

Government Gazette Staatskoerant

REPUBLIC OF SOUTH AFRICA
REPUBLIEK VAN SUID-AFRIKA

Vol. 516

Pretoria, 13 June
Junie 2008

No. 31143

CONTENTS

No.

*Page
No. Gazette
 No.*

GOVERNMENT NOTICE

Environmental Affairs and Tourism, Department of

Government Notice

657 Marine Living Resources Act (18/1998): Draft Guidelines for Marine Ranching and Stock Enhancement 3 31143

GOVERNMENT NOTICE

DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM

No. 657

13 June 2008

**MARINE LIVING RESOURCES ACT, 1998 (ACT NO. 18 OF 1998)
DRAFT GUIDELINES FOR MARINE RANCHING**

I, Marthinus Christoffel Johannes Van Schalkwyk, Minister of Environmental Affairs and Tourism, hereby, publish for public comment, the draft Guidelines for Marine Ranching and Stock Assessment in South Africa and the draft Guidelines and Potential Areas for Ranching and Stock Enhancement of Abalone (*Haliotis Midas*) in South Africa in the Schedule.

Any person who wishes to submit representations or comments in connection with the draft guidelines are invited to do so by 16h00 **FRIDAY 29 August 2008**. All representations and comments must be submitted in writing to the Deputy Director-General of the Department of Environmental Affairs and Tourism, Branch Marine and Coastal Management:

By post to: The Deputy Director-General:
Environmental Affairs and Tourism
Marine and Coastal Management
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**MARTHINUS VAN SCHALKWYK,
MINISTER OF ENVIRONMENTAL AFFAIRS AND TOURISM**

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SCHEDULE

**GUIDELINES FOR MARINE RANCHING
AND STOCK ENHANCEMENT
IN SOUTH AFRICA**

Department of Environmental Affairs and Tourism

May 2008



environment & tourism

Department:
Environmental Affairs and Tourism
REPUBLIC OF SOUTH AFRICA

TABLE OF CONTENTS

<u>Content</u>	<u>Page no.</u>
1. INTRODUCTION	3
2. FACTORS TO CONSIDER WHEN PROPOSING TO UNDERTAKE RANCHING AND STOCK ENHANCEMENT	5
3. ASSESSMENT OF PROPOSALS TO UNDERTAKE MARINE RANCHING	6
3.1 Description of proposed activity	6
3.2 Objectives and performance targets	7
3.3 Economic feasibility	7
3.4 Access and Resource sharing issues	7
3.5 Environmental issues	8
3.5.1 Carrying capacity	8
3.5.2 Trophic/Ecological	8
3.5.3 Genetic	9
3.5.4 Disease management	9
3.6 Monitoring	10
3.7 Enforcement	11
4. PILOT OR LOCAL SCALE PROJECTS	12
5. FULL COMMERCIAL RANCHING OR STOCK ENHANCEMENT	12
REFERENCES	13

1. INTRODUCTION

Environmental degradation and poor fisheries management have caused several of the world's fisheries to decline or even collapse. At the same time the demand for fishery products globally is expanding. In order to meet the shortfall, ranching and/or stock enhancement has been used in other countries to sustain continued production from the marine environment.

Definitions and Scenarios of Marine Ranching and Stock Enhancement

- Marine Ranching

Bannister (1991)¹ defines marine ranching (reseeding) as “Identifiable stock released with the intention of being harvested by the releasing agency.”

- Stock Enhancement

Bannister (1991) defines enhancement as “The releasing of stock for the public good without the intention of directly benefiting an exclusive user group”. Generally this would imply some form of government assistance.

The primary objectives for ranching and stock enhancement are the following:

1. Restocking, which is undertaken to compensate for depletion or eradication of a species, to replenish an area where it used to occur but has since been eradicated (re-introduction), or to provide additional spawning stock to an area where the fishery has declined or collapsed (supplementation). Restocking may also be considered to further improve production in an already sustainable fishery.
2. Augmentation is undertaken to compensate for loss of or damage to the habitat through stock release. It recognises the effect of the modified habitat through the release of fish at a size or age when the habitat is no longer a limiting factor. Some habitats cannot support animals at an early stage of development but may support older animals.

¹ Cited in Borg 2004

3. Addition, when a new species is translocated into an area outside its natural range. The ongoing experiment with abalone on the West Coast is an example of this practice. The production and stocking of trout for recreational fishing is another well-known example.

The deliberate or accidental release of a species into a marine environment outside its “current” distribution range is referred to as an introduction (introduced species = alien, non-indigenous etc.). The movement of individuals of a species or populations from one location to another within its current range is called a transfer. (Precautions to be taken when these activities are undertaken are contained in international codes such as the ICES Code of Practice on the Introductions and Transfers of Marine Organisms).

The terms “indigenous” and “alien” are used according to the definitions provided in the National Environmental Management: Biodiversity Act, No 10 – 2004, as follows:

“indigenous species” means a species that occurs, or has historically occurred, naturally in a free state in nature within the borders of the Republic, but excludes a species that has been introduced in to the Republic as a result of human activity.

“alien species” means-

a) a species that is not an indigenous species.

The risk of unpredictable harmful effects that stocking could bring about is accepted by some as sufficient reason to resist the practice of stocking altogether. Others adopt a more flexible position that accepts that circumstances do exist where stocking would be acceptable, provided it takes place in accordance with appropriate standards and protocols. This document is developed on the basis that the policy on marine aquaculture in South Africa will be based on the latter position. The applications for specific marine ranching projects would be evaluated on their merits.

2. FACTORS TO CONSIDER WHEN PROPOSING TO UNDERTAKE RANCHING AND STOCK ENHANCEMENT

Ranching and stock enhancement should only be considered in poorly performing fisheries where stocks fail to recover after applying traditional fishery management tools and, only in exceptional instances for the development of a new fishery, e.g. to enhance economic development or social up-liftment.

It is important to determine the level of biological risk (risk to other species and to the environment) before considering ranching or stock enhancement. It is clear that there is no such thing as 'no risk' in stock enhancement. Therefore, it is necessary to determine species level "an acceptable level of risk". Based on (Borg 2004) for inland fisheries, the following levels of risk were identified:

1. The lowest level of risk is the introduction of naturally occurring species into areas within their range but where they are no longer found.
2. A higher level is introduction of stock within its range where it is already found, to restore abundance to levels of productivity of naturally occurring stock.
3. The next level is when a species whose reproductive biology is well understood is introduced in to an area outside its natural range where it is known that successful reproduction cannot occur.
4. An even higher level is translocation of an indigenous species' outside its natural range, where neither its reproductive biology is known nor conditions for successful reproduction are known to exist.
5. The highest level of risk is introduction of alien species that has the potential to be invasive in that particular environment.

The Department of Environmental Affairs and Tourism (the Department) will only consider proposals for enhancement and ranching that fall within the first four levels of risk in terms of species.

The other "non biological" risks are the following:

- User group conflicts (*i.a.* "conventional" fishing activity).

- The potentially harmful ecological and environmental impacts of populations of introduced and transferred species on populations of indigenous species and their natural environment.
- The potential genetic impact of introduced and transferred species by the interbreeding of farmed and wild stocks as well as of the release of genetically modified organisms.
- The possibility of inadvertent transfer of harmful organisms associated with the target (host) species. Mass transfer of large numbers of animals and plants has led to the simultaneous introduction of pathogenic or parasitic agents causing damage to indigenous fisheries.

3. ASSESSMENT OF PROPOSALS TO UNDERTAKE MARINE RANCHING

Where ranching and/or stock enhancement is considered desirable and feasible, a rigorous process should be undertaken to assess proposals. Proposals to undertake an introduction should be reviewed by a panel of experts. Such a review will determine the risk as well as precautions that need to be taken to prevent introductions of non-target species.

Proposals must provide information on the aspects listed below as a minimum.

3.1 Description of proposed activity

Proposals should contain a full description of the proposed activity details of species to be introduced and associated biological parameters, e.g. origin or source of stock (i.e. hatchery-reared or wild stock), growth, reproduction, survival rates, resource status, etc. In the case of hatchery-reared stock, the animals should be obtained from a marine aquaculture establishment approved by the Department. In the case of wild stock, details of collection sites, stock status, collection equipment and methods should be provided. Proposals should describe the proposed area and site(s) for the release of stock, as well as release equipment and methods, e.g. timing and size/age at release. Detailed maps and diagrams should be provided. Proposals should also

provide details of the proposed harvesting of the released stock, e.g. timing, size/age and methods.

3.2 Objectives and performance targets

Proposals should provide clearly defined objectives and associated performance targets to be monitored within the framework of other activities in the area. The targets should therefore be realistic and measurable.

3.3 Economic feasibility

Proposals should provide information on the economic feasibility of the proposed activity, such as cost benefit analyses. Positive economical benefits need to be balanced against negative ecological effects. These economic benefits should include a demonstration that there will be increased productivity and production in the area. Possible revenue generation opportunities should be identified whether local or international. The applicant should demonstrate that the project will be profitable and sustainable. Details of facilities, infrastructure and employment opportunities that will be created in the process, should also be provided.

3.4 Access and Resource sharing issues

Proposals should address distribution of benefits and how other users in the area will be affected by the proposed initiative. Also to be addressed is the right of access to the area and the need for large areas of water to be allocated for these activities. All these issues should be addressed on a case by case basis prior to embarking on ranching/enhancement initiatives.

In order to encourage investment in ranching, which is capital intensive, exclusive ranching rights would be given as an incentive. The decision to grant exclusive ranching rights would have to be balanced with the interests of the broader public and other user groups.

3.5 Environmental issues

Proposals should provide an analysis of potential impacts at the introduction site, including potential ecological, genetic and disease impacts and consequences of its spread. The applicant is therefore required to undertake a strategic environmental assessment (SEA) in respect of ranching or stock enhancement under the National Environmental Management Amendment Act No. 8, 2004 and regulations. An Environmental Authorisation should be issued by the National Department of Environmental Affairs. The SEA should be undertaken by an appropriately qualified person/organization (“independent”). An environmental monitoring and management plan that will provide details of management practices and mitigation measures should also be developed. With regard to the above (environmental assessment and management plan), the following environmental issues should be addressed:

3.5.1 Carrying capacity

A primary consideration is habitat suitability, i.e. existence of critical habitat characteristics for the life history stage under consideration. Environmental carrying capacity should be considered when deciding on the appropriate number of individuals to be released into an area. The density of animals occurring in pristine natural populations of the animal in question would be an indicator in this regard.

3.5.2 Trophic/Ecological

There are many examples where introduced stock have replaced or dominated indigenous populations due to competition, differing predator responses, or introduction of a predator (food-web modifications or ‘trophic cascades’). Due consideration must be given to behavioural aspects of the species to be introduced and potential effects on natural ecosystem functioning at the site of the intended release. Predator control could be considered but would require detailed knowledge of the ecosystem functioning.

3.5.3 Genetic

Genetic issues are a major concern even when the released species is indigenous. Biodiversity can be lost through breeding between hatchery and wild stock resulting in different set of survival traits of the hybrids. Proposals should take the following guidelines into consideration:

- All hatchery stock to be released into the marine environment should originate from broodstock obtained from the same area or an interconnecting system (same genetic zone).
- Large numbers (in excess of 100) of randomly collected animals for broodstock should be used to produce juveniles for release purposes. This will help prevent loss of genetic diversity through inbreeding and genetic drift.
- No selection process to improve the broodstock must occur in the case of transfers. Some selection process may be allowed for introductions/re-introduction to an area to optimize fitness and improve survival.

3.5.4 Diseases

All stock releases, whether of an introduced or transferred species, carry the danger of accidental introduction of disease causing agents and/or non-target species including pathogens, parasites and pest organisms to an area, with potentially highly detrimental effects on the ecosystem. It is important that careful quarantine procedures are implemented such as described in the ICES Code of Practice on the Introductions and Transfers of Marine Organisms 2004 (ICES 2004). Stock to be released must be tested for diseases and pests. Testing and certification of disease- or pest-free status must be performed by government veterinarians or other authorized officials.

Proposals should include a thorough review of non-target species that could accompany the introduction or transfer. Some important issues to be covered are:

- Known pathogens and parasites of the species.
- Susceptibility of species in the area of enhancement to diseases and parasites found to affect the introduced species in its current range.

- The likelihood that the introduced species will act as an intermediate host for unwanted species.
- Precautions undertaken to ensure no unnecessary biota accompany the shipment.
- A disease monitoring programme for introduced or transferred stocks.
- Contingency plan in the event of a significant disease agent being detected in the area of enhancement.

Only fingerlings or spat of the introduced species may be released into the wild. The introduced or transferred organisms used as broodstock for the production of fingerlings or spat should be kept in a quarantine facility. The quarantine facility serves to prevent escape of non-target species and provide assurance of freedom from diseases prior to release. The animals should be disease and parasites free before being introduced. The operational plan for the facility should address at a minimum the following:

- Treatment of all effluents and wastes to destroy all disease agents and other non-target species. All disinfectants should be neutralized before release into the surrounding medium.
- Isolation of the introduced broodstock from progeny, disease agents, birds and other animals, unauthorized entry etc.
- Regular inspections for reportable diseases and pathogens.
- Detailed record keeping - mortalities, effluent/influent treatments, veterinary reports etc.
- The quarantine period required to allow detection of all non-target species (including non-pathogenic parasites and diseases).

3.6 Monitoring

The applicant should submit a proposed monitoring programme to be undertaken by an appropriately qualified person/organisation. A monitoring programme should be implemented to evaluate the costs and benefits of the project. Success should be evaluated in terms of social, ecological and economic considerations. Both the pilot

(see section 4) phase and subsequent commercial (see section 5) phases should be monitored.

Monitoring will also serve to verify that the project is meeting its performance targets. An initial (baseline) survey should be undertaken to determine the status of the stock prior to release of the animals that are being introduced. The stock should be assessed again prior to harvesting to determine appropriate harvest levels. The Department will review progress reports and results submitted by the permit holder and may undertake additional investigations or sampling where necessary. Resource surveys should be undertaken by the Department or an appropriately qualified independent person/organisation.

In the event of a “catastrophic event”, the releasing agent will be liable. The realising agent would need a contingency plan to be in place for such an eventuality.

3.7 Enforcement

The applicant should assess the risks of illegal harvesting of the released stock and should identify the intended approach to prevent such illegal activities. The fact that reseeded stock may not always be identifiable from wild stock raises some important monitoring and enforcement issues related to access, quotas, size at harvest, etc. An enforcement risk assessment and plan should be provided by the applicant who will take primary responsibility for enforcement. Prior to implementation, the compliance enforcement plan should be finalised in consultation with the Department’s enforcement division.

The applicant will be required to comply with regulations set out in the permit conditions to be issued by the Department. The Department will perform random inspections (spot checks) to ensure compliance with permit conditions.

4. PILOT OR LOCAL SCALE PROJECTS

Once a proposal has been assessed and deemed feasible, a pilot scale operation should be carried out during which ecological interactions and risk assessment assumptions, and social and economic responses are monitored to determine viability. Scientific assessment should address survival of the released stock and main causes of mortality, impact on the gene pool, and other environmental impacts.

The pilot phase should be long enough to allow assessment of the enhancement techniques employed and critical ecological processes and effects, but short enough to keep the risk that may arise as low as possible. The duration of the pilot period will depend on the lifecycle of the species but should allow enough time for grow-out and harvest. If a pilot project is deemed to be unsuccessful, it is important that the reasons are ascertained. It should be appreciated that natural fluctuations in stock abundance can mask the success or failure of an enhancement project.

5. FULL COMMERCIAL RANCHING OR STOCK ENHANCEMENT

A successful pilot project may lead to a longer-term, commercial ranching or enhancement initiative. Notwithstanding the findings of the pilot project, there is a need for ongoing monitoring for success or failure during the lifetime of the project. Assessments should be based on not only the enhancements, but also other uses of the resources or area. Should there be consensus that the pilot project be rolled out into a full scale operation, the applicant should apply for a long-term right that shall not exceed 20 years.

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- Caddy J.F. and O. Defeo 2003 Enhancing or restoring the productivity of natural populations of shellfish and other marine invertebrate resources. FAO Fisheries Technical Paper 448. Food and Agricultural Organization of the United Nations, Rome. pp 159.

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**GUIDELINES AND POTENTIAL AREAS FOR RANCHING
AND STOCK ENHANCEMENT OF ABALONE
HALIOTIS MIDAE
IN SOUTH AFRICA**

Department of Environmental Affairs and Tourism

May 2008



environment & tourism

Department:
Environmental Affairs and Tourism
REPUBLIC OF SOUTH AFRICA

TABLE OF CONTENTS

Content	Page
1. INTRODUCTION	2
2. KEY ISSUES FOR ABALONE RANCHING	3
2.1 Environmental Interactions	3
2.1.1 Tropical / Ecological	3
2.1.2 Carrying Capacity	4
2.1.3 Genetic	5
2.1.4 Disease	5
2.2 Resource sharing issues	5
2.3 Economic viability	6
2.4 Monitoring	6
2.5 Enforcement	7
3. POTENTIAL AREAS FOR ABALONE RANCHING	7
3.1 Northern Cape	7
3.2 Western Cape	8
3.3 Eastern Cape	9
3.4 Kwa-Zulu Natal	11
4. GRANTING OF RIGHTS	11
4.1 Pilot Projects	11
4.2 Full Commercial	12
5 Map of Potential Areas for Abalone Ranching	12

1. INTRODUCTION

The abalone *Haliotis midae* occurs naturally between Cape Columbine on the west coast and Port St Johns on the east coast of South Africa (Fig. 1). A commercial fishery for abalone has been in existence since 1949 and is centred in the south-western Cape region from Cape Columbine to Quoin Point along the south coast (Fig. 1). In the past abalone were harvested by subsistence fishers also in parts of the Eastern Cape province. Although the intertidal stocks in most areas are now depleted, and there is currently no regulated fishery in that area. A large recreational sector targeted abalone along its entire natural distribution range (excluding closed areas) for approximately 20 years, but was suspended in 2003 because of a decline in the resource. Poaching and ecological changes have led to the collapse of commercial abalone fishery. The fishery was closed in February 2008.

Since the 1980's, farming of abalone has developed rapidly and production levels are now in the order of 900 tons (in 2007). With the increase in the availability of abalone seed/juvenile larvae, various ranching (reseeding) experiments have been initiated, mainly in the vicinity of Port Nolloth along the west coast, and on a smaller scale, at Cape Recife along the east coast. The precautionary approach was followed and the number and extent of these operations were restricted. However, interest in abalone ranching has grown and the Department of Environmental Affairs and Tourism (the Department) has developed Guidelines for Marine Ranching in South Africa.

The purpose of this document is to provide information to assist applicants wishing to undertake ranching of abalone, *Haliotis midae* specifically and should be read together with the Guidelines for Marine Ranching in South Africa and the Policy for the Development of a Sustainable Marine Aquaculture Sector in South Africa.

The Guidelines for Marine Ranching in South Africa uses the following definitions and these should be applied to abalone:

- Marine Ranching

Bannister (1991)¹ defines marine ranching (reseeding) as "Identifiable stock released with the intention of being harvested by the releasing agency."

- Stock Enhancement

¹ Cited in Borg 2004

Bannister (1991) defined enhancement as “The releasing of stock for the public good without the intention of directly benefiting an exclusive user group”. Generally this would imply some form of government assistance.

2. KEY ISSUES FOR ABALONE RANCHING

Parties who are interested in undertaking abalone ranching should address, in particular, the broad concerns (potential risks) listed and discussed briefly below. These concerns should be addressed (discussed) in the application and should as far as possible be included in the scope of the Risk Assessment (RA) as per the National Environmental Management Biodiversity Act (2004) in the case of translocated animals or a Strategic Environmental Assessment (SEA) as per the National Environmental Management Act (1998). The level or extent of biological risk needs to be determined and if it is considered to be at an acceptable level in accordance with the Guidelines for Marine Ranching in South Africa, then the potential benefits need to be carefully considered and weighed against the potential risks. Note that only a few of the more important factors are discussed below, but proposals must still include all the information that is required in accordance with the Guidelines for Marine Ranching in South Africa.

2.1 Environmental Interactions

2.1.1 Trophic/Ecological

The impact of an introduced species on the ecosystem and species biodiversity needs to be assessed. Competition with other grazers and predation (e.g. by rock lobsters) should be considered. For example the recent large-scale migration of west coast rock lobster into the area between Cape Hangklip and Hermanus has led to the demise of the sea urchin population and has affected the survival of juvenile abalone. Juvenile abalone derive shelter and protection from predators such as lobsters by settling at the base of the sea urchin spine.

The impact on biodiversity is of particular concern when introducing abalone into areas outside of its natural range e.g. along the Northern Cape coast, in which case it is an ‘alien’ species in accordance with the Biodiversity Act (2004). In this instance, it will also

be important to investigate possible reasons why abalone do not occur naturally within an area, so that this may be addressed during the pilot project stage.

The objectives of any future abalone ranching or stock enhancement initiatives need to be clearly identified upfront by the applicant in accordance with the definitions listed in the Guidelines for Marine Ranching in South Africa. Ranching or stock enhancement initiatives will only be considered if the resource has declined to a level where reproduction (successful fertilisation) is compromised to an extent that recruitment is severely impaired. This applies in particular to areas that support or once supported viable populations of abalone. If the reason for the low levels of the resource in a particular area is poaching, then stock enhancement is not the solution. The solution in this case is simply to stop the poaching to enable the resource to recover.

These issues will need to be thoroughly addressed in the RA or SEA that is required before commencing with ranching or stock enhancement initiatives (i.e. resource surveys will need to be undertaken if adequate information does not already exist and enforcement plans/arrangements need to be developed).

2.1.2 Carrying Capacity

In all cases, the environmental carrying capacity of the area should be assessed, and stocking densities should not exceed the carrying capacity. Carrying capacity would vary across different sites and from year to year. It would also vary depending on the size of abalone to be released and on survival rates. Even if past estimates are available, the current carrying capacity may be reduced relative to past levels due to habitat modifications. Determination of the environmental carrying capacity is a complicated process requiring extensive scientific input. In reality such information is unlikely to be readily available. Basic information on food availability and suitable substratum should provide a starting point for estimating the carrying capacity. In the case of *H. midae* another indicator that may be of use is the average density of 3 abalone per m² for emergent abalone recorded in Betty's Bay (a protected area) in 1995, when the population was still considered to be at pristine levels (i.e. just prior to the escalation of poaching and the movement of west coast rock lobster into the area). Note, however, that densities were highly variable within the area, ranging from 0.08/m² to 11.45/m² along some transects.

2.1.3 Genetic

In areas where abalone occurs naturally, the potential loss of (genetic) biodiversity through breeding between hatchery and wild stocks needs to be considered and appropriate steps need to be taken to mitigate this potential risk, e.g. detailed broodstock and genetic verification protocols. Proposals should take the following guidelines into consideration:

- (i) All hatchery stock to be released into the marine environment should originate from broodstock obtained from the same area or an interconnecting system (same genetic zone).
- (ii) Large numbers (in excess of 100) of randomly collected animals for broodstock should be used to produce juveniles for release purposes. This will help prevent loss of genetic diversity through inbreeding and genetic drift. A rotational breeding protocol should be adopted.
- (iii) No selection process to improve the broodstock must occur in the case of transfers of species within their natural range. Some selection process may be allowed for introductions/re-introduction to an area to optimize fitness and improve survival.
- (iv) Animals from the wild, broodstock and seed should be routinely profiled to compare genetic similarity and dissimilarity.

2.1.4 Disease

The potential for the accidental introduction of pathogens, parasites needs to be considered and mitigated against and disease monitoring and certification protocols need to be included. Stock to be released must be examined for diseases and pests before hand. Testing and certification of disease or pest-free status must be performed by registered veterinarians.

2.2 Resource sharing

Apart from all the other resource user issues that need to be considered (see Guidelines for Marine Ranching in South Africa), the following are of particular importance:

Ownership of the stock and harvesting rights will differ depending on whether the resource is within or outside of the natural range of *H. midae*. In areas outside of the natural range, ownership and rights of access can be more easily determined. In areas

within the natural range, it is more difficult to differentiate reseeded stocks from natural stocks.

In areas where a commercial fishery is/was in existence, exclusive harvesting rights will be allocated and the harvesting will be managed and regulated in accordance with the wild fishery. Regulations will include catch and size limits (to be determined per area) and closed seasons, if applicable. The initial harvesting date will be determined based on the growth rates and size at maturity and may differ on a regional basis.

2.3 Economic viability

Proposals should provide information on the economic feasibility of the proposed activity, such as a cost benefit analyses. Positive economic (productivity, revenue, profitability, jobs etc) benefits need to be balanced against negative ecological effects. Details of facilities, infrastructure and employment opportunities that will be created in the process, should be provided. The economic viability of abalone ranching in South Africa has not yet been determined, although models suggest that it has the potential to be a lucrative business. However, this will need to be thoroughly assessed.

2.4 Monitoring

The applicant should submit a proposed monitoring programme to be undertaken by an appropriately qualified person/organisation. The monitoring programme should be developed to evaluate success and determine the cost and benefits of the project. Monitoring serves to verify that the project is meeting its performance targets. The Department will review progress reports and results submitted by the applicant and may undertake additional investigations or sampling where necessary. The effectiveness of any enhancement operations will need to be closely monitored – hence methods need to be established to distinguish “wild” from seeded abalone where natural populations exist. These techniques have not yet been developed in South Africa, and any future initiative will need to address this aspect. The environmental impacts need to be monitored by an independent party, to be contracted by the applicant if successful. This should be undertaken in consultation with the Department.

2.5 Enforcement

The applicant should develop an enforcement plan since illegal harvesting (poaching) will no doubt be a problem. This should involve the Department, the right holder, local community and other key stakeholders (e.g. provincial and local agencies). The allocation of exclusive harvesting rights should aid in enforcement of compliance and this management approach will be favourably considered. Traceability protocols (ie tracking system for the animals from source to retail) will be determined prior to harvesting.

The right holder will be required to comply with the terms of the right and permit conditions and failure to comply may result in legal proceedings.

3. POTENTIAL AREAS FOR ABALONE RANCHING

The broad areas that might be suitable for abalone ranching have been identified and are illustrated in Fig 1 (broken bold lines on the map). Within the broad areas, specific sites still need to be identified. Site suitability will depend upon, amongst other things, on habitat suitability, accessibility, degree of wave exposure and other coastal activities (resource user conflict issues) including protected (closed) areas. Therefore some of the areas that are included in Fig. 1 may prove to be unsuitable upon closer inspection or following a SEA.

The size of the area to be allocated will be based on kelp bed area (which is the main source of food for abalone), survival estimates and on available economic model projections. Where different rights are allocated adjacent to one another, buffer zones (approximately 1 km) will separate adjacent ventures. Buffer zones will also be used to separate ranching areas and areas that are set aside to protect viable populations, including closed areas and Marine Protected Area's (MPA's).

3.1 Northern Cape

This area of coastline falls beyond the northern-most limit of the distribution of *H. midae* along the west coast. It is characterised by the occurrence of large areas of west coast kelp (mainly *Laminaria pallida*) beds. Ranching experiments have been undertaken in this region since 1995 and have shown that abalone can survive and grow in the kelp beds

along this coastline. A large number of abalone has been seeded at various sites with variable survival rates. At least one site has been identified where high survival rates were obtained and where there are high densities of emergent abalone. Modelling exercises suggest that the potential returns from ranching could be considerable. However the abalone still needs to be harvested in order to assess the economic viability of ranching operations.

A number of key aspects have been addressed during the course of the pilot projects undertaken in this area. These include survival rates (although these were limited to the early stages), growth rates (again, limited to the short term), factors affecting survival and growth, and estimates of the total biomass, potential yield, economic viability and the minimum viable length of coastline required for a future commercial venture. However many questions remain unanswered, namely: the impact of abalone introductions, a species "alien" to the Northern Cape coast, on the natural biota of the area (effect on the ecosystem); why abalone do not occur naturally along this coastline; studies into new diseases and pathogens need to be undertaken for effective disease control; long-term survival and growth rates and additional information on factors affecting these two parameters; and economic viability.

Ranching of abalone in this region should continue on an experimental (pilot project) basis to address the gaps in information. However, any further seeding of abalone along this coastline is subject to the applicant first undertaking a RA, a requirement in terms of the National Environmental Management Biodiversity Act (2004) for the introduction of an "alien species" (i.e. in this case a translocation of an indigenous species to an area outside of its natural distribution range). Such an assessment should also assess the reproductive potential of the seeded abalone. Note that the area between the Orange River and Port Nolloth is not considered to be suitable and the Groen-Spoeg National Park will also not be considered.

3.2 Western Cape

This region has had abundant abalone populations and has supported a commercial fishery since 1949, but resource declines over the past decade have resulted in large reductions in size of the population and the Total Allowable Catch for this sector to the extent that the fishery has been closed.

The area along the west coast from *Olifantsbos* to *Cape Columbine* is on the northernmost fringe of the natural distribution range of *H. midae*, and contains moderate densities of abalone due to low and sporadic recruitment. This area has sustained moderate levels of commercial fishing over the years. Ranching or stock enhancement may be considered in this area, subject to a SEA being undertaken. Note that this does not include the coastline around Robben Island which still supports a significant population of abalone.

The Cape Peninsula and False Bay areas from Olifantsbos to Smitswinkel Bay also supports significant abalone populations therefore ranching or stock enhancement will not be considered for this area at present.

The area between Cape Hanglip and Hermanus has been impacted most by ecological changes, and as a result, there are very low levels (less than 5%) of abalone recruitment due to predation by west coast rock lobster into the area. The ranching or seeding of abalone along this stretch of coastline may be considered at present. However under the current condition, predation by the west coast rock lobster will need to be factored into the reseeded protocol, e.g. by reseeded animals at a size where they are less vulnerable to predation.

The area from Hermanus to Quoin Point still supports a viable abalone population. Ranching or stock enhancement will not be considered for this area at present, but may be considered in the future if stocks decline to a level where natural recruitment is affected.

The abalone population in the area *East of Quoin Point (to Natures Valley / the provincial border)* is patchily distributed as a result no commercial fishery developed in this region. Certain areas along this stretch of coastline might be suitable for ranching or stock enhancement. The specific areas will need to be carefully selected on the basis of suitable habitat, and potential factors that have limited the levels of natural populations need to be considered.

3.3 Eastern Cape

The abalone resource in this region is also patchily distributed and as a result no commercial fishery was ever established. However, experimental and subsistence fishing

permits were issued for a number of years in the former Ciskei and Transkei areas. Stocks in this region have now been severely depleted due to poaching, and no further harvesting permits were issued since 2004.

The area in the vicinity of *Cape Recife* once supported a significant population of abalone, but is now severely depleted and has been identified as a potential site for ranching or stock enhancement as a means to facilitate recovery of natural stocks. A pilot project investigating the potential of stock enhancement in this area showed high survival rates (although only short term survival was monitored). However a theoretical economic analysis based on this study suggested that a future commercial ranching venture at this site would probably not be economically feasible as a stand-alone operation but could be operated effectively if it complemented an existing abalone farming venture.

Certain sites *West of Cape Recife* might be suitable for ranching or stock enhancement, although the specific areas will need to be carefully selected on the basis of suitable habitat. Potential factors that have limited the levels of natural populations in the first instance need to be identified upfront and addressed through the pilot project.

Certain sites along the stretch *between Cape Recife and Port St Johns* might also be suitable for ranching or stock enhancement. However, the specific areas will need to be carefully selected on the basis of suitable habitat. The potential factors that have limited the levels of natural populations in the first instance need to be determined and addressed through a pilot project. Specific areas might include areas around Hamburg, i.e. between the Great Fish and Tsholomqa rivers and in the vicinity of the Great Kei river to Wavecrest). These areas held viable abalone populations and were the sites for experimental and subsistence harvesting in the past. The sites might still be targeted by poachers who harvest the deeper component of the stock, where there are still pockets of abalone.

Note that the area between Kleinemonde and the Great Fish River is to be assessed for suitability and potential for ranching.

The area around Bird Island is a marine protected area therefore will not be considered for ranching at this stage. .

3.4 Kwa-Zulu Natal

Since this area falls beyond the natural distribution range of abalone, with no known suitable habitat for abalone, ranching or stock enhancement is not being considered in this region.

4 GRANTING OF RIGHTS

Applications may be lodged with the Department and these will be assessed by the Marine Aquaculture Working Group (DEAT internal advisory body). Among the criteria that will be used when assessing the applications shall be: ability and capacity to undertake ranching/stock enhancement, environmental considerations, community involvement and beneficiaries, job creation (number of jobs per tonne), investment (Rands per year), economic feasibility and transformation including Broad-Based Black Economic Empowerment (BBBEE) objectives. Applicants will be given up to three years to exercise the right to ranch. In the event that the right has not been exercised for 3 years, the right will be revoked. Once a right is granted, a permit will be issued, subject to conditions, for a specified period not exceeding two years.

4.1 Pilot Projects

Once a proposal is assessed and deemed feasible, a pilot scale operation should be carried out during which ecological interactions and risk assessment assumptions, and social and economic responses are monitored to determine viability. A limited number of sites will be available for pilot projects in each of the areas identified above. Scientific assessment should address survival of the released stock and the main causes of mortality, growth of the released stock, impact on the gene pool, and other environmental impacts.

The pilot phase shall not exceed 10 years. This is considered to be long enough to allow assessment of the enhancement techniques employed and critical ecological processes and effects.

4.2 Full Commercial

A successful pilot venture may lead to a longer-term, commercial enhancement or ranching initiative. Notwithstanding the findings of the pilot study, there is an ongoing need to monitor for success or failure during the lifetime of the project. Assessments should be based on not only the enhancements, but also other uses of the resources or area. Should there be consensus that the pilot study be rolled out into a full scale operation, the applicant should apply for a long-term right that shall not exceed 20 years.

5 MAP OF POTENTIAL AREAS FOR ABALONE RANCHING

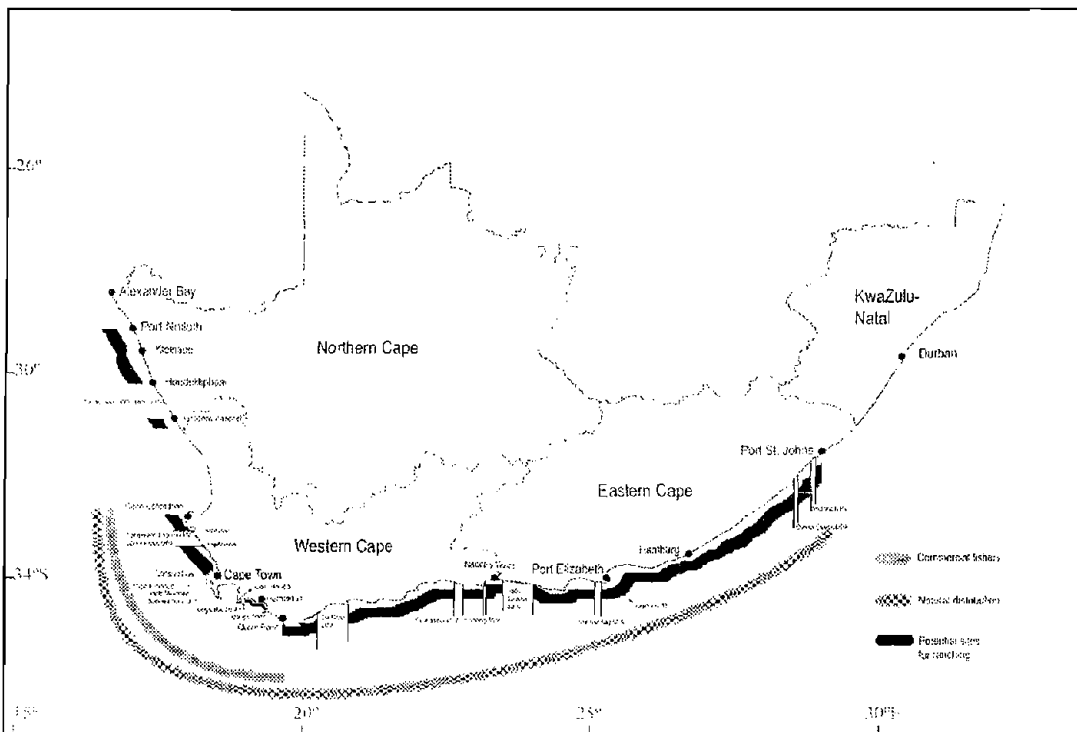


Fig.1 Map of South Africa indicating the natural distribution range of *H. midae*, the abalone commercial fishing grounds and potential areas for abalone ranching or stock enhancement.