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## The Seychelles sea cucumber fishery

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# Regional thematic school on the Vulnerability of Reef heritage DIDEM program

## The Seychelles sea cucumber fishery

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June 10, 2024 – Blue Economy Research University of Seychelles



# Overview

Introduction: heritage & common pool resources

Case study :  
The history of the sea cucumber fishery in the Seychelles

The SeacuSey research project

The current status of the fishery & future research activities

Q & A

# Introduction: heritage in fisheries and common pool resources

Marine resources as natural capital shall yield maximum (individual) economic output

Natural heritage assumes long-term conservation strategy for future generations and social cultural values

The role of stakeholders and the State

Co-management supports collective stewardship and fishery sustainability

Research may strengthen co-management process and the heritage value of marine resources, including through international institutions (eg, CITES Appendix II)

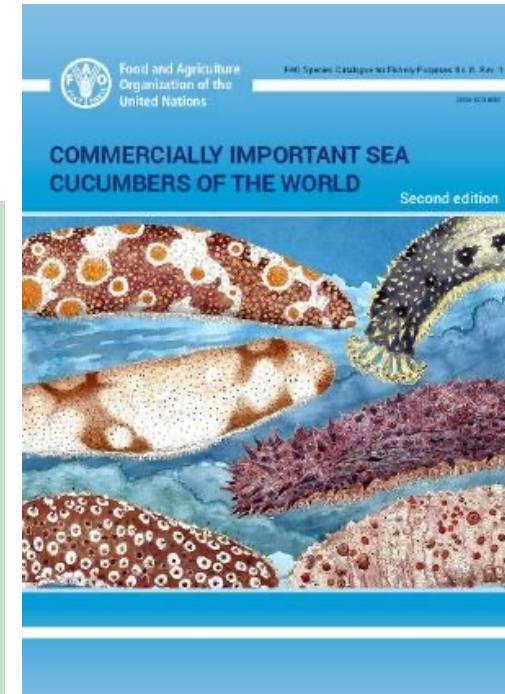
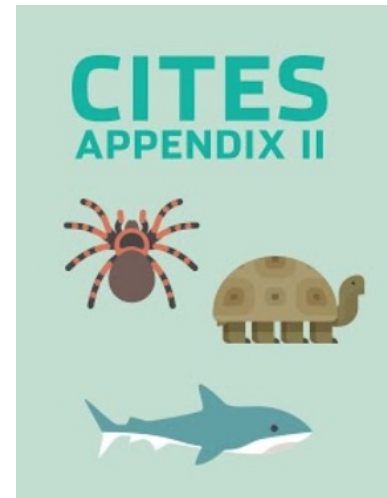
Léopold M., Thébaud O., Charles A. (2019). The dynamics of institutional innovation: crafting co-management in small-scale fisheries through action research. *Journal of Environmental Management* 237:187-199.

<https://doi.org/10.1016/j.jenvman.2019.01.112>

*Holothuria nobilis* (2022) including *Holothuria (Microthele)* sp. “pentard”

*Holothuria fuscogilva* (2022)

*Thelenota ananas* (2024)



# A case study: The history of the Seychelles sea cucumber fishery

- Sea cucumber fisheries date back to the 1800s- remained small-scale until the late 1990s
- Rapid increases in catches observed following booming demand on Asian markets
- Led to an evolution of harvesting from foot in shallow waters to the use of SCUBA in deeper areas
- Signs of declines led to SFA introducing precautionary management measures in 1999
  - ✓ Issuing of fishing & processing licenses
  - ✓ Limit to 4 divers per licensee
- Insufficient measures & lack of catch data led to a temporary closure in 2001



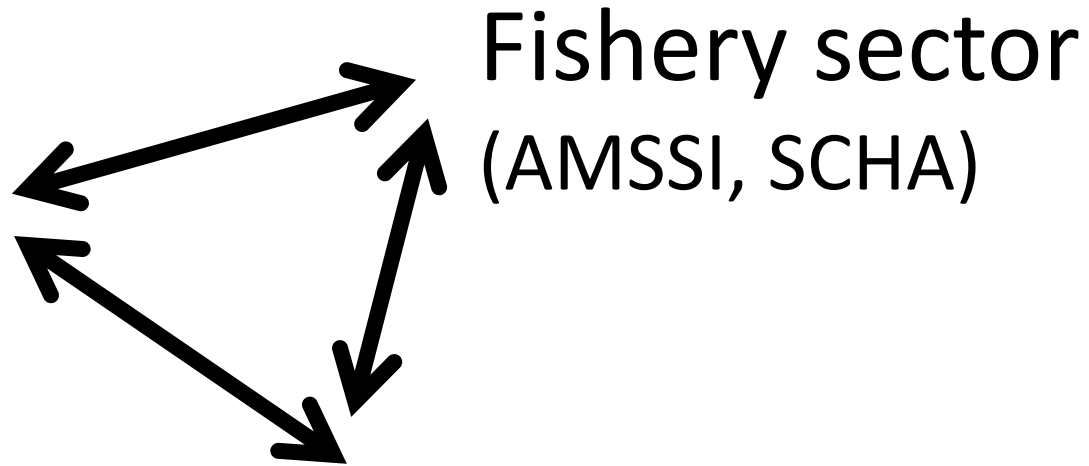
# A case study: The history of the Seychelles sea cucumber fishery

- **2001**- the fishery was reopened with further management measures
  - Fishing licenses capped at 25
  - Logbook and receipt books issued to fishers and processors
  - Mandatory catch reports submitted to SFA on a monthly basis
- **2005**- the SFA carried out a first independent stock assessment on the local sea cucumber population
  - Revealed that some species were overfished (e.g. sandfish and yellowsurf)
  - Some were under exploited (e.g. black teatfish)
  - Recommendation: introduction of a Total Allowable Catch (TAC)
    - Heavily debated by stakeholders
    - Result: not adopted
- **2012**- Dependent stock assessment carried out by MRAG based on CPUE data from logbooks
  - Recommendations:
    - reiterated the TAC suggested in 2005
    - Enhance the quality of data for more comprehensive stock assessment
    - Introduction of minimum landing weight for certain species
      - SFA & stakeholders to review management plan in 3 years
- **2013**- Setting up of the Management Advisory Committee (MAC)
- **2017**- Dependent stock assessment carried out by MRAG
  - Revealed significant decline of one particular species (i.e. black teatfish)
  - Recommendations:
    - Reduce fishing season from 9 to 8 months
    - Define TAC & quota allocation
    - Only 3 species permitted to be harvested



# The SeacuSey project (2017-2019): A collaborative research initiative

<https://umr-entropie.ird.nc/index.php/portfolio/projets-termine/projet-seacusey>



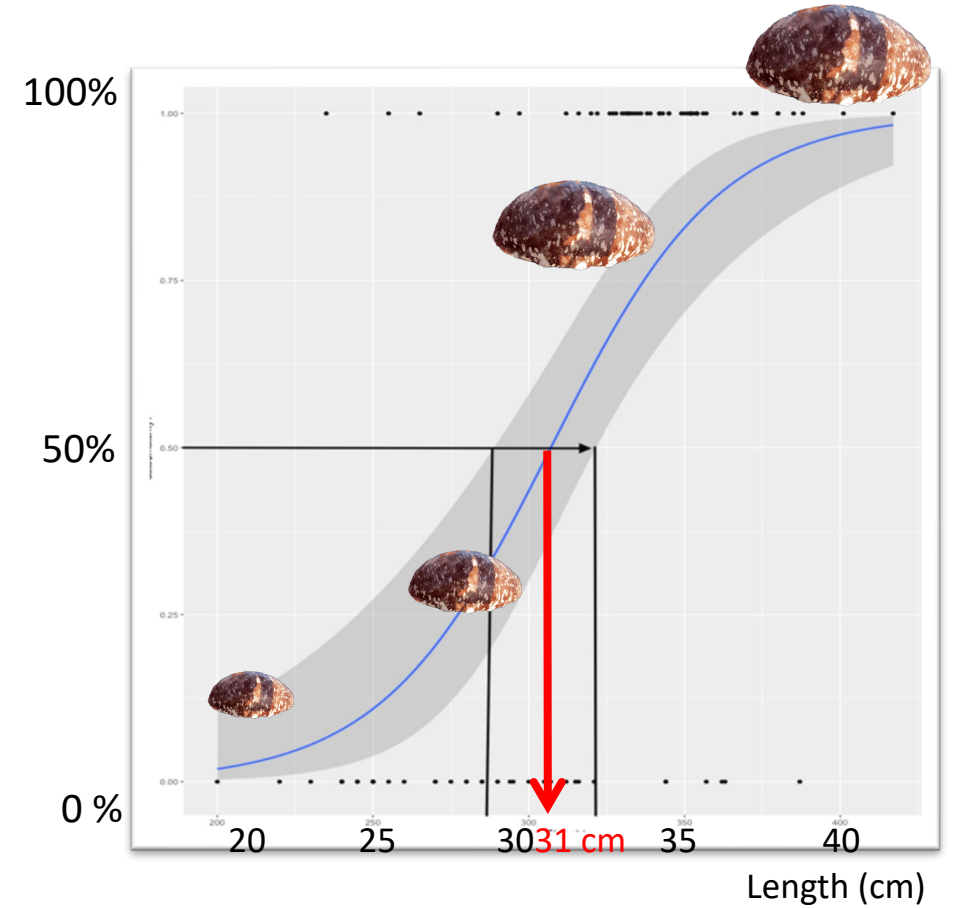
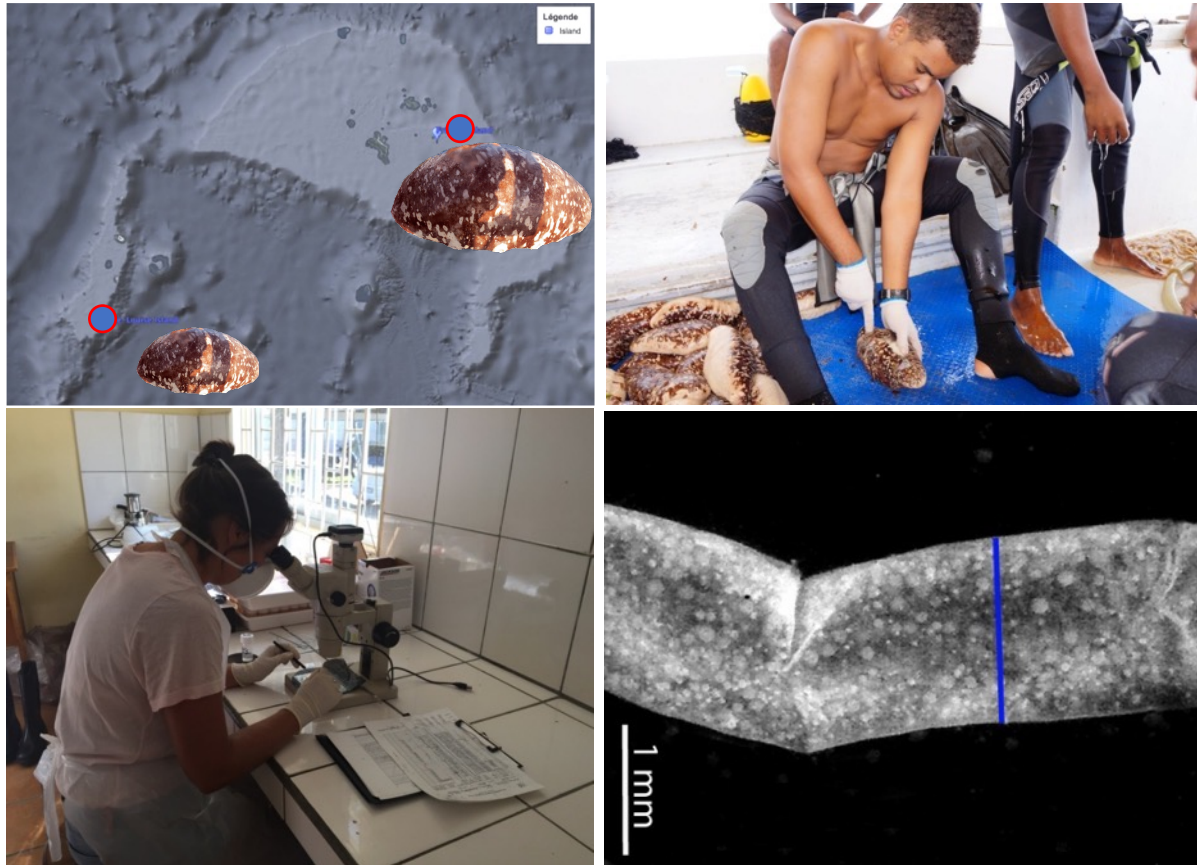
Objective: To improve the sustainability of *socioeconomic benefits*...

... by providing better *ecological knowledge* to inform co-management decisions

# The SeacuSey project: a collaborative research initiative

## 1. Size at maturity of « pentard »

Participatory sampling (n=92)



→ Minimum catch size / weight?

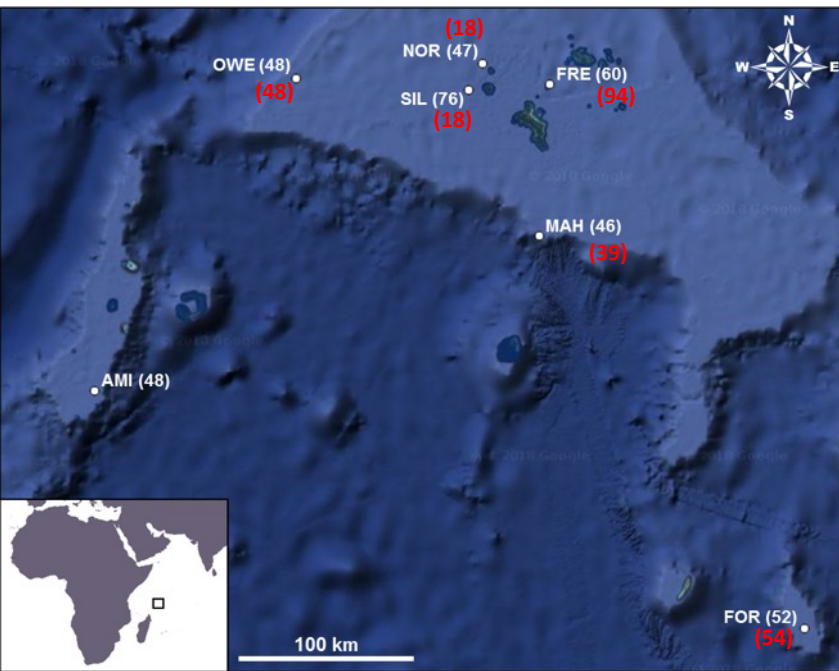


# The SeacuSey project: a collaborative research initiative

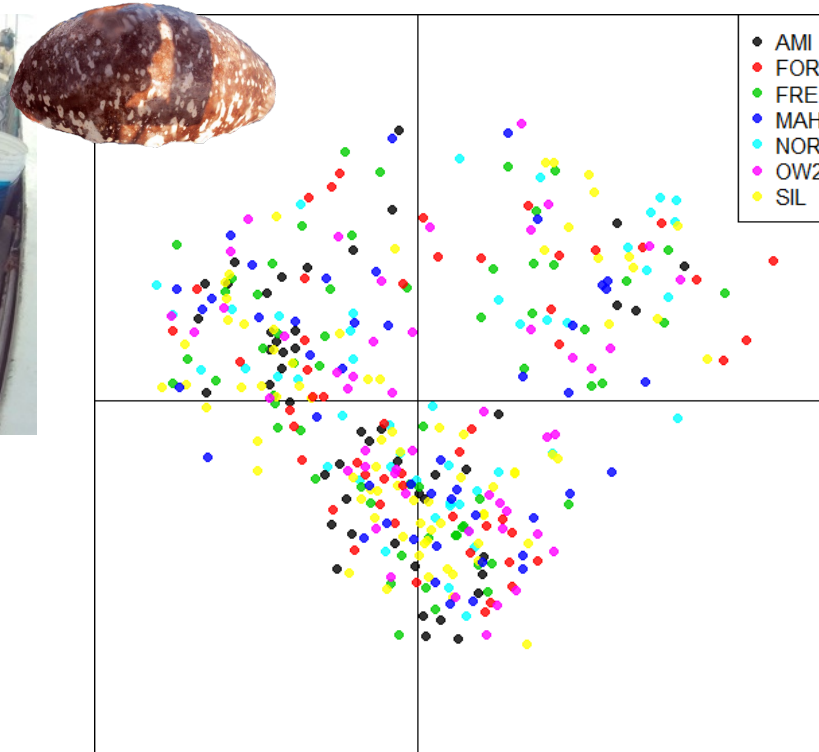
## 2. Genetic structure



Participatory sampling

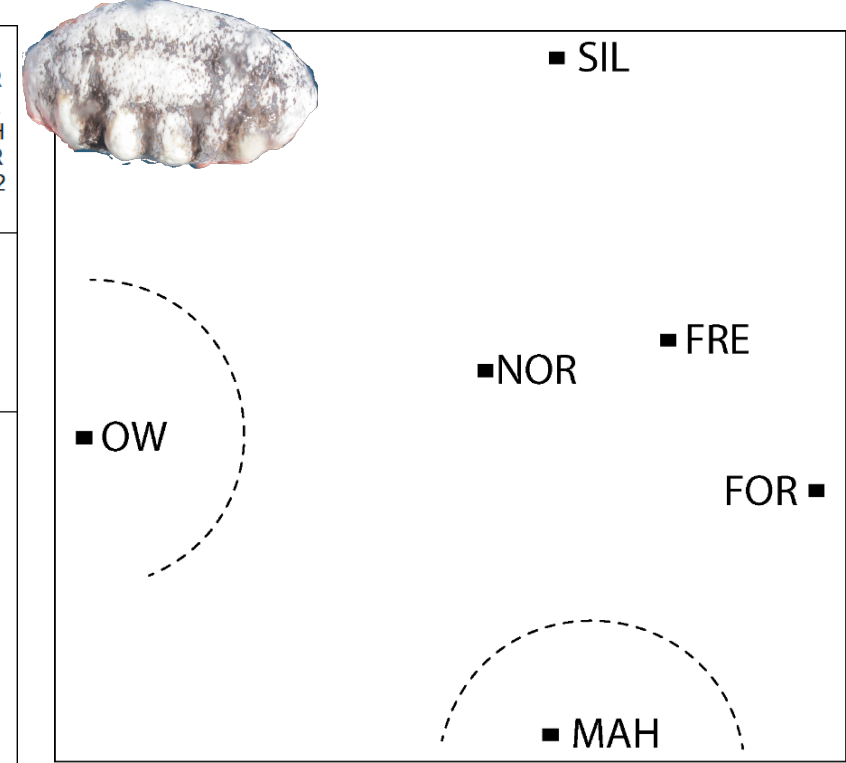


**Pentard** (377 samples)



All sampled populations are **strongly connected**

**White teatfish** (271 samples)



Owen and Mahé populations show **limited connectivity** (due to low abundance ?)

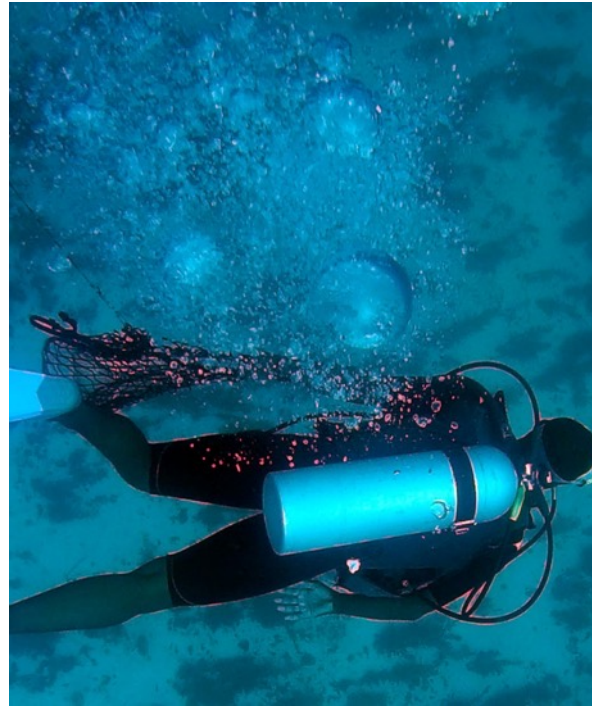
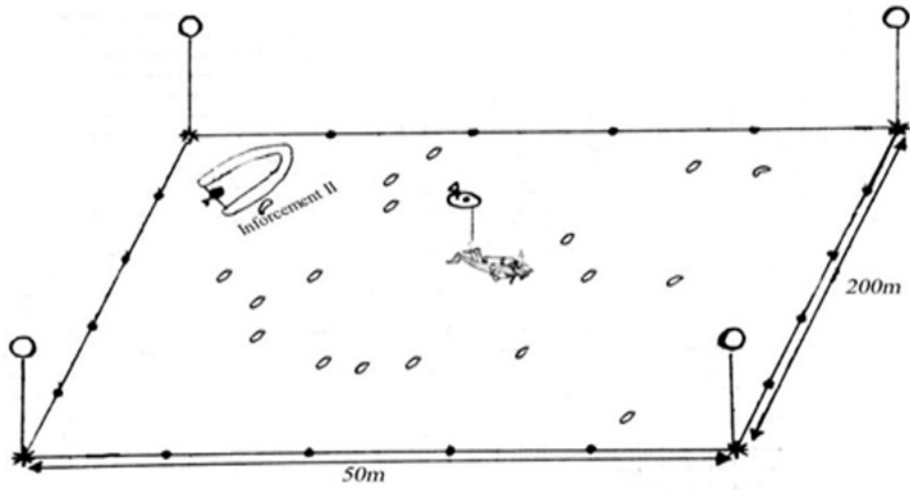
Oury N., Léopold M., Magalon H. (2019) Isolation and characterization of microsatellite loci from three widespread tropical sea cucumbers of the genus *Holothuria* (Echinodermata, Holothuroidea), and cross-amplification among them. *Molecular Biology Reports* 3501-3510.

Oury N., Léopold M., Magalon H. (2019) Isolation and characterization of 42 microsatellite loci from the prickly redfish *Thelenota ananas* (Echinodermata, Stichopodidae). *Molecular Biology Reports* 5569-5574

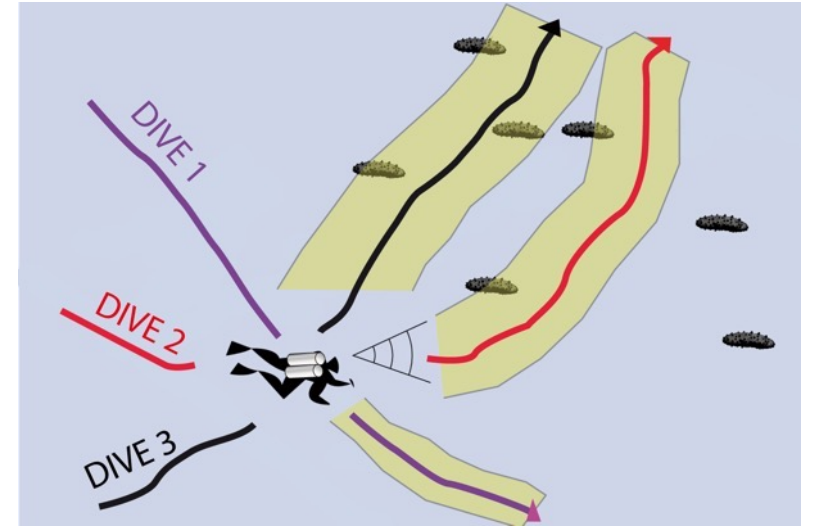
# The SeacuSey project: a collaborative research initiative

## 3. Fishery-dependent abundance data (CPUE)

Step 1 : Participatory experimental fishing



1 boat, 3 divers, 106 sea cucumbers



- Catch per dive depends on:
- sea cucumber density
  - underwater visibility
  - dive time

# The SeacuSey project: a collaborative research initiative

## 3. Experimental and *in situ* surveys for reliable fishery-dependent abundance data (CPUE)

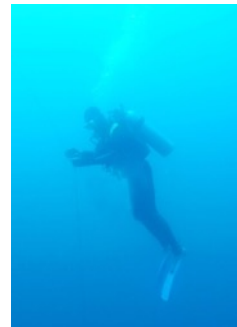
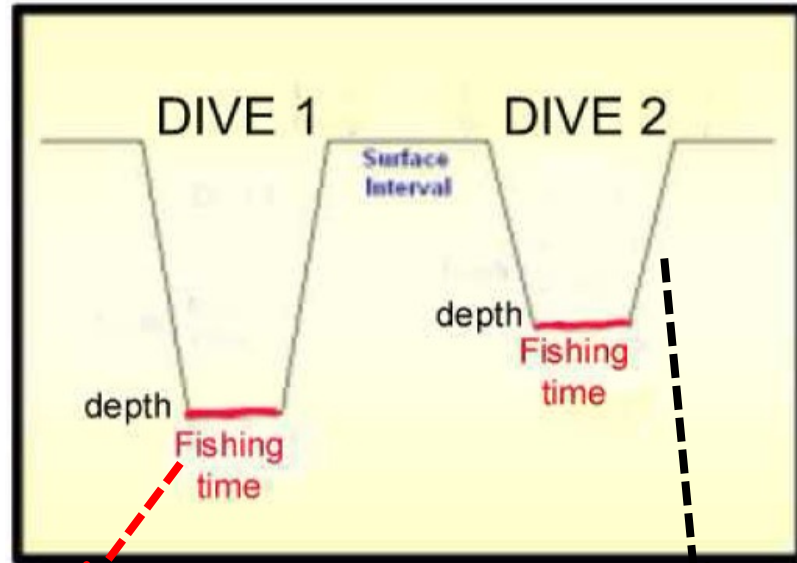
### Step 2: Participatory diving monitoring



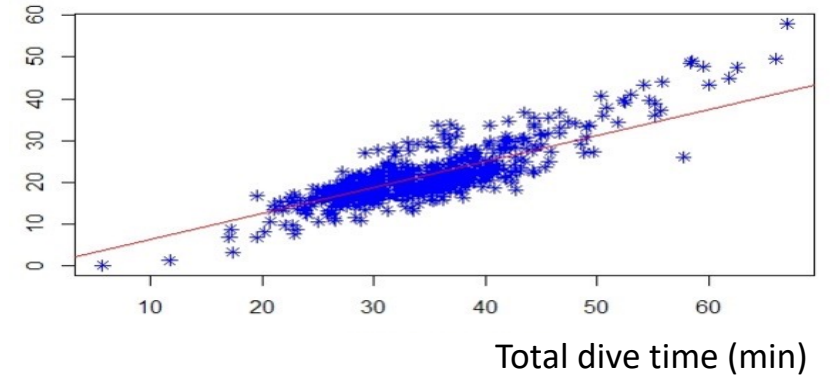
Depth logger



3 boats, 6 divers, 609 dives



Effective fishing time (min)



- Small difference across divers
- Skippers should declare total dive time at higher accuracy in their logbook

# The SeacuSey project: a collaborative research initiative

## 3. Experimental and *in situ* surveys for reliable fishery-dependent abundance data (CPUE)

### Step 3: Trial of a fishing app for participatory data collection



seacusey-prop1

Name  
Marc

Diver

Fishing date  
05 nov. 2017 09:58

GPS Location  
-23.3597583 43.6869128 -18.0 5.0

Species collected

Depth

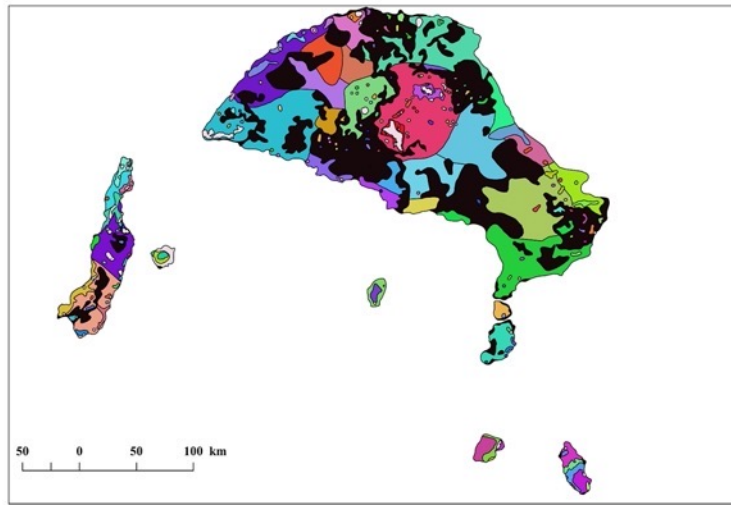
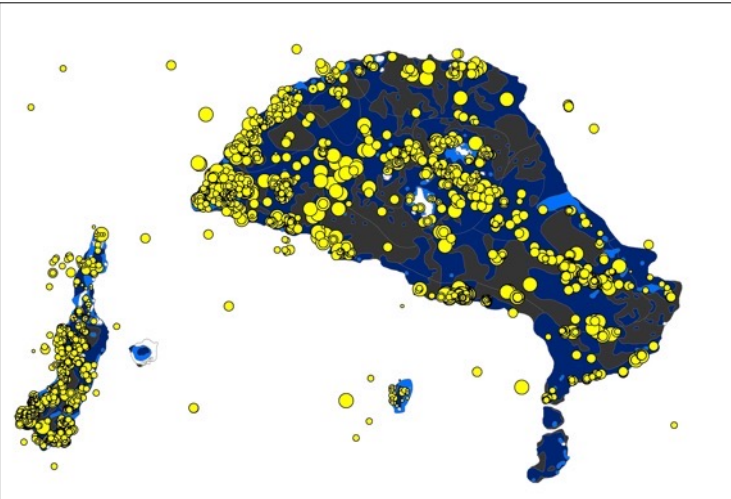
Visibility

Current type

Dive duration  
02:00

Observations/ comments

Monter Aller au début Aller à la fin



Online fishery information system at SFA



Geomorphological areas (depth and substrate)

# The SeacuSey project: a collaborative research initiative

## 4. National workshop for awareness, comments, and perspectives

Sea cucumber stock under the microscope

14-September-2018



The workshop in progress



Conand C., Claereboudt M., Dissayanake C., Ebrahim A., Fernando S., Godvinden R., Lavitra T., Léopold M., Mmbaga T.K., Mulochau T., Naaem S., Shea S., Vaitilingon D., Yahya S., Friedman K. (2022) Review of fisheries and management of sea cucumbers in the Indian Ocean. WIO Journal of Marine Science 21 (1) : 125-148

# Current status of the fishery & Future research initiatives

## Challenges and need for new survey

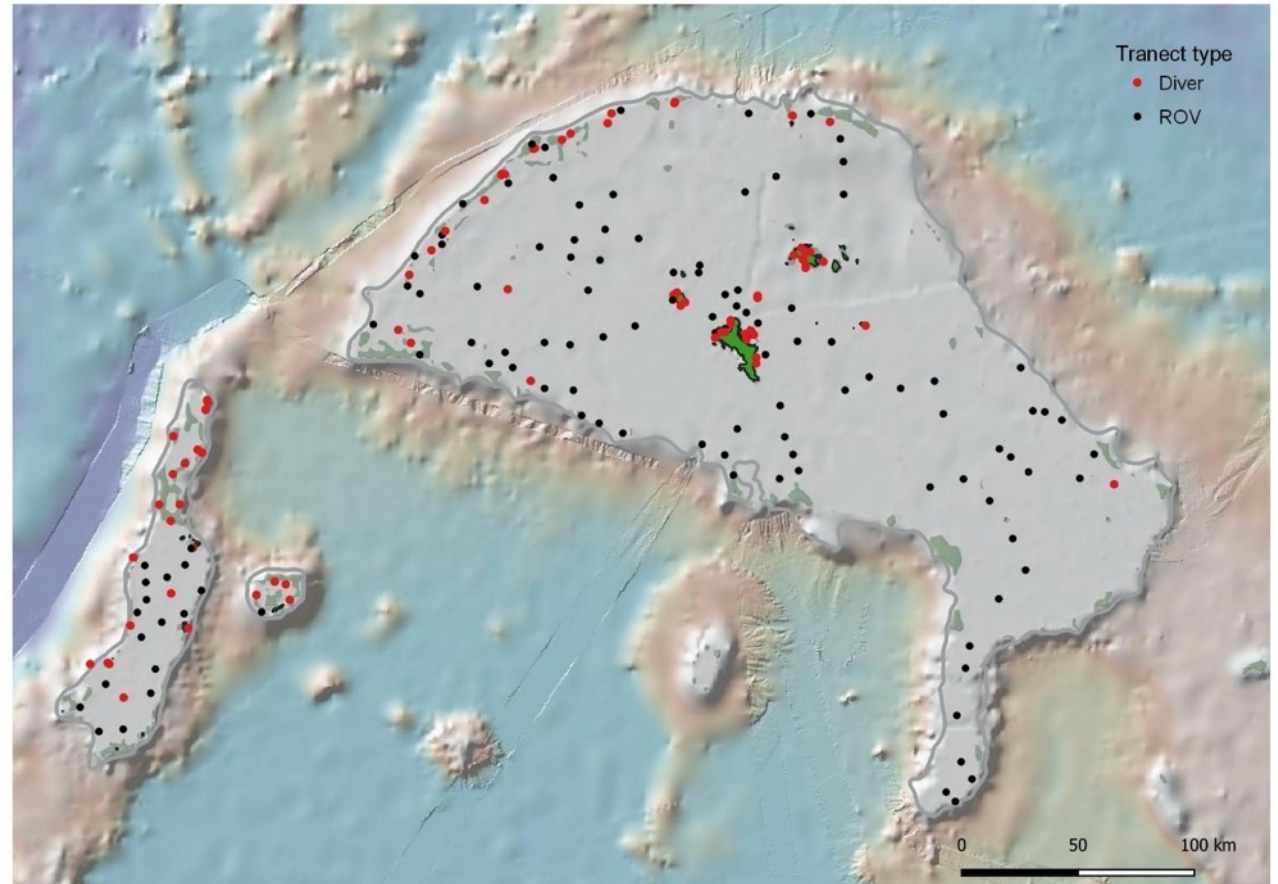
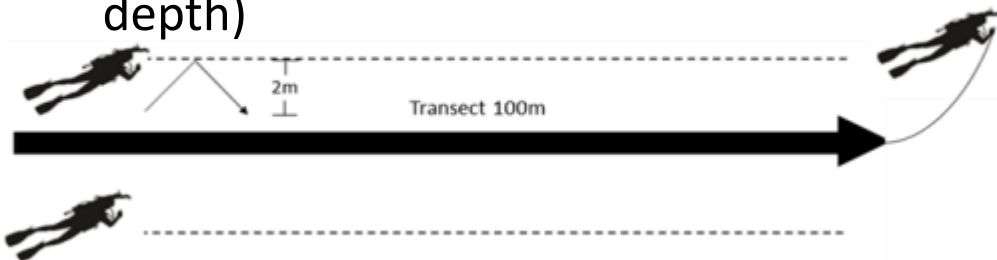
- Challenges in data collection – position recording, literacy of some skippers
- Fisheries Comprehensive Plan (November 2019)
  - Commission a study to assess stock status
  - Consider new management measures based on study
- Last fishery independent assessment undertaken in 2004
- Clear need for new study to assess the status of sea cucumber stocks
- Important to minimise impact of the study on the livelihood of stakeholders
- Co-management approach – **Stakeholder participation key for success**



# Current status of the fishery & Future research initiatives

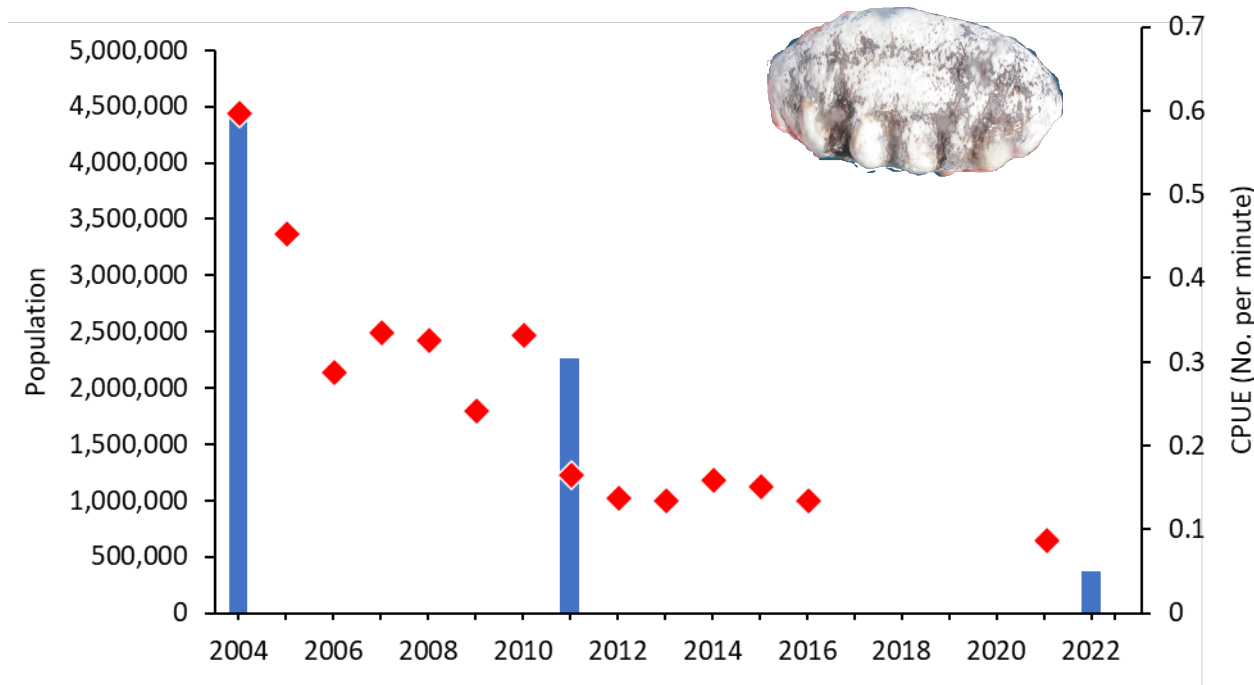
## New study – Survey sites and methodology

- 2021 recruited consultant for technical assistance – survey design and analysis
- Repeated measures – using sites from 2004
- Mahe Plateau & Amirantes Bank
- 206 sites
- 182 sites were repeated from 2004
- Two types of surveys
  - Underwater Visual Census (UVC) (<30m depth)
  - Remotely Operated Vehicle (ROV) (>30m depth)

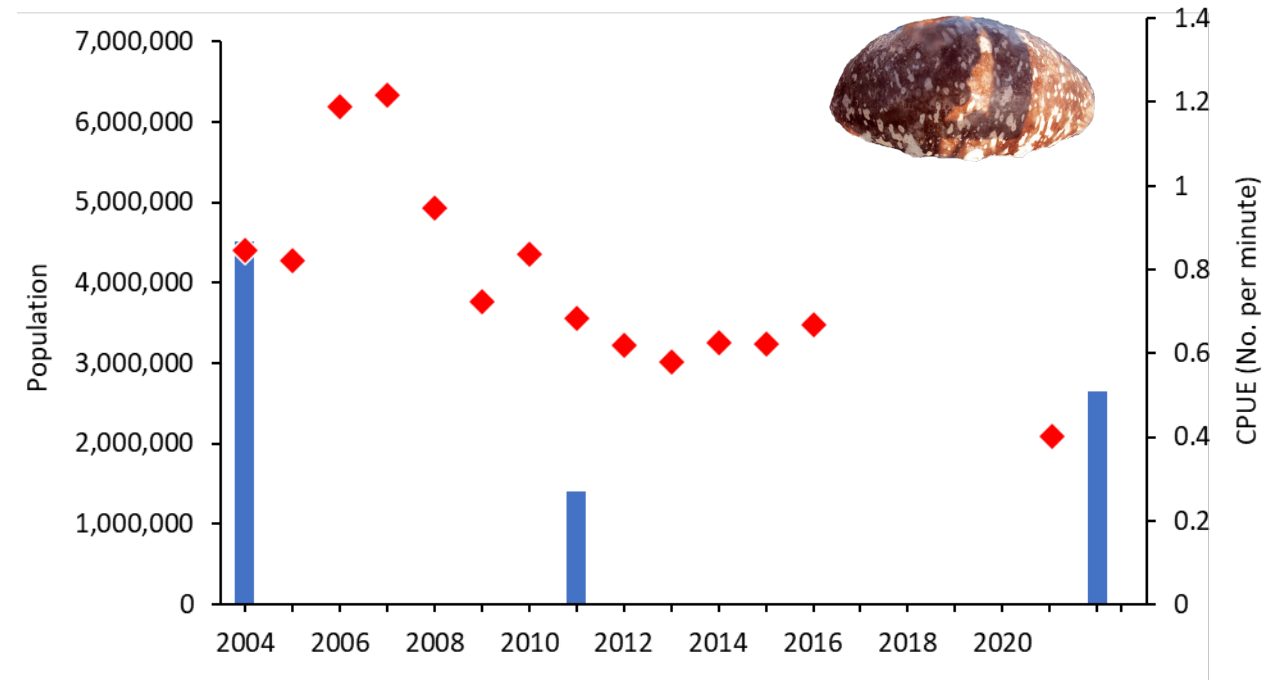


# Current status of the fishery & Future research initiatives

## New study – Survey results



- Decline from 4.5M to 400k
- Steady decline in CPUE
- Heavily depleted

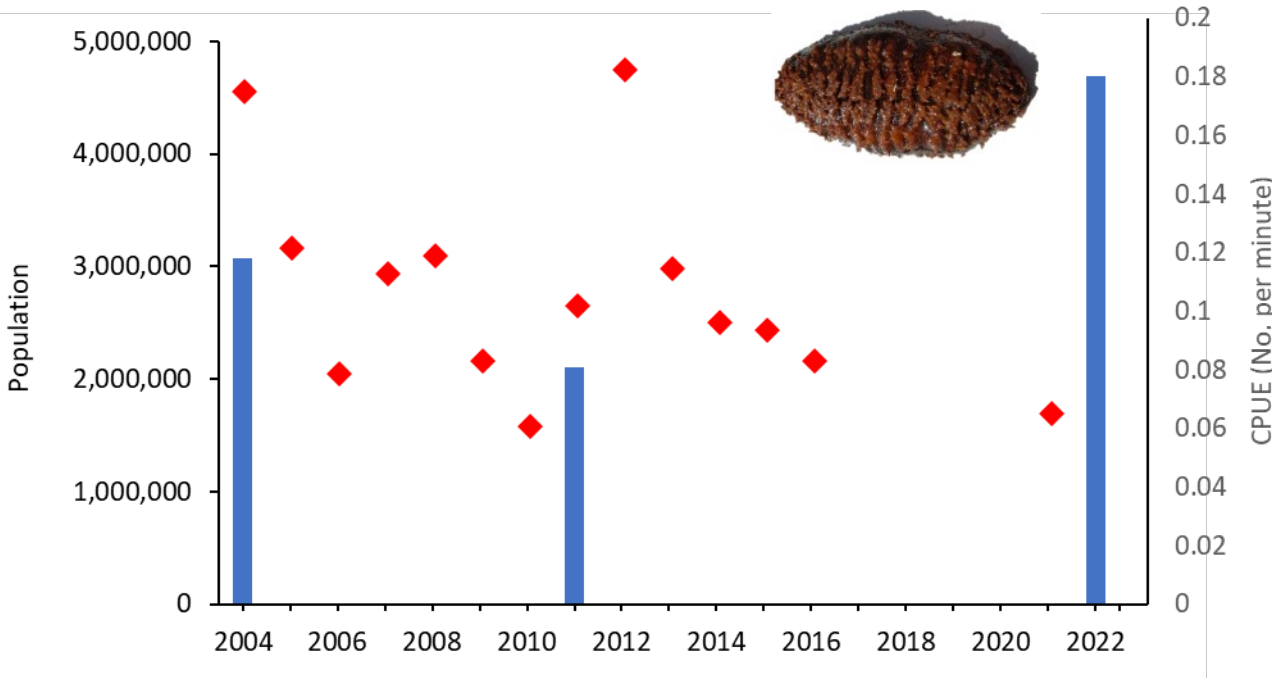


- Slight decline from 4.5M to 2.7M
- Declining trend in CPUE – less steep
- More resilient to fishing pressure
- Overexploited

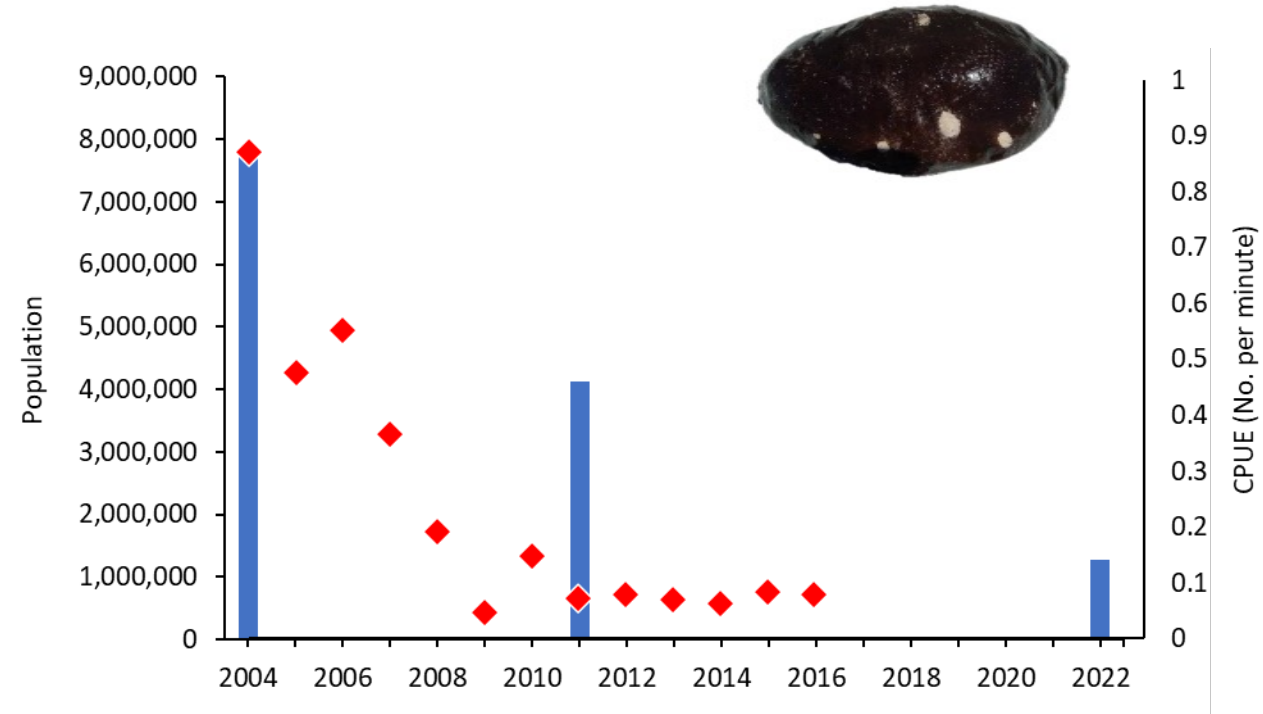


# Current status of the fishery & Future research initiatives

## New study – Survey results



- Increase from 3M to 4.7M
- Highly variable CPUE – probably reflecting the variable targeting of this species
- Relatively healthy population
- Uncertain but likely under-exploited



- Decrease from 8M to 1.3M
- Steep decline in CPUE
- Depleted

# Current status of the fishery & Future research initiatives

## New study – Recommendations and management measures

- Series of recommendations from the study
- Reviewed and discussed by the Stakeholders
- Measures endorsed and agreed by Management Advisory Committee (MAC)
  - Closure of white teatfish
  - Reduction of flower teatfish quota by 5% (11,250 pieces to 9,619 pieces)
  - Increase in quota of prickly redfish by 20% (1500 pieces to 1800 pieces)
  - Opening of Golden sandfish (4000 pieces)
- Measures implemented as of 2022-2023 fishing season

# Current status of the fishery & Future research initiatives

## Way forward and future research

- Development of Sea cucumber Fisheries Management Plan – Consultancy ongoing
- Adoption of Harvest Strategies
- Enhance stakeholder engagement – Fisher Associations, MAC
- Exploratory fishery – Joint Management Area (JMA)
- Fishery independent survey scheduled in 2025
- Fishery dependent stock assessments in 2026



Thank you!!

