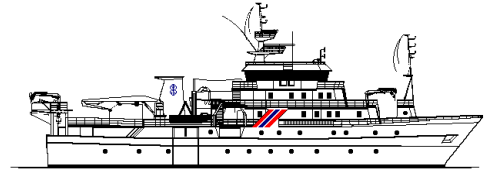


<b>Country:</b> Mozambique				
<b>Research vessel:</b> R/V DR. FRIDTJOF NANSEN				
<b>Survey number:</b> 2007408				
<b>Number of days:</b> 84				
<b>General objectives</b> Survey of the marine living resources of Mozambique				
	<b>Port</b>	<b>Date</b>	<b>Coverage</b>	<b>Specific objectives</b>
<b>Departure</b>	Maputo Mozambique	27 September	Mozambique	<p><u>Ecosystem survey</u></p> <ul style="list-style-type: none"> <li>• to map the distribution and estimate the acoustic abundance of the main pelagic species / groups in Mozambique.</li> <li>• to describe the distribution, composition and estimate the abundance of the main demersal species on the shelf by the swept-area trawl method.</li> <li>• to collect bottom sediment samples to record the benthic biodiversity at specific locations.</li> <li>• to collect zooplankton samples for distribution and species identification.</li> <li>• to map the general hydrographic regime by using a CTD and a surface salinograph to monitor the temperature, salinity, oxygen and fluorescence at bottom trawl stations and on specific hydrographical transects..</li> <li>• on-the-job training on the main survey routines</li> </ul> <p><u>Special studies</u></p> <ul style="list-style-type: none"> <li>• Special studies in areas off Quirimbas and Bazaruto national parks (including detailed 3D bottom topography mapping, benthos and sediment sampling, UW photography/video).</li> <li>• Baseline pollution assessments based on the above mentioned studies (sediment analyses)</li> <li>• More detailed survey of the St. Lazarus Bank and other banks /sea mounts in the Mozambican channel (during return to Maputo at the end of the cruise).</li> </ul>
<b>Arrival</b>	Maputo	21 December		





**NANSEN PROJECT**



**Cruise leader:** Emidio André (local cruise leader), Silvia Abdula (local cruise leader), Carlos Bento (local cruise leader), Ascensão Pinto (local cruise leader), Tore Strømme (cruise leader), Espen Johnsen (cruise leader), Bjørn Serigstad (cruise leader), Jens-Otto Krakstad (cruise leader).

**Participants:**

**EP,** Fishing School, Alexandre Antonio Nbanala, Angelo Filipe Buramuge

**IDPPE:** Ascensão Pinto

**IIP; Instituto Nacional de Investigacao Pesqueira,** Sonia Nordez , Afonso L. Muduze, José Cuna, Afonso Buque, Nilza Dias, Osvaldo J., Daniel Fernando, Boavida Matavele, Grichone Chambule, Martinho Padera, Isaias Tembe, Emidio André, Neto B. Sulemane, Bernardino Malawene, Isabel Chauca, Feliciano Manjate, Osvaldo Chacate, Dionisio Varala, Silvia Adula, Badru Hagy, Jose Chamusse, Alice Inacio, Augusto Maciane, Pedro Pires, Adriano Alfredo Manjate, Antonio Salvador Siteo, Feliciano Manjate, Eurico Morais, Alvarenga C., Lourenço Zacarias

**IMR;** Institute of Marine Research, Norway, Tore Strømme (cruise leader), Espen Johnsen (cruise leader), Oddgeir Alvheim, Tore Mørk (Instrument Chief), Tor E. Johansson (instrument chief), Terje Hovland, Ole Sverre Fosshem, Marek Ostrowski, Bjørn Serigstad (cruise leader), Franz Uiblein, Magne Olsen, Alexey André, Diana Zaera, Reidar Johansen, Jens-Otto Krakstad (cruise leader),

**MPES, AQUA:** Department of Aquaculture of Ministry of Fisheries, Edson A. Jose,

**MPES, DNAP;** Directorate of fisheries Economy of Ministry of Fisheries, Samuel Siteo

**MPES, DNEP;** Directorate of fisheries Administration of Ministry of Fisheries, Hermino Tembe

**SAIAB;** South African Institute of Aquatic Biodiversity, Phil Heemstra, Helaine Heemstra

**TVM:** Esmeraldo Mondlane, Berto Chongo

**UEM, DCB:** Department of Biological Sciences of University Eduardo Mondlane, Ivan Nerantzoulis, Mauricio J. Lipassula, Veronica Mondlane

**UEM, ESCMC;** School of Coastal Marine Sciences, Avelino Langa, Valera Dias, Valentina Vassela

**UEM, Museu;** Museum of Natural History of University E. Mondlane, Cristina Silva, Carlos Bento

**UoB;** University of Bergen, Norway: Cristiane Todt

**UoL:** Univeristy of Lisbon, Portugal: Carolina Sà, Miguel Leal, Vanda Brotas

**Summary of the results:**

**Oceanography:** In the northernmost section of the Mozambican Chanel the water column exhibits a strong thermocline between 100 and 250m, overlaid by the relatively homogenous layer of Tropical

Surface Water (TSW). The temperature increased from 24 °C at the base of the thermocline to 27 °C at the surface. Oxygen distribution drops to below 2 ml l<sup>-1</sup> at 1000 m, and this indicated presence of Subsurface Red Sea Water (RSW).

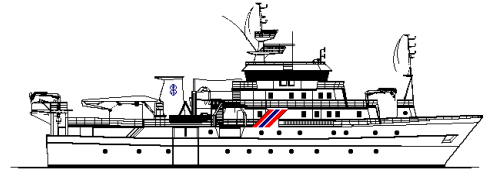
The Central Mozambique Channel and the Sofala Bank, TSW is identifiable at the surface by means of temperature above 24 °C and salinity around 35.2 o/oo. Slight increase in oxygen concentration near 1000 m above 2 ml l<sup>-1</sup> compared to the northern section of the channel indicated diminished influence of the RSW. Upward sloping pattern of isotherms indicated clearly that the dominant flow along the continental slope off the Sofala Bank was southward.

Significant contrast was observed between shelf and open ocean conditions. The water column is well mixed and salinity distribution exhibits strong horizontal gradient with the lowest values near the coast. This was found to be related to the terrestrial outflow from 105 numerous rivers along this section of the coast and strong tidal currents, storm surges associated strong mixing at the shallow bottom. Predominant features of the surface water masses in the southernmost section of the





NANSEN PROJECT



Mozambique Channel manifested influence of subtropical climate regime. Excess of evaporation raises surface salinity and intense wind mixing erodes the thermocline. A relatively colder (approximately 24 °C) and more saline Subtropical Surface Water (STSW) replace the homogenous TSW layer seen at the surface on the northerly sections. A transition of water masses is also found at depths greater than 800 m where the relatively high salinity and low oxygen signature of RSW is replaced by a less saline and more aerated waters sourced from Antarctic Intermediate Water (AAIW) of the Southern Ocean origin. Satellite altimetry revealed occurrence during the cruise of cyclonic eddies between Zavora and Pomene and two anticyclonic eddies in the vicinity of Sofala Bank. The anticyclonic eddies seemed to trap the tropical water masses in the northern Mozambique Channel preventing them from spreading south, and the cyclonic eddies confined the subtropical water masses south. A deep chlorophyll maximum (DCM), a measure of primary productivity, was typically located near the coast and just above the thermocline in open sea because supply of nutrients is the highest and light quantities still sufficient. In the open sea of tropical water the chlorophyll maximum is only located in the thermocline. Low chlorophyll concentrations were found at the surface. In the subtropical waters, the highest chlorophyll concentrations are still found in the thermocline but they are more vertically spread across the water column, often reaching the surface.

**Biomass estimates:** Biomass estimates were calculated using the swept-area method stratified by region and depth. No biomass was estimated for the northern region as the trawl sampling effort was too low to establish any reliable estimates. The total biomass of fish, cephalopods and shrimps on the southern and central regions were 189 300t and 23 600t respectively. In the southern region, the biomass of the pelagic groups was 33 000t and 6 900t in the central region. In both regions the dominant families for the pelagic groups were carangids followed by sardines in the central region and barracuda in the southern region. For the demersal fish groups, the biomass estimates were 6 900t and 4 000t in the southern and northern regions, respectively. In the central region the dominant families for the demersal groups were snappers followed by grunts and croakers, and in the southern region the main families were cusk eels followed by groupers and seabreams. The highest abundance of shrimps was found in deep waters, and the 106 most abundant deep water shrimp species were *Haliporoides triarthrus*, *Aristaeomorpha foliacea* and *Aristeus antennatus*, which inhabited the southern slope and in the deeper waters of the central region. *Plesiopenaeus edwardsianus* and *Penaeopsis balssi* had a similar depth distribution with the highest biomass on the southern slope. All the shallow water shrimp species; *Penaeus indicus*, *Metapenaeus monoceros*, *Penaeus semisulcatus*, *Penaeus monodon*, *Penaeus japonicus* and *Penaeus latisulcatus* were found in the central region, whilst *Metapenaeus monoceros* were also caught on the southern shelf.

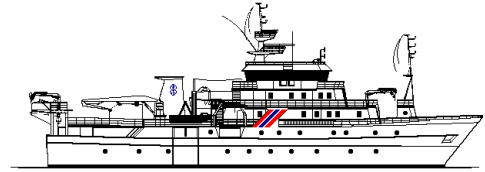
The acoustic recordings revealed low to medium acoustic densities over most of the shelf, and only plankton and mesopelagic fish were found in the water column from the shelf break and further offshore. Acoustic biomass estimates were calculated for clupeoids and a group (PEL2) consisting of carangids, barracudas, hairtails and scombrids. Low densities of clupeoids were found in the southern region south of Dikambane and between Beira and Angoche. In a relatively small area off Beira higher densities of clupeoids were recorded, and no acoustic recordings were observed in the northern region. The PEL2-group was found on the Mozambican shelf from the South African border up to Angoche, and in a small area south of Pemba. No acoustic densities of PEL2 were recorded in the area between 25°S and 24°15'S, but in a small area south of Beira higher densities of PEL2 were observed.

**Special studies:** The special studies focused on seven locations of special interest. These were the Quirimbas National Park, St. Lazarus Bank, Paisley Seamount, Primeiras e Segundas





**NANSEN PROJECT**



Arquipelago, The Zambezi river mouth, Bazaruto National Park and the Almirante Leite Bank. The Cabo Inhaca area was not visited during this survey because of rough weather conditions that made it impossible to survey the area. For all areas a detailed program with sampling of oceanographic parameters, recording of bottom topography, fishing trials and sampling of sediments and plankton were executed. Data on benthic biodiversity and chemical composition as well as from the plankton sampling program are analysed on-shore and are not reported here. The study areas can roughly be divided in four distinct habitats. The Quirimbas National Park, St. Lazarus Bank and the Primeiras e Segundas Archipelago are typical coral habitats with corals fringing the more exposed parts of the shallow water areas and sand and mud dominating the more sheltered areas. Each of the three areas have distinct features that are described further in each respective chapter. Generally fishing trials in these areas had variable success. Trawling was difficult and resulted in a number of broken trawls. Catches were low, but with high diversity of species and relatively high catch rates of high quality fish species. The fourth habitat type is made up of the Paisley Seamount and the Almirante Leite 107 Bank which are typical deep water sea mounts. The bottom on these seamounts consisted of volcanic rocks and was untrawlable. Mesopelagic fish were observed in both habitats. Particularly the Almirante Leite bank revealed a striking underwater topography with clear volcanic cones rising more than 1000 m towards the surface from the ocean floor. The Zambezi river mouth is a typical shelf habitat with strong freshwater influence. Pelagic fish were dominant in the region and catch rates were relatively high. Sediments were of river origin with high content of organic matter. The east end of Bazaruto National Park was dominated by sandy substrate with smaller areas of seagrass. Hard bottom exposed by tidal currents supported small coral reefs predominantly made by soft corals, with some hard coral species represented within.

**Report: status: final References:**

NORAD - FAO PROJECT GCP/INT/003/NOR CRUISE REPORTS "DR. FRIDTJOF NANSEN"  
EAF - N/2007/8, **SURVEYS OF THE LIVING MARINE RESOURCES OF MOZAMBIQUE  
Ecosystem Survey and Special Studies, 27 September – 21 December 2007**, Institute of Marine Research (IMR), Norway, Instituto Nacional de Investigação Pesqueira (IIP), Mozambique

**Constraints/Comments:**

