THE IDENTIFICATION OF ECOSYSTEM SHIFTS ATTRIBUTED BY CLIMATE CHANGE AND FISHERIES FOR SARDINE (*SARDINOPS SAGAX)* AND CAPE HORSE MACKEREL *(TRACHURUS CAPENSIS)* USING OTOLITH BIOCHRONOLOGIES.

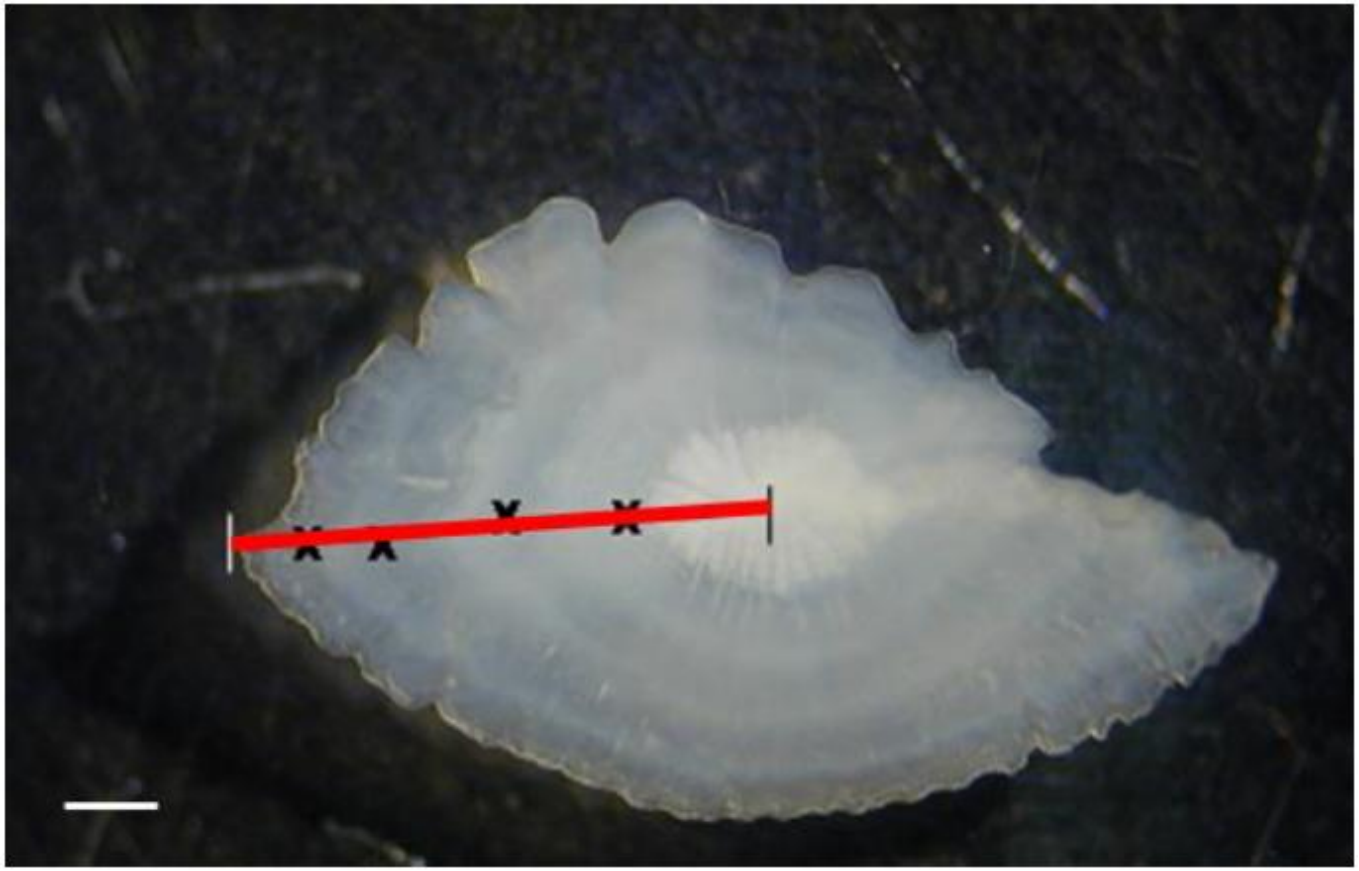
Faye Brinkman
Supervisor: Margit Wilhelm
University of Namibia
TRIATLAS: CT1, CT2

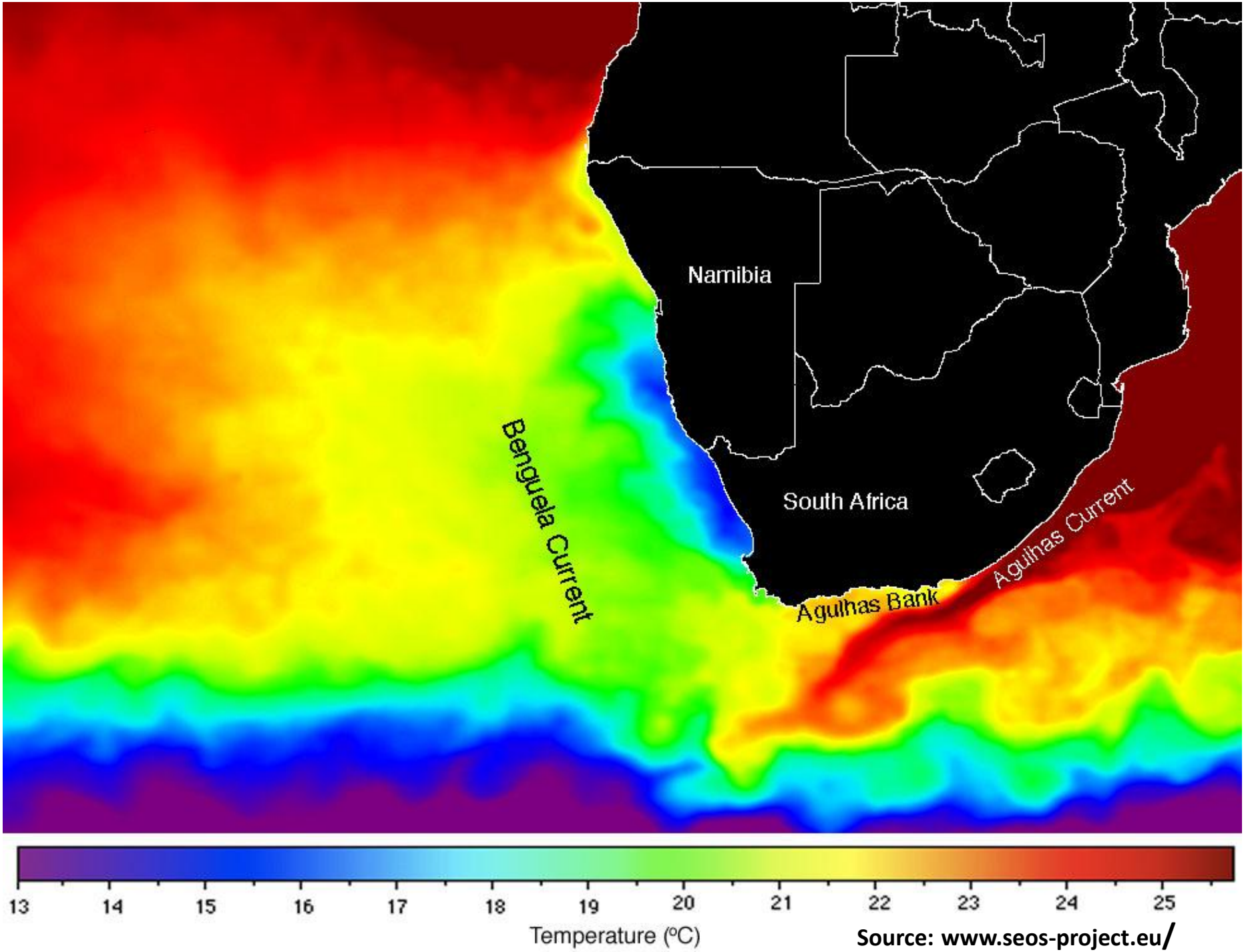
Can otoliths be used to identify past ecosystem change?

⇨ Otolith chronologies

Can otoliths determine trophic relationships?

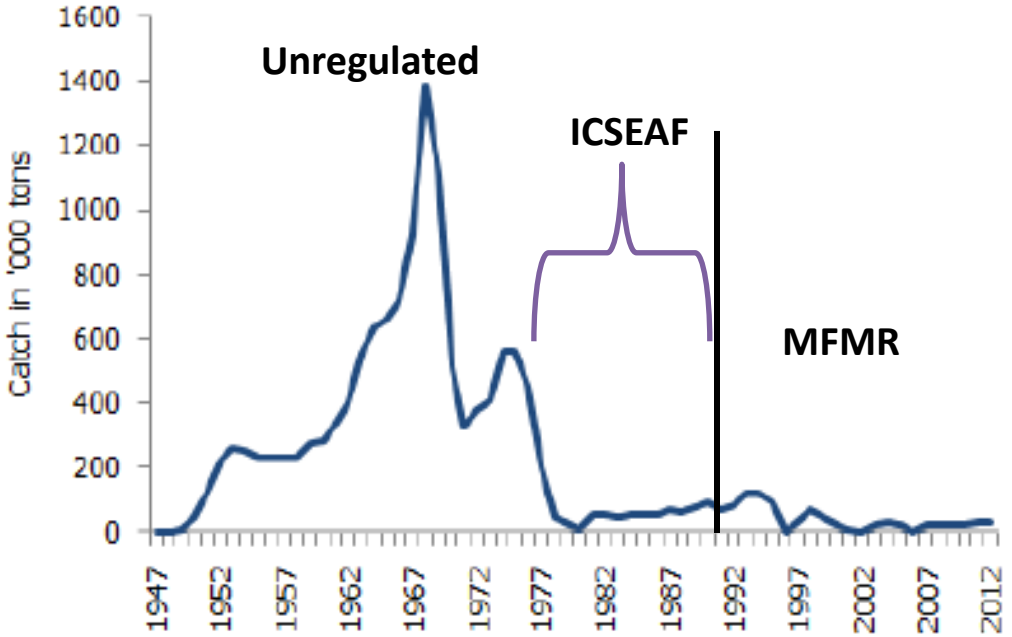
⇨ Isotope Stable Analysis using otolith

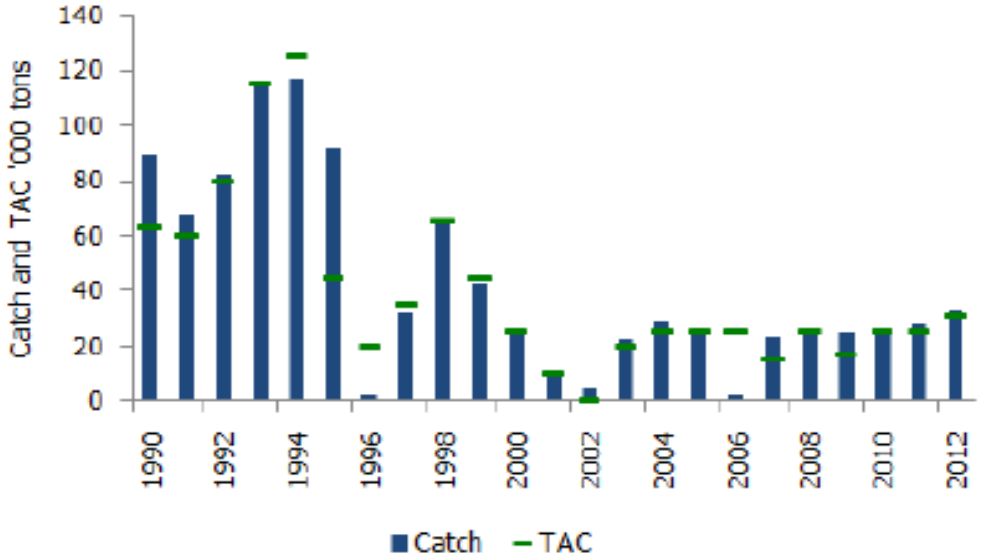




Source: www.seos-project.eu/

Sardine collapse in Namibia: Why has sardine not recovered in Namibia?





Kirchner et al, 2012. State of the Stocks Review Report No. 2

Compare with South African sardine otolith and temperature data

Senegalese Case Study: Evaluate sardinella data and otoliths

Investigate the relationship wrt growth between Cape horse mackerel sardine and the environmental changes

Methods

1. Biochronologies determination:

- 25 Sliced Cape horse mackerel and sardine whole otoliths for every/2nd year
- Measure annual increments

2. Stable isotope analysis:

- Approx. 300 dry otoliths from < 2 years old sardine and Cape horse mackerel respectively caught during (1967 – 2018)
- The homogenized material to be prepared using Grønkjær et al. (2013) method.
- Available muscle and stomach content data of sardine and Cape horse mackerel and their respective prey are to be used for comparison with the otolith SOM.
- The SIA will be carried out by continuous flow isotope ratio mass spectrometry at a relevant laboratory.

Otolith Chronology:

De-trending – mixed effects model

Morrongiello & Thresher (2015). Ecol. Monogr. 85(1): 93-115

Log(Inc) ~ Log(Age)*Sex + Log(AAC) + Log(Age) | FishID + 1 | Year + Cohort

Institute	Fish Species	Years
National Marine Fisheries Research Institute, Poland	Sardine caught in the Benguela	1975 1976
National Marine Fisheries Research Institute, Poland	Sardinella caught in Senegal	1972 – 1980 1980
National Marine Fisheries Research Institute, Poland	Cape horse mackerel caught in Benguela	1967-1978 1973 1976 1977 1978 1981 1983 1984
Ministry of Fisheries and Marine Resources, Namibia	Sardine	1990 - 2018
Ministry of Fisheries and Marine Resources (MFMR), Namibia	Cape horse mackerel	1990 - 2018
South African Department of Agriculture, Forestry and Fisheries (DAFF), South Africa	Sardine	1987 - 2018

Data Analysis e.g. Smoliński & Mirny 2017. Ecological Indicators 79: 286–294

Biochronology of European flounder (*Platichthys flesus*) 1942 – 2016: showing alterations in growth (change point analysis) 1982, 1993 and 2006 = regime shifts