Genetic population structure and connectivity of the big blue octopus, *Octopus cyanea* (Gray, 1849), in the Western Indian Ocean

Annelore H. M. Van Nieuwenhove, Hajaniaina Andrianavalonarivo Ratsimbazafy, Marc Kochzius

Marine Biology, Ecology & Biodiversity, Vrije Universiteit Brussel (VUB), Pleinlaan 2, 1050 Brussels, Belgium

INTRODUCTION

Figure 1: Artisanal octopus fishing in Madagascar
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- Traditional octopus fishing is economically very important for communities in the Western Indian Ocean (WIO) (Fig.1) **[1]**
- Increasing market demand for cephalopods worldwide **[2]**
- Growth of artisanal African octopus fisheries and drastically increasing exploitation rates of *Octopus cyanea* populations (Fig. 2) **[3]**
- Concern over sustainability **[3]**
- Networks of Marine Protected Areas (MPAs) are necessary
- Connectivity among populations through larval dispersal should be taken into account when designing MPAs **[4]**
- **This study**:
  → determining connectivity in WIO by using cytochrome C oxidase subunit 1 (COI) gene as marker

Research questions

1. Is a genetic break present between the populations of Madagascar and the African mainland?
2. Is there gene flow among populations along the coast of Madagascar?
3. Are the results comparable when using microsatellite markers?

Figure 2: *Octopus cyanea* (big blue octopus)
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MATERIALS AND METHODS

SAMPLING

→ Arm tips of 275 individuals
→ 15 sample sites in the WIO (Fig. 3)
→ samples were preserved in 95% ethanol

LAB PROCESSING

→ DNA extraction
→ Primer testing + establishing PCR protocol
→ PCR using COI marker
→ DNA sequencing

ANALYSIS OF DATA

→ Sequence editing (CHROMASPRO)
→ DNA barcoding
  →BLAST (Genbank)
  → Neighbor Joining Tree (MEGA 7)
→ Sequence alignment (Clustal W, MEGA 7)
→ Quality control (MEGA 7)
→ DNA collapsing (FABOX)
→ Further DNA analysis (Arlequin)

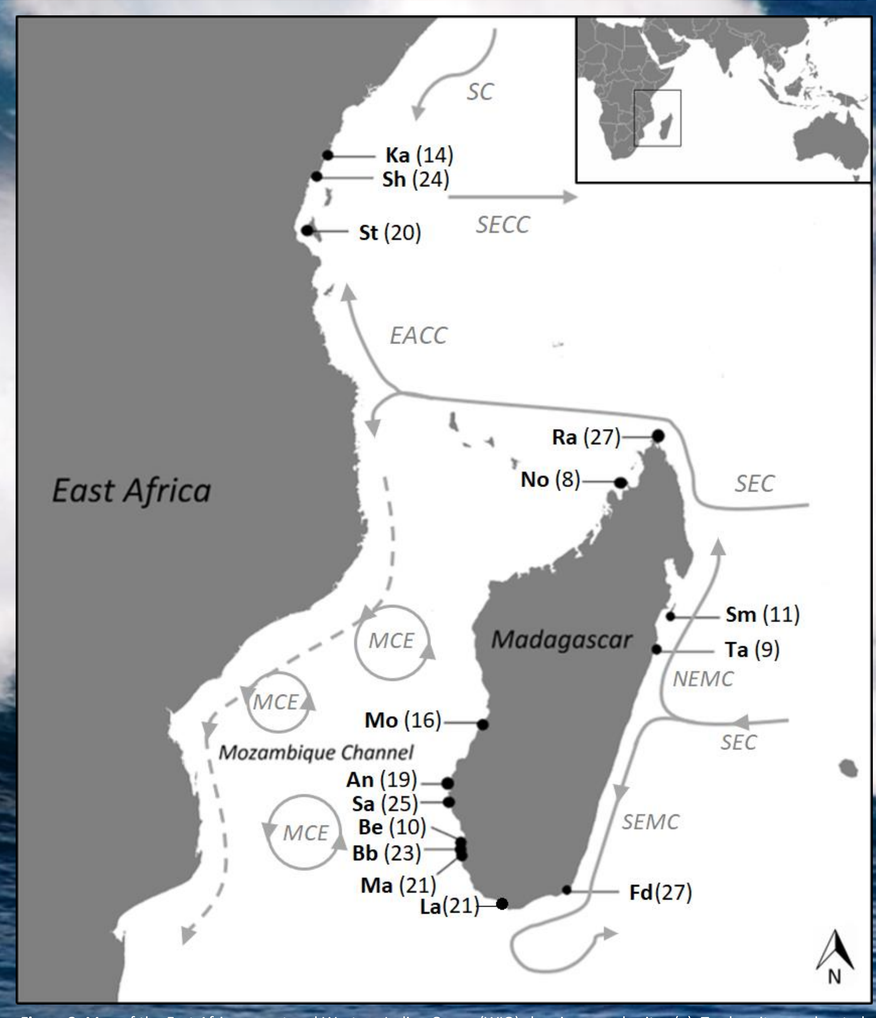

Figure 3: Map of the East African coast and Western Indian Ocean (WIO) showing sample sites (•). Twelve sites are located in Madagascar (Ramena (Ra), Nosy be (No), Morondava (Mo), Andavadoaka (An), Salary (Sa), Beheloke (Be), Besambay (Bb), Maromena (Ma), Lavanono (La), Fort Dauphin (Fd), Tamatave (Ta) and Sainte-Marie (Sm)), one in Tanzania (Stone Town (St)) and two in Kenya (Shimoni (Sh) and Kanamai (Ka)). Number of samples between brackets. Major ocean currents are indicated schematically. SC: Somali Current; SECC: South Equatorial Counter Current; EACC: East African Coast Current; NEMC: Northeast Madagascar Current; SEC: South Equatorial Current; SEMC: Southeast Madagascar Current; MCE: Mozambique Channel Eddies.

PRELIMINARY RESULTS

- ✓ Universal primers were selected and used for PCR **[5]**
  - Forward primer HCO2198 (5'-TAA ACT TCA GGG TGA CCA AAA AAT CA-3')
  - Reverse primer LCO1490 (5'-GGT CAA CAA ATC ATA AAG ATA TTG G-3')
- ✓ Succesfully established PCR protocol (Fig. 4)

Figure 4: gel electrophoresis results showing length of succesfully amplified DNA fragments.

- ✓ DNA barcoding (BLAST):
  - Only Lavanono (La) and Fort Dauphin (Fd) contained multiple species:
    - La (n = 21): 20 *O. vulgaris,* 1 *O. oliveri*
    - Fd (n = 27): 2 *O. cyanea*, 10 *O. vulgaris*, 9 *C. luteus* and 6 *C. orantus*
  - All other sites: 100 % *O. cyanea*

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- 229 samples *Octopus cyanea*
- 30 samples *Octopus vulgaris*
- 9 samples *Callistoctopus luteus*
- 6 samples *Calisstoctopus orantus*
- 1 sample *Octopus oliveri*

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Contact Information
Annelore H. M. Van Nieuwenhove
MSc Biology - Specialisation Ecology & Biodiversity
Marine Biology Research Group
Pleinlaan 2 - 1050 Brussels, Belgium
anvnieuw@vub.be