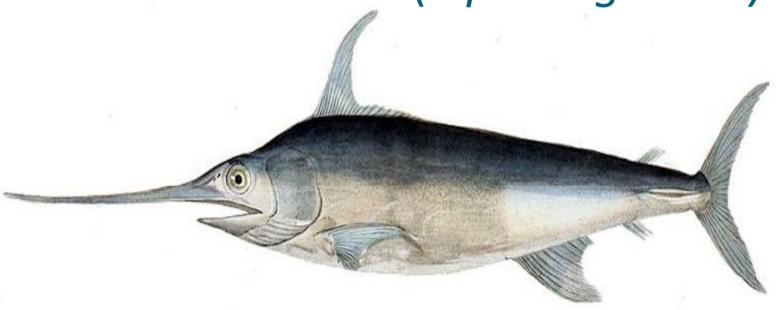
THE LEVELS OF TOTAL MERCURY IN SWORDFISH CAUGHT IN THE WESTERN INDIAN OCEAN

Layout of presentation

- Introduction
- Objectives
- Materials and methods
- Result and discussion
- Conclusion
- Recommendations

THE SWORDFISH (Xiphias gladius)





Introduction

- Inorganic mercury present naturally in earth crust
- In aquatic environment, some inorganic Hg converted into methyl mercury by micro organisms.
- MeHg is neurotoxic
- All fish contains at least trace amount, level for most fish o.o1 to o.5 mg/kg

Introduction cont/....

- In food chain, MeHg is bio-accumulated and bio-concentrated.
- •Large predatory fish such as swordfish, shark, marlin, tuna, have the highest levels
- •Hg is absorbed through feeding and also by extraction from water through the gills

Maximum limits in fish

Commission Regulations (EC) 1881/2006)

- 1.0 mg/kg of total Hg in predatory species(shark, swordfish, tuna, Marlin, emperor, eel, etc)
- o.5 mg/kg in other species inluding crustaceans
 FDA- US
- 1.0 mg/kg of MeHg in all species
 Codex Commission- (guideline level)
- 1.0 mg/kg MeHg in predatory species
- o.5 mg/kg in other species

Objectives of the study

•To investigate the relationship between size and mercury content.

•To compare level of total mercury in swordfish caught in Seychelles water with other parts of the world.

Objectives cont/...

•To determine whether the swordfish caught in Seychelles water exceed maximum limit set by EU, FDA and Codex.

•To provide reliable data to the CA and the Fisheries Sector.

Materials and Methods

Sampling

- Fish caught in Seychelles EEZ (1.4 million km/sq), latitude 00°29' 12°47' South and longitude 43°10'- 59°30' East
- All fish were sampled after heading and gutting.
- Fish were divided into 6 categories based on weight.
- Twenty (20) samples collected from each weight category from which 10 were carefully selected for analysis.

Sampling cont/....

Weight (kg)	No of samples
Less 20	10
21-40	10
41-60	10
61-80	10
81-100	10
Above 100	7

Estimation of Fish Weight

In swordfish the head + offal = approx 23% of total weight.
 Whole weight is calculated by multiplying carcass weight by a factor of 1.3

Example of weight calculation

- If carcass weight = 75 kg
- Approximate weight of whole fish = $1.3 \times 75 = 97.5 \text{ kg}$
- Therefore approximate weight of head and offal = 22.5 kg
- NB 22.5 kg = 23% of 97.5kg

Analytical determination of total Mercury

Method Used: Cold Vapour Atomic Absorption Spectrometry

Results expressed at 95% conmeanfidence interval of the concentration.

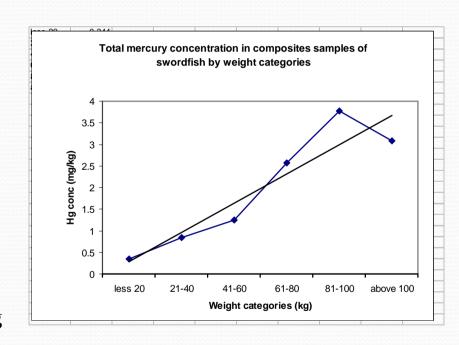
Results and Discussions

Fish Weight and Level of Total Mercury

Fish Weight (kg)	Average Weight (kg)	Range levels of Hg (mg/kg)	Level of Hg in Aggregate samples (mg/kg)
Less 20	10.9	0.130-0.660	0.344
21-40	30.0	0.595-1.447	0.845
41-60	52.2	0.364-3.992	1.246
61-80	74.3	0.881- 4.035	2.576
81-100	85.1	2.365-3.249	3.772
Above 100	202.6	2.044-4.302	3.077

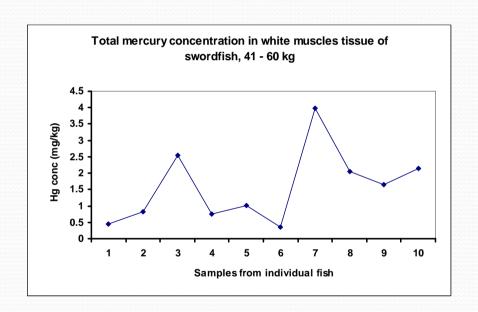
Weight and Level of Total Mercury

- Level ranged from 0.13mg/kg in a 5 kg fish to 4.302 mg/kg in a 240 kg fish.
- Reflect observation made in other research Example of study in the Azores sea – level ranged from 0.06 to 4.91 mg/kg
- Clear demonstration of relationship between weight and level of Hg - 20 kg up to 81-100 kg.
- Above 100 kg not clearly observable.
 Possible reasons include: sample size, sex and fish weight above 100kg forming the aggregate sample.



Difference in Hg level between fish of almost similar size

- There could be wide variation in fish of almost similar weight, therefore level of Hg alone does not always directly relate to the weight.
- No 6 60 kg 0.364 mg/kg
- No 7- 58kg 3.992 mg/kg
- Difference of 3.628 mg/kg
- Differential growth rate between males and females not enough to explain this and further research is needed to clarify the implication of physiological difference in mercury bioaccumulation kinetic between sexes.



Levels detected versus maximum allowable levels

- 61% of the samples (35 out of 57) recorded results above 1.0 mg (EU)
- 77% of the fish with results greater than 1.0 mg/kg were above 60 kg.
- It is estimated that about 80% of fish landed in Seychelles are below 60 kg

- For official monitoring, sampling protocol of Commission Reg 836/2011 must be respected.
- Official limits should be interpreted in relation to the recommended sampling procedure.
- Compliance of a lot will heavily depend on the average size of the fish landed provided sampling is done representatively.

Conclusion

- Level of total mercury in Swordfish caught in Seychelles water clearly demonstrate the bioaccumulation property of the contaminant.
- The level of total mercury in swordfish caught in Seychelles water does reflect levels detected in other studies other parts of the world.
- Most individual fish above 60 Kg exceed the maximum limit of 1.0 mg/kg.
- Aggregate sample taken from a lot assuming that more than 80% are below 60kg may easily comply to the maximum allowable imit.

Recommendations

- The study should continue to properly cover fish above 100 kg.
- Future study should include a smaller interval for different weight categories e.g. 10 kg. This would ensure a more linear relationship between the fish weight and level of total mercury.

Recommendations cont/--

- Suggested re-evaluation of mercury acceptable levels in marine fish especially predatory species, in light of new scientific knowledge on the relationship between selenium and mercury absorption in consumers
- Possible introduction of a <u>maximum size limit</u> of fish for export, while addressing the sustainability concerns in term of minimum size allowed by relevant management body.

THANK YOU FOR YOUR ATTENTION

• QUESTIONS??