

Marine Fisheries Research Techniques and Application in Kenya



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RV Mtafiti Training
Workshop
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Introduction

The Kenya Economic Development Plan Vision 2030 recognises the **management and development** of the marine fishery sector to support the economic development goals

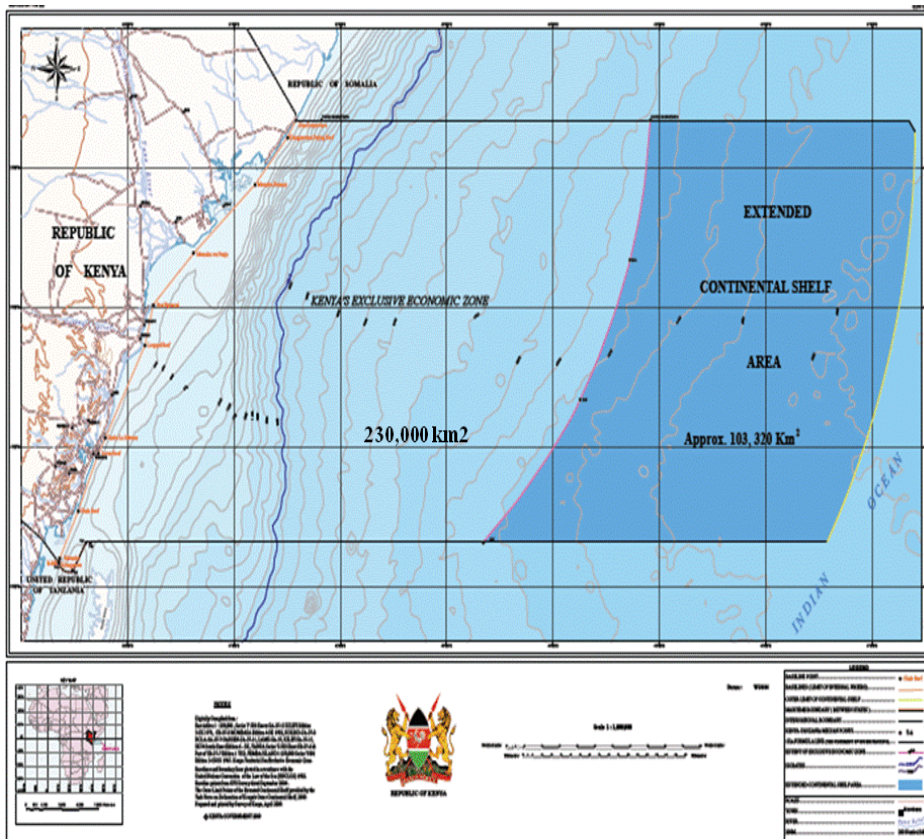
The second MTP of Vision 2030 (2013-2018) aims to:

- To increase fish production from capture and culture fisheries by 10% annually;
- To reduce postharvest losses from approximately 25% to 5% by 2017;
- **Development of the 200 mile EEZ for marine fisheries.**
- Implementing Agencies: NTD, FAO, MOEWNR, MOALF, CG

Outcomes

- Stock assessment & set reference points;
- Increased fish production from capture and culture fisheries;
- Reduced fish post harvest losses per annum;
- Increased exports of marine products.

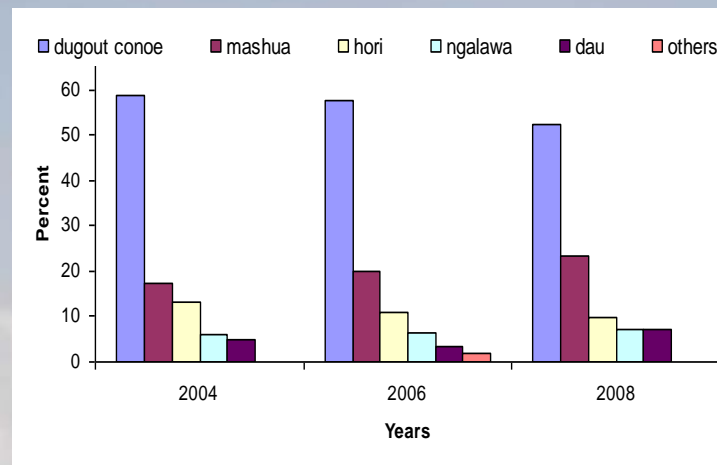
Kenya marine fisheries-Facts and Figures



- 600 Km coastline, 230,000Km Sq EEZ, and 100,320Km sq continental shelf. (UNCLOS)
- 6000-9000mt, worth Ksh. 776m of 4-10% national of fish landings
- Gross under-estimate, studies show actual catches may be 1.5 to double
- 80% of the marine catches are landed by artisanal fishers from the territorial waters

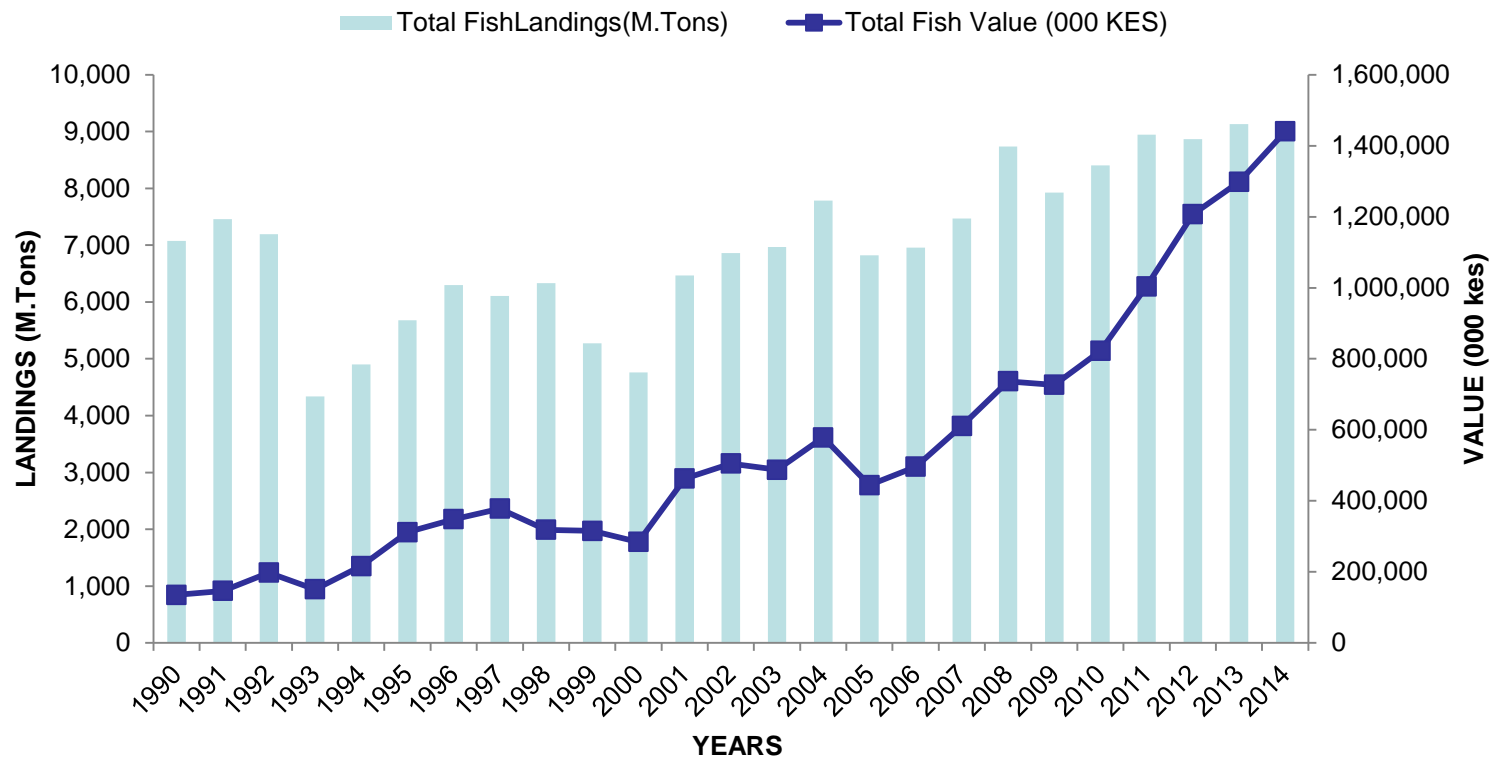
Artisanal fishing capacity: facts and figures

- approximately 10000 fishers, increasing by 15% annually
- approximately 2600 fishing vessels, and the increase is about 8% annually
- 8% of the vessels motorized by outboard engines



% Dugout decline slightly while % mashua increased slightly

Catches and value

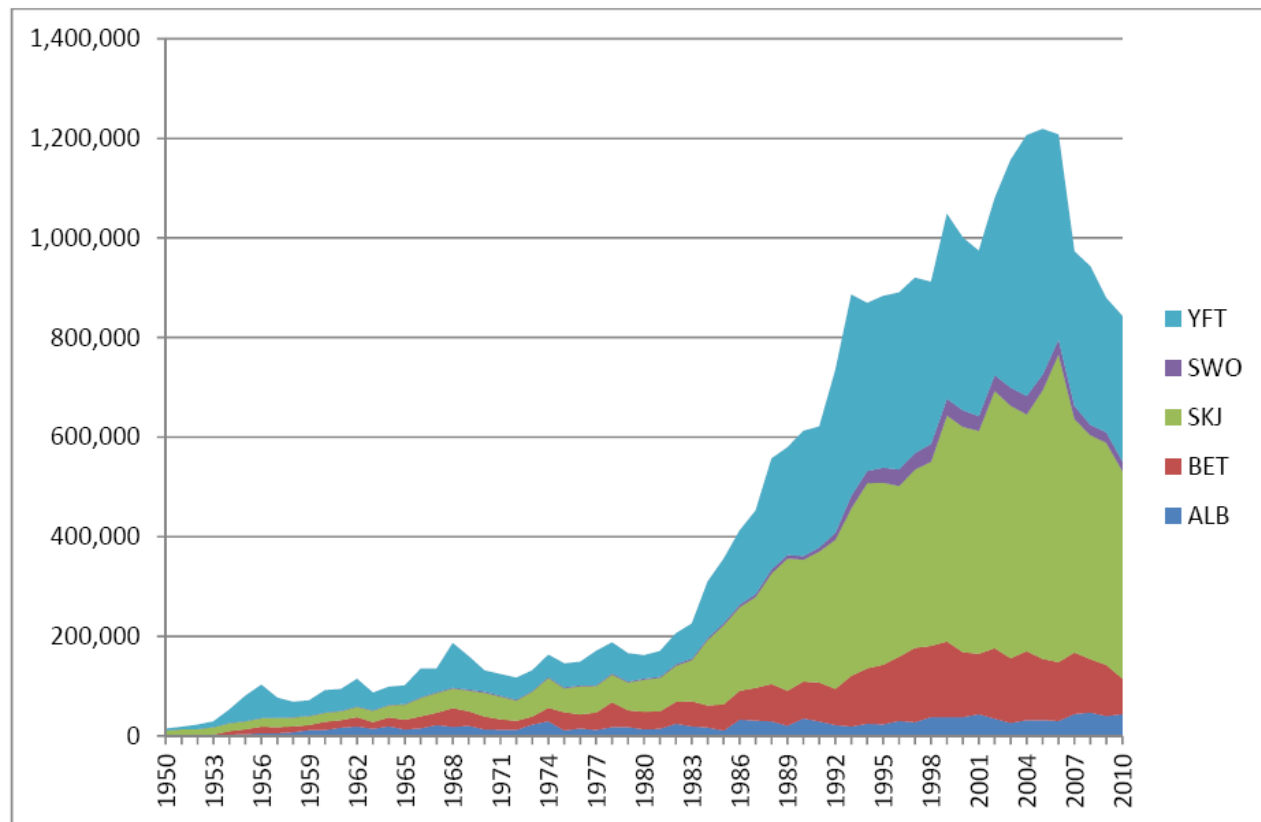


Indian Ocean tuna fisheries

- Indian Ocean produces about 900,000mt of tuna and other associated large pelagic species from international waters as well as national waters under bilateral agreements that give distant fishing nations (DFN) access to fish stocks within the EEZ
- Kenya licenses about 30 purse seiners (mainly from the EU) and up to 50 long liners (Far East) annually by paying for a fishing license (usd50,000) to access stocks in the EEZ
- Illegal Unregulated Unreported (IUU) contribute unknown additional fishing effort
- Catches dropped dramatically since the 1990s due to decline in stocks, economic considerations, and piracy



Tuna Catches 1950-2010 (IOTC data)

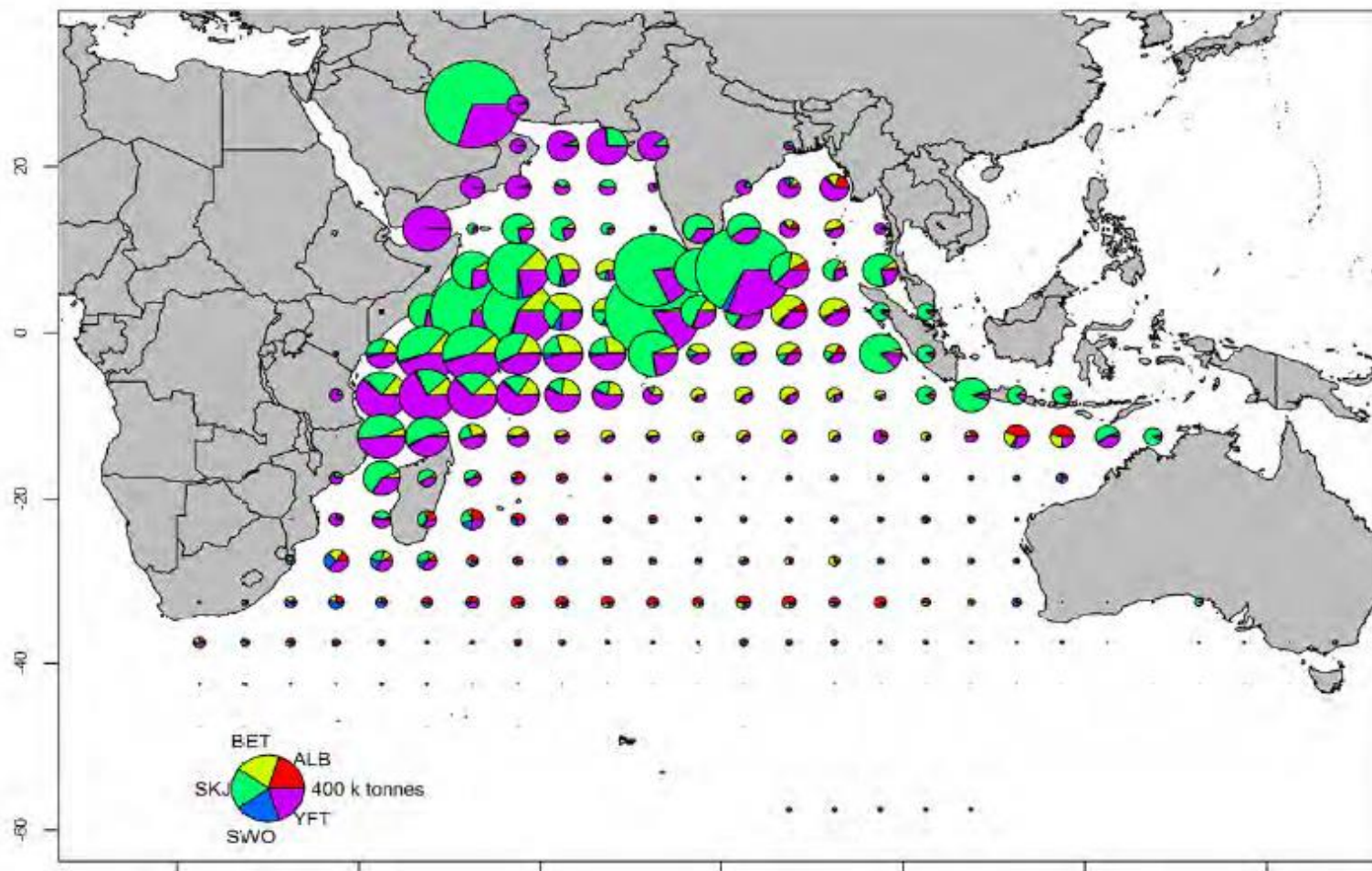


Units: Mt

YFT= Yellowfin; SWO=Swordfish; SKJ=Skipjack; BET=Bigeye; ALB=Albacore



Distribution of Indian Ocean Catches by Species



Time-area catches of tropical tunas, albacore and swordfish estimated by species during 2000-2009: Albacore (ALB, red); yellowfin tuna (YFT, purple); swordfish (SWO, dark blue); skipjack tuna (SKJ, bright green); bigeye tuna (BET, yellow).

Fishing licences issued by Kenya to Distant Water Fishing Nations

Number of licences	2010	2011	2012	2013	2014
France/Mayotte	13	13	12	13	7
Korea	0	0	1	2	3
Mauritius	0	0	0	0	0
Oman	0	0	0	0	1
Seychelles	8	8	7	7	4
Spain	12	13	14	14	14
Taiwan	0	0	0	0	2
Total	33	34	34	36	31

Challenges and intervention

Small scale fishery

- use basic fishing gear and vessels restricting the stocks and the area within the territorial and the EEZ that can be effectively exploited

Industrial fishery

- little reliable time and space information exist to determine catches and the **value** of fish from the EEZ for planning for development

Current interventions

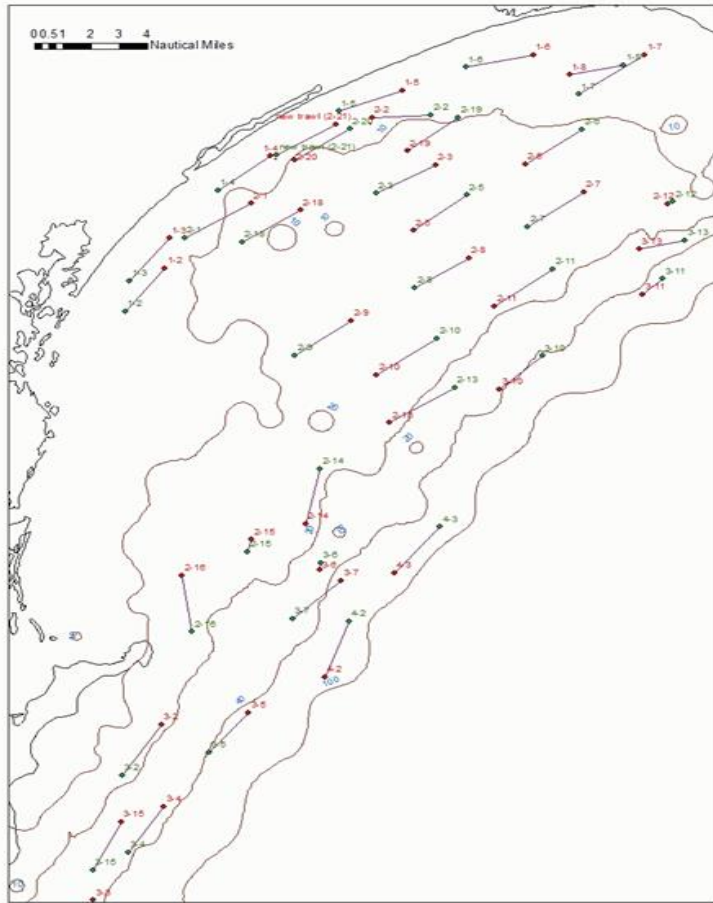
- Port state measures
- Indian Ocean tuna quarter allocation initiative
- Development of national fleet and land based facilities
- Development of Modern MSC facility

1. Shallow water prawn survey

The objectives of the survey were to:

- Determine the prawn biomass, species composition and distribution
- Identify and quantify the by-catch associated with prawn trawl fishery
- Determine the effect of Turtle Excluder Device on prawn catches as well as fish by-catch
- Provide samples for genetic and biological studies

Study area and methodology



Distribution of trawl in the Malindi-Ungwana bay

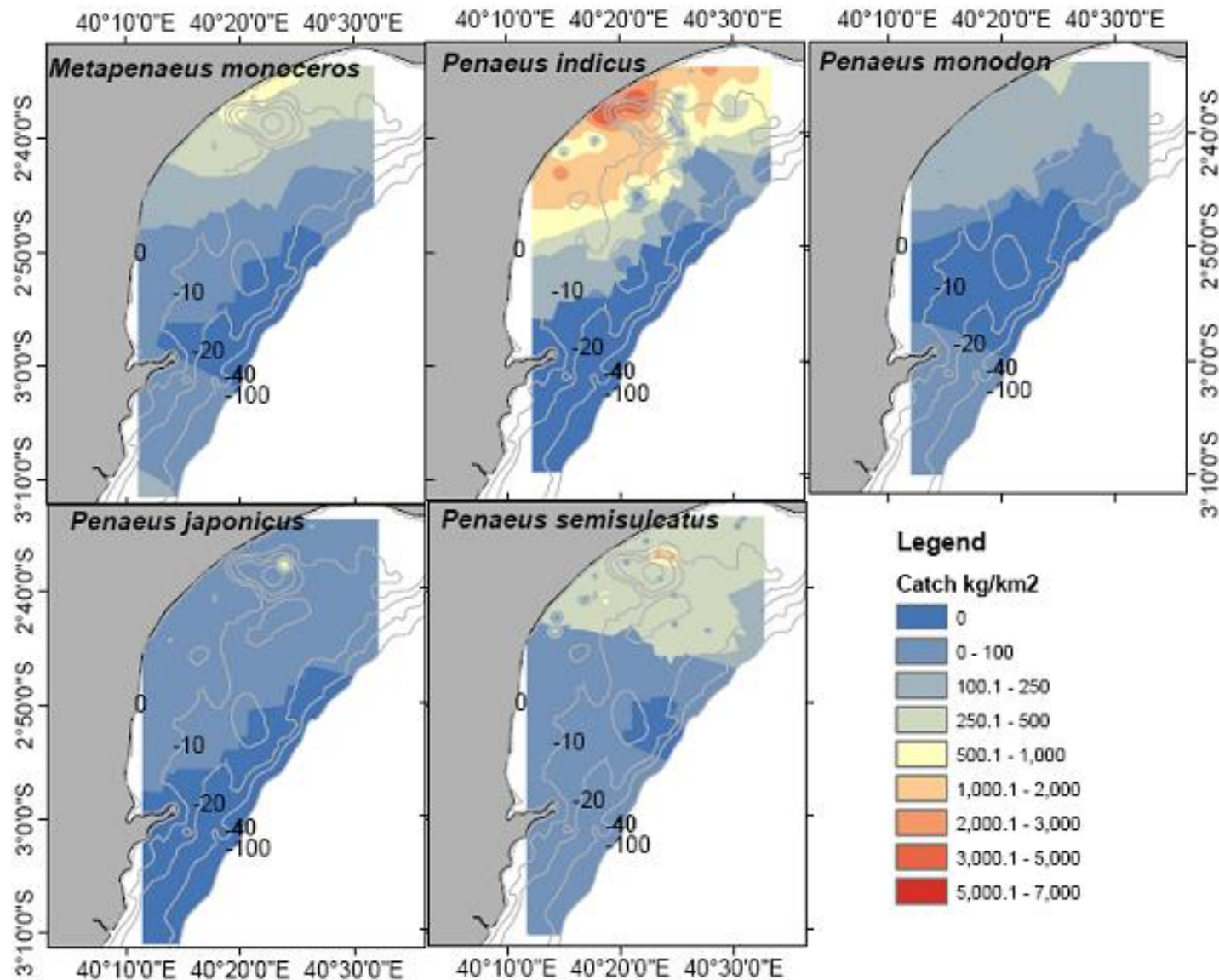
- Two surveys (NEM and SEM) done
- Depth stratified zones:
- Zone 1: 0-10m
- Zone 2: 10-20m
- Zone 3: 20-40M
- Zone 4: 40-100M
- Trawls for one hr



Prawn catches

Zone	Area (nm ²)	% of area < 100m	Mean kg/nm ²	Biomass	% of total Biomass
Zone 1	137.3	25.1	1156.8 ± 268.6	158,834	63.1
Zone 2	234.1	42.8	373.1 ± 175.6	87,358	34.7
Zone 3	136.3	24.9	40.4 ± 35.3	5,511	2.2
Zone 4	38.7	7.1	0	0	0
Total	546.4	100	433.1 ± 122.7	251,703	100

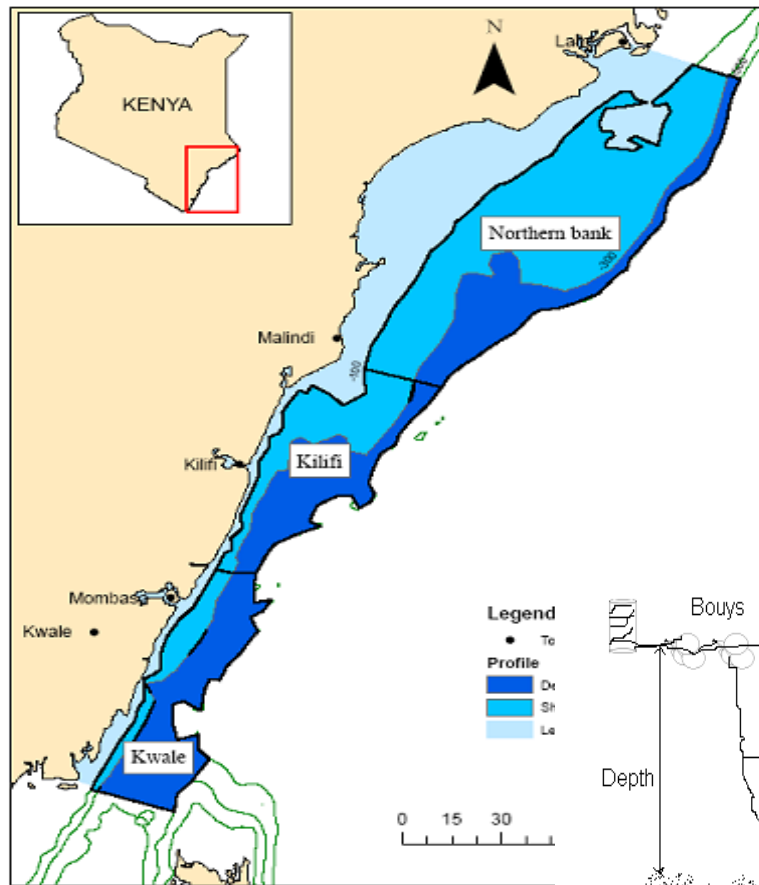
Distribution of prawn species



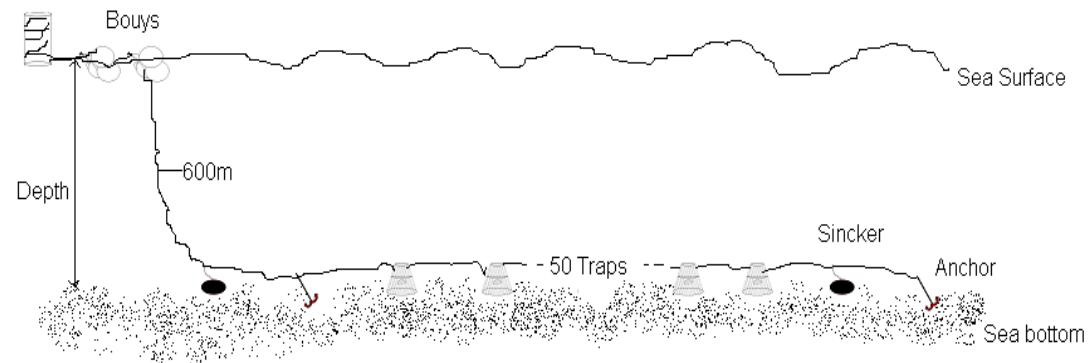
2. Deep water trap survey

- Determine the species composition and quantity (numbers and weight) of crustaceans captured in traps
- Determine the species composition and quantity (numbers and weight) of by-catch (fish, sharks, cephalopods, low value crustaceans) caught per long-line
- Collect biological samples per species (length, sex, and reproductive stage)
- Record standard environmental information before each set at the surface and sea bottom using the CTD

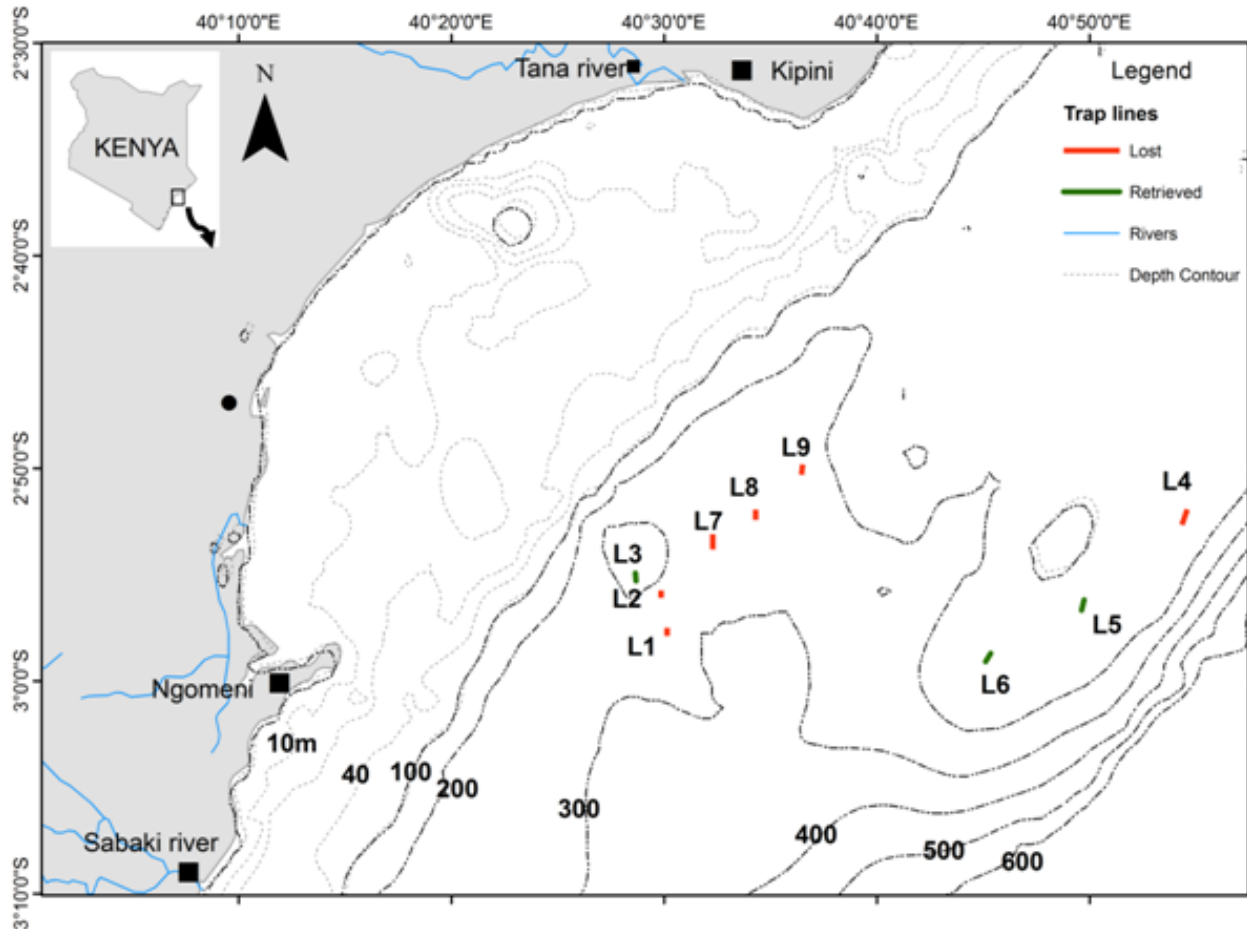
Study area and methodology



- 15 day survey between 1st and 15th of May, 2012 onboard MF Roberto
- 3 study areas and two depth strata (100-300m), 300-500m
- 9 longlines with 50 traps deployed in each strata and retrieved after 24hrs



Results



- Deployed 9 long lines
- retrieved 3 survey called off on the 9th day due to bad weather

Total catches

Sample type	Species Name	Number of samples	Total Weight (kg)	Avearge weight
Crab	<i>Chaceon macphersoni</i>	3	2.5	0.83
Shark	<i>Cephaloscyllium sufflans</i>	4	15.8	3.95
Shark	<i>Mustelus mosis</i>	1	90.2	90.20
Fish	<i>Polysteganus coeruleopunctatus</i>	7	12.8	1.83
Fish	<i>Siderea picta</i>	1	0.5	0.50
Shark	<i>Squalus megalops</i>	2	13.9	6.95
	Grand Total	18	135.7	

Observations

- Experimental deep water trap fishing on smaller scale targeting shallower (100-200m) rocky areas in the north Kenya banks may yield deep water fish and crabs
- Better traps as well as better navigation equipment

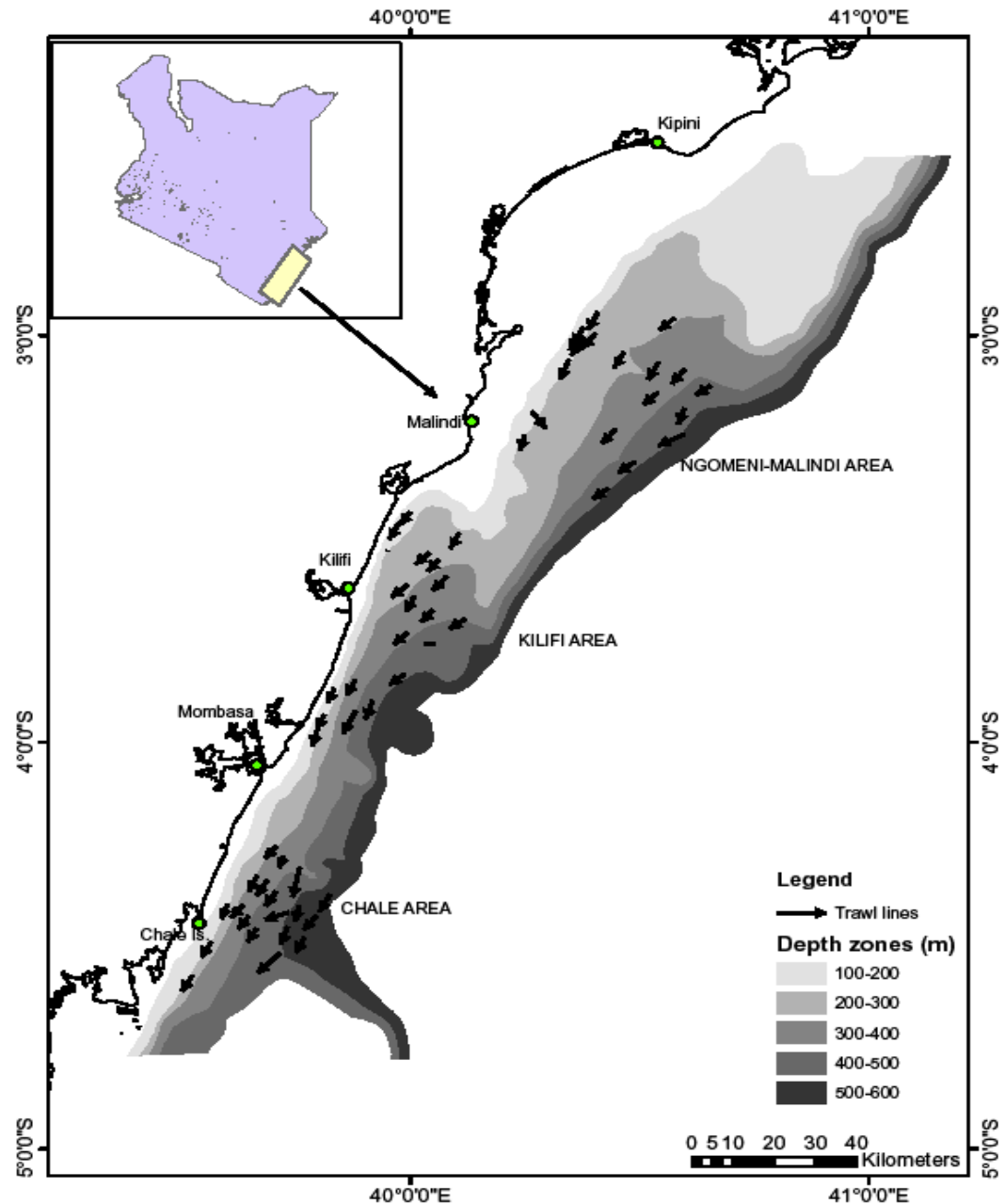
3. SWIOFP Deep water trawl survey

The objectives of the survey were to:

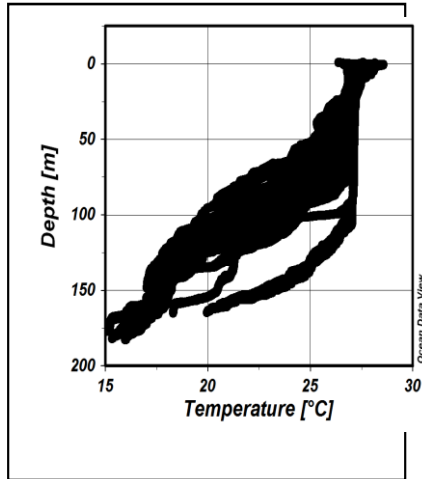
- Determine the biomass and distribution of crustaceans species composition and distribution
- Identify and quantify the by-catch associated with prawn trawl fishery
- Provide samples for genetic and biological studies

Study area

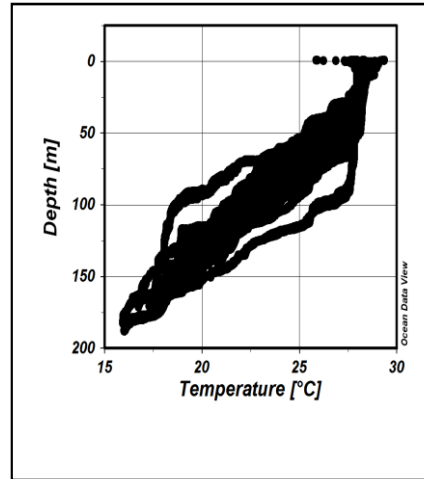
- 15 days survey on FV Roberto (24th of February and the 7th of March, 2011)
- 3 areas (Ngomeni-Malindi, Kilifi, Chale)
- 4 depth strata
- 5 trawls in each strata in each area=60 trawls
- Data was analysed using swept area method to estimate biomass



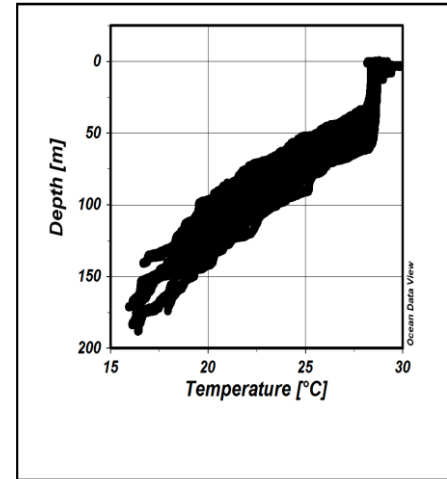
Environment (CTD data)



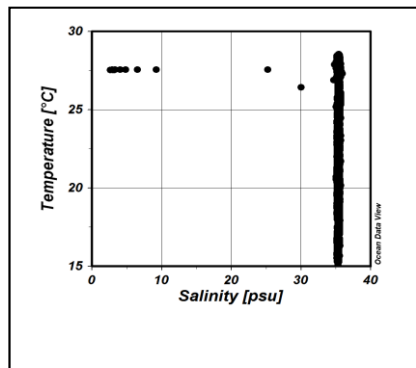
Ngomeni-malindi



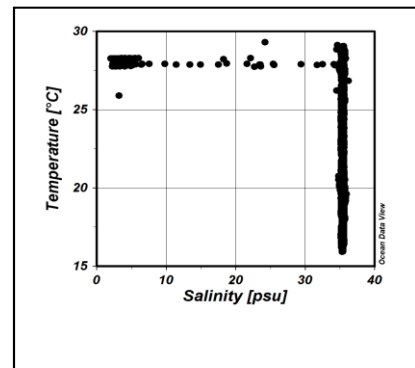
b: Kilifi



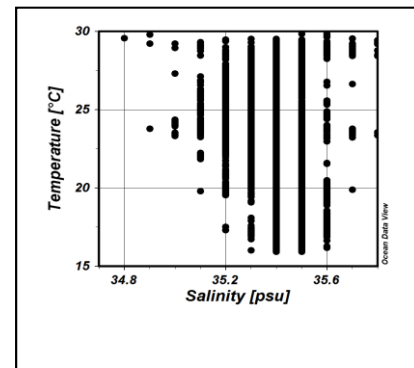
c: Chale



Ngomeni-Malindi



b: Kilifi



c: Chale

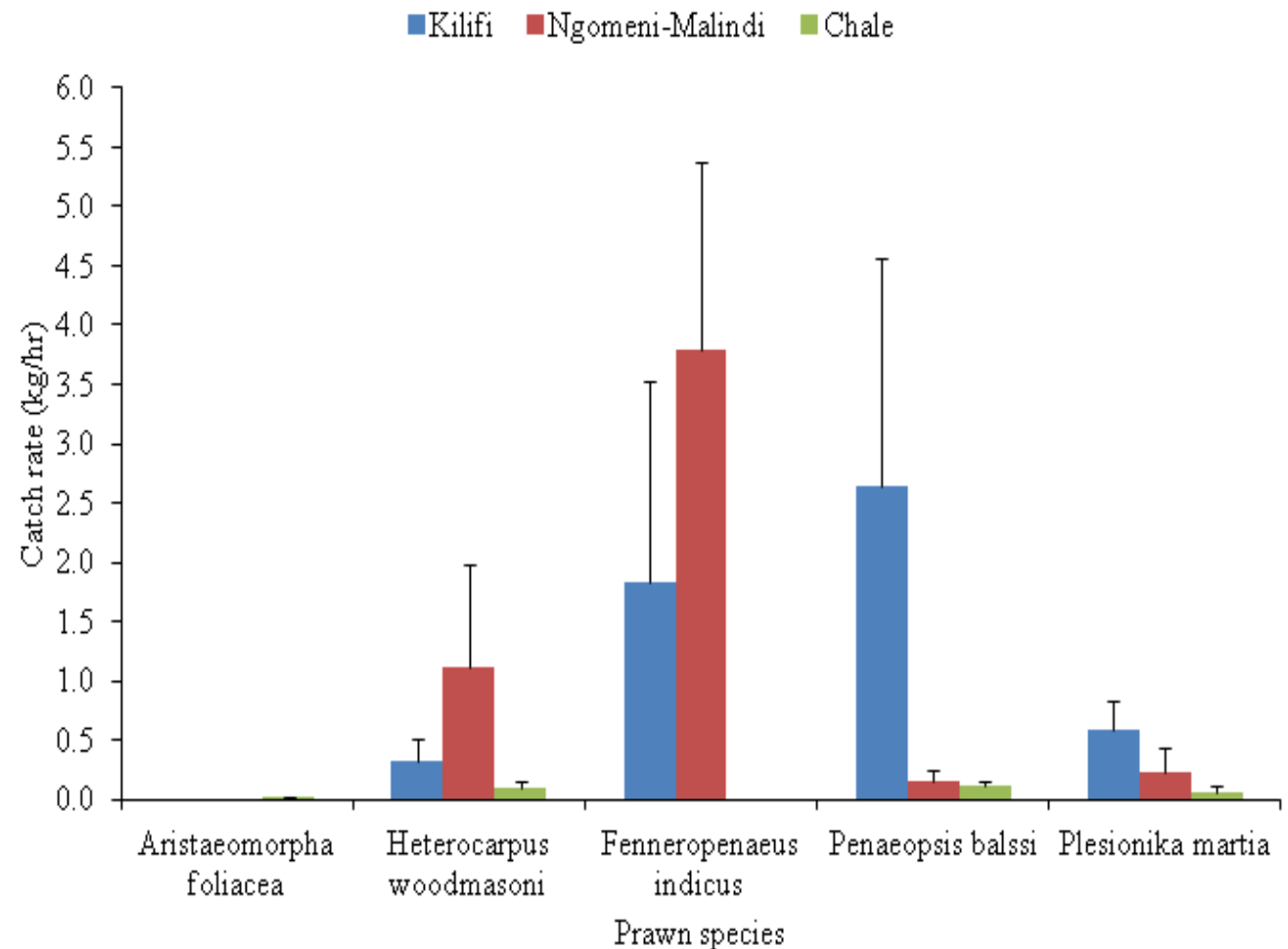
Total catches

Taxa	No. species	Wt kg	No.	% Wt
Fish	143	4598.8	108336	71.9
Prawns	14	241.6	19420	7.0
Echinoderms	8	249.8	1420	4.0
Crabs	17	343.1	7225	8.5
Lobsters	8	62.9	1098	4.0
Cephalopods	6	41.4	459	3.0
Molluscs	3	2.0	54	1.5

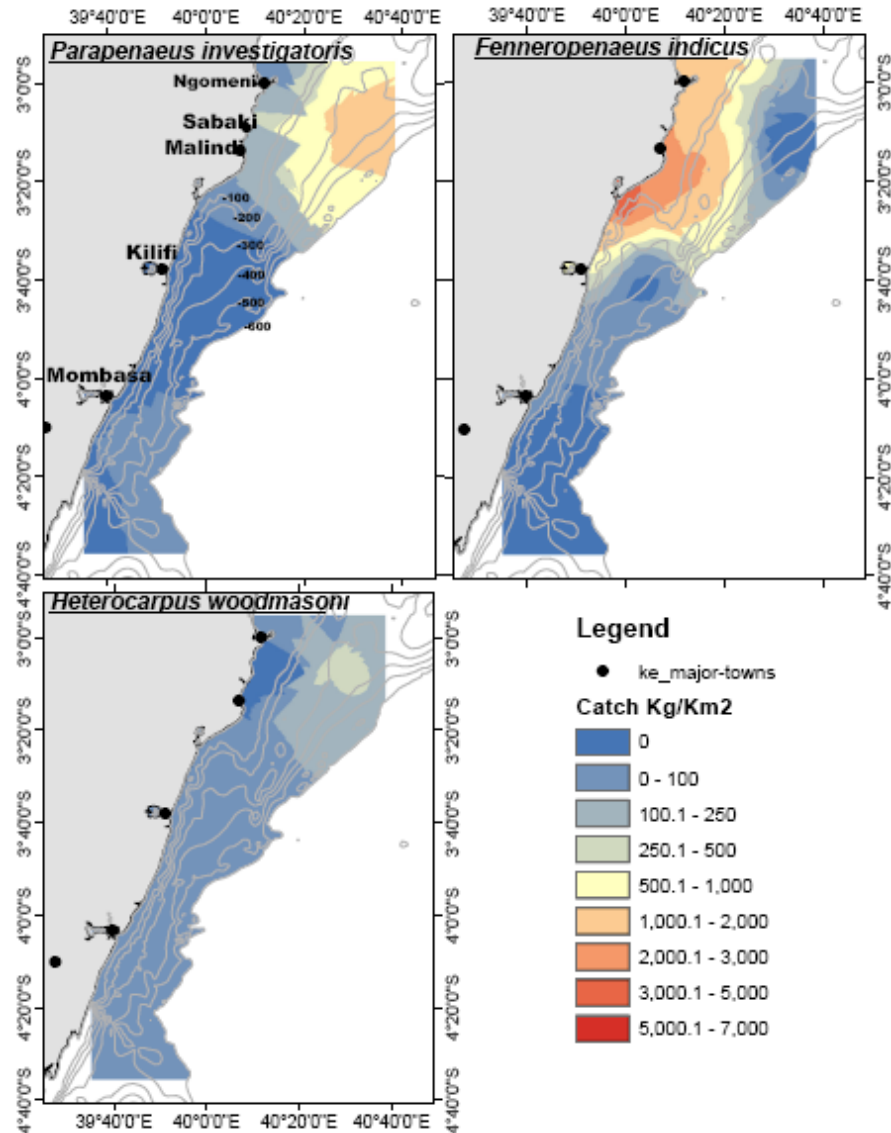


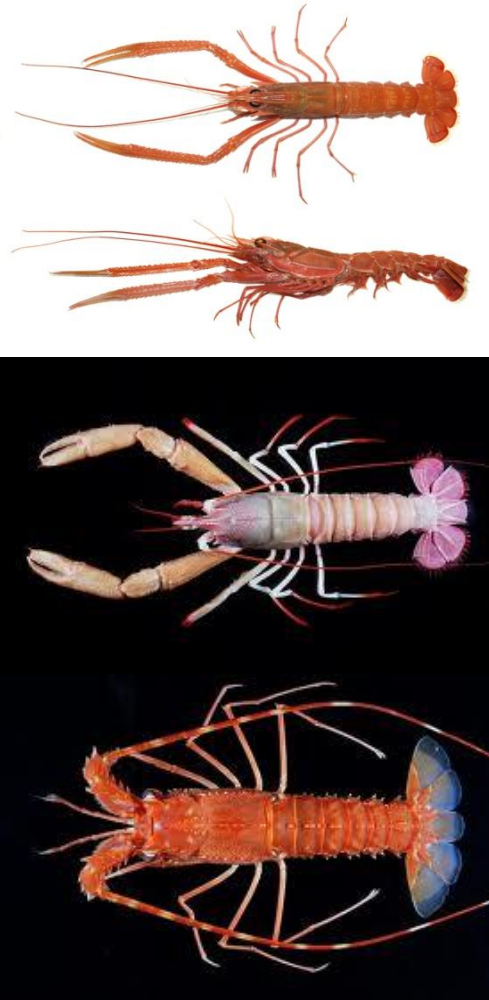


Deep water prawn catch rates

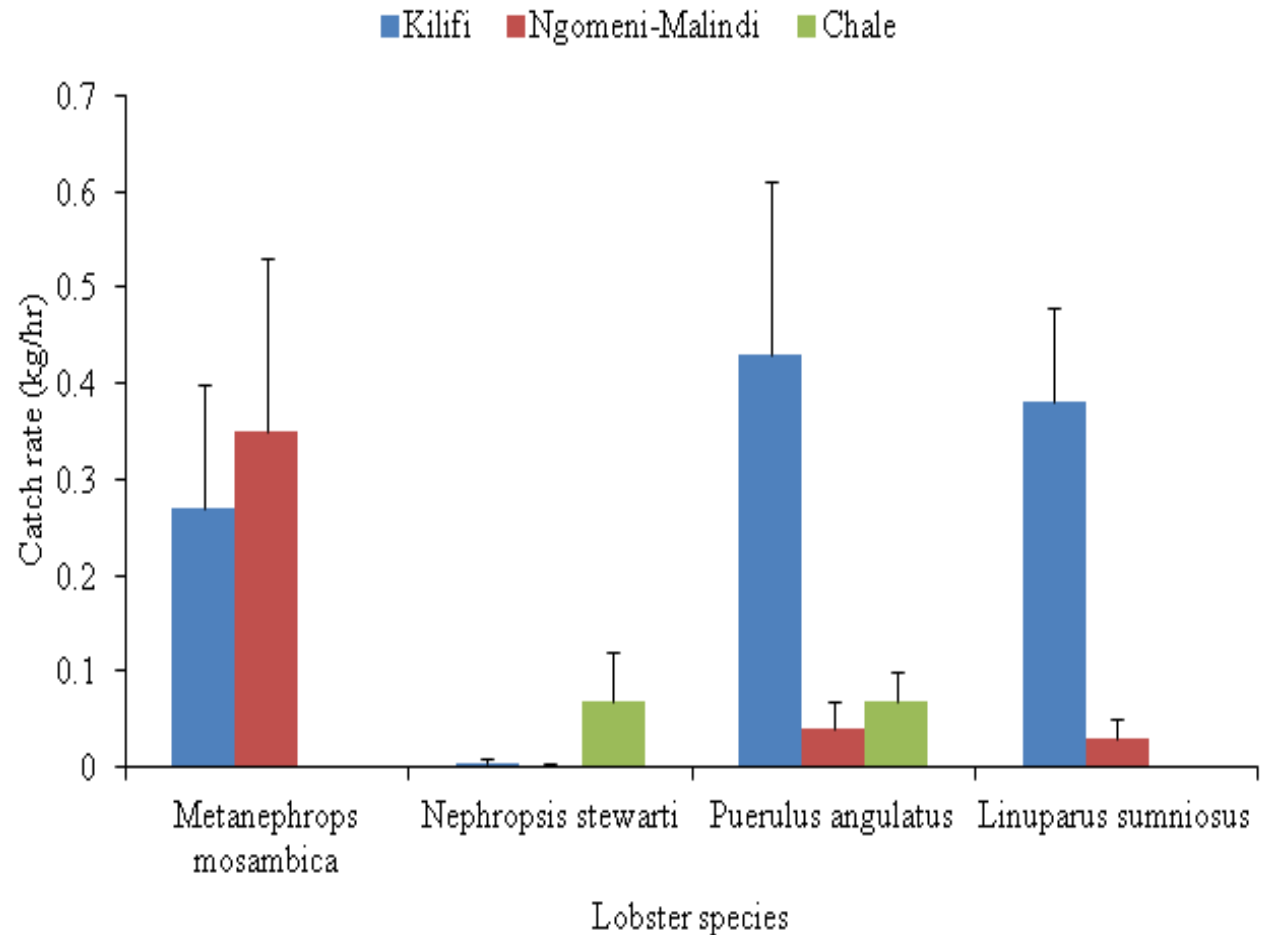


Distribution of fisheries resources (prawns)

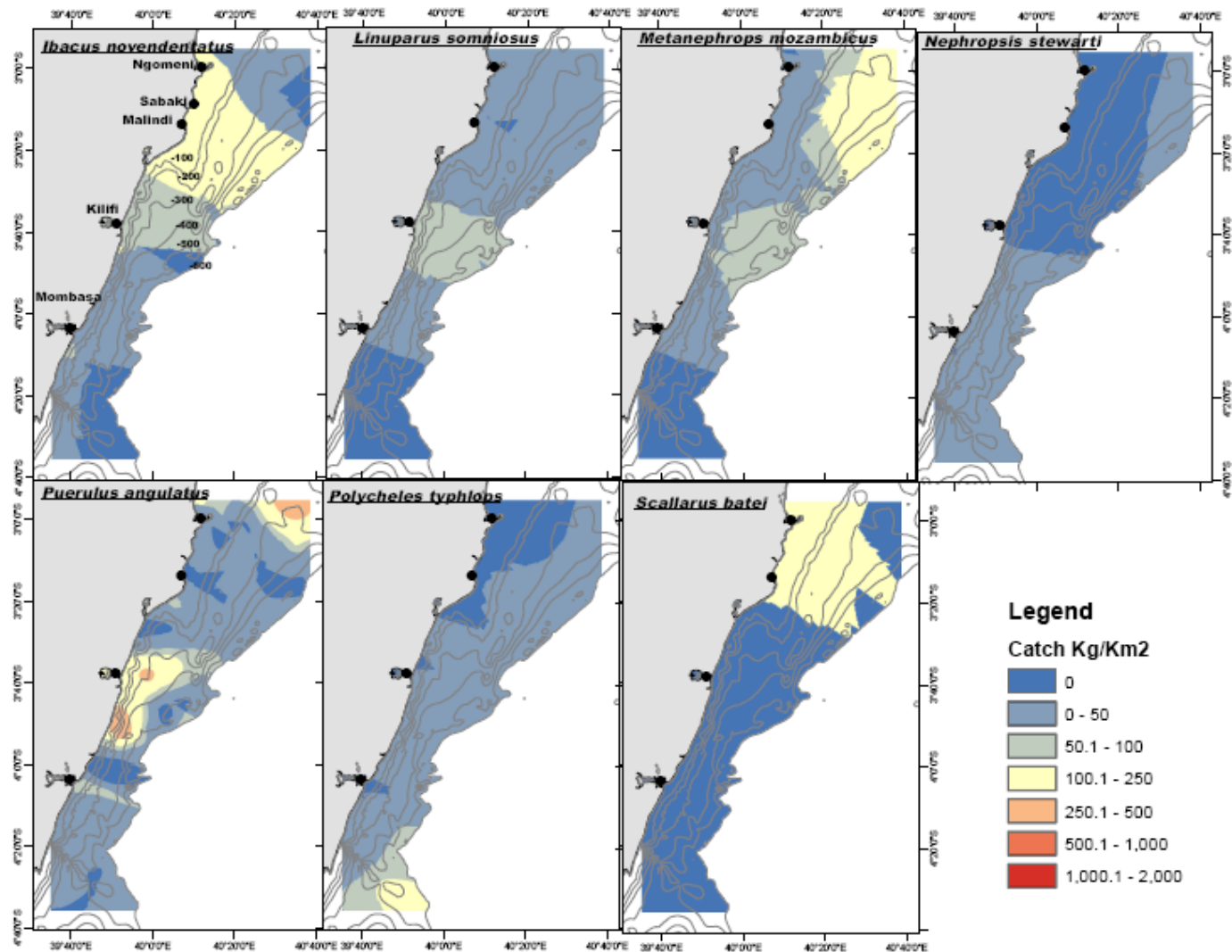




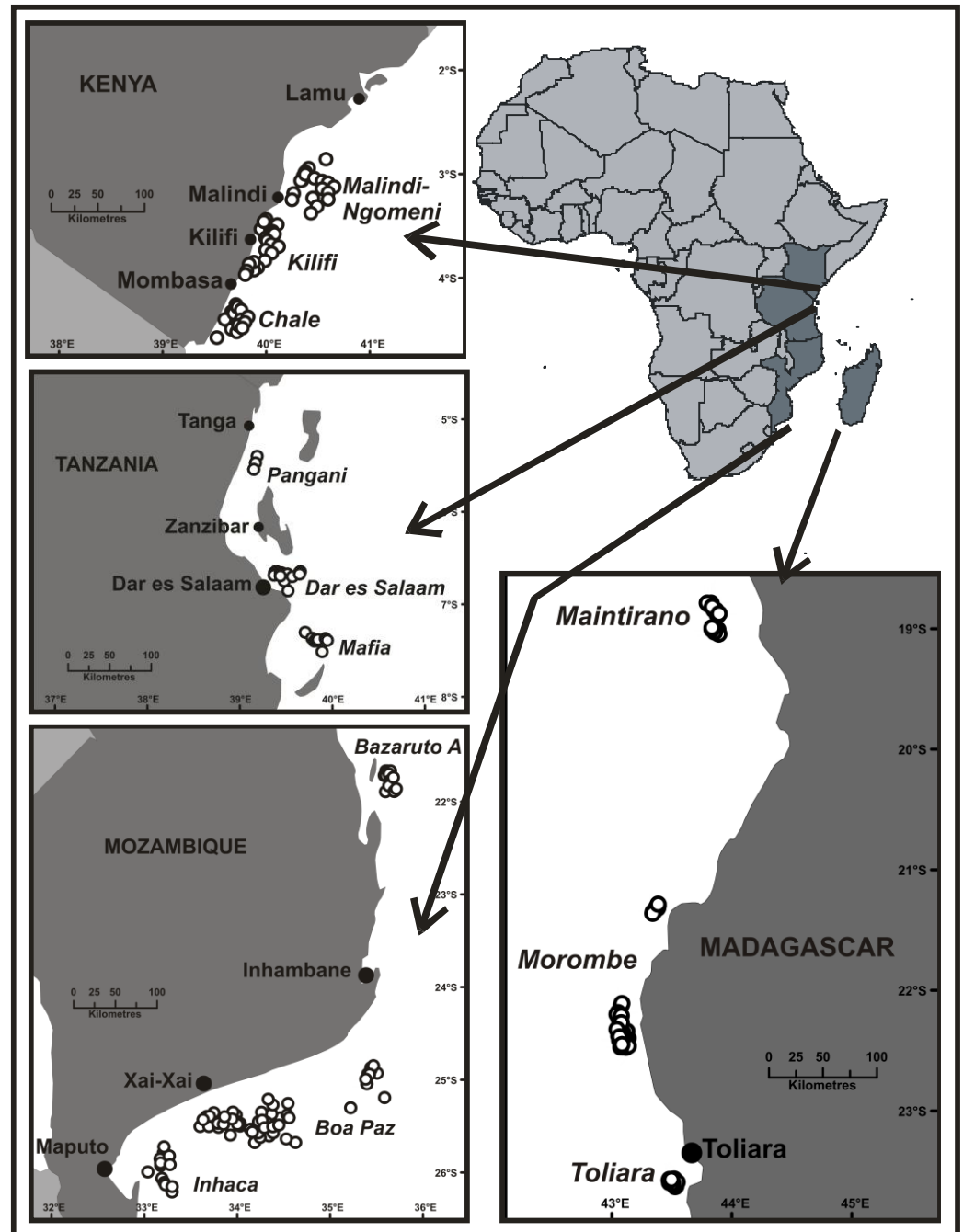
Lobster catch rates



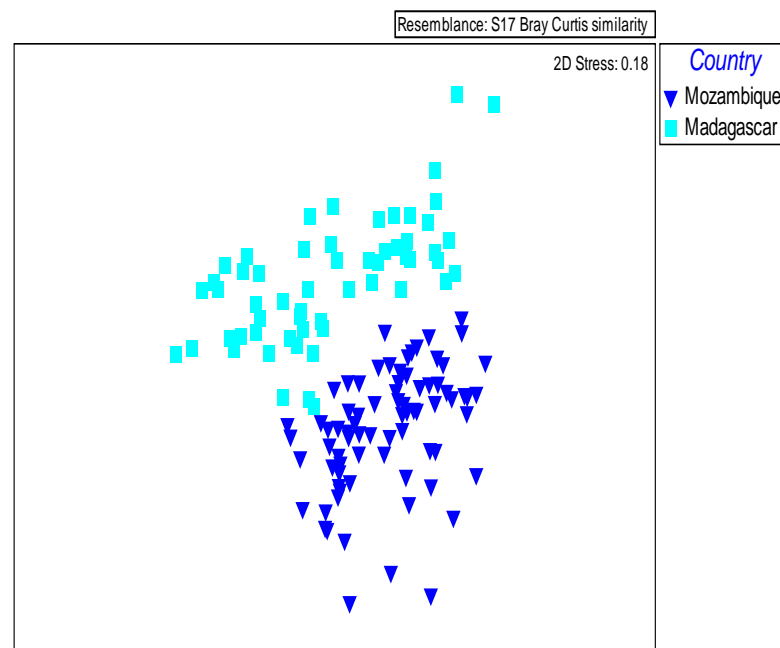
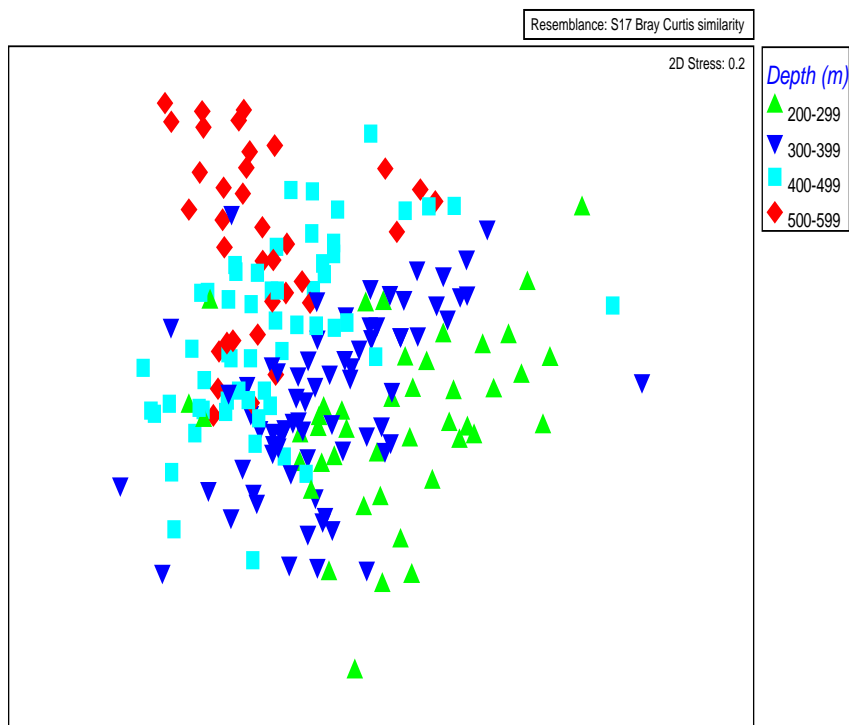
Distribution of deepwater lobsters



Regional comparisons and biogeography



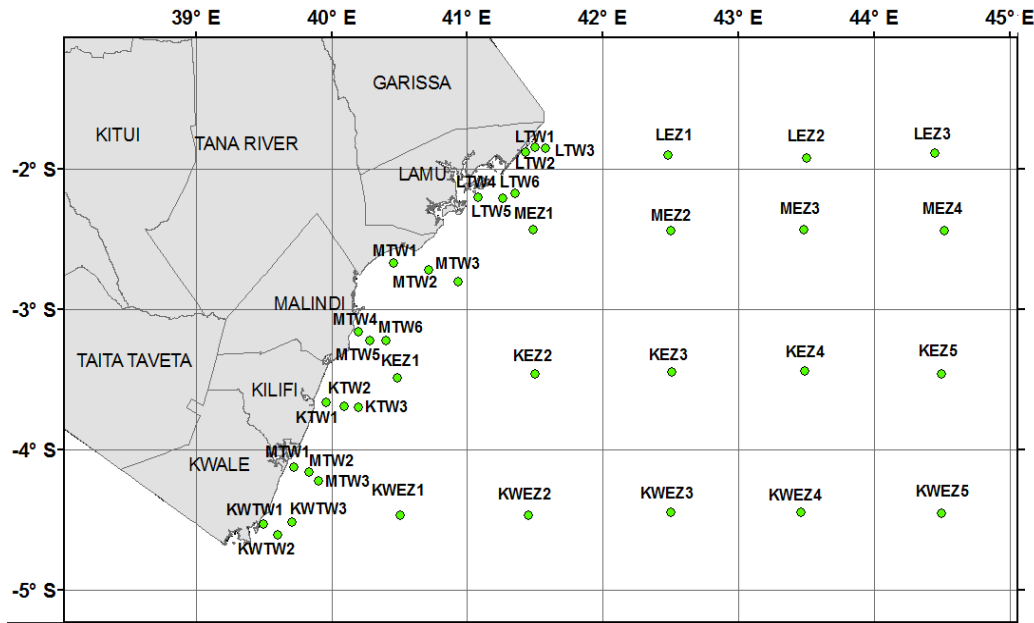
Regional analysis (MDS plots)



Achievements

- Deep water trawl fishery areas in Kenya are better known
- The knowledge of available crustacean species resources and their abundance and distribution
- Regional biogeographically comparisons

RV Mtafiti: Opportunities for research



KCDP MCS and Research Cruise

aims:

1. Monitoring control and surveillance
2. Fishing gear trials
3. Ocean environment research

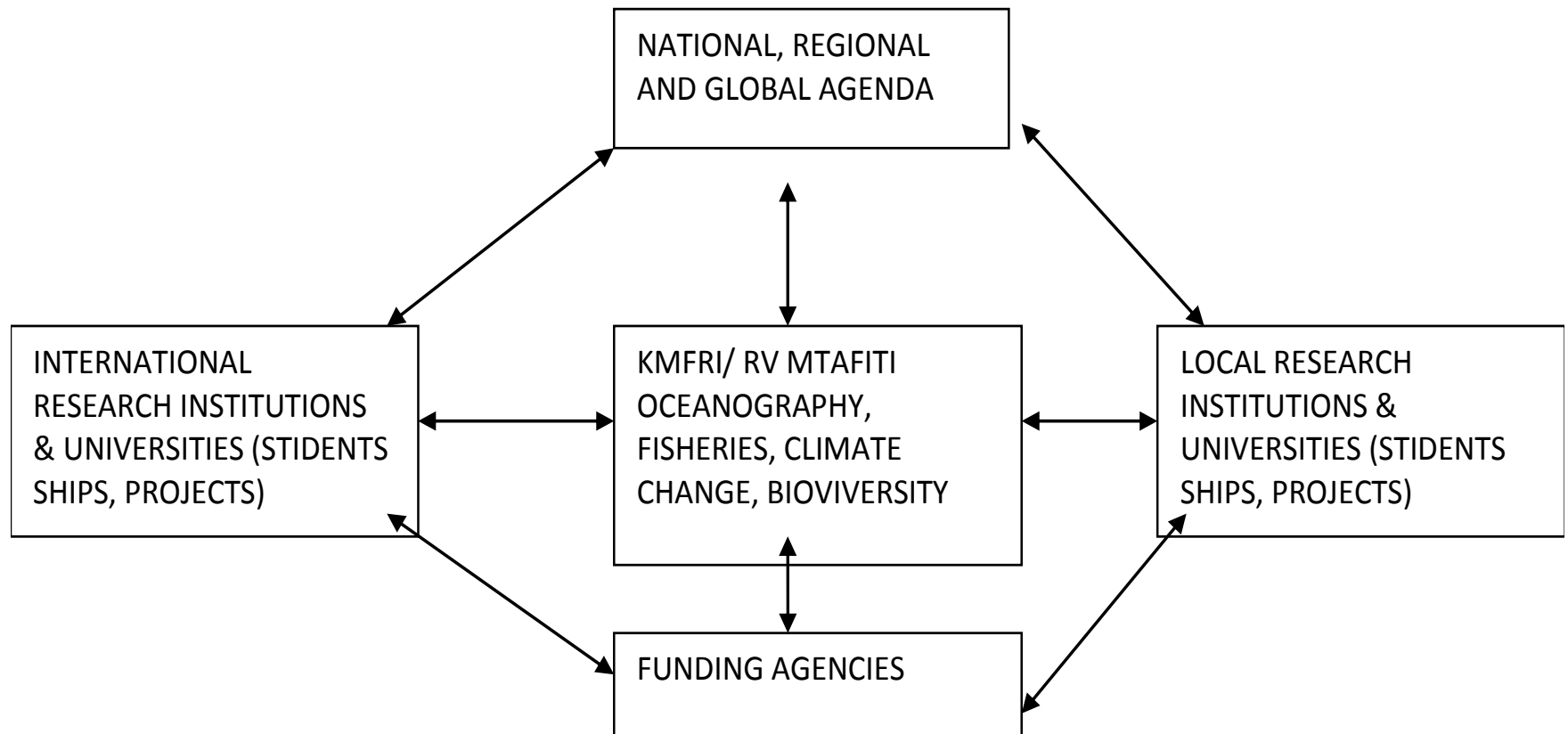
Research Equipment on RV Mtafiti

Gear	Data/Samples
CTD	Conductivity, temperature, PH
Sediment grab	Collect sediment samples
Niskin Bottles	Water samples for nutrient analysis
Zooplankton net	Zooplankton samples
Phytoplankton sieves	Phytoplankton samples
Long Lines	Fish samples
Drop lines	Fish samples
Long range camera	Marine mammal and sea birds observations
Hand held GPS	Geographical Location
Thermosalinograph	Surface sea water temperature, salinity and conductivity

Research Equipments needed

Equipment	Purpose
1. Echo-sounder EK60/120/333KHZ split systems, installation and commissioning	Fish biomass and distribution surveys
1. CTD-Rosette sampler model 1018 with 3000m cable and deck unit	Physical environment-conductivity, temperature, depth measurement
1. Account Doppler (ADCP) 38KHZ	Currents measurements
1. Neumatic piston corer 1500m	Sediment coring for biological, environmental studies
1. Bongo net with accessories	Plankton sampling
1. Low pressure filtration apparatus (4-7psi)	Filtration of water samples for chlorophyll, POC and other parameters
1. Expendable Bathythermographs (XHT)	
1. Salinometer	for calibrating CTD
1. Radio buoys and accessories	Recovery of set instruments

Collaboration model



RV Mtafiti: Opportunities for collaboration

- Joint national/regional oceanography and fisheries research cruises
- University studentships for higher degrees in marine science: collection of research data and samples
- National/regional periodic research review and planning forum

Thank you

