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Indian Ocean Swordfish Stock Structure – IOSSS 2009-2012 Preliminary results and conclusions

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IOTC- WPB

ESPADON IOSSS

July 2011

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IOSSS Project/ ESPADON

Team leader : IFREMER

Partners: CSRIO (Australia), IRD (France), SFA (Seychelles), AFRDEC (Thailland), CapFish (South Africa), Apollo Marine International (Sri Lanka)

Funded by European Union (FEP)
France
Région Réunion

Started in February 2009

IOSSS – Project

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IOSSS

IOTC CTOI

REPRODUCTION

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ISOTOPES
Feeding behaviour

IRD

OTHOLITHES

CNRS

?

GENETIC
- *mtDNA*
- *20 microsatellites*
- *SNPs* ?

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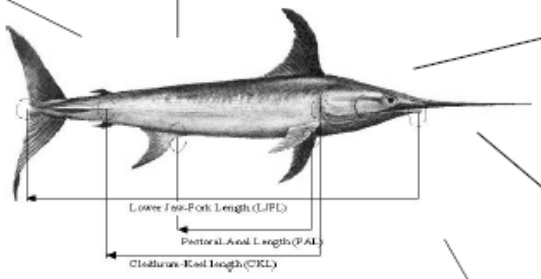
CSIRO



Data collection on
- Size
- Sex ratio
- Maturation stages

PARASITES GENETIC

?

CapFish

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- The data quality management
  Database / Genetic data
- Sampling results
  Method, summary per component, area grouping
- Biological data results
  Size, sex-ratio per area
- Stomach content analysis
  Per area, sex and size
- Isotope analysis
  Per area, sex and size
- Genetic analysis
  mtDNA, microsatellites, conclusion
- Recommendation and perspectives
  What is expected from IOSSS / recommendation for future genetic works

STOMACH CONTENT RESULTS

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Team leader: IRD Institut de recherche pour le développement Michel POTIER

Objectives

•Analyze the feeding habits and variability of the diet between ecosystems.

• Estimate the trophic level of swordfish and study the spatial variability between different ecosystems (equatorial, oceanographic gyre and Mozambique Channel)

•Compare trophic levels and feeding habitats of large predators sharing the same ecosystem (swordfish, tuna, shark – associated to Isotope signatures)

STOMACH CONTENT RESULTS

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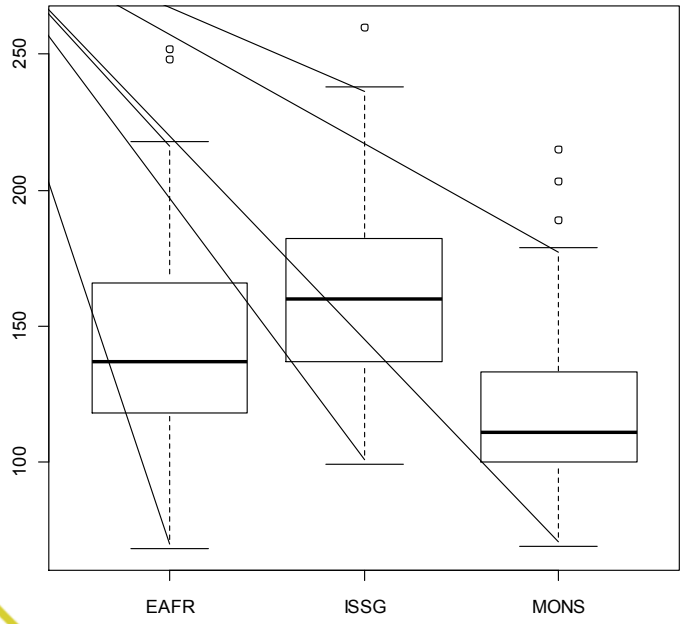
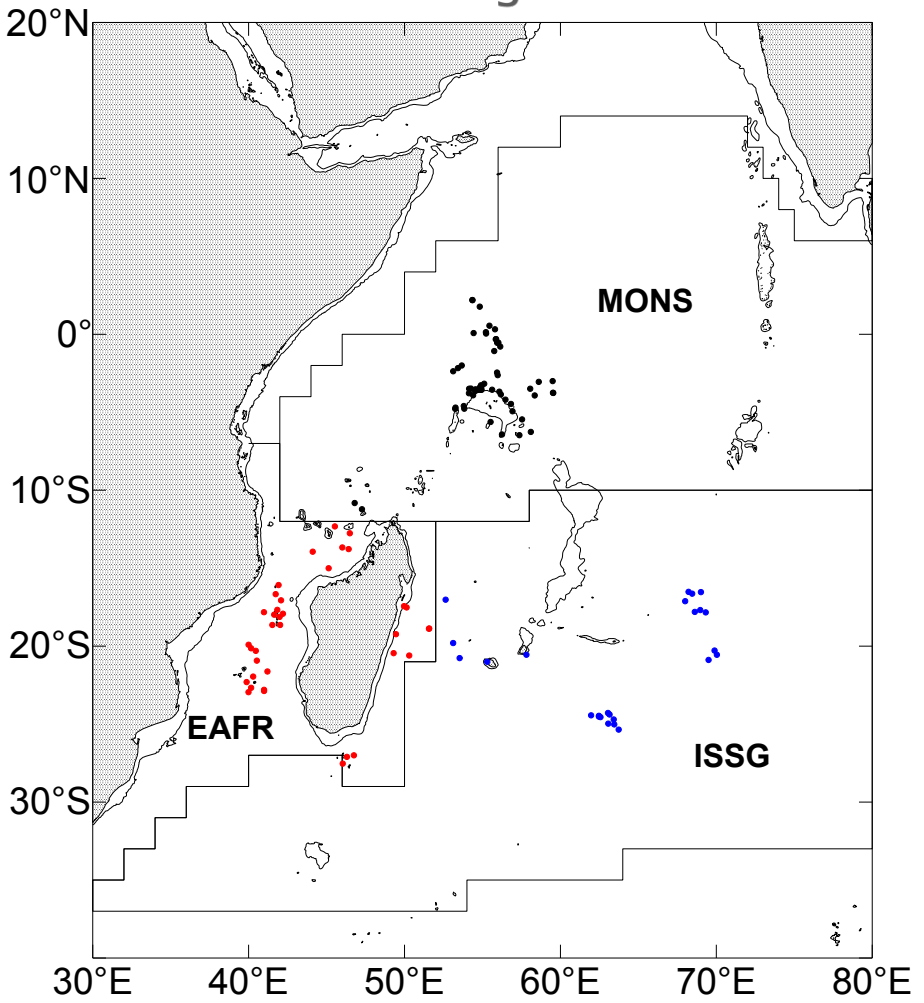
Number of sampled individuals
By Longhurst area

MONS	EAFR	ISSG
159	163	213



Size distribution of sampled individuals
By Longhurst area



Location of the swordfish samples
In the Western Indian Ocean

STOMACH CONTENT RESULTS

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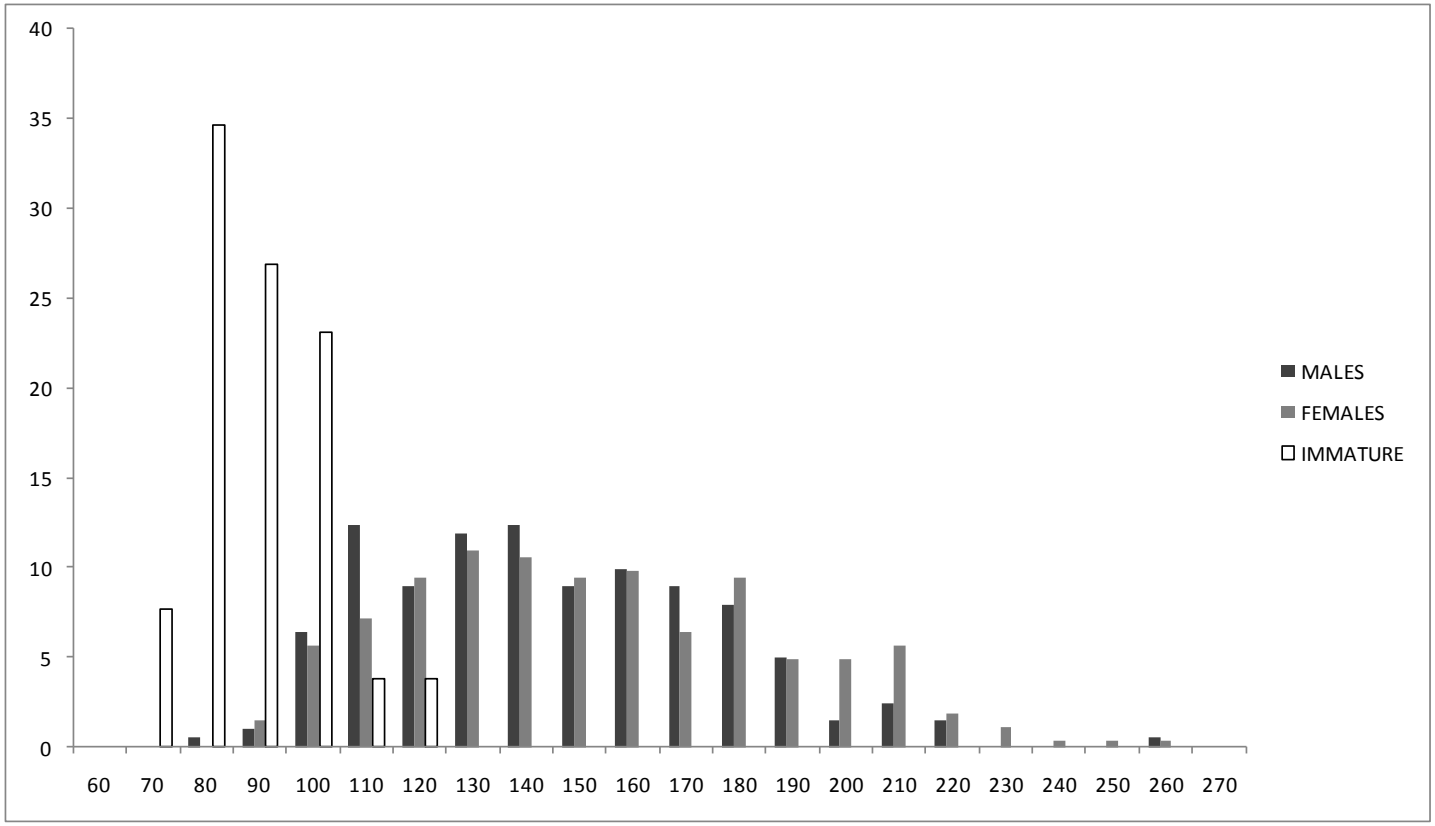

Size frequency distribution of the swordfish samples by sex

STOMACH CONTENT RESULTS

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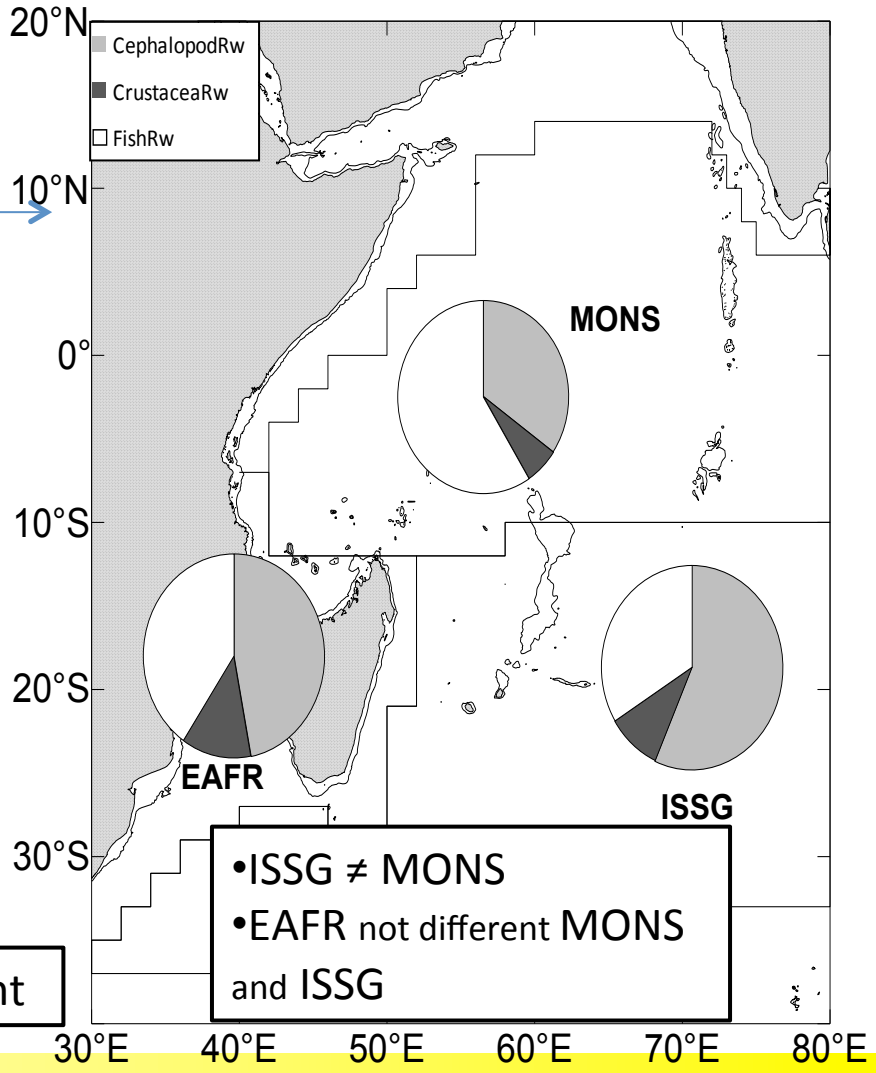
Reconstituted Weight by Longhurst area and large Zoological group



By Sex:

- MALE ≠ IMMATURE
- FEMALE not different MALE and IMMATURE

VARIANCE ANALYSIS on Reconstituted Weight:

- ISSG ≠ MONS
- EAFR not different MONS and ISSG

Area and Size effect on the reconstituted weight

STOMACH CONTENT RESULTS

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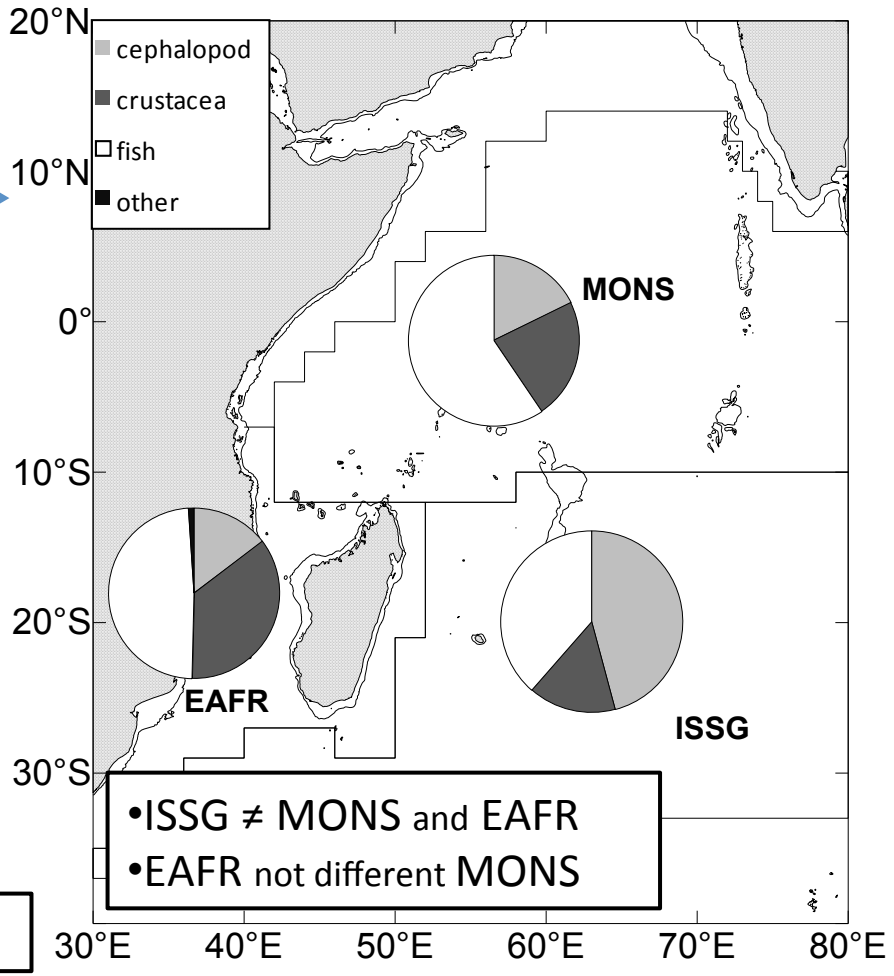
Prey number by Longhurst area and large Zoological group



By Sex:

- MALE not different IMMATURE
- FEMALE ≠ MALE and IMMATURE

- ISSG ≠ MONS and EAFR
- EAFR not different MONS

VARIANCE ANALYSIS on Prey Number:

Area, Sex and Size effect on the Prey number

STOMACH CONTENT RESULTS

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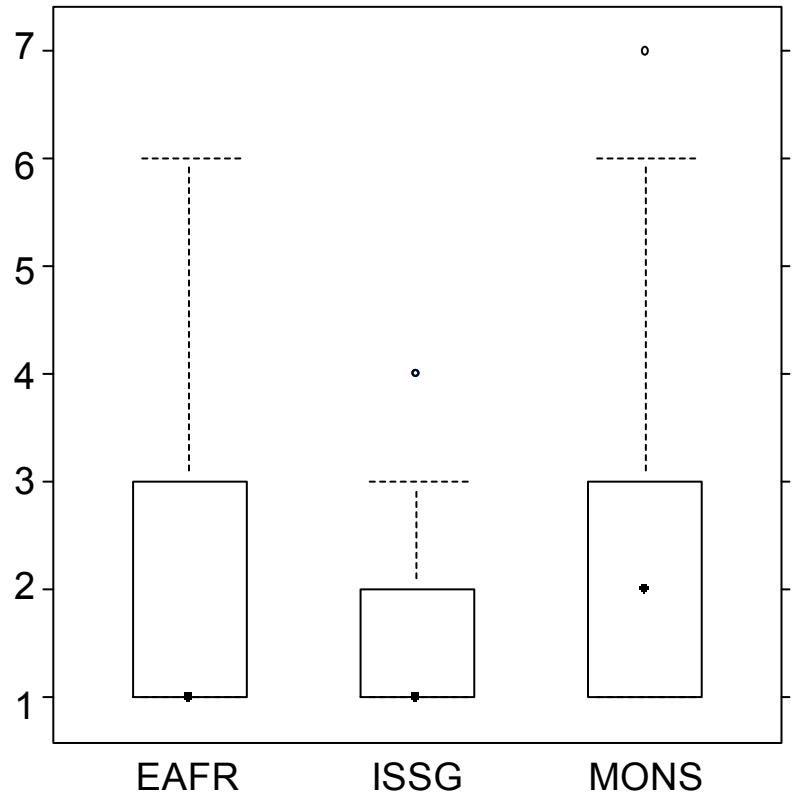
Species Richness :



- ISSG≠ MONS
- EAFR not different MONS and ISSG

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CONCLUSIONS

- SWO SIZE and AREA have an effect on the stomach contents

- Variation on stomach contents per AREA: could be explained by (i) preys available per area and (ii) distribution of the swordfish population in the Indian Ocean.

- Variation on stomach contents by SIZE: ontogenetic changes in the diet of the swordfish. Larger SWO feed on few prey and on larger prey.

Contribute to understand the spatial dynamic of SWO

ISOTOPE RESULTS (N & C)

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Team leader: IRD Institut de recherche pour le développement Frédéric MENARD

Objectives

• To use δ^{13}Carbon and δ^{15}Nitrogen stable isotopes as trophic markers

• To test the difference in isotope signatures of swordfish caught in several areas of the Indian Ocean – to test the influence of sex & size per area

• To analyse the results in terms of trophic position, vertical habitats and environmental gradients

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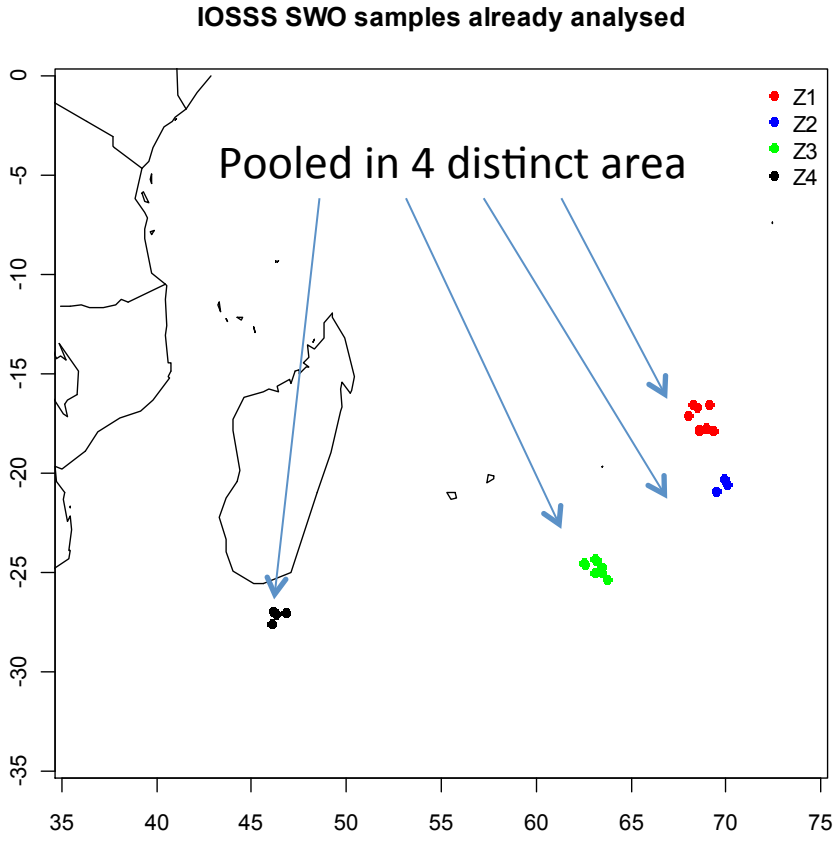
SAMPLES ANALYSED

Zone	Nombre de mâles	Nombre de femelles	Total
Z1	39	23	62
Z2	11	7	18
Z3	58	31	89
Z4	30	20	50
Total	138	81	219

500 samples are expected to be analysed in all the Indian Ocean at the end of IOSSS



ISOTOPE RESULTS (N & C)

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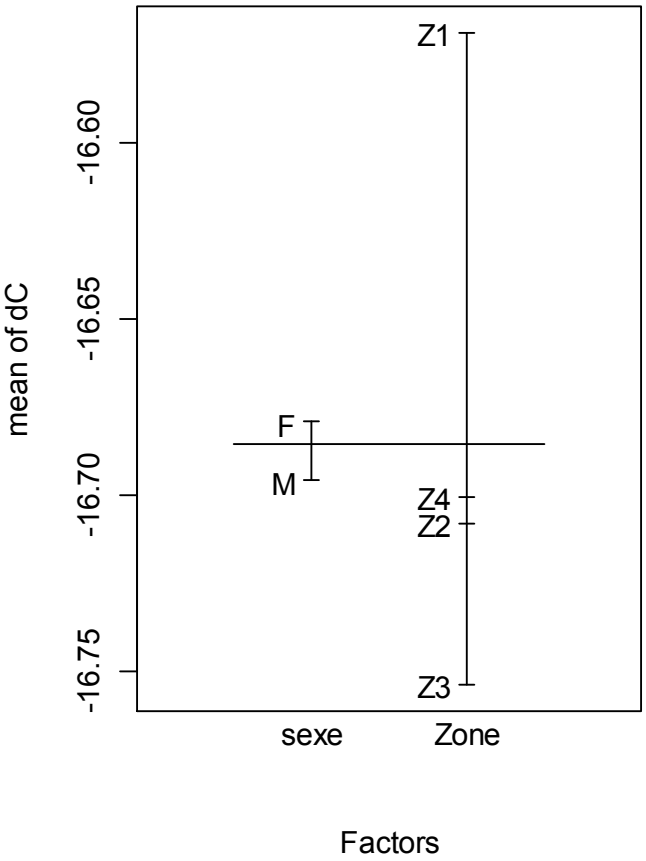

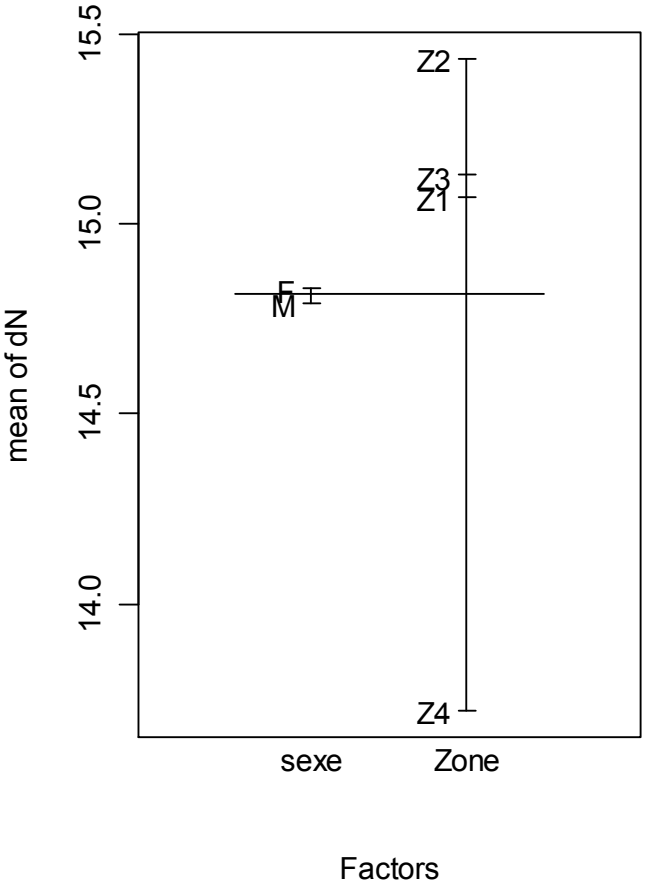

Only $\delta^{15}N$ influences the signature of SWO caught according to area = good markers

ISOTOPE RESULTS (N & C)

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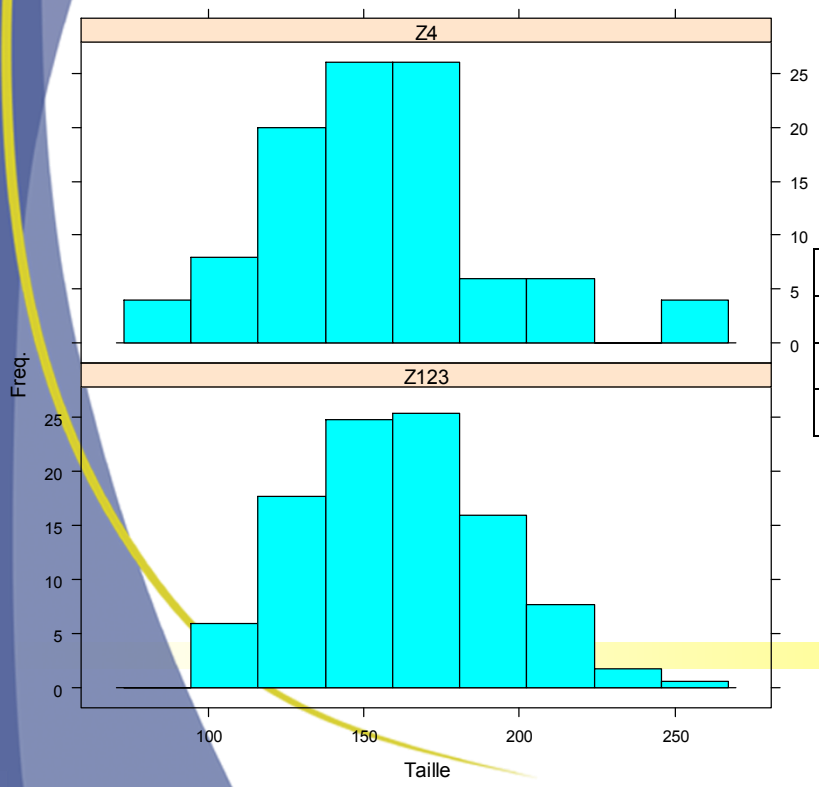
There is a significant difference between Z4 (south Madagascar) and the 3 other zones (1, 2, 3)
= samples were pooled Z4 vs Z123



Zone	Nombre de mâles	Nombre de femelles	Total
Z123	61	108	169
Z4	20	30	50
Total	81	138	219

ISOTOPE RESULTS (N & C)

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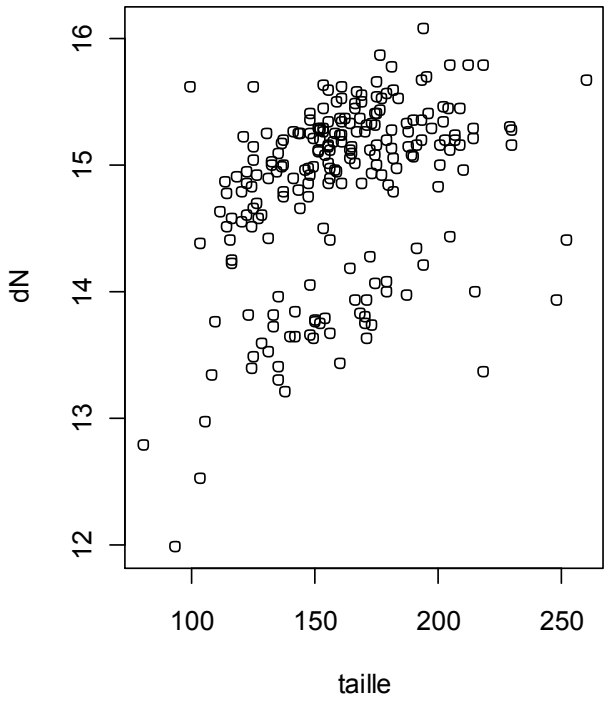

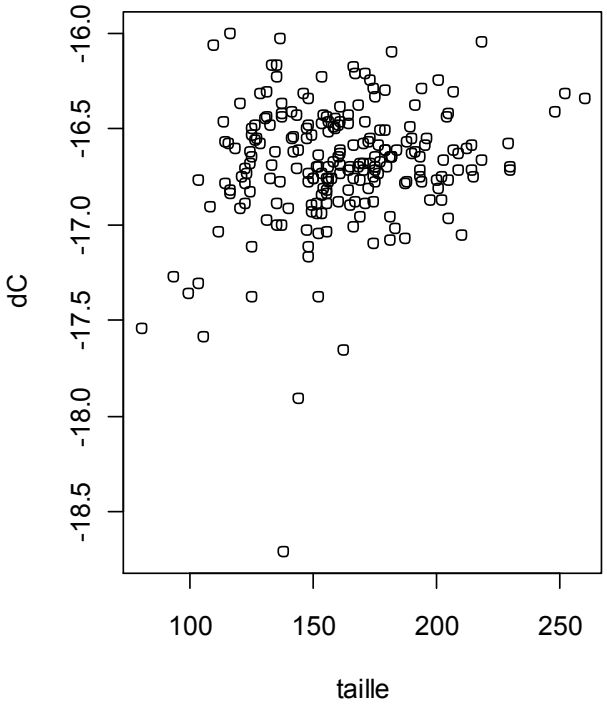

Only $\delta^{15}N$ influences the signature of SWO according to SWO size = good markers

ISOTOPE RESULTS (N & C)

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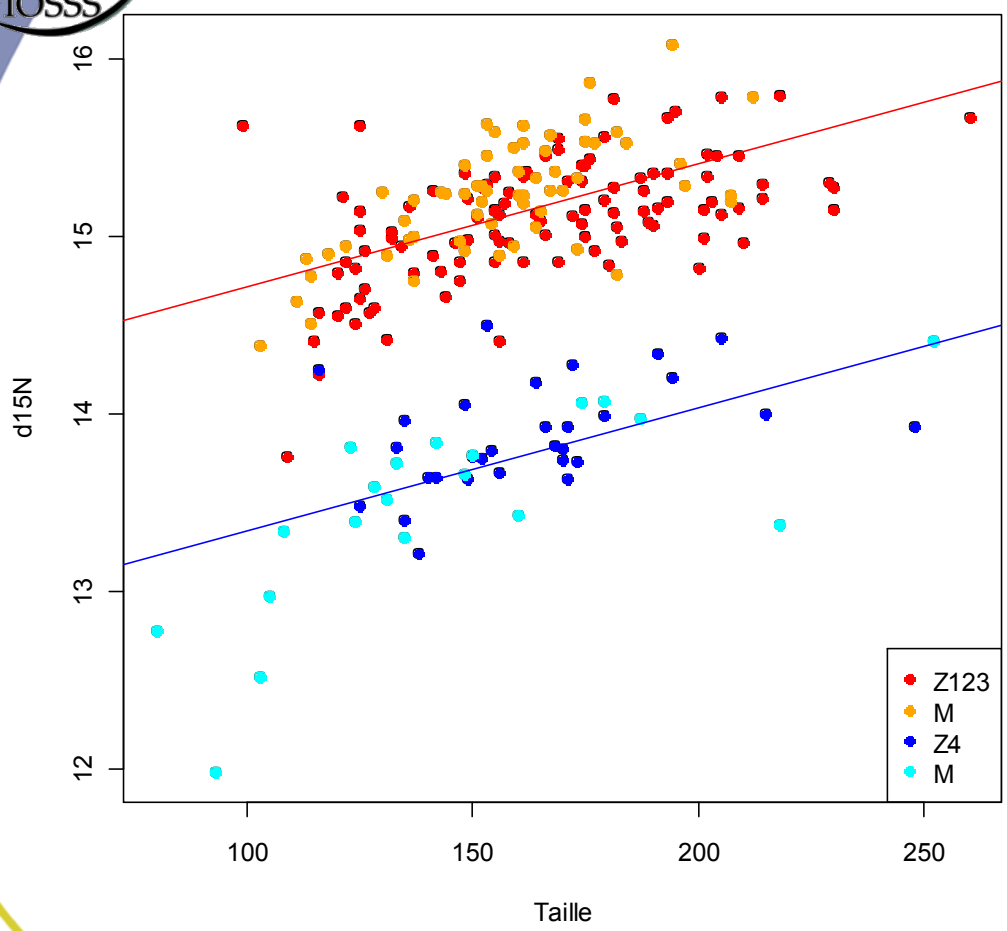

Best parcimonial model:

Zone and Size effect, without interaction between both

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FIRST CONCLUSIONS

• SWO SIZE and AREA have an effect on $\delta^{15}N$ signature – it's not the case of $\delta^{13}C$ = in agreement with previous studies on tropical pelagic animals

• Variation on $\delta^{15}N$ per AREA: could be explained by (i) variation on preys per area or (ii) a difference in the basic level per area that is transmitted along the food chain

• Variation on $\delta^{15}N$ by SIZE: could be explained by the fact that larger SWO feed on larger prey

• Information available on SWO seem to validate the hypothesis that there is a basic level of $\delta^{15}N$ different per area (to be detected)

→ Analysis to be extented to the other IOSSS samples