

OCEAN SCIENCE IN ACTION

9.1 A SMALL FISH WITH A BIG MISSION: AN INTRODUCTION TO SMALL PELAGICS OF THE PEMBA CHANNEL

VIDEO DURATION– 05:29

Just south of the equator off the coast of Tanzania, lies the Zanzibar Archipelago, Unguja (also known as Zanzibar) and Pemba. In this series of lectures, our attention will focus on the Zanzibar and Pemba Channels – two straits separating the mainland of Tanzania from the islands.

You will learn about the coastal communities inhabiting their shores and try to understand how their lives are influenced by the marine environment and how an accelerated pace of climate change is going to impact them.

This introductory lecture was written by Dr Narriman Jiddawi, a fisheries expert from the Institute of Marine Sciences in Zanzibar, and Professor Mike Roberts, a physical oceanographer from the Nelson Mandela University in South Africa.

For centuries, the history, culture and economy of the coastal population living on the shore of the Pemba Channel have been rooted in the sea.

Much of the coastal population is reliant on fishing for their livelihoods. Most people live in small villages along the coast with fishing being the main daily activity. Small pelagic fish (mostly anchovy and sardine) are not only an important component of the diet but also are sold to buyers and then exported to other African countries. This provides cash to the villages who are then able to purchase other needed items. So in other words - people with very little alternative livelihoods other than fishing.

Small pelagics are small forage fish that live in the surface and near-surface waters over the continental shelf of most of the coasts around the globe, and constituting nearly half of the global fish landings. Sardines, anchovies and mackerel are among the most common small pelagic species. Although their commercial value is low, they provide important income for the coastal population of developing countries. Small pelagics tend to form large schools, which makes them an easy target for small boats and relatively simple gear, and thus makes it an essential component of food security for poor coastal populations.

However, stocks of the small pelagic fish fluctuate a lot and even collapse, driven by the fishing pressure and by the natural variability at scales from seasonal to decadal. When alternative livelihoods are limited, a low catch season, year or decade can push communities to the brink of starvation.

Small pelagic fish are caught at night from long, hand-made, wooden boats using lamps and seine nets. The simple boats are about 10 meters in length and have typically 15 men on board with no structure for shelter. Several hundred boats set sail each night producing a “city of light” in the channel and return the next morning with their catch. Catch yields and earnings for each fisher are meagre as the catch needs to be divided amongst the 15 fishers.

Small pelagic fish are strongly driven by their environment. They feed on phytoplankton and zooplankton, which in these tropical waters follow complex dynamics of ocean upwelling supplying nutrients to the surface. There are many complex mechanisms involved in the functioning of upwelling systems along the Tanzanian coasts – local winds, large scale monsoonal changes, strong boundary currents and intricate changes of the bottom topography and coastlines. Multidecadal oscillations such as El Niño and the Indian Ocean Dipole also play a role.

In the background of these complex environmental controls, the population of Tanzania is increasing, and the small pelagic fish are often seen as an unlimited resource which is able to absorb this increase.

However, these small pelagic fish are being over-exploited, and the ecosystem dynamics of these waters are moving into a big unknown: we are beginning to see the signs of accelerating Climate Change. Understanding of how it may impact this complex system and the people reliant on it is a major challenge.

Not much is known about physical and biogeochemical properties of these waters. Lack of local research vessels make regular monitoring nearly impossible, and until recently, international research expeditions were rare because of maritime security. However, the situation is beginning to change and this series of lectures will introduce you to the novel and traditional methods of oceanographic observations and analysis, which are beginning to unravel a complex and intriguing dynamic of the Tanzanian waters.

In the next lectures, we will show why the small pelagics are so important to the coastal population of Tanzania and what role they play in their food security. We will introduce you to the key environmental factors controlling the dynamics of these fish and how we can investigate them not only in the field, but also using models and satellite observations. We will take you onboard a small research vessel, measuring key physical and biogeochemical parameters of the Pemba Channel. We will show how marine robotics can help us to measure the marine environment when the ship-based observations are rare. And finally, together with scientists from many disciplines working together, you will learn how interdisciplinary marine science can help address the challenges faced by our society.