

9.1 Loss of Coastal and Marine Biodiversity

The Earth's biosphere comprises a marvellous array of living organisms. This diversity of life, and specifically the term biodiversity, describes the richness or variety of organisms living on Earth, in an ecosystem, habitat, niche or any defined area. Biodiversity forms the basis of life on earth and sustains human well-being through provisioning (food security), regulating (waste assimilation), and cultural ecosystem services that provide recreational and spiritual benefits. Primary production and nutrient cycling are also essential life support processes attributable to biodiversity.¹

Biodiversity is intimately dependent on a particular supporting ecosystem or habitat, such that the loss of, or damage to an ecosystem is a primary cause of biodiversity loss. The magnitude of biodiversity varies between ecosystems with tropical forests, coastal shorelines and coral reefs being amongst the richest. Yet species in these

systems are often highly specialised and adapted to narrow habitat niches, making them vulnerable to change. Such change can result in biodiversity loss where the mix of species is altered, their numbers reduced or in extreme cases, extinction occurs.² Biodiversity loss invariably also represents a reduction in genetic diversity within populations.

There are many threats to biodiversity and habitat loss, not all directly attributable to human activities. A number of naturally occurring events such as hurricanes, storm surges, tsunamis and eruptions can cause, albeit temporarily, massive loss of habitat and disruption to the abundance and life cycles of species. However, human activities generally result in more significant, persistent and permanent impacts.³

The impact of coastal habitat and biodiversity loss is far reaching, affecting the provision of ecosystem goods and services.⁴

Land cover change and mono cropping are two of the biggest drivers of biodiversity loss.



Photo: ORI



Human drivers of habitat change

There are a number of activities that can cause habitat change and consequent biodiversity loss, including land cover change, water abstraction and pollution. Some culprits are discussed here.

Land cover change as a result of human activities is one of the most significant drivers of habitat loss. Coastal development (see *Section 9.2*) sees the replacement of natural habitats by settlements, harbours, croplands and plantations, mines and quarries and other human constructions.⁵ In KZN, extensive natural land in coastal regions and catchments has been converted to sugar cane, especially between the 1950s and 1980s.¹

Port development has destroyed significant and sensitive coastal habitats, including seagrass meadows, mangrove forests and intertidal soft sediment banks. The removal of seagrass from Richards Bay compromised the nursery function of juvenile stumpnose, a fact later detected in much lower catches of this popular linefish.⁶

Deforestation, sometimes far from the coast, often results in erosion thereby increasing sediment loads so that estuaries and offshore regions become more turbid. Increased turbidity reduces the penetration of much needed sunlight, particularly in shallow waters, affecting a range of plant species and consequently their productivity.³ Increased turbidity also affects the mix of fish and invertebrate species, for example in compromising visual predators, hence altering the natural balance of the coastal environment.

In many parts of the world, aquaculture has contributed to enormous habitat and biodiversity loss. Invariably located in floodplains and estuaries, huge ponds are built at the expense of rich mangrove forests or seagrass meadows. This in turn has compromised the nursery potential for wild stocks and their fisheries, thereby questioning the sustainability of numerous aquaculture facilities. Although aquaculture in KZN is not of such scale, the two established facilities are also located in sensitive estuaries.

Human activities generate a plethora of waste types, including hydrocarbons, fertilizers, nitrates and other chemical effluents that can form part of runoff which ultimately reaches the coastal and marine environment. Toxic runoff impacts the life cycles of many species and hence the biodiversity of coastal ecosystems.³

Inland dams, water abstraction and canalization of water courses for agriculture often decrease freshwater flow to estuaries, increasing the salinity of coastal waters resulting in an alteration of these habitats.³ A most striking example of this has been the degradation of the St Lucia system over many years, having been starved of natural fresh water inflow with huge destruction and alterations in habitat and biodiversity. Fluctuating levels of extreme salinity decimated biodiversity, while extended periods of mouth closure impacted on St Lucia's nursery function as reflected in reduced marine harvests of prawns and several linefish species.

It is estimated that between 1960 and 2000, reservoir storage capacity in KZN quadrupled. Dams also trap and retain natural nutrients; they cut off fish migration routes and drown habitats.^{3;5} Overuse of groundwater aquifers for domestic, agricultural, and industrial purposes affects the natural balance of groundwater and decreases ground water seepage to the coast and its sensitive coastal lakes.²

Decline of coastal ecosystems

More than half of the 14 biomes assessed by the Millennium Ecosystem Assessment have experienced a 20%-50% conversion from natural to human use.¹ The global loss of threatened coastal ecosystems is estimated at between 4% and 9% annually. For corals this is approximately 1%-2% each year, for saltmarshes 1%-3% each year and for mangroves between 2% and 5% a year. To put this into perspective, these losses are more rapid than the global loss of tropical forests, estimated at 0.5% per year.⁴ For KZN, it is estimated that 50% of the coastal environment has been transformed as a result of human activities. Of concern, research shows that areas that experience transformation of between 30% and 50% will see a decline in habitat connectivity affecting population dynamics and interactions.⁷

Should current transformation trends continue, it is estimated that by 2050, 78% of the entire province's landscape will be in a transformed state and the ability of the landscape to support biodiversity will be severely compromised.⁸ This is of concern for as this may lead to higher habitat fragmentation through the complete loss of habitats, which effects the survival of remaining species.² It is imperative that the habitats be conserved in order to maintain ecological functioning and preservation of biodiversity.

What action can be taken?

In order to protect habitats and their biodiversity it is necessary to strengthen environmental planning tools and focus on the conservation and sustainable use of biodiversity and ecosystem services. Not all development needs to be impeded and wise planning and management can mitigate many habitat and biodiversity threats. For example, ports can be designed to include natural habitats. Similarly, coastal development should be in development nodes rather than the ribbon-like development evident.



Ribbon-like development leads to loss of natural coastal biodiversity.

The establishment and management of appropriate Protected Areas is of great potential benefit to protect biodiversity. Current KZN marine and coastal Protected Areas are not all ideally located in the context of habitat and species diversity, suggesting a review may be justified (see *Section 10.4*). In several cases the MPA management plans and structures are inadequate to address issues such as inappropriate settlement, illegal harvesting, unsustainable tourism and impacts of invasive species. The nature and intensity of exploitation should be closely managed in order to ensure the recovery of individual species.

Genetic diversity needs to feature more prominently in conservation planning amid increasing concern that the range of genetic diversity is decreasing. Ecosystem restoration is a valuable management tool, a common practice in many countries, and certain to become an increasingly important option in coastal KZN as ecosystems become degraded.¹

While humanity has benefited from the exploitation of biodiversity and the conversion of natural systems to human-dominated systems, these have caused losses in biodiversity and changes in these very ecosystem services. This has led to some communities experiencing declining well-being and poverty as resources are no longer available.¹

Loss of biological diversity can be seen in many forms, the most dramatic being the extinction of species. Extinction rates depend on the rate of environmental change and the ability of species to adapt to these changes.⁵ It is therefore important that we understand the environmental implications of our actions so as to mitigate and minimise these. ■

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