



SOLSTICE



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The Fishery Potential of the North Kenya Banks



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Key Messages:

Sustainable utilization of Kenya's marine resources is a key component of the Vision 2030 economic plan.

Uncertainty over the size and seasonal availability of fishery resources and whether the national fishing fleet can access the resources of the North Kenya Banks remains high.

Lack of knowledge of the fishery and its productivity drivers increases the risk and chances of long-term damage.

Extractive and protective activities must be managed together based on the precautionary principle to ensure long-term sustainability.

Introduction

Much of the coastline of Kenya is flanked by a narrow, 10 to 20 km-wide continental shelf, defined by the 200 m depth contour, from whose outer edge the seabed slopes steeply to the ocean depths. The only exception is at Ungwana Bay and the adjacent North Kenya Banks (NKB) that extends seaward as a submerged platform for 60 km at the widest southernmost point (**Figure 1**). Covering an area of between 3,000 km² and 4,300 km² depending on the interpretations of its boundaries, the NKB represents one of very few continental margin extensions of this type in the Western Indian Ocean region.

In many temperate waters, such a submerged bank would be a prime fishing ground, ideal for industrial seabed trawlers targeting demersal species such as cod and hake. In the tropics, such extended shelf areas do not always provide rich demersal fishing grounds but may nevertheless provide fishing opportunities better than those in adjacent open waters or traditional inshore fishing grounds.

Kenya has prioritized the sustainable utilization of its ocean and blue economy resources as an enabler of the Vision 2030 economic blueprint. President Uhuru Kenyatta, speaking on Thursday 3rd December 2020, at the State House, Nairobi, whilst presiding over the national launch of the New Ocean Action Agenda, has said that "It is clear that the ocean economy is a smart investment that can deliver social, economic, and environmental benefits to our people. As such, Kenya is keen to fully realize the potential of its 142,400 km² exclusive economic zone (EEZ). However, as we do so, we will steadfastly protect our marine resources even as we pursue its enhanced development

and productivity". Under this drive, one objective is to sustainably develop fisheries resources and the NKB is one area being looked at with this target in mind. Kenya also plans to transform the infrastructure, security and energy sectors among others, whilst as a signatory to the Nairobi Convention is committed to the protection of its marine environment.

The aim of this Science into Policy Review is to present the state of knowledge on the marine, environmental, geologic and other features relevant to the NKB, and present recommendations to face the challenges while reconciling different national development objectives and recognizing regional and international obligations, in light of climate change implications.

The target readership for this Policy Brief is primarily the Kenyan authorities and other stakeholders responsible for marine protected areas (MPAs), those involved in marine spatial planning (MSP), national and county-level fisheries management as well as organizations responsible for improving fisheries control and surveillance. It is also of interest to funding agencies (national, regional and international) that support research such as that relevant to addressing the key research gaps on the NKB that are highlighted below.

Oceanic processes, river inputs and productivity

The oceanic processes and primary productivity of Kenyan waters are influenced by the seasonally reversing monsoon winds. The southeast (SE) monsoon wind (from May to October) accelerates the East African Coastal Current (EACC) to 3 m s^{-1} while the northeast (NE) monsoon wind (December to March) slows its northerly flow, which off northern Kenya may even reverse and flow south at 0.5 to 1 m s^{-1} . During the latter season, the Somali Current flows south into Kenyan waters and meets the EACC near the NKB. Together these two currents flow away from the coast eastwards, forming the South Equatorial Counter Current (Figure 1).

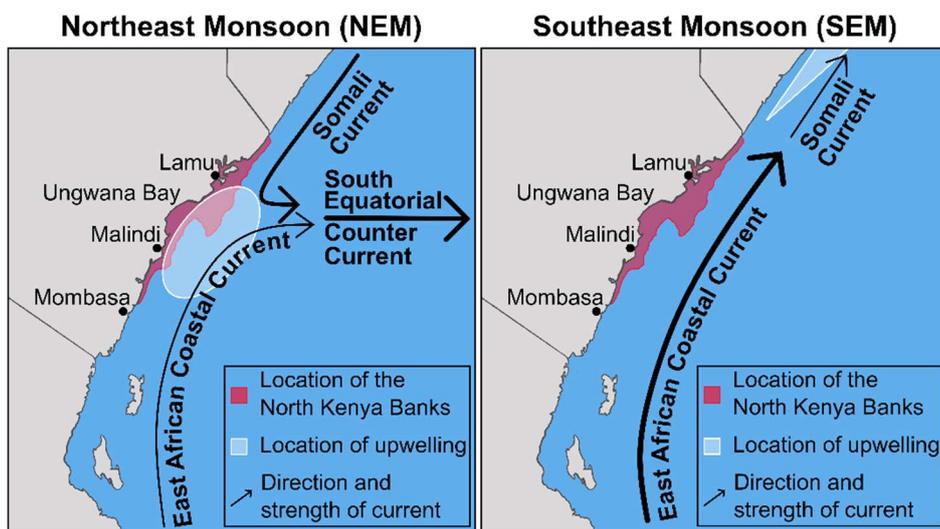


Figure 1: The North Kenya Banks region and the large-scale ocean circulation regime during the northeast (left) and southeast (right) monsoon periods.

As a result of this eastward flow away from the coast, the NKB is one of few sites in the region that experiences a convergence-generated upwelling which brings cold, nutrient-rich waters from depth to the surface, usually between December to February. Of note is that the exact position along the Kenyan coast where this happens varies from year-to-year (Jacobs et al., 2020). Even though the upwelling is always rooted to the NKB, the position, spatial extent, and intensity of the upwelling exhibit considerable interannual variability. For example,

during the strong El Niño event of 1997/98, a major shift in the zone of high productivity was detected using remote sensing data, revealing that the confluence zone between the two currents shifted south, in effect moving the productive water into Tanzania's EEZ. This variability in the intensity, position, and spatial extent of productive waters provide the first indication of the environmental controls that need to be taken into account when developing plans for sustainable exploitation of fisheries resources.

In general, higher primary productivity (plankton growth) leads to higher pelagic fish production. With respect to NKB waters, there appear to be two processes involved. Firstly, the convergence-generated upwelling typical of normal NE monsoon seasons, partly influenced by the topography of the NKB, and secondly discharges from Tana River into Ungwana Bay. High levels of chlorophyll, the photosynthetic pigment in phytoplankton, have been confirmed over the NKB by satellite imagery for the months of January or February for the years 1993-2015 (Jacobs et al., 2020). Meanwhile, at the local scale, there is evidence that Tana River sediments and nutrients spill into Ungwana Bay, from where at times they are dragged out by the EACC and over the NKB and beyond, notably during the SE monsoon season. The estimated annual terrigenous riverine sediment influx is of around 7 million tonnes (Kitheka et al., 2005). Recent analysis of satellite data demonstrated that Tana River influence on the productivity is confined to the coastal zone and can be distinguished from upwelling influence (Mutia et al., 2021; **Figure 2**), thus confirming the overall dominance of oceanic upwelling as the main driver of productivity over the NKB.

Added to this is that the Tana River upper basin catchment has been subjected to the construction of hydroelectric power plants and dams, which, combined with water abstraction downstream, has increasingly affected run-off to the estuary and the seasonal flood cycle. The impacts of catchment flow changes, combined with climate variability, include unpredictable high turbidity and heavy sedimentation, and degradation of flood-supported riverine forests, wetlands, mangrove forests and marine ecosystems. These in turn lead to reduced abundance and diversity of fish locally (KMFRI 2002, Kitheka et al., 2016), but most likely also affecting marine life over the NKB.

Coastal Fisheries

Local fishery

The outcome of the oceanic and local processes is a highly productive marine environment associated with the NKB (and Ungwana Bay) which provides the key ingredients to support an offshore fishery. The high prevalence of larvae of migratory species such as Albacore tuna, yellowfin tuna and mackerel to the north of the banks is suggestive of an important nursery area for migratory stocks (Mwaluma et al., 2021). Exploited in a sustainable way, such stocks represent the “blue resources” – the main focus of the Blue Economy that aims at raising the marine fisheries worth. Currently, only a handful of fishers, with handline and longline gears, catch red snappers, tuna and sharks off the NKB. **Whether this fishery resource is there on the scale hoped, throughout the year, and accessible to the Kenya fleet is yet to be determined.**



Figure 2: True colour MODIS satellite image for July 2000 showing a plume of sediment extending seaward from Ungwana Bay.

A reliable offshore fishery resource is an attractive proposition to many, because currently Kenya's marine fisheries are mainly artisanal and subsistence, undertaken mostly from small, non-motorized boats, with fishing mainly constrained to inshore areas. Even in the Tana and Sabaki river estuaries, considered important for biodiversity conservation and for supporting the livelihoods of coastal communities around Ungwana Bay, especially artisanal fishers, local marine fisheries infrastructure at Ngomeni village is limited with this area being one of the poorest areas in the country.

Despite Ungwana Bay being the most productive marine fishing ground in Kenya, local artisanal fishers struggle with a lack of basic safety equipment, navigation, depth sounding and communication devices, and gears to appropriately exploit offshore areas. Others resort to illegal gears. For example, though the use of beach seine nets is prohibited in Kenya, this unselective and destructive gear is still openly in use, including in Ungwana Bay. Similarly, the semi-industrial ring-net fishery, though not illegal, but attracting business investors due to its profitability, is used at the expense of damage to seabed habitats and fish stocks. This gear is now widespread and opposed by many local fishers, including from Ngomeni and Lamu (Murage et al., 2010).

Sport fishery

Parts of the Kenya coast have developed a thriving marine recreational or sports fishing industry, dating back to the 1960s. Watamu and Malindi are world-renowned destinations, attracting clients and tourists to catch black, blue and striped marlin, sailfish, short-billed spearfish, broadbill swordfish and tuna species, including from areas adjacent to the NKB. Over recent decades, much of the billfish caught have been tagged and released, which significantly helps in understanding their movement and growth. Billfish are also a source of food and income for artisanal fishers and a competitive interaction exists between recreational and artisanal sectors, with significant implications for management and shared socio-economic benefits (Kadagi et al., 2021).

Fisheries Management

It is widely recognized that Kenyan coral reefs are among the most heavily exploited reefs in East Africa with some considered overfished well above the maximum sustainable yield (MSY). At the current fishing effort, experts agree that it is unlikely that yields higher than the present levels can be expected in future unless urgent steps are taken to more strictly enforce gear restriction, regulate new entrants into the fishery and improve data collection both at national and local levels (Tuda and Wolff 2015). Another local factor is the impacted upstream watershed reducing river discharges of nutrients. **Therefore, expanding onto the NKB before the fishery and productivity is better understood potentially creates more risk and long-term damage.**

Marine Mammals

Based on records of dolphins and whales, three Important Marine Mammal Areas (or IMMAs) were identified in the vicinity of the NKB in 2019 (**Figure 3**). These are the Malindi-Watamu and the Lamu Offshore areas. The former is based on the consistent presence of the endangered Indian Ocean humpback dolphin, as well as Indian Ocean bottlenose dolphins and humpback whales, while the latter site was based on sightings, about 100 km east on the NKB, of endangered blue whales during a seismic survey in late 2014, suggesting that northern Kenya forms an important habitat for blue whales in the Indian Ocean (Barber et al., 2016).

The third site of importance, so far only attaining Area of Interest status, is the Lamu to Kiunga Archipelago, reflecting what marine mammal experts determine as being of interest as a future candidate IMMA, of value for

marine mammal conservation within the region. This area includes the entire NKB. Fortunately, Kenyan legislation prohibits the capture of cetaceans (Fisheries Act 2012, The Fisheries Management and Development Bill), as it does for sea turtles and dugongs. Attaining IMMA status would provide an initial regional focus, thus helping to prioritize use of the area in informing the design of effective protection networks or national management schemes, whilst not necessarily excluding fisheries

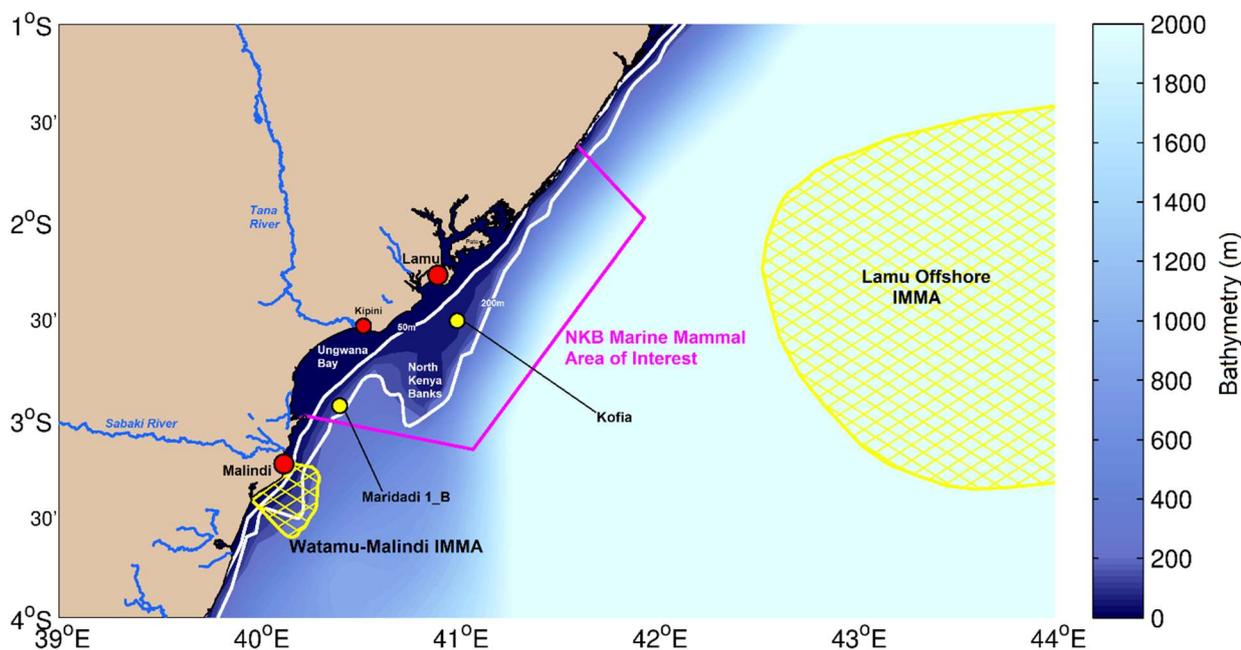


Figure 3: The NKB marine mammal Area of Interest (purple outline) and the Malindi and Lamu offshore IMMA (yellow hatched areas).

Offshore oil and gas exploration

Oil and gas exploration in the Lamu area began with ten wells drilled on land in the 1960s, though none were fully evaluated despite indications of oil and gas deposits. Interest in the offshore Lamu Basin in the 1970s and 1980s resulted in drilling of four more wells: Simba-1, Maridadi-1A and B, and Kofia-1, the latter on the NKB. Two encountered hydrocarbon 'shows'. Following massive gas discoveries in Tanzania and Mozambique in the early 2000s, renewed interest in Kenya led to the gazette of seven new Lamu Basin offshore blocks in 2003. Further south, the Mbawa-1 well, 70 km off the coast of Malindi, found a stratum of about 52 m of gas, representing Kenya's first hydrocarbon discovery offshore.

Associated with onshore hydrocarbon exploration is the approved pipeline from northern oil fields to Lamu where a second port is being built, as part of the Lamu Port-South Sudan-Ethiopia-Transport (LAPSSET) Corridor project. When completed, between 80,000 and 150,000 barrels of crude oil may be exported per day.

There is a growing list of multinational corporations seeking to exploit fuel deposits believed to be present in the Indian Ocean, including in the Lamu Basin. **Yet, the outcome of the drop in demand for hydrocarbon resulting from the COVID-19 pandemic and the global transition to renewable sources remains uncertain, thus there is uncertainty over future activity in this sector in the highly sensitive offshore**

areas of Kenya, including the NKB, where multiple stakeholder groups have interests and expectations. There is therefore a strong need for continuous re-evaluation of development priorities.

Marine Conservation Obligations

Kenya is a signatory to the Convention on Biological Diversity (CBD) of the United Nations, and a contracting party to the Nairobi Convention. **Through its CBD commitments, Kenya has a target of 10 percent of its EEZ to be protected, but to date, through the establishment of a total of six MPAs, Kenya has succeeded in protecting less than 1 percent** (Tuda and Thoya 2021). These MPAs were mostly gazetted in the late 1960s.

As with many other countries in the region, to achieve the 10 percent marine conservation target, the only real option is to designate offshore areas. If the NKB, with a minimum area of 3000 km², were to be considered for development as an offshore MPA this would massively increase the Kenya marine conservation estate to 3 percent of the EEZ. Similar approaches have recently been adopted by the Seychelles and South Africa, where trade-offs with fisheries and other extractive activities are agreed, ideally under some form of marine spatial planning approach, and where all implications of such management intervention would need to be considered. Increasing the marine area under protection also aligns with the obligations under the Nairobi Convention, whereby Kenya aims to address the accelerating degradation of the WIO and coastal areas through the sustainable management and use of the marine and coastal environment, as well as to protect its shared marine environment.

Future Strategy and Recommendations

Transitioning to a sustainable Blue Economy will take a concerted effort from the Kenya government, scientists, non-state actors and the private sector. It requires sound science, strengthened and sustained dialogue between technical experts and policymakers, and the availing of resources to address the challenges. The NKB fishery zone is of considerable interest in this context, as it holds huge potential likely to boost local fishery resources. The challenge is to confirm that a fishery exists and to understand its origins, importance and extent, including inherent management challenges due to climate change (Jacobs et al., 2021) and then to inform efforts to develop the fishery in a sustainable fashion, mindful of the various other national priorities. To achieve this, and **develop evidence-based informed management interventions based on the precautionary principle**, the following are the broad recommendations of this policy brief:

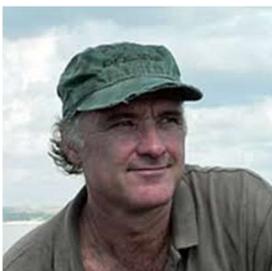
1. **Improve understanding of upwelling and river-borne nutrient supply** mechanisms responsible for elevated productivity, including interannual variability, through new in situ observations, with due consideration of climate variability influences.
2. **Conduct fishery and seabed surveys** of the NKB to improve understanding of the fisheries potential and the driving forces that support it. Based on the high larval densities encountered and evidence of it being a nursery ground for migratory fish implies that the NKB is an important fishery requiring appropriate management oversight.
3. **Consider a continental shelf MPA** that takes into account the importance to cetaceans, Nairobi Convention obligations and conservation targets. Such an offshore MPA would potentially permit the seasonal fishery for certain species, as is the case with several MPAs in South Africa, Mauritius and

the French Indian Ocean Territories. Developing such a site would benefit from marine spatial planning approach, typically involving all stakeholders (see item 8 below).

4. **Undertake further survey work on blue whales and other whales**, to confirm their presence (or not) during the entire year to help establish reasons for whales using the area and how that presence can be protected.
5. **Establish a strong monitoring, control and surveillance** (MCS) operation to ensure enforcement of payment of royalties by vessels from distant water fishing nations, that fees match international rates, and improve the understanding and regional awareness of illegal, unreported, and unregulated fishing occurring in Kenya's EEZ.
6. **Enforce fisheries and river basin management regulations** to protect inshore marine resources, including to control marine pollution and environmental degradation.
7. **Develop fisheries management strategies** that integrate ecological and socioeconomic aspects to sustain fisheries productivity and ecosystem health and allow sustainable exploitation of the resource. Typically gear restrictions, closed seasons, establishment of community managed areas in the vicinity of NKB and other interventions would be applicable. Successful development and future management of a NKB fishery also requires development of climate change adaptation measures (Kamau et al., 2021) (linked item 1 above).
8. **Develop a marine spatial planning (MSP) approach** appropriate to ensure sustainable and integrated management of human activities within the marine zone of Kenya (including the NKB area and further offshore) and relevant river catchment areas (Philip et al., 2020). Such a framework helps identify the most appropriate area for different uses (including river basin management, tourism, sports fishing, coastal communities and indigenous fishers, oil and gas, industry, government, conservation and recreation) to reduce or mitigate environmental impacts, including from climate change, and facilitate a sustainable blue economy.

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