

Importance of a Kenyan mangrove forest, Mida Creek, for the ichthyofauna in terms of ecological functions as feeding ground and nursery habitat

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Mangroves are forests consisting of trees that are able to withstand harsh conditions such as saline soils and regular flooding. These ecosystems attract a rich associated fauna and flora (Tomlinson, 1986; Northern Territory Australian Government, 2002). These dynamic ecosystems situated in (sub)-tropical regions are found in the inter-tidal region between sea and land (Polidoro *et al.*, 2010; Giri *et al.*, 2011). They are spread worldwide in these regions and occur in 118 countries (and territories) mainly composed of developing countries. The mangrove area is about 18 million hectares which represents 0.12% of the world forest and woodland (Spalding, 1997; Taylor, 2003; Giri *et al.*, 2011). As many other forests in the world, their coverage is decreasing. Since 1980, the global loss is estimated to reach 20% to 35% and the rate of disappearing is around 1% per year (Polidoro *et al.*, 2010). According to Duke *et al.* (2007), mangroves could functionally disappear within 100 years. Mangrove forests are largely deforested and degraded due to human activities. Urban development, overharvesting of fuelwood, aquaculture, and salt extraction are some causes of its decrease. Scientists have further pinpointed shrimp ponds to be the main trigger of tree removal. In addition, along the Kenyan coast, 20% of swamp fields have been converted into ponds for salt extraction (Abuodha & Kairo, 2001; Rönnbäck *et al.*, 2007). Their unfortunate future will impact the associated fauna and flora as well as the local population.

Indeed mangroves fulfill several types of ecological functions, ranging from a human economic perspective until a biodiversity conservation point of a view. The main physical functions are buffer against storms, protective barrier to reduce turbidity and erosion of the shoreline, absorption and transformation of nutrients. The local population living within this ecosystem often relies for their entire economy on goods provided by mangrove forests. The wood is used as fuel as well as to build boats. Mangroves are as such of vital importance for humans and for the fauna living within this ecosystem. In fact, mangroves are part of the "tropical coastal seascape" comprising the coral reefs and seagrass beds (Moberg & Rönnbäck, 2003). It supports the connectivity principle between these forests, mud/sandflats and seagrass beds in order to explain their respective and relative importance for the ichthyofauna. Overlaps in carbon and nitrogen signatures of fish collected in these different ecosystems allowed scientists to suggest that more than one habitat is chosen as feeding ground. In other words, the mangrove ichthyofauna probably consists of species migrating to different individual systems in order to find food and/or shelter. Their movements may be triggered by several factors: tides, food availability and variation in salinity (Lugendo *et al.*, 2006). Mangroves are, therefore, designated as potential feeding and nursery habitats for commercial pelagic fish and crustaceans. The conservation and protection of mangroves are so crucial steps to maintain the quality of the environment on a long-term basis.

So this master thesis investigates the fish assemblage of Mida Creek (Kenya, East Africa) as well as the presumed feeding and nursery functions of the area for the present ichthyofauna. In fact, this research performed in Mida is part of a Kenyan-Flemish project (RIP-VLIR) in which scientists have investigated the impacts of human use and management regimes of mangroves in Mida Creek, on the habitats and associated fauna including the benthos and demersal fish. The main goal of this bilateral project is to compare the impacts on the ecosystem between protected and unprotected mangrove areas differently used by local communities.

Since the purpose of this master thesis is to determine the species composition of the ichthyofauna of Mida and their trophic interactions, five representative locations were selected. They were situated at different distances from local villages in order to enlighten the effect of different degrees of human disturbance. Samples were collected during 5-6 consecutive days close to spring tide in mid July 2011. Fishes were caught using several types of passive fishing gears such as large and small fyke nets, gill nets and occasionally beach seine. All fishes were identified to species level, measured and weighed. We performed stomach content analysis to provide information about

fish diet. Furthermore, stable isotope analysis was applied on most fishes in order to detect whether the source of primary production for the higher trophic levels is specific of mangroves or not. A total of 29 fish species was found with a catch of 939 teleost specimens. Families of small-sized fish of wide distribution (Clupeidae and Ambissidae) in shallow waters dominated Mida Creek. Our analyses showed that a majority of fish belonged to the zoobenthivorous/omnivorous trophic mode since they were mainly feeding on invertebrates. By using stable isotope and stomach content analyses, we were able to identify parts of the food chain and to enlighten trophic interactions between fish species. Results suggested that the fish assemblage of Mida Creek can be divided into two groups. The first group comprised two species (*Sphyraena barracuda* and *Synodus variegatus*) being carnivore, especially piscivore. The second group consisted of fish belonging to zoobenthivorous/omnivorous trophic mode; feeding on benthic and pelagic invertebrates. Their diets were quite similar according to locations and life stages. Concerning the population structure, fishes caught in Mida were composed of transient (coral or seagrass associates) and resident species (i.e. *Sphaeramia orbicularis* and *Ambassis natalensis*). But juveniles were, however, numerically more abundant in the whole Creek than adult specimens. This result supports so the nursery function of Mida Creek and for all mangroves in general.

Our results confirm that Mida Creek mangrove is an important habitat for the ichthyofauna especially for juvenile fishes. They also suggest that the conservation of the functions provided by mangroves may require an integrated management of not only the creek, but of the integrated systems, the catchment, the forest, with the creek and adjacent offshore ecosystems (i.e. coral reefs and seagrass beds).