix | | | | Concentration in ng/g of fresh matrix | |
|---|---|---|---|---|---|---|---|---|
| | | | **OMS-TEQ$_{2005}$ (PCDD/F) / poids frais** | OMS-TEQ$_{2005}$ (PCDD/F) – incertitude | **OMS-TEQ$_{2005}$ (PCDD/F+PCB-DL) / poids frais** | OMS-TEQ$_{2005}$ (PCDD/F+PCB-DL) – incertitude | **Somme 6 PCB-NDL / poids frais** | Somme 6 PCB-NDL - incertitude |
| *Thunnus atlanticus* | TN1-DOR | 0,75 | **0,020** | 0,017 | **0,043** | 0,034 | **0,837** | 0,647 |
| | TN1-VEN | 0,87 | **0,011** | 0,009 | **0,035** | 0,028 | **0,643** | 0,497 |
| | TN2-DOR | 0,88 | **0,036** | 0,029 | **0,066** | 0,054 | **0,394** | 0,305 |
| | TN2-VEN | 0,89 | **0,019** | 0,015 | **0,080** | 0,065 | **2,172** | 1,679 |
| | TN3-DOR | 0,56 | **0,016** | 0,013 | **0,070** | 0,056 | **1,115** | 0,862 |
| | TN3-VEN | 0,57 | **0,014** | 0,012 | **0,059** | 0,047 | **0,741** | 0,580 |
| *Thunnus albacares* | TJ1-DOR | 0,81 | **0,013** | 0,011 | **0,055** | 0,044 | **0,413** | 0,320 |
| | TJ1-VEN | 0,81 | **0,014** | 0,012 | **0,068** | 0,055 | **0,819** | 0,699 |
| | TJ2-DOR | 0,33 | **0,015** | 0,012 | **0,050** | 0,041 | **0,387** | 0,299 |
| | TJ2-VEN | 1,06 | **0,013** | 0,010 | **0,055** | 0,044 | **0,327** | 0,253 |
| | TJ3-DOR | 0,40 | **0,008** | 0,007 | **0,052** | 0,042 | **0,665** | 0,514 |
| | TJ3-VEN | 0,47 | **0,016** | 0,013 | **0,095** | 0,076 | **1,662** | 1,285 |
| *Makaira nigricans* | MB1-DOR | 0,27 | **0,019** | 0,015 | **0,038** | 0,031 | **0,365** | 0,282 |
| | MB1-VEN | 0,26 | **0,015** | 0,013 | **0,036** | 0,029 | **0,262** | 0,202 |
| | MB2-DOR | 0,40 | **0,018** | 0,014 | **0,047** | 0,038 | **0,761** | 0,588 |
| | MB2-VEN | 0,40 | **0,023** | 0,019 | **0,054** | 0,043 | **1,237** | 0,956 |
| | MB3-DOR | 0,46 | **0,021** | 0,017 | **0,178** | 0,143 | **1,437** | 1,111 |
| | MB3-VEN | 0,45 | **0,011** | 0,009 | **0,158** | 0,126 | **1,345** | 1,040 |
| **Mean (all species)** | | | **0,014** | | **0,055** | | **0,673** | |
| **Regulation UE (n°1259/2011)** | | | **3,500** | | **6,500** | | **75,000** | |

# Quality of FAD fishing products, preliminary results
## Results

- **Chemical contaminants of the flesh**

| Species | Matrix | Concentration in mg/kg of fresh weight (ppm) | | |
|---|---|---|---|---|
| | | Lead | Cadmium | Mercury |
| *Thunnus atlanticus* | TN1-DOR | ND | 0,02 | 0,24 |
| | TN1-VEN | ND | 0,04 | 0,25 |
| | TN2-DOR | ND | ND | 0,40 |
| | TN2-VEN | ND | ND | 0,42 |
| | TN3-DOR | ND | 0,02 | **1,31** |
| | TN3-VEN | ND | 0,02 | **1,44** |
| *Thunnus albacares* | TJ1-DOR | ND | ND | 0,07 |
| | TJ1-VEN | ND | ND | 0,09 |
| | TJ2-DOR | ND | ND | 0,14 |
| | TJ2-VEN | ND | ND | 0,15 |
| | TJ3-DOR | ND | ND | 0,78 |
| | TJ3-VEN | ND | 0,01 | 0,70 |
| *Makaira nigricans* | MB1-DOR | ND | 0,02 | 0,83 |
| | MB1-VEN | ND | 0,02 | 0,81 |
| | MB2-DOR | ND | ND | 0,77 |
| | MB2-VEN | ND | ND | 0,83 |
| | MB3-DOR | ND | **0,11** | **3,47** |
| | MB3-VEN | ND | **0,11** | **3,29** |
| **Regulation UE (n°1881/2006)** | | **0,30** | **0,10** | **1,00** |

## Quality of FAD fishing products, preliminary results
## Discuss

- Discuss
  - Post-capture handlings
    Histamine and BTS
  - Chilling
  - Hygiene indicators
  - Tropical fish specific spoilage flora
  - Chemical composition of the flesh
  - Chemical contaminants
    Mercury

- **Recommandations**

**Manual for fisherman to improve the quality of FAD fishing products**

RFM

FAO FIAT PANIS

COPACO Western Central Atlantic Fishery Commission

# Thank for your attention

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