

**NATIONAL SUSTAINABLE
DEVELOPMENT STRATEGY**

**SPECIALIST REVIEW:
COASTAL & MARINE
COASTAL & MARINE LIVING
RESOURCES**

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Trends and Forecasts

Variations in the health and stock status of living marine resources in South Africa are mostly driven by important changes in the physical environment (viz. loss and modification of habitat, pollution, and climate change), fishing pressure and the introduction of alien invasive species in the environment. Changes in the physical environment have been dealt with in the accompanying chapter (Clark and Atkinson 2005) while trends in and the effects of fishing pressure and alien invasive species are dealt with here.

Harvesting and Mariculture of Living Marine Resources

The marine and coastal resources of South Africa are a rich and diverse national asset, providing important economic and social opportunities for an ever-increasing population. The people of South Africa have developed a strong reliance on these resources for food, recreation, transport and financial gain (Attwood et al. 2002). South African fishers (commercial, subsistence and recreational) catch over 250 marine species, however, less than 5 % of these are actively targeted and together comprise 90 % of the catch (Mann 2000). Major fisheries include the pelagic purse seine fishery which targets sardine and anchovy, the demersal trawl and longline fisheries that targets mostly hake, sole and horse mackerel, the traditional linefishery that targets a wide variety of linefish species, and the west coast rock lobster and abalone fisheries.

The pelagic fishery contributes the greatest tonnage of fish landed from South African waters (538 000 tonnes in 2002) with sardine contributing the greatest portion of the catch landed (Fig. 1). Since 1999 sardine stocks have been recovering (average annual catch 230 000 tonnes) after nearly collapsing in the late-1960's (annual average catch 70 000 tonnes). The increase in anchovy catches to some extent compensated for the reduction in sardine biomass during this time period, but economic returns from anchovy are not as rewarding as for sardine. It is likely that sardine stocks will continue to recover in the future (probably at the expense of the anchovy biomass) with the existing conservative management strategies in place, resulting in positive economic benefits for the industry. The recovery of sardine has led to positive effects on other marine species that feed on sardine like snoek, yellowtail, marine birds and seals. The pelagic fishery contributes a substantial percentage of annual landings (74 %), however, due to the low price obtained for this resource, this only equates to approximately 20 % of the value of total fish landed per annum in South Africa.

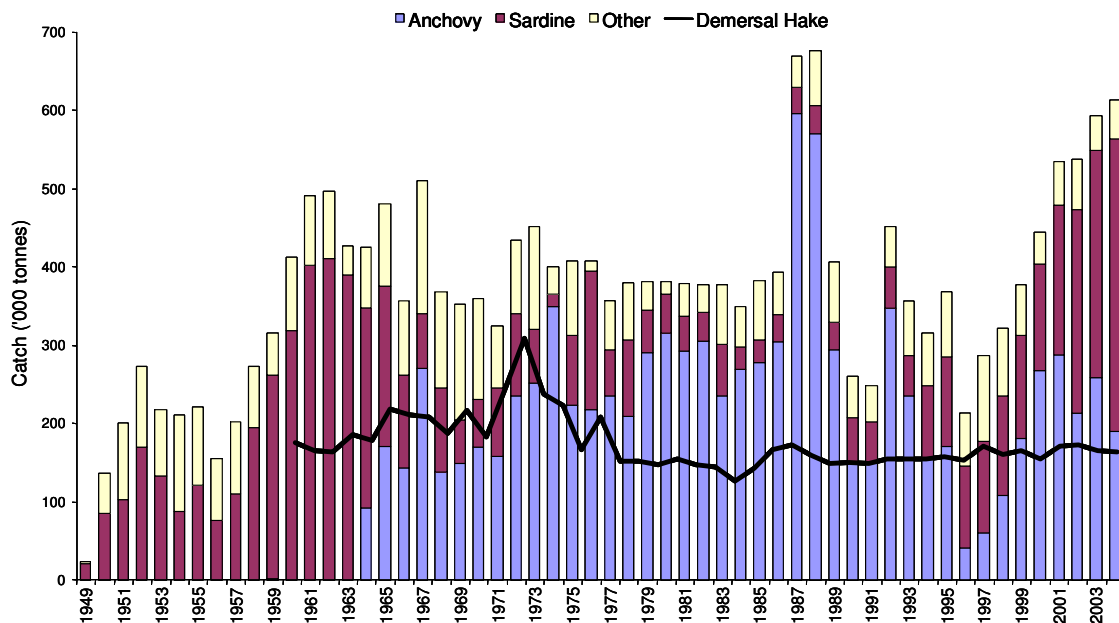


Figure 1. Pelagic and demersal hake commercial catch landed in South Africa 1950 - 2004

The demersal trawl fishery is South Africa's second largest fishery with respect to amount of fish landed. During the 1970's the hake resource was heavily depleted (Fig. 1) and was subsequently managed conservatively, with the objective of implementing a long-term rebuilding strategy. During the early 1970's catch rates of hake peaked at an average 240 000 tonnes per annum. The average hake catch rate per annum over the past five years (1999 to 2003) was 150 000 tonnes. Poor recruitment of these species in the late 1990's has resulted in a further decline in the catch-per-unit-effort (CPUE) of this resource. The Total Allowable Catch (TAC) has been reduced by between 2000 and 4000 tonnes in recent years with further reductions predicted before recovery is anticipated (DEAT 2005). The demersal hake fishery contributes approximately 19 % of the total fish landed in South Africa each year, however, the value contributed by this fishery makes up as much as 47 % of the total value of the South African fishery.

The traditional linefishery is one of the oldest fishing activities in South Africa, dating back to the early 19th Century. Currently, the linefishery is the third most valuable fishery in South Africa with commercial, subsistence and recreational fishers utilization this resource. Of the 21 most important linefish species, 13 are classified as collapsed resources (DEAT 2005). Factors contributing to the overall demise of linefish stocks include increased commercial and recreational fishing effort, confounded by several life history traits of targeted species (e.g. predictable locality, longevity and late maturity), making this resource particularly vulnerable to over-exploitation (Griffiths 2000). There has

been very little improvement in the status of most linefish species since 1999. In an attempt to address the failure of past regulations in managing the linefish resource, a Linefish Management Protocol (LMP) was developed in 1999. As part of this management protocol, drastic reductions in commercial linefish effort and stringent bag limits, size limits, closed seasons and banned species were introduced for recreational fishers. New linefish policies, based on the LMP, were *Gazetted* in May 2005 and are hoped to be instrumental in ensuring the rebuilding and sustainable utilization of the linefish resource.

The West Coast rock-lobster (*Jasus lalandii*) resource is targeted by commercial (large- and small-scale) and recreational fishers in South Africa (DEAT 2005). The rock-lobster resource is managed using a combination of TAC quotas allocated for zones around the coast, a minimum size limit, closed seasons, daily bag limits (recreational fishery) and restricted fishing hours (recreational fishery). Historical overfishing (1950's -1960's), stunted growth rates and poor recruitment (1990's) has led to a significant reduction in total rock-lobster landings (Fig. 2), with the TAC being reduced to approximately half of what it was in the 1980's (Griffiths *et al.* 2004). Furthermore, there has been a noticeable decline in rock-lobster abundance on the West Coast with a concomitant increase in numbers on the Southeast Coast (Tarr *et al.* 1996, Mayfield and Branch 2000). These aspects of the fishery require the rock-lobster resource to be managed using an Operational Management Procedure that prescribes set targets to attain recovery of the resource (DEAT 2005). With the increase in rock lobster along the Southeast coast, sustainability of a small-scale commercial fishery was considered viable and has recently been implemented in this area. Catch rates and stock status will continue to be carefully monitored to ensure sustainable TAC's are set for each fishing area. The future of rock lobster resource as a whole remains uncertain.

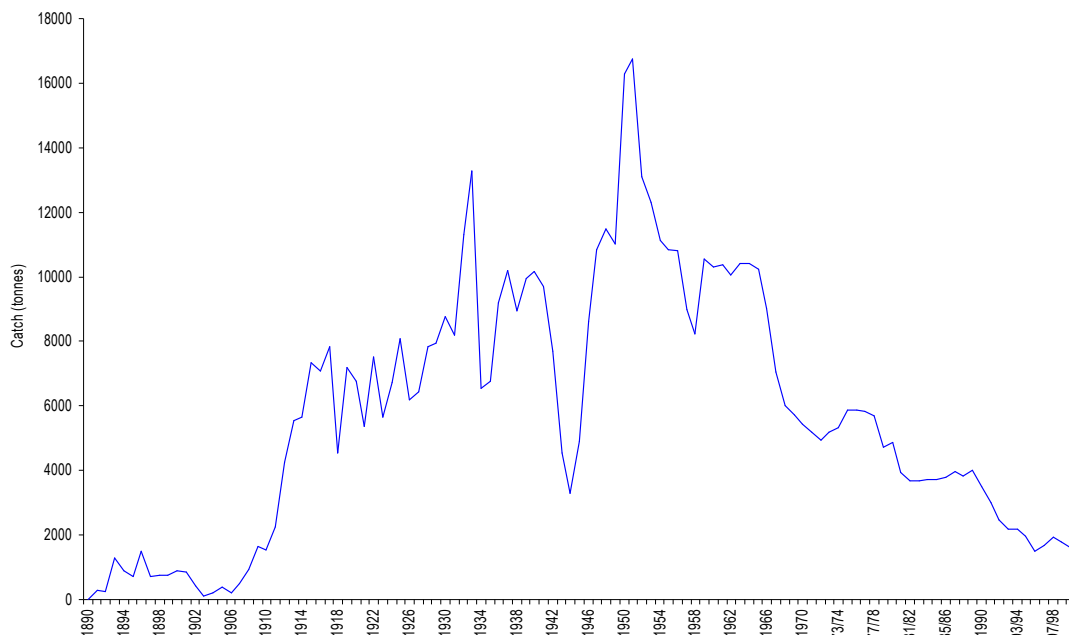


Figure 2. Annual commercial landings of West Coast rock lobster in South Africa from 1890 to 2001.

The South African abalone (perlemoen) resource is considered to be in severe crisis and extreme management measures have been implemented in an attempt to prevent the targeted species (*Haliotis midae*) from becoming commercially extinct. A combination of extremely high international demand and exorbitant prices, coupled with insufficient enforcement capacity, has led to the establishment of highly organized illegal abalone fishery syndicates. The increasing illegal removal of abalone (more than 50% removed are immature) currently renders this resource unsustainable. Additionally, ecological changes and species distribution shifts in two of the major fishing zones, has severely reduced normal recruitment patterns and success (DEAT 2005). The commercial TAC's have been reduced by 47 % and the recreational fishery has remained closed since 2003. New long-term (10 year) fishing rights were allocated in 2003/2004 with the Territorial User Rights in Fisheries (TURF) concept being introduced in an attempt to create a sense of ownership and co-management of the resource. Enforcement capacity and effort have been increased and infringement of the law with respect to illegal abalone removal is met with greatly increased fines. South African abalone is currently being considered for listing on Appendix III of CITES (species identified as requiring international trade controls), which would greatly assist in control of international trade and thus illegal activities associated therewith. Unless the illegal abalone fishery is eradicated, this highly valuable resource faces commercial extinction in the near future.

A substantial number of other marine resources are targeted by commercial, recreational and subsistence fisheries along the South African coast including mullet, prawns, squid and various seaweed species. Most of these fisheries are sustainably fished, however, some have been subjected to declining catches in recent years (e.g. mullet and prawn). Several new or experimental fisheries are being investigated as opportunities for sustainable harvesting (e.g. octopus) and are hoped to become viable in coming years.

Aquaculture (freshwater and marine) development in South Africa (indeed Africa as a whole) has lagged behind the rest of the world, with the continent producing only 2.4% of the global output and South Africa contributing only 1.6 % of this output (Hinrichsen and Brink 2004). World aquaculture production has been increasing at approximately 10 % per year over the past decade (Sauer *et al.* 2003) but total mariculture production in South Africa has remained relatively static over this time period (Griffiths *et al.* 2004). Mariculture of marine species in South Africa is becoming an increasingly environmental and economically viable option for sustainable production of protein for human consumption. Farming of the valuable abalone in South Africa is considered to be highly lucrative, successful and sustainable with as many as 12 established operations through the Northern, Western and Eastern Cape (Sauer *et al.* 2003). The introduced alien black mussel (*Mytilus galloprovincialis*) is successfully farmed in Saldanha

Bay and oysters (*Crassostrea gigas*) in Knysna Lagoon. Mariculture of specific fin fish species (salmon and dusky kob) show promising potential and experimental ventures are being established. Mariculture is recognized by the South African government as a means to promote diversity, vitality and long term viability of coastal economic activity but little has been done to promote this industry in South Africa. It is likely that there will be increased focus on mariculture in the future with the completion of the fishery transformation and long term rights allocation processes.

In recent years, there has been an increased focus on development of sustainable, non-consumptive marine resource use in South Africa, e.g. whale and shark viewing. With rigorous management, these activities can successfully generate interest in marine conservation, socio-economic empowerment and employment opportunities for coastal communities. There has been an increase in the number of boat-based whale and shark viewing permits issued and applied for, suggesting an increasing demand and future growth in non-consumptive marine resource use in South Africa.

Exotic or Introduced Invasive Marine Species

Marine fauna and flora have intentionally, or more often accidentally, been transported around the world as a result of human activities (Griffiths *et al.* 2004). Many introduced species rapidly die out before they are able to become established, however, some species, having no local predators, pathogens or limited competition, spread rapidly, and displace indigenous species. Once established, these invasive alien species are extremely difficult to control or eradicate and can significantly reduce natural biodiversity. The most frequent means of introducing marine alien species is through the ballast water of ships, which is discharged when loading cargo at ports or harbours, along with any surviving organisms. The highly dynamic nature of South Africa's marine environment appears to have prevented many marine alien invasive species from becoming established. Of the ten currently known marine invasive species that have become established in South Africa (excluding phytoplankton), only two (Mediterranean mussel, *Mytilus galloprovincialis* and the ascidian, *Ciona intestinalis*) are considered to have major negative ecological or economic impacts, while one (crab, *Carcinus maenas*) has the potential for negative impact. Once established the invasive species rapidly displace indigenous species occupying the same niche habitat and result in overall reduced biodiversity, frequently over expansive regions.

Microscopic algae (phytoplankton) are easily transported in ship ballast water and once discharged, can become invasive. Phytoplankton are frequently the cause of harmful algal blooms which can result in mass mortality of marine life. In order to establish whether a phytoplankton species is invasive to a region, a comprehensive historical database must be available, historical core samples must be referenced and molecular genetic techniques are needed for positive identification. These resources

are frequently not available for most species and South Africa has not yet been able to positively identify all potential invasive phytoplankton species. It is, however, likely that some species of phytoplankton, known to cause harmful algal blooms in South Africa, are introduced species.

The increasing scope and potential of trade (local and international) in aquarium fish species (especially tropical fish), combined with the current limited legislative control in this regard, poses a potential for introduction of invasive fish species, leading to further loss of biodiversity. Similarly, unregulated mariculture of marine species has the potential to threaten biodiversity through the accidental introduction of alien species or parasites. Rigorous control measures are required to prevent this and with this threat in mind, national government has issued a draft aquaculture policy (under review) and is in the process of drafting a Mariculture Bill.



Relevant Policies and Strategies

A summary of relevant domestic legislation (National Policy, Regulatory and Strategic frameworks) and International conventions and agreements to which South Africa is signatory, is provided in the table below. The relevance of each legislation or policy to each of the key issues identified above is indicated with an X.

	Harvesting and mariculture of living marine resources	Alien invasive species	Key provisions
NATIONAL / PROVINCIAL LEGISLATION			
White Paper on a Marine Fisheries Policy for South Africa (1997)	X	X	This policy was designed to improve the overall contribution from the fishing industry and address previous historic imbalances in fishery quota distribution whilst providing a management framework for improving marine resource use. Key objectives include implementation of long-term management plans with the use of operational management procedures, for optimal and sustainable utilization of all significant living marine resources, preventing marine resource exploitation from jeopardizing target resources, their environment or ecosystem or long-term sustainable yields, and conformation with relevant international standards, laws and treaties. Also makes provision for designation of Marine Protected Areas (MPAs) and identifies mariculture as requiring attention with respect to expansion and diversification of activities.
Marine Living Resources Act, 1998	X	X	Principle legislation governing South Africa's marine resources and was designed to conserve South Africa's marine ecosystems and allow sustainable utilization of marine living resources through scientifically based and publicly acceptable operational management procedures; affords protection to every species of sea animal (vertebrate and invertebrate), including spawn or larvae, but excludes seals or sea birds; ensures that all fishing activities (including any form of disturbance and mariculture) can only be undertaken with a fishing right or other such exemption. The Act emphasizes fair and equitable access to resources, transformation to environmentally sustainable fishing methods, the development of fees for utilization and a favorable business environment in fisheries; it The Act stipulates national control and co-ordination of marine resources and places responsibility for marine resource-allocation decisions with the Minister of Environmental Affairs and Tourism, and provides for control over non-consumptive use of marine resources (whale and shark viewing).
Sea Birds and Seals Protection Act, 1973	X		Provides for the protection and controlled capture and/or killing of sea birds and seals, and for the disposal of the products of these organisms; and also provides for control over access to certain islands and rocky outcrops within South African waters.
National Environmental Management Biodiversity Act, 2004	X		Provides for management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; and provides scope for prevention of introduction and spread of alien and invasive species and methods to control and eradicate such species.
Sea Fisheries Act, 1988	X	X	Most of the provisions of this Act have been repealed by the Marine Living Resources Act, 1998, but still provides some level of restriction over collection and removal of aquatic plants from the sea shore; also renders it illegal to make use of poison or narcotics to kill fish, capture undersized fish, sell fish (unless in possession of a permit for such purposes), dump catch at sea or import/export fish without a permit.
Draft Mariculture Bill	X	X	A draft bill is being prepared that will focus specifically on mariculture in South Africa and aims to address issues of introduced species and threats to biodiversity.



	Harvesting and mariculture of living marine resources	Alien invasive species	Key provisions
INTERNATIONAL CONVENTIONS AND AGREEMENTS			
Convention on Biological Diversity: Jakarta Mandate	X	X	The Convention provides for the conservation of the biodiversity, the sustainable use of biological resources and the fair and equitable sharing of benefits arising from the use of genetic resources. Parties of this Convention are obliged to protect biodiversity and thus promote environmentally sound integrated pollution and waste management practices. The White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity addresses some requirements of this convention and South Africa is responsible for developing and implementing national strategies, plans or programmes to address the provisions of the convention.
United Nations Convention: Law of the Sea (UNCLOS) 1982, including that relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks	X		This convention provides for the coastal State to be responsible for ensuring proper conservation and management measures be implemented to maintain the living resources in the EEZ such that they are not endangered by over-exploitation. Populations of harvested species are to be maintained at maximum sustainable levels. The convention also allows the coastal State to permit other States access to living resources within its EEZ, in accordance with the laws of the coastal State. The convention provides specific guidelines for management of straddling stocks, migratory species, marine mammals and estuarine dependant marine fish. The convention also provides regulations for appropriate conduct and cooperative utilization of marine resources occurring in the high seas.
Food and Agriculture Organization of the United Nations: Code of Conduct for Responsible Fishing	X		The Code sets out principles and international standards of behaviour for responsible fishing practices to ensure the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity. The Code recognises the nutritional, economic, social, environmental and cultural importance of fisheries, and the interests of all those concerned with the fishery sector. The Code takes into account the biological characteristics of the resources and their environment and the interests of consumers and other users.
Southern African Development Community (SADC): Protocol on Fisheries	X		This Protocol relates the countries of the southern African region and provides a set of rules by which to govern fisheries of the signatory countries in a manner that promotes responsible and sustainable use of the living aquatic resources and ecosystems of interest to State Parties. Protocol for, <i>inter alia</i> , management of national and international responsibilities, shared resources, access agreements, high seas fishing, subsistence fishing, aquaculture and trade and investment are provided for.
Convention on Wetlands of International importance, RAMSAR 1971	X	X	The Ramsar Convention is an inter-governmental treaty that provides a framework for international co-operation for the conservation of wetland habitat. Obligations are to promote the wise use of wetlands and uphold the ecological integrity of wetlands through stringent application of Integrated Environmental Management principles and practices.

Note: Various aspects of the National Environmental Management Act, 1998 (NEMA) and the Environmental Conservation Act, 1989 have relevance to harvesting of marine resources, mariculture and invasive species. The Sea Shore Act, 1935 makes reference to mariculture of marine resource species and provides some level of guidelines, however, this legislation is outdated and will be repealed by the proposed Mariculture Bill. These Acts are summarized in the accompanying document, Coastal and Marine Physical Environment Specialist Review, and thus not repeated here.

Key Challenges and Policy Implications

Harvesting and Mariculture of Living Marine Resources

South Africa's transition from Apartheid in 1994 was marked by a comprehensive review of administrative policies, including those affecting the utilisation of living marine resources. The introduction of the *White Paper on Marine Fisheries Policy in 1997* and the *Marine Living Resources Act (MLRA)* in 1998 posed very serious challenges to fisheries management authorities over the last 10 years. On one hand, most resources were at least maximally or in many cases overexploited, while on the other, fisheries managers were being required to accommodate a whole host of new entrants to the fishing industry at all levels, subsistence fishers (not formally recognized) had to be accommodated and management structures established to deal with allocation of rights to this sector, and new management approaches had to be developed to improve rights allocation across all fishery sectors. Many felt that they were being asked to achieve the impossible, and the period following the introduction of the new legislation was very difficult, with initial attempts to transform the fishing industry not being particularly successful. The Department of Environmental Affairs and Tourism was plunged into a state of crisis as it was ill prepared for the dramatic increases in rights applications (from fewer than 300 prior to 1990 to almost 12 000 in 1999) precipitated by the introduction of the MLRA. There were long delays in issuing rights and numerous legal challenges ensued. Decisions by the authorities were overturned by the courts, and poaching escalated. The new allocation process also destabilised the fishing industry due to financial insecurity associated with annual fishing rights. Decisive management intervention was required to prevent the situation spiraling out of control, and in 2001, the transformation process of the fishing industry was reinitiated, using a different approach, based on longer-term fishing rights, increased application fees, and independent verification of rights applications. Applications were invited for 'medium-term rights' for 2002-2005, with the intention of introducing longer-term rights (up to 15 years) in 2005. Applications decreased by 50% (to 5 496), and by 2002, 1 879 rights had been allocated for the most important commercial fisheries, rising to 5 837 in 2004 (see Kleinschmit *et al.* 2004, Branch and Clark in Press for more details). Applications for long-term (10 year) rights in most commercial fisheries in this country have been submitted, litigation has almost ceased, and stability has been largely restored. In hindsight it can now be said that South Africa has benefited from the opportunity to "re-invent" its fishery administration, which has ultimately resulted in a fisheries policy that is amongst the most modern in the world. Notwithstanding this, a number of important challenges still remain. Stocks of many species are still in a critical state (e.g. abalone and linefish), poaching is still rampant in some of these fisheries, full roll-out of subsistence fishery rights still has to be accomplished, and the amount of coastal and offshore marine habitats incorporated within marine protected areas still falls well short of internally accepted standards. Fishery management authorities now have more effort and resources available to direct at these issues and it is hoped that they will be resolved in the near future. In summary, following the words of Branch and Clark (in press) it can be said that "changes in rights-ownership and management style over the short 10 years of democracy are an extraordinary, if unfinished, symphony"



Exotic or Introduced Invasive Marine Species

Legislation pertaining to mariculture in South Africa (Biodiversity, Marine Living Resources and Environmental Acts) is considered, by some, to be too restrictive to allow sufficient scope for growth in the mariculture industry. To some extent, these concerns are valid, however, such stringent measures are essential to prevent the accidental introduction of alien invasive species through mariculture ventures. According to the National Environmental Management Biodiversity Act, any form of ballast water release into harbours or ports is illegal without a risk assessment having been completed and the risk evaluated as negligible. This is however, not currently enforced and seldom applied. A new Ballast Water Management Policy is currently being drafted with the aim to address such discrepancies between practical and impractical mitigation measures to prevent invasive species introduction.

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