

# Are climate change impacts the cause of reduced fisheries production on the African Great Lakes?

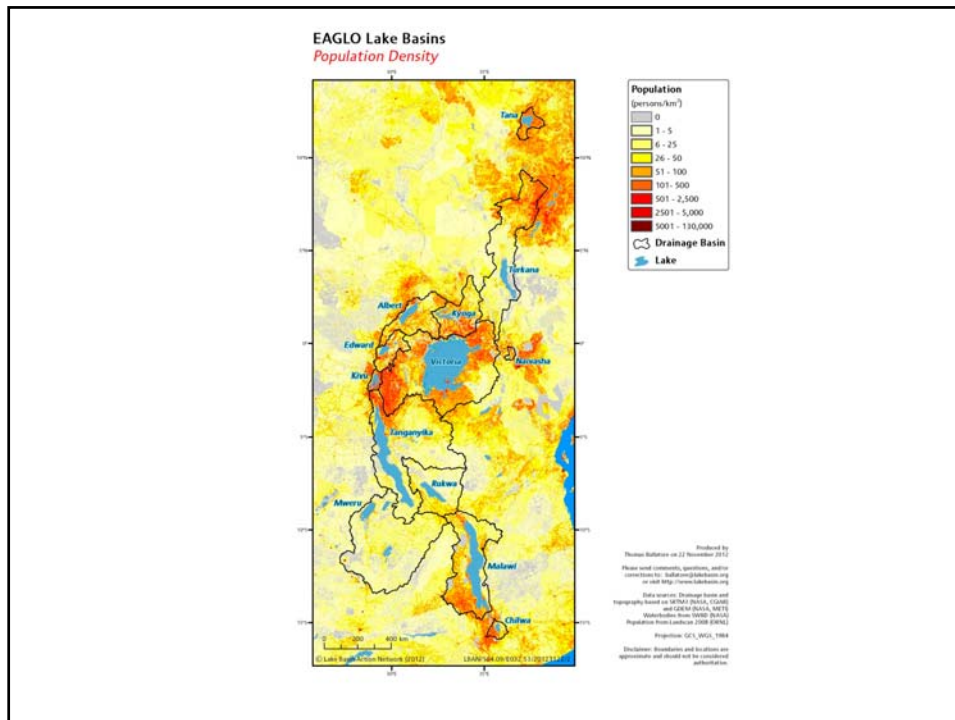
THE LAKE TANGANYIKA CASE STUDY

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BANGKOK, 8 AUGUST 2016

## AFRICAN GREAT LAKES



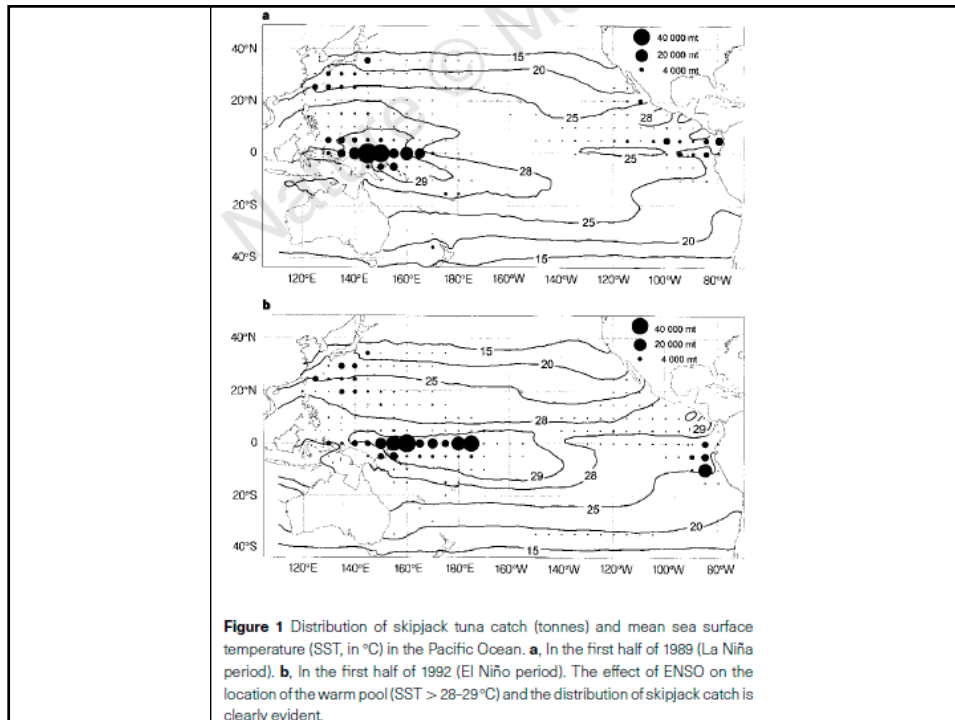


## CLIMATE CHANGE AND FISHERIES

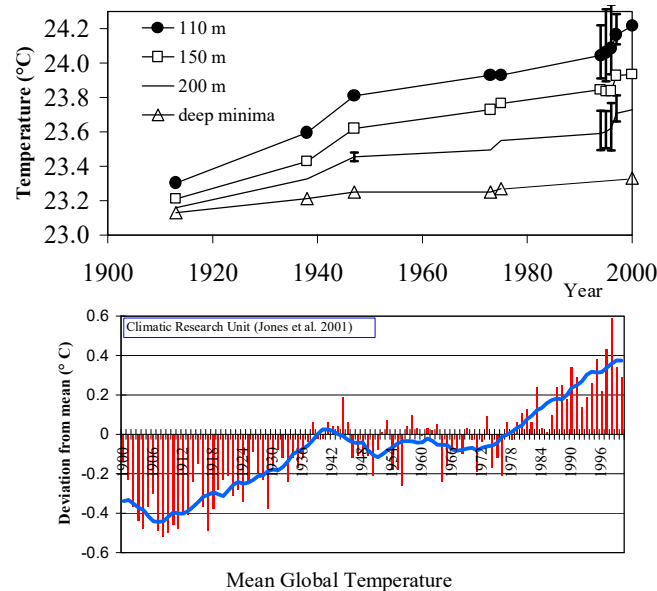
- **WHAT ARE THE POSSIBLE SYMPTOMS OF A FISHERY AFFECTED BY CLIMATE CHANGE?**
- **HOW CAN WE RECOGNIZE CLIMATE CHANGE IMPACT ON FISHERIES?**
- **IS CLIMATE CHANGE THE ONLY STRESSOR?**
- **NO, FISHING PRESSURE, HABITAT REDUCTION, POLLUTION, INVASIVE SPECIES**
- **SO, HOW WILL WE MEASURE IT?**

## GLOBAL WARMING

- Increased frequency and severity of storms
- Regional warming causes decreased rainfall and increased evapo-transpiration
- Expansion of subtropical deserts
- Agricultural yields affected
- What about fisheries?



Evidence for deep water warming in Lake Tanganyika over last century has raised concerns about declining deep water and nutrient renewal



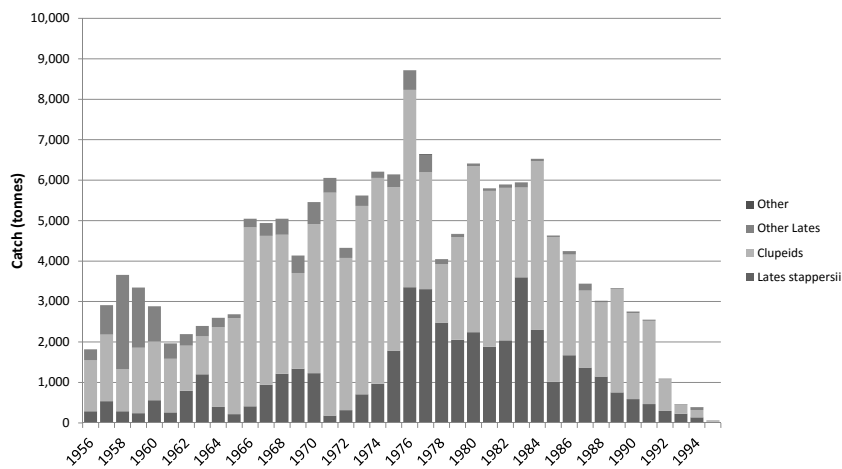
## Harvest reduction linked to climate change?

- Maybe
- Temperature increase of surface water
- But also in deeper waters
- Paleolimnological indicators show lakewide decline in primary productivity (O'Reilly et al)
- 20% reduction → 30% reduction fish harvest
- Decline in wind velocities by 30%, but ....
- Sabasaba

## Harvest reduction linked to climate change?

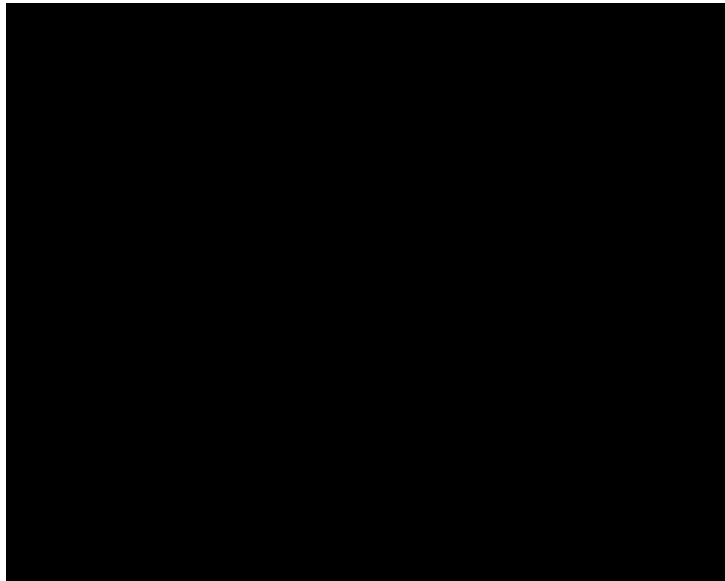
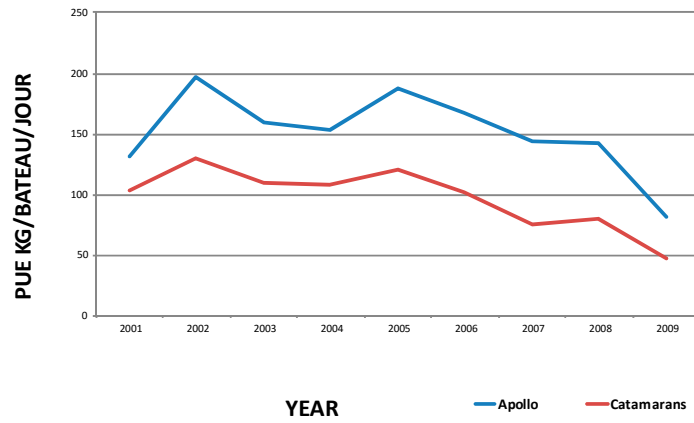
- Doubts about carbon isotope data analysis
- Insufficient information on nano and picoplankton (primary productivity)
- Caution conclusion on phytoplankton (larger cells)
- Increase in diatoms in the northern part of the lake → clupeid abundance
- Piscivores abundant in the South (shrimp)

## Burundian industrial fisheries



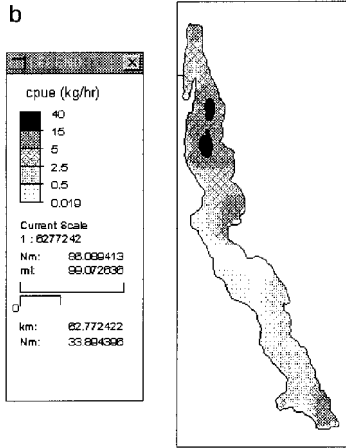
# ARTISANAL FISHERY BURUNDI

Catch per unit of effort



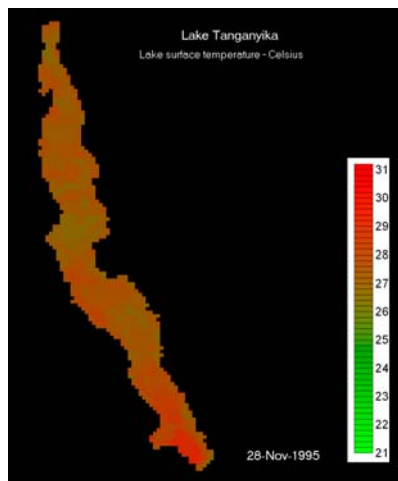
# FISH ABUNDANCE LAKE TANGANYIKA

November-December 1995



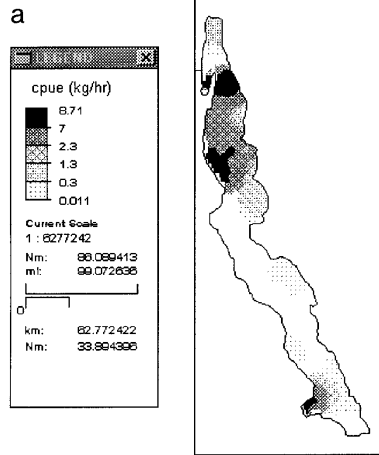
# LAKE TANGANYIKA WATER TEMPERATURE

November 1995



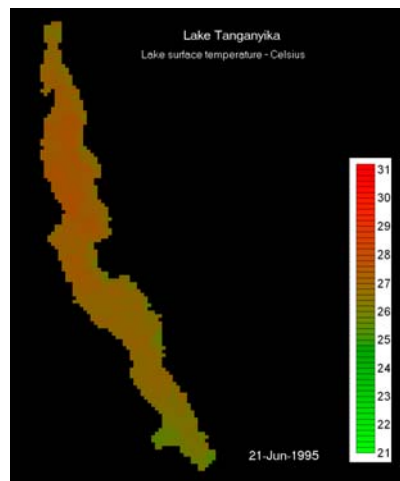
# FISH ABUNDANCE LAKE TANGANYIKA

June 1995



# LAKE TANGANYIKA WATER TEMPERATURE

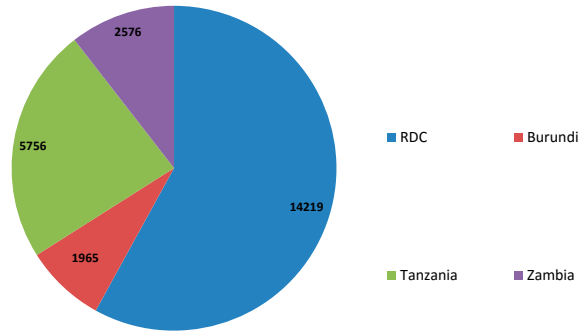
June 1995



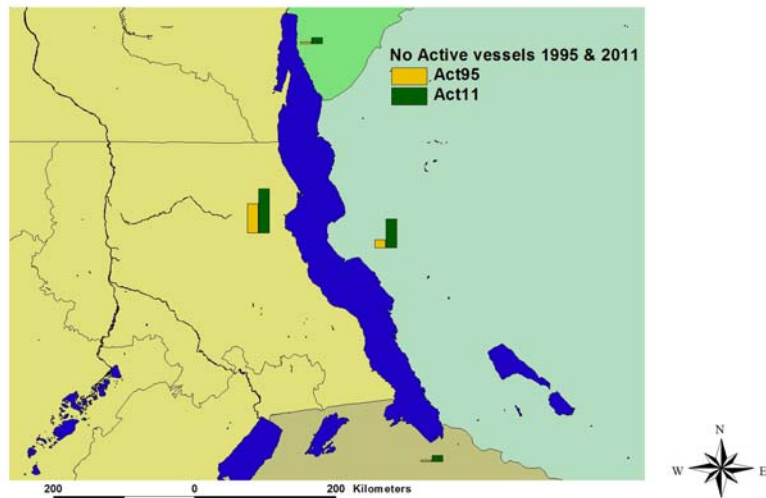


# ACTIVE FISHING UNITS 2011

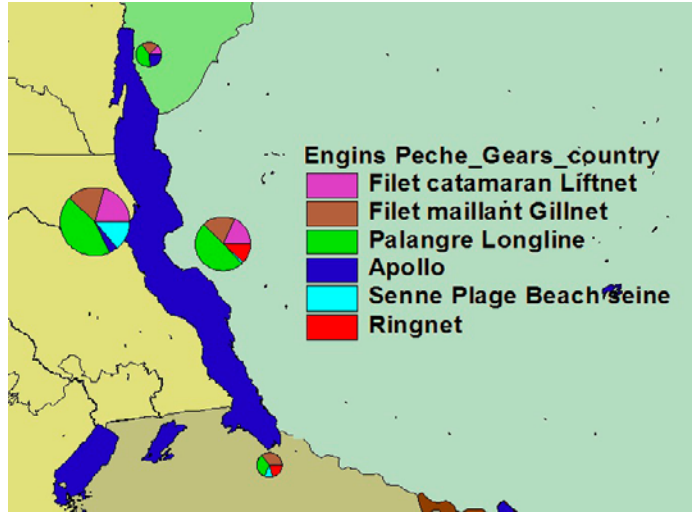
No of active fishing units  
Total 25.000



# VESSELS ON LT IN 1995 AND 2011

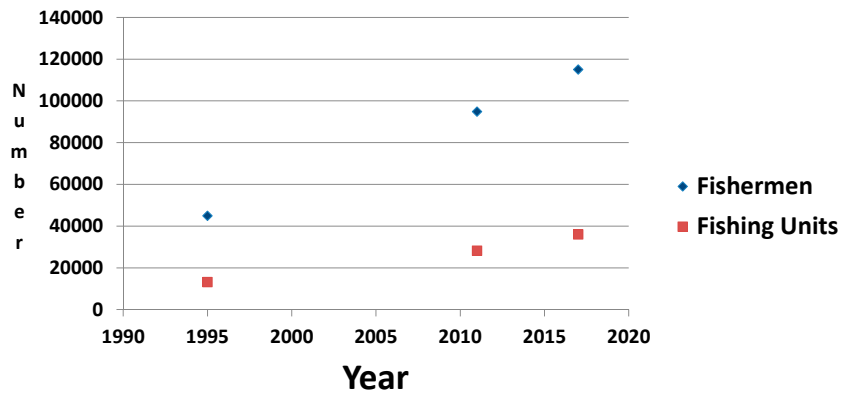


## FISHING GEARS 2011



## OPEN ACCESS---ACCES LIBRE

Projection 2017



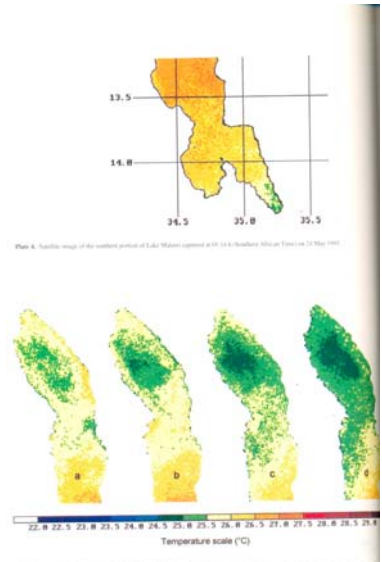
## **FISH PRODUCTION**

- **1990s**    **165,000 TO 200,000 TONS/YEAR**
  
  - **2011**    **APPROX 55,000 TONS 3 COUNTRIES**  
              **DRC 50% OF FISHERMEN**  
              **TOTAL FISH PRODUCTION 110,000**  
              **TONS PER YEAR**
- FROM 165,000 TO 110,000 TONS/YEAR**

## **CO-MANAGEMENT BURUNDI**

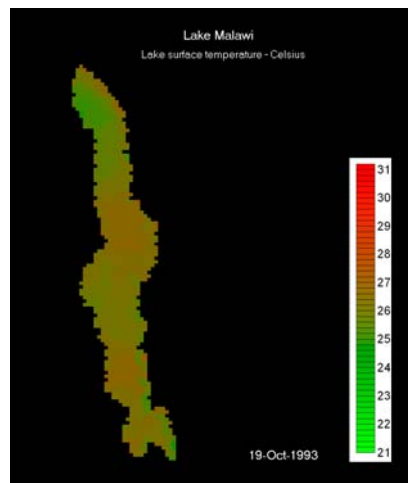
- **Two groups of village-based fisheries committees banned illegal gears and conduct community surveillance (net burning)**
- **Closed areas**
- **Protection juvenile fish**
- **Production up from 11 to 14 thousand tonnes per year**
- **.... And then civil strife again**

# LAKE MALAWI WATER TEMPERATURE



# LAKE MALAWI WATER TEMPERATURE

19 October 1993



## **FUTURE?**

- **What are consequences of changing fisheries ecosystems for people, particularly the millions of small-scale fisherfolk (fishers, fish processors, fish traders, ancillary workers, etc) in developing countries who are among the most vulnerable to Climate Change?**

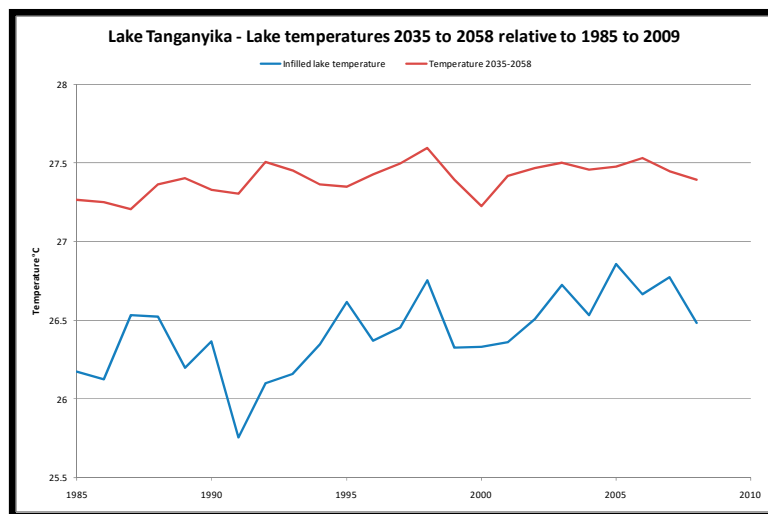
## **Recommendations?**

- **Too many recommendations**
- **Lake Tanganyika Authority**
- **Financing agencies assume sustainability of research and monitoring to be provided by countries after project implementation**
- **Lake Tanganyika contains 17% of the world's surface freshwater resources: international obligation to assist**

## RECOMMENDATIONS

- FMPs exist, so enough recommendations
- Aquaculture development (non invasive)
- Reduce post-harvest losses
- Climate related projects took place in selected areas → lakewide
- Twinning of research and management organizations
- Microbial loops to be studied

## CLIMATE CHANGE PROJECTIONS – LAKE TANGANYIKA



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