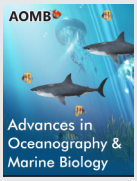

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The Coelacanth, its Conservation and Concerns in Tanzania

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Abstract

Referred to as one of the world's best-known "living fossils" the Coelacanth (Latimeria chalumnae), was thought to have been extinct until it was "rediscovered" in South Africa in 1938, causing much excitement. Since 2003 Tanzania witnessed unprecedented catches of coelacanths which led to conservation measures of the species by establishing a marine park named after it. This short paper is about this unique fish, its ubiquitous capture in Tanzania, the prospects and threats for its conservation due to inherent and emergent factors particularly the construction of the 1,443 kilometres East African Crude Oil Pipeline from Hoima in Uganda to Chongoleani within the precincts of the park.

Keywords: Coelacanth; fish; fossil; conservation; marine park; threats; tanzania

Introduction

Coelacanth (*Latimeria chalumnae*), pronounced "seel-lee-kanth", is a member of the Crossopterygian group of fish. The name "coelacanth" comes from the Greek words for `hollow' and `spine,' (koilos = hollow, akanthos = spine) referring to the fish's hollow oil-filled notochord [1]. It is said to be one of the world's best-known "living fossils"; also referred to as one of the "primitive" fishes, dating back to the Triassic period (240 million years ago) and thought to have become extinct in the Cretaceous (65 million years ago) until a live one was caught by a commercial trawler in East London, South Africa, in 1938 and recognized as unusual and preserved by Dr. Marjorie Courtenay Latimer, a local naturalist, teacher, and curator of the East London Natural History Museum. She described it as, "…the most beautiful fish I had ever seen… It was five feet long, a pale, mauvy blue with faint flecks of whitish spots. It was covered in hard scales and four limb-like fins and a strange little puppy-dog tail." Dr. James Leonard Brierley Smith who recognized the fish as a coelacanth and named it Latimeria chalumnae after the curator (Marjorie) and the river (Chalumna) where it was caught; a 1939 newspaper headlined it as, "…one of the most sensational scientific discoveries of the 20th century" [2].

According to Mary Bates https://www.wired.com/2015/03/creature-feature-10-fun-facts-coelacanth) the coelacanth has a number of interesting features. For example, it has four fleshy fins which extend from its body like limbs and move in an alternating pattern resembling the movement of the forelegs and hind legs of a tetrapod walking on land. Another unique aspect is that coelacanths

have an oily hollow and pressurized tube that serves as a backbone, whereas in most other vertebrates, this is a vertebral column. Moreover, coelacanths have an electro sensory system which they use to avoid obstacles and detect prey; coelacanths feed mainly on fish, eels, skates, shark, squid and octopus. Also, a coelacanth's brain occupies only 1.5% of its cranial cavity, the rest of the braincase being filled with fat. Of special mention is that coelacanths have extremely very long gestation periods, up to three years and they give birth to live offspring. Coelacanths are nocturnal, spending their days resting in caves, only to leave them late to feed, mostly on fish and cephalopods, during which they may travel as much as eight kilometres before retreating to a cave before dawn and more than a dozen coelacanths may seek shelter in the same cave, but they don't appear to show any aggression towards each other.

In fact, they are said to be sociable and often congregate in their caves, possibly returning to the same home cave day after day. Coelacanths have unique locomotion which combines flying and gliding, interspersed with head stands and belly-up drifts which appear to defy gravity, allowing them to move sluggishly near the ocean bottom using the current and their flexible lobed fins. But they are worthless as a sea-food fish for human beings and other fish-eating animals, because their flesh has high amounts of oil, urea, wax esters, and other compounds which give them a foul flavour and can cause sickness. The fish is a huge creature, about 1.8 meters long with a weight of about 100 kilogrammes (Figure 1).

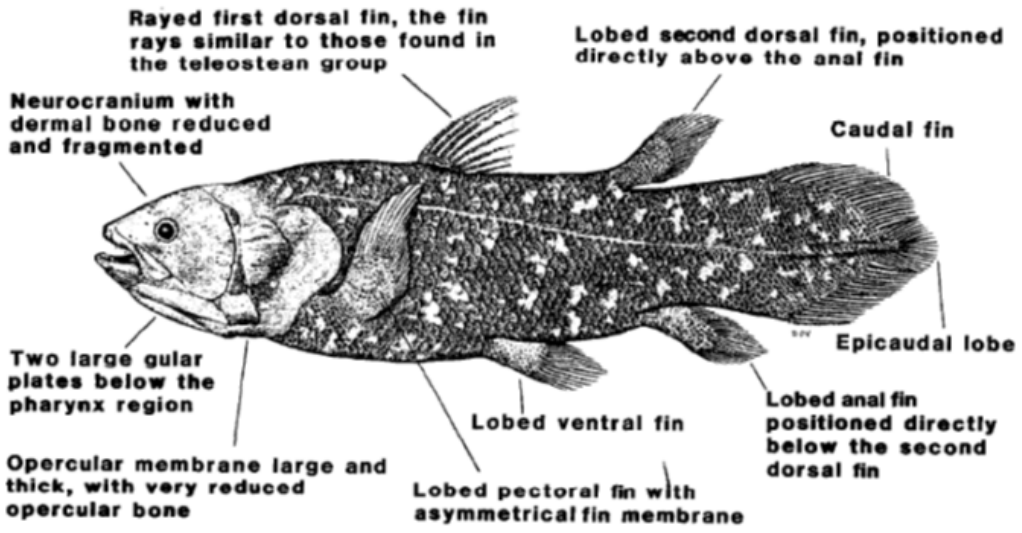

Figure 1: Source: Whittaker K (2014) Endangered Species act Status review Report for the Coelacanth latimeria chalumnae.

Results

Coelacanths are important for understanding the transition from water to land, in that they may occupy a side branch of the vertebrate lineage, closely related to, yet distinct from, the ancestor of tetrapods [3]. Scientific interest of coelacanth arose since the rediscovery of the species in 1938 when international scientists and researchers cherished the coelacanth as the only representative of an important evolutionary branch in the tree of life. The 1938 discovery caused so much excitement because at that time Coelacanths were thought to be the ancestors of the tetrapods (land-living animals, including humans), leading to surveys to better understand the fish's ecology, habitat, distribution, and evolution. The coelacanth has an interesting history, in that it was thought to have died out 65 million years ago but was found to still exist in the late 1930s by Marjorie Courtenay-Latimer, a 32-year-old museum employee from the South African town of East London. The story goes that on 23rd December 1938, a local trawler captain named Hendrick Goosen caught a haul of various fish while fishing just outside the mouth of the Chalumna River.

Out of curiosity the curator Courtenay-Latimer, sent a sketch of the strange looking fish to onr Professor Smith who identified it as a coelacanth. In 1952 two local fishermen in the Comoros Islands caught a coelacanth when fishing for other species and more coelacanths were caught throughout the 1960s and 1970s, and in 2000 scientists used an underwater ROV (Remote Operate Vehicle) to gain the first-ever footage of coelacanths in their natural environment at depths of 125 metres off the coast of South Africa. Before 1938 they were believed to have become extinct approximately 80 million years previously when they disappeared from the fossil record. In the West Indian Ocean coelacanths have been captured in South Africa, the Comoros Islands, Mozambique, Madagascar, and Kenya but no coelacanth capture were recorded in Tanzania until 9th September 2003, when one was caught by a fishermen off Songo Mnara Island in Kilwa district; the fish was

caught in a net at a depth of 100meters, only a few hundred meters offshore. The coelacanth, which was 132 centimeters long and weighed 40 kilogrammes, was first kept at the Marine Parks and Reserves Unit (MPRU) in Dar es Salaam for processing and later preserved and displayed at the National Museum for public viewing.

Hereafter the coelacanth as a new find in Tanzania generated massive national and international interest from scientists and environmentalists. Since then, more than 80 captures of Coelacanths have been reported by fishers from as far apart as Kigombe, Mwarongo and Mwambani villages in Tanga region in the northeast and Mtwara, Lindi, Kilwa in southern Tanzania and northern Zanzibar (see picture below) and Dar es Salaam, leading to an oceanographer, Dr. N. Nyandwi [4] designating coastal Tanzania as a "new home to the living coelacanth". In July 2006, the then president of Tanzania, Jakaya Kikwete had directed the relevant authorities to take immediate measures to protect the Coelacanth and as a result three local and international stakeholders' workshops were held to raise awareness and to heed the call for the establishment of a conservation area to protect the species and its environment. These workshops led to the establishment of the Tanga Coelacanth Marine Park (TACMP) which was gazetted through Government Notice No. 307 of 28th August, 2009 as a third marine park in the country after Mafia Island (MIMP) and Mnazi Bay Ruvuma Estuary Marine Park (MBREMP).

TACMP is located on the northern coastline of Tanzania, extending from north of Pangani River estuary along a 100-kilometre coastal strip towards Mafuriko village just north of Tanga City. It includes the bays of Tanga City and Mwambani, Tongoni estuary, and three small islands of Toten, Yambe and Karange. In total, the park covers an area of 552 km^2 of which only 15% is terrestrial. It encompasses 9 villages and 9 Tanga City localities (Streets and/or suburbs) with an estimated resident population of about 45,000. Unlike the other two marine parks, TACMP [5] spans two administrative districts of Muheza and Tanga. The goal of the Tanga Coelacanth Marine Park is to conserve marine biodiversity, resource abundance, and ecosystem functions of the Park, including the coelacanth and its habitat; and enable sustainable livelihoods and full participation of local community users and other key stakeholders (Figures 2-5).

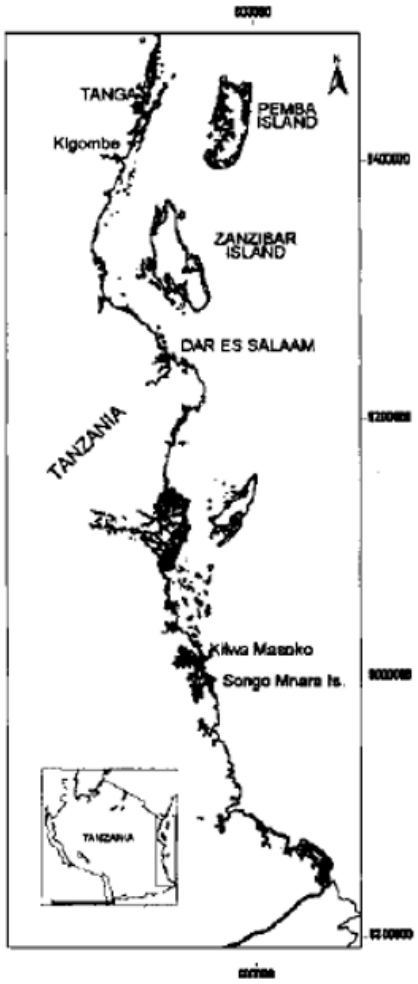

Figure 2: Map showing the sites where coelacanths were captured in Tanzania.

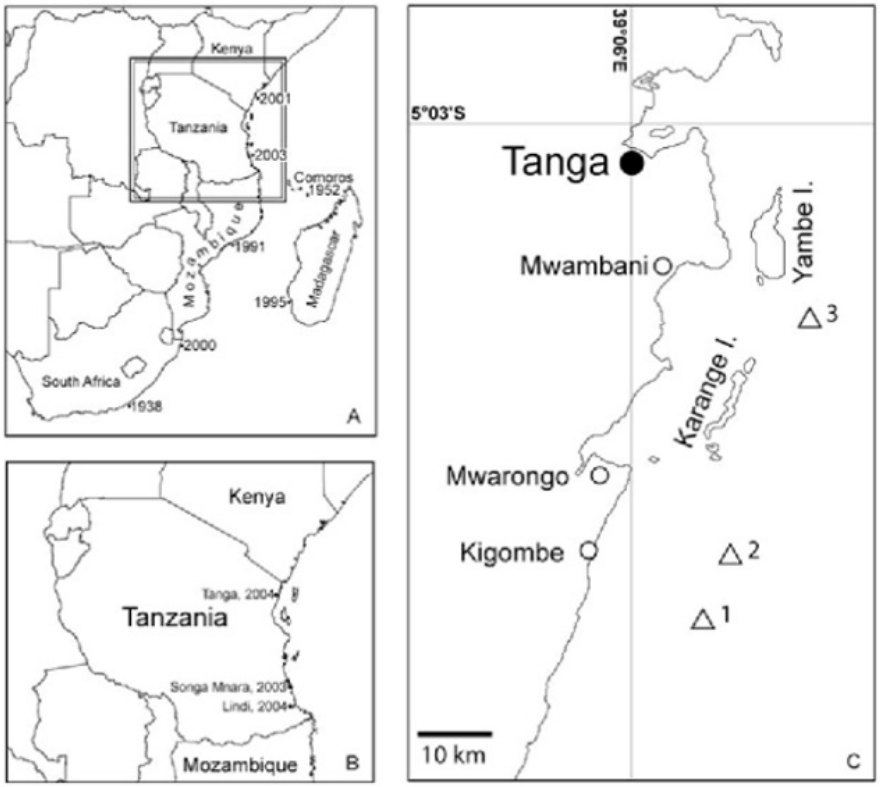

Figure 3: Map showing important arrears mentioned above.

Figure 4: The Institute of Marine Sciences (IMS) of the University of Dar es Salaam staff with a coelacanth catch.

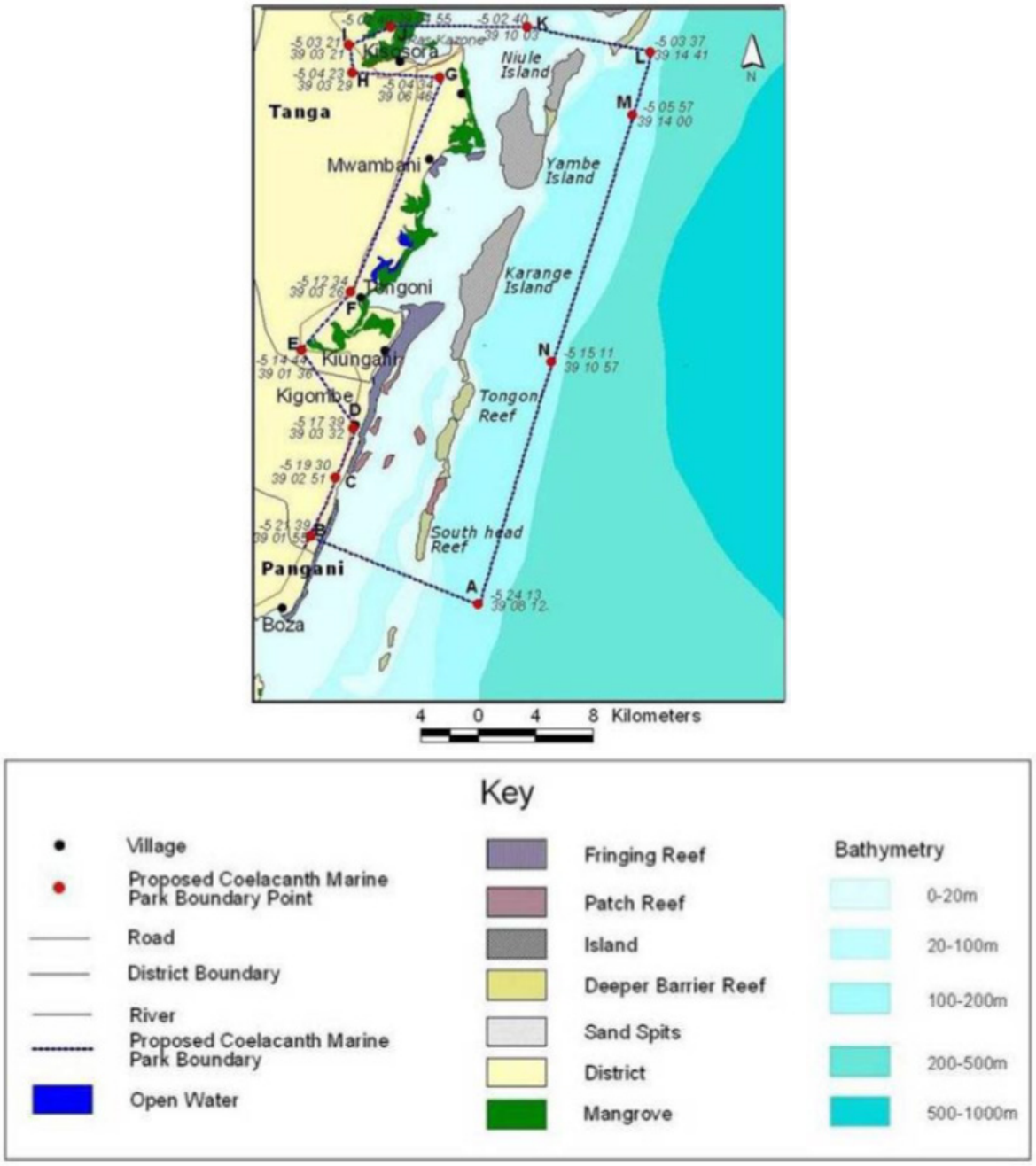

Figure 5: Source: Harrison P. (2010) Entrenching Livelihoods Enhancement and Diversification into Marine Protected Area Management Planning in Tanga, Tanzania. IUCN ESARO, Nairobi.

Discussion

Inherent and Emerging Threats

Conservationists welcomed the speedy creation of a marine national park in 2009 as groundbreaking at the time and hailed the speed with which this was undertaken but are equally concerned about plans to build a new harbour in the middle of what is a relatively shallow Mwambani bay. The plans for the park, specific to the coelacanth, are to restrict fishing within its boundaries, including fishing with deep-set shark gillnets, the primary source of coelacanth by catch in the area. It is to be noted that there is a connection of coelacanth by catch with trawling-especially by big vessels near the coelacanth's habitat, Whittaker [6] raised concerns on the implementation and enforcement of the park's regulations

and goals which seemed to be are unclear and untested. There were other reasons including infrastructure, funding and park management may not being adequate to fully prevent coelacanth by catch within the park's boundaries. In addition, illegal fishing off the coast of Tanzania is high while widespread poverty has affected the effectiveness and implementation of other east African marine parks, and it is likely the Tanga Coelacanth Marine Park may face similar challenges [7].

Even before the establishment of the park concern had been aired about the threat to "Tanzania's old man of the sea", posed by Tanzanian Port Authority (TPA)'s plans to build a multi-million dollar new port at Mwambani Bay, just 8km south of the original old Tanga Port right in the middle of the Coelacanth Marine Park which would include submarine blasting and channel dredging, destroying known coelacanth habitats in the vicinity of Yambe and Karange islands, which may disrupt coelacanth habitats by direct elimination of deep-water shelters, or by a large influx of siltation that would likely lead to coelacanth displacement [8]. As if this was not enough the proposed 1,443-kilometre oil export pipeline starting at Kabaale, Hoima District, in Uganda and terminating at a marine storage terminal and load out facility at Chongoleani, Tanga municipality is another threat facing not only the coelacanth species but also the integrity of the marine park [9-11].

Conclusion

This short paper has endeavoured to characterise a unique fish species which was thought be extinct for millions of years only to excite scientists when it was "rediscovered" in 1938 in South Africa and later caught by ordinary fishermen in several West Indian Ocean islands and coastal states like the Comoros and Tanzania which have established marine parks for its conservation. The paper details the background and rationale of the Tanga Coelacanth Marine Park in 2009 which apart from conserving the coelacanth is also concerned with marine biodiversity, ecosystem functions and enabling sustainable livelihoods and full participation of local community users and other key stakeholders. The inherent and anticipated challenges posed by the planned building of a modern deep-sea port at Mwambani and Chongoleani being the terminus of the longest heated pipeline in the world being built from Uganda are highlighted. It is to be noted that the effectiveness of Tanga Coelacanth Marine Park has not been established because since its establishment no concise research report on the park has been produced. Such reporting should put emphasis on the conservation efforts and challenges since the establishment of the park [12-15].

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