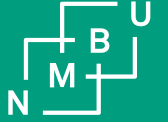


Norwegian University  
of Life Sciences



# Occurrence and levels of persistent organic pollutants (POPs) in marine farmed and wild fish from Tanzania, A pilot study

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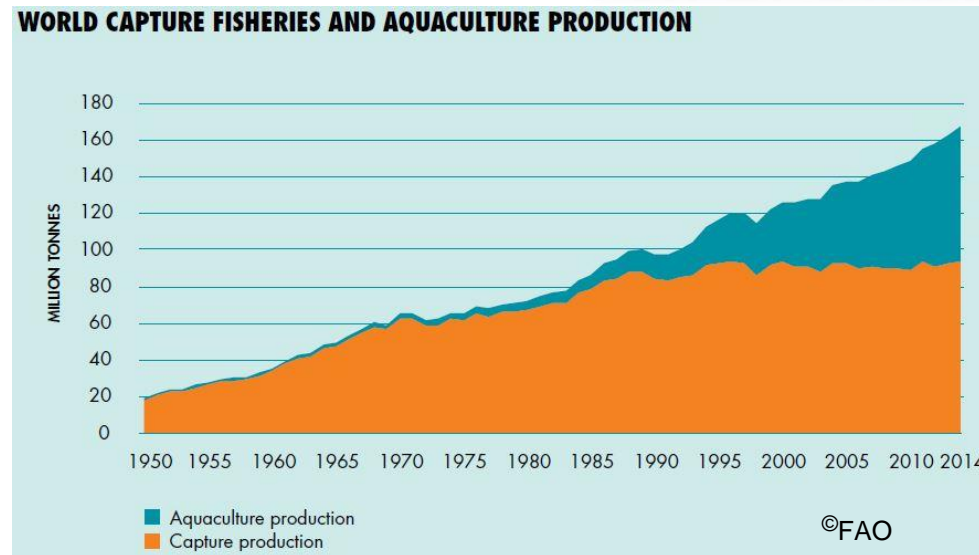
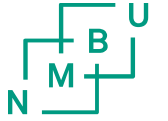
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# Background

- Tanzanian population is growing fast (3.21%/year)
- Estimate for 2017 of 56,821,301 people
- Challenges in food security
- Increased demand for food, especially fish
- Insufficient catch from stagnated wild fisheries

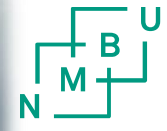
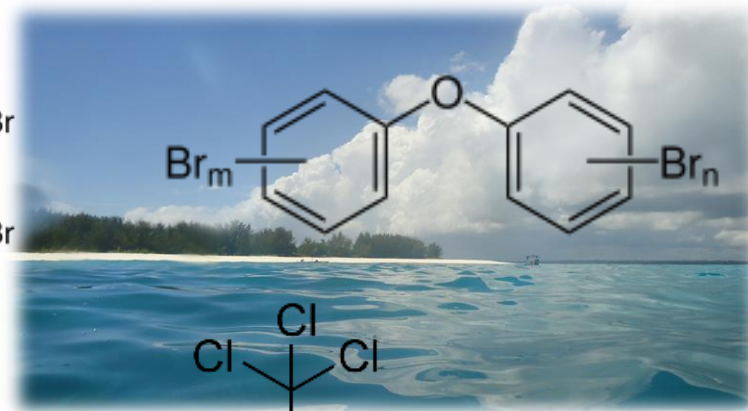
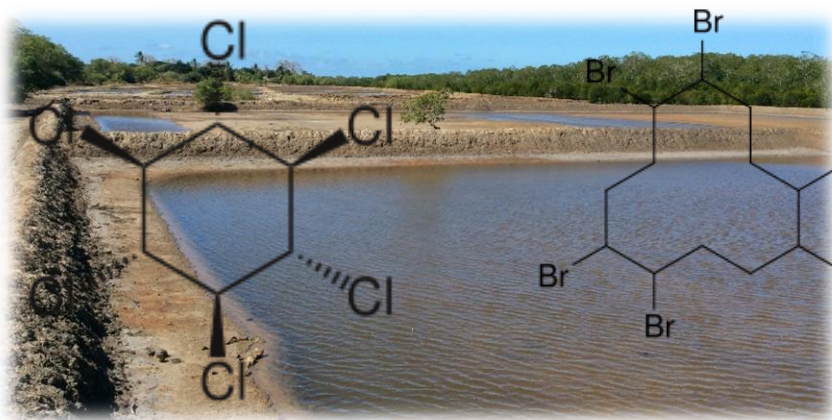


Aquaculture introduced-1950s,  
growing very fast

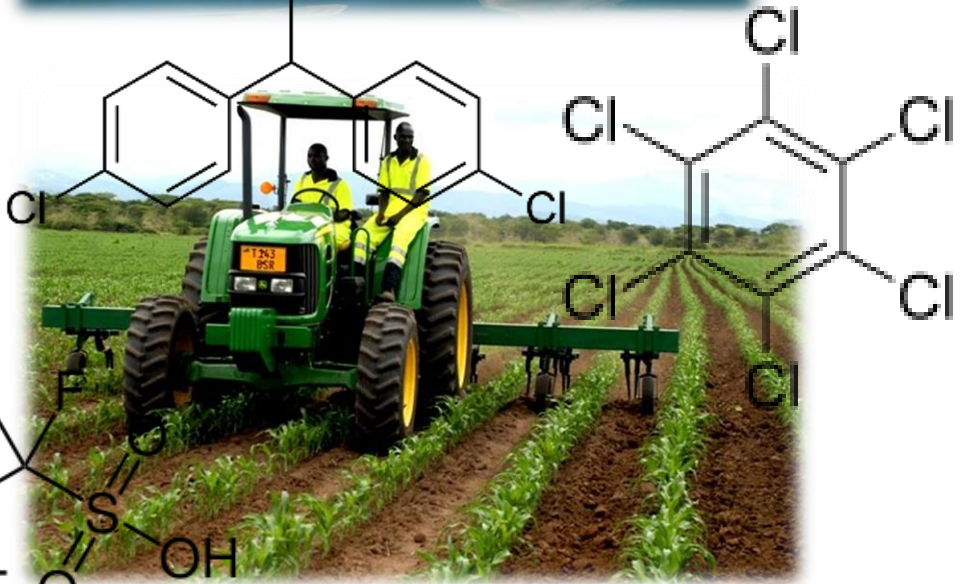
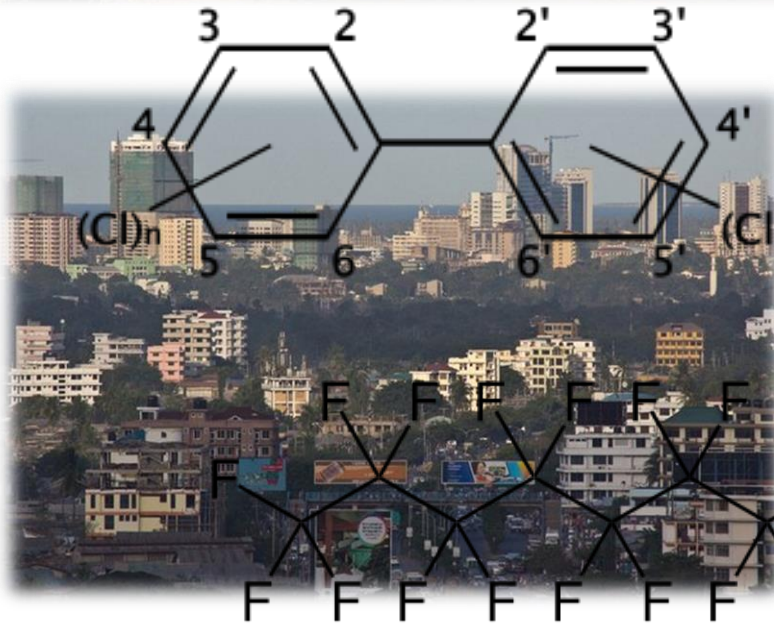
- Freshwater aquaculture of  
tilapia, rainbow trout and  
catfish
- Mariculture (Farming of  
marine water species) of  
milkfish, mullet and  
seaweed



- Mariculture dependent on quality of environment



- Environment Influenced by several dev. activities



- Led to increased potential harmful chemicals

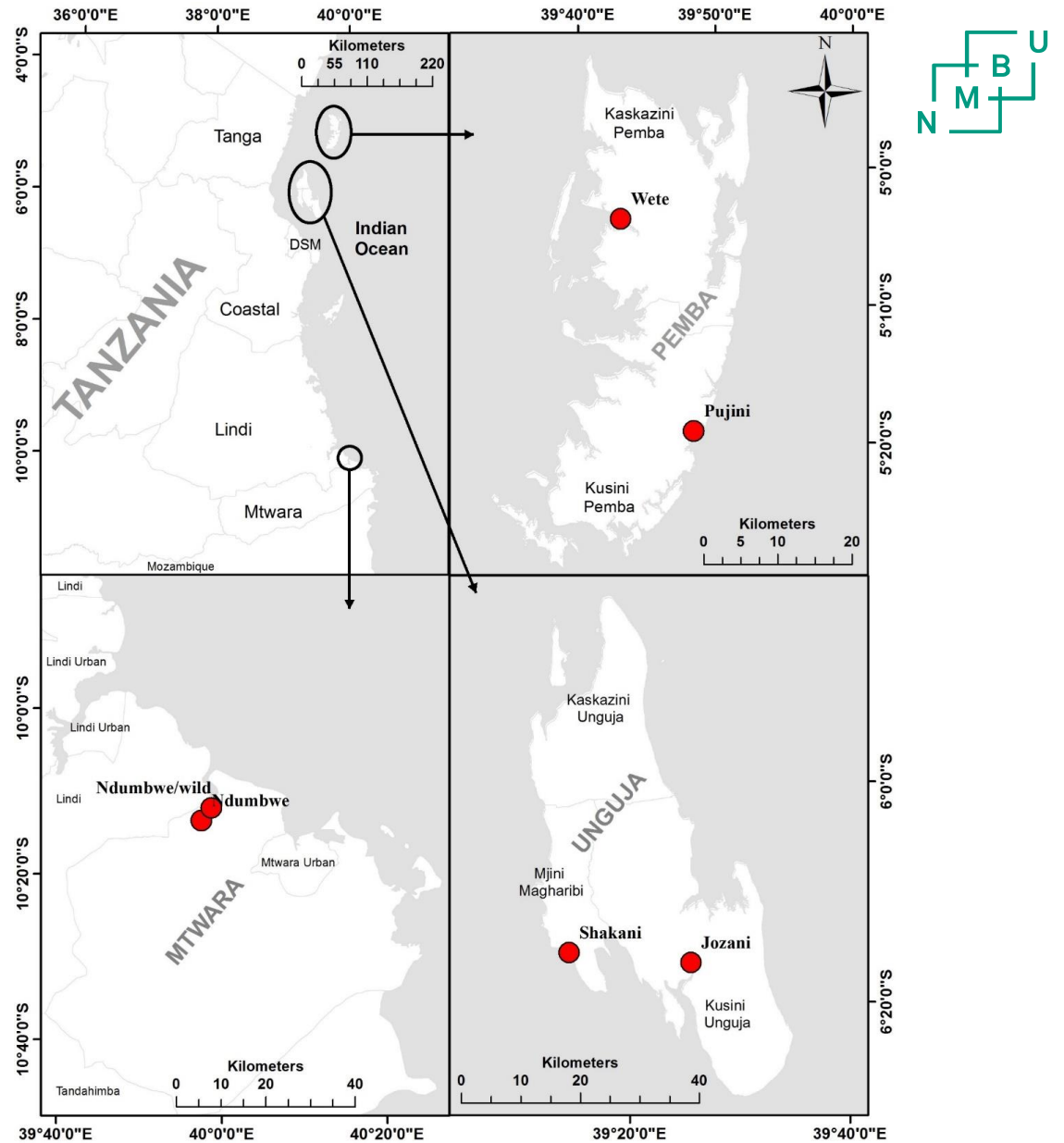
- No study has been done on chemical contaminants in farmed fish

# The objective

- *To determine the occurrence and levels of POPs in selected farmed fish and wild fish near the fish farms*
- ***What to accomplish***
  - To reveal the occurrence of POPs (***OCPs, PCBs, BFRs & PFAS***) in farmed and wild fish in the coast of Tanzania
  - To explicate the levels of POPs occurring in the farmed and wild fish in the coast of Tanzania

# Materials and Methods

- Study area: Tanzanian coast
- Study sites : Fish farms and wild
  - Two (2)- Tanzania-mainland
    - (Mtwara)
  - Four (4)- Tanzania-Zanzibar Isl.
    - Unguja and Pemba
- Number of samples:
  - 121 fish

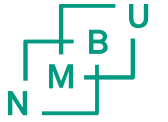


# Target sites

## Operational fish farms



# Target species



## Milkfish (*Chanos chanos*)



## Mulletts (*Mugil cephalus*)

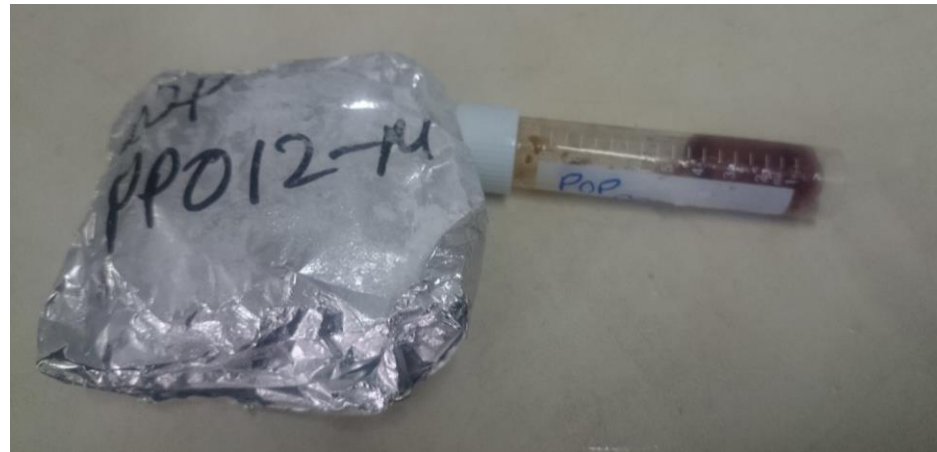
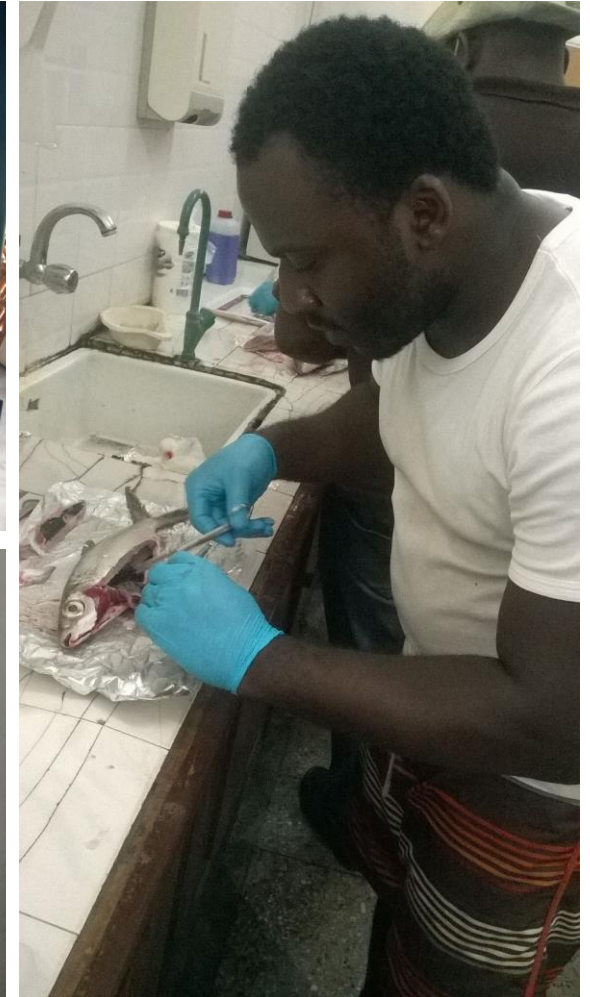




# Biometric information of sampled fish

Site	Fish type	Sampling time	Mean weight(g)	Weight range(g)	Mean length (cm)	Length range(cm)	No of analysed sample
Unguja Jozani	Milkfish	Jan-16	662	413-826	44	38-48	8
Unguja Shakani	Milkfish	Jan-16	683	533-936	43	40-48	8
Pemba Ponds	Milkfish	Mar-16	211	196-226	29	28-31	8
Pemba wild	Mullet	Mar-16	611	542-711	39	37-42	8
Mtwara ponds	Milkfish	Apr-16	189	83-308	25	20-29	8
Mtwara wild	Milkfish	Apr-16	107	59-185	21	18-27	8

# Sample collection



# Sample analysis: Laboratory of Environmental Toxicology, NMBU, Norway

Sample preparation



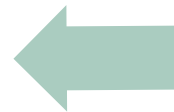
Lipid extraction



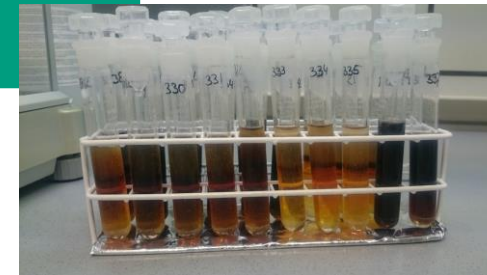
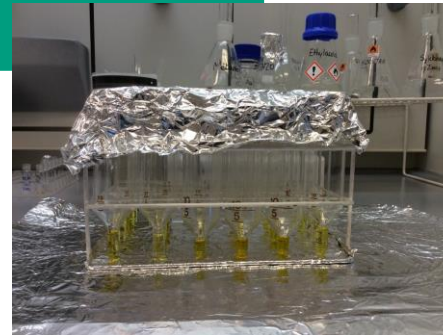
Lipid cleanup



Analyte extraction



Separation & detection



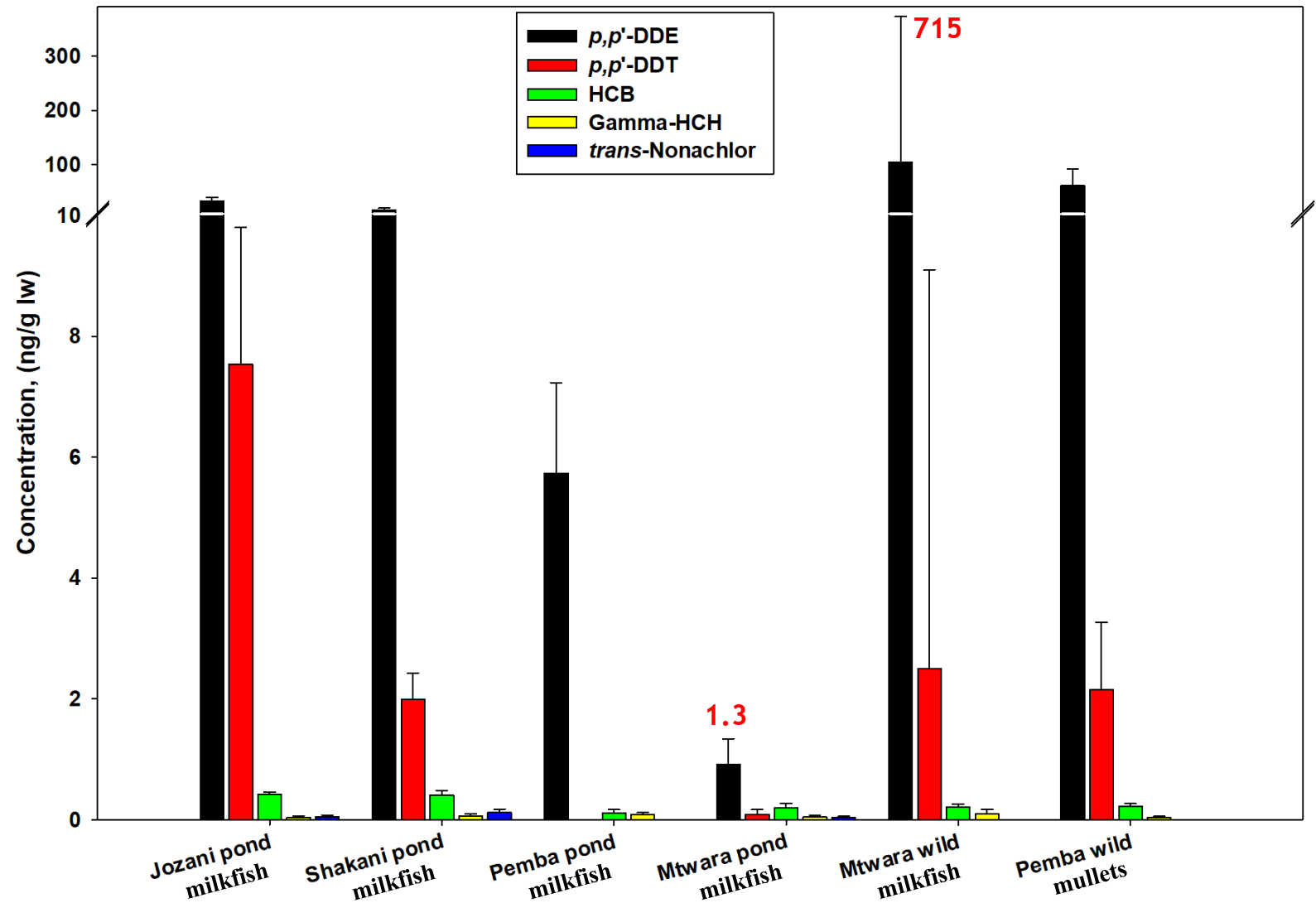
**Method:**  
*Polder et al. 2014*

# Results and discussion

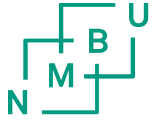
# Organochlorine Pesticides (OCPs)



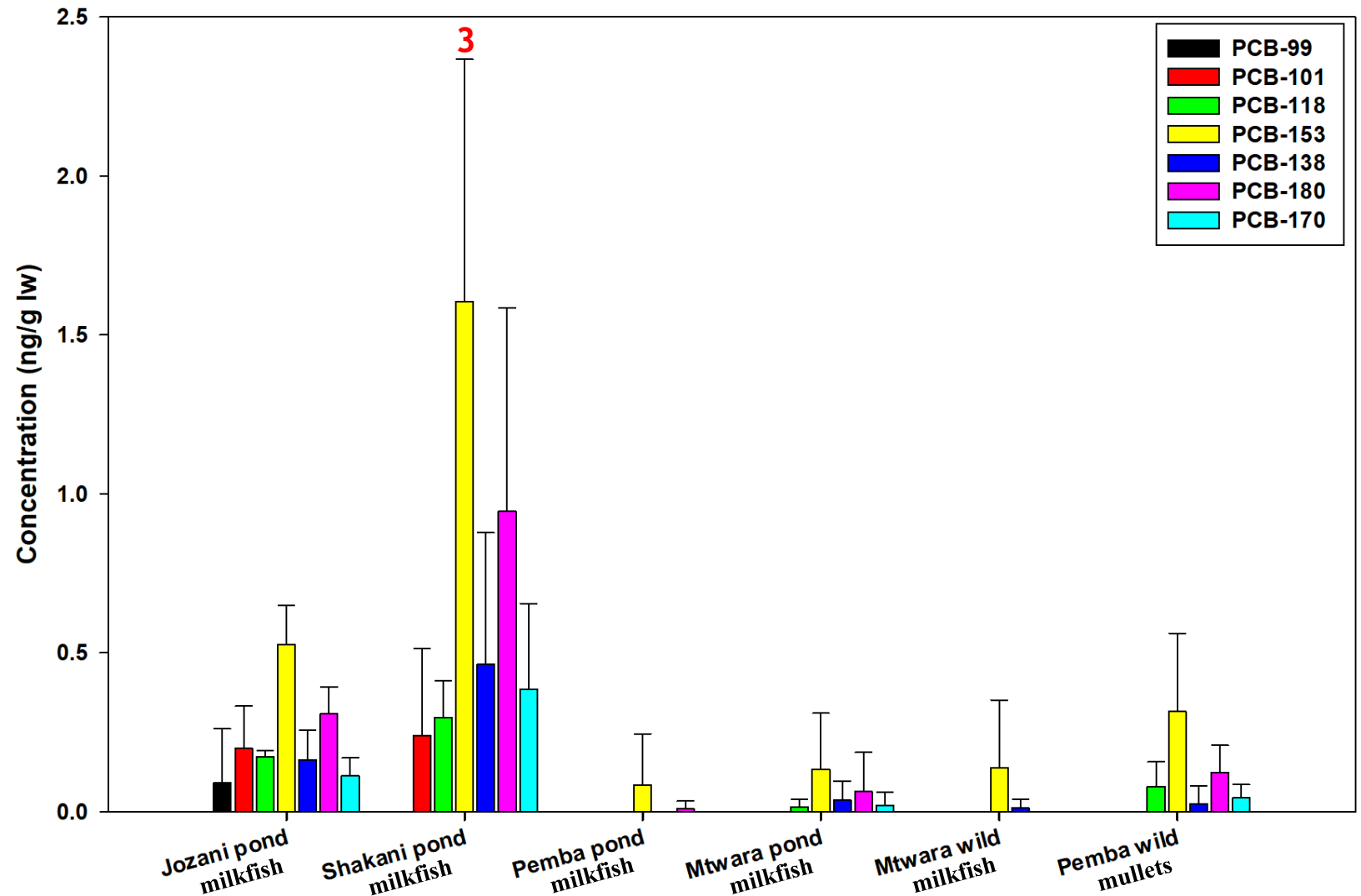
- DDTs major contaminants
- *p,p'*-DDE- dominant
- Highest in wild milkfish (Mtwara)
- Lowest in farmed milkfish (Mtwara)
- Recent and historical use
- Other OCPs - low levels



# Polychlorinated Biphenyls (PCBs)



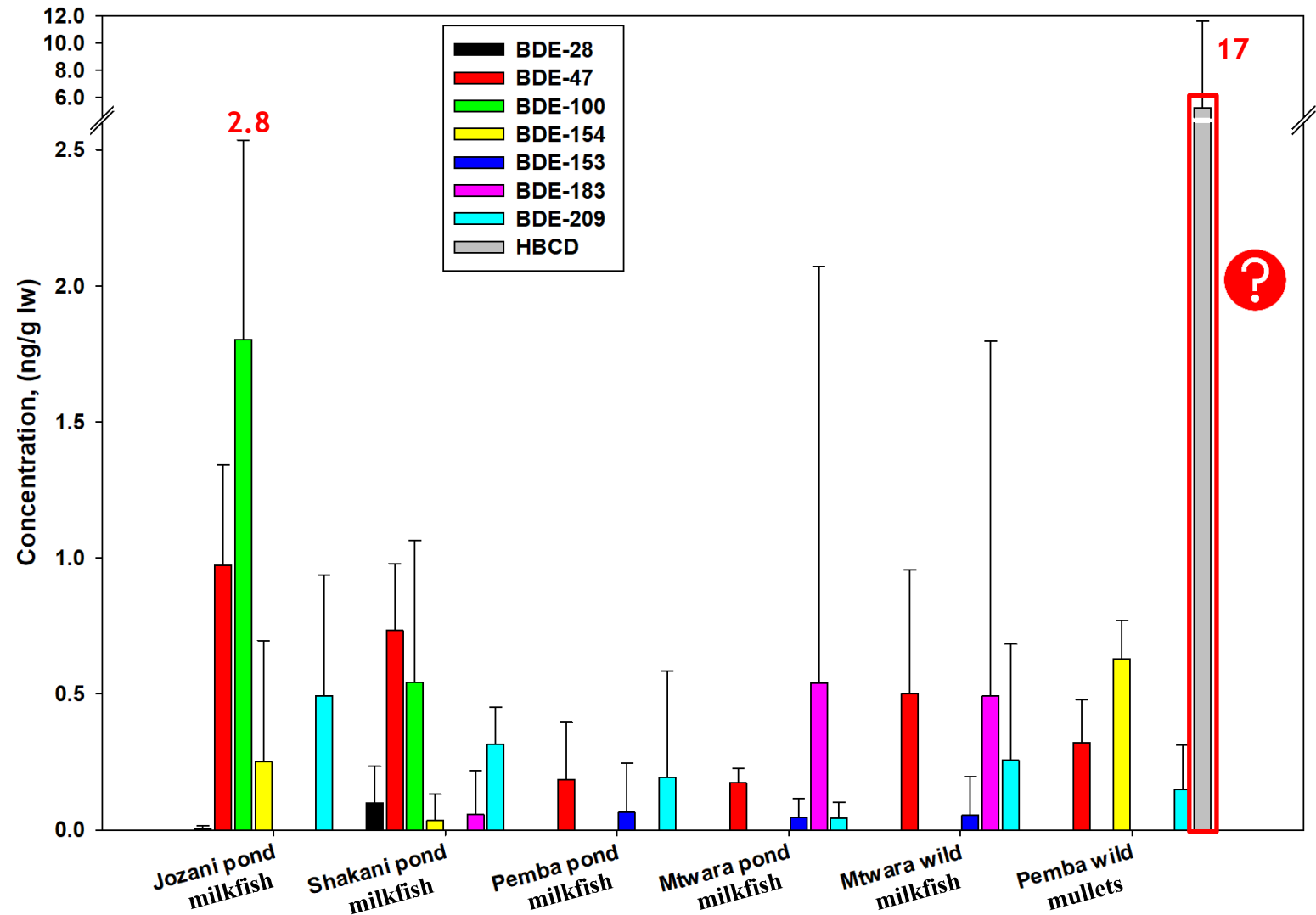
- PCBs- low levels
- **PCB-153** - dominant
- Milkfish from Unguja had highest levels
- Long range atmospheric transport (LRAT)
- Soil deposition
- Improper handling of products with PCBs
- Airport emission



# Brominated Flame retardants (BFRs)



- **BDE-47** - >80% detection
- **BDE-100** - highest mean conc. (**1.8 ng/g lw**)
- **HBCD** - detected only in wild mullet from Pemba (**5.2 ng/g lw**)
- Imported consumer products
- Improper disposal of waste

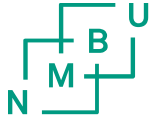


## Perfluoroalkyl substances (PFAS)

- PFASs were below detectable limit in all sites
- Clean from/*Insignificant PFAS contamination*
- Levels may probably increase in the future
  - Detection in human blood (*Müller et al. 2017 in press*)
  - Continue importation and use in PFAS imbedded consumer products



# Conclusions



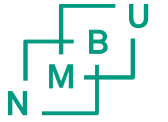
- OCPs
- DDTs were the dominant contaminants
- Historical and recent use in the environment revealed
- Other OCPs from historical use

- PCBs
- PCBs: widespread in all locations
- LRAT potential source
- Improper handling/disposal of PCBs products, open fires
- Emissions from airport

- BFRs
- PBDEs were found highest in areas close to human activities
- May be originated from improper disposal of consumer products

The levels of detected contaminants were below the **USFDA** and **EU MRLs**

## Zanzibar, (Unguja island)



- **PCBs** and **PBDEs** levels may reflect general background levels in the sites
- The higher levels of **PCBs** and **PBDEs** in Unguja and **HBCD** in Pemba may be influenced by some **active** sources
  - Airport emission
  - Sewage discharges
  - Improper waste disposal



# Acknowledgement

- Financial support from NORAD
- ICCE 2017
- Laboratory of Environmental Toxicology, NMBU
- Institute Marine Science, UDSM

Thank you for listening

