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GOVERNMENT NOTICE

DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES

No. 728 **20 August 2010**

MARINE LIVING RESOURCES ACT, 1998 (ACT NO. 18 OF 1998)

DRAFT CRITERIA FOR ALLOCATING RIGHTS FOR ABALONE RANCHING OR STOCK ENHANCEMENT PILOT PROJECTS

I, Tina Joemat-Pettersson, Minister of Agriculture, Forestry and Fisheries, hereby under the Marine Living Resources Act, 1998 (Act No. 18 of 1998)("MLRA") publish for comment the draft criteria for allocating rights to engage in abalone ranching or stock enhancement pilot projects as set out in the schedule hereto.

Interested and affected parties may submit written comments to the Directorate: Marine Aquaculture Management, at the Department of Agriculture, Forestry and Fisheries ("the Department"), Private Bag X2, Roggebaai, 8012. Written comments may be posted by registered mail to the above address, hand delivered to: Department of Agriculture, Forestry and Fisheries: Customer Services, Foretrust Building, Martin Hammerschlagh Way, Cape Town, or emailed to KhumoM@daff.gov.za. All written comments must be received by the Department by no later than 16h00 on 21 September 2010. Comments received after this time may not be considered.

TINA JOEMAT-PETTERSSON

MINISTER OF AGRICULTURE, FORESTRY AND FISHERIES

SCHEDULE

DRAFT CRITERIA FOR ALLOCATING RIGHTS FOR ABALONE RANCHING OR STOCK ENHANCEMENT PILOT PROJECTS.

EXCLUSIONARY CRITERIA

CRITERIA	RATIONALE
(a) Application form	All applicants must complete an application form. Applications will not be considered if the application forms are incorrectly completed or incomplete. All applicants are required to pay the application fee as required by the Department and the proof of payment must be attached to the application form. Applications that do not have the proof of payment attached to their application will not be considered. All applications must be accompanied by a valid tax clearance certificate from SARS.
(b) Compliance	A right to engage in a Pilot Project for abalone Ranching or Stock Enhancement will not be allocated to an applicant if the applicant, or its members, directors or controlling shareholders, had any fishing and/ or aquaculture right cancelled, suspended or revoked in terms of the MLRA, or if their assets were seized under the MLRA or the Prevention of Organised Crime Act,1998 (Act No. 121 of 1998). If an applicant, or its members, directors or controlling shareholders have been convicted of any offence in terms of the MLRA or any other fishery-related and/ or aquaculture legislation the applicant will not be allocated a Marine Ranching or Stock Enhancement Pilot Project right. Applicants that have been convicted of one of the offences as listed above, and that have paid an admission of guilt fine will not be disqualified in their application for a Marine Ranching or Stock Enhancement Pilot Project right.
(c) Access to finance	The applicant(s) must demonstrate that they will have access to finance in order to implement the project.

(d) Access to seed/ spat	The applicant(s) must demonstrate that they have access to spat/ seed. A hatchery seed supply agreement must be signed and submitted to the Department.
(e) Transformation	The participation of historically disadvantaged individuals ("HDI") in the marine aquaculture industry , i.e. BEE, BBBEE and including BBBEE SMME, is a national priority and therefore applicants who accommodate this priority will be preferred. Compliance with the Employment Equity Act, 1998 (Act No. 55 of 1998) and the representativity of HDI's at the various levels of employment will be a requirement.

BALANCING CRITERIA

CRITERIA	RATIONALE
(a) Equity and job creation	Inequalities of the past and the decline in fish stocks have compromised the viability of coastal livelihoods resulting in hardships for coastal communities. These communities should thus be the primary beneficiaries and partners of opportunities for the marine-based component of Ranching and Stock Enhancement of abalone Pilot Projects. Although the nature of the Pilot Projects for Marine Ranching and Stock Enhancement of abalone activities are recognised, provision for permanent jobs or greater levels of job security for lower level skilled and unskilled staff is promoted. Applicants who are able to create or indicate how they will create significant amounts of jobs per tonnage harvested will score higher.
(b) Capacity (Technical)	Pilot Projects for Marine Ranching and Stock Enhancement of abalone require a widespread, level of technical ability (involvement in related fishing sector, fish farming, diving e.t.c.) and an understanding of the marine aquaculture sector. A successful Marine Ranching or Stock Enhancement Pilot Project enterprise will need to display a well-rounded technical capability and capacity.
(c) Future Investment in the sector	Applicants must be able to demonstrate plans to invest in fixed assets and research done in the development of marine ranching products. Applicants will have to show how they intend to process and market marine ranching products and whether they have invested in any research into the harvesting and marketing of these products.

(d) Environment considerations	The applicant should be able to identify key environmental risks and demonstrate how the risks will be managed by a specialist. A copy of an agreement for the appointment of a specialist to monitor environmental impacts should be attached to the application.

No. 729 **20 August 2010**

DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES

MARINE LIVING RESOURCES ACT, 1998 (ACT NO. 18 OF 1998)

PUBLICATION OF THE GENERAL GUIDELINES FOR MARINE RANCHING AND STOCK ENHANCEMENT IN SOUTH AFRICA

and

PUBLICATION OF THE GUIDELINES AND POTENTIAL AREAS FOR MARINE RANCHING AND STOCK ENHANCEMENT OF ABALONE (*Haliotis midae)* IN SOUTH AFRICA

I, Tina Joemat-Pettersson, Minister of Agriculture, Forestry and Fisheries, hereby, under the Marine Living Resources Act, 1998 (Act No. 18 of 1998) ("MLRA") publish The General Guidelines for Marine Ranching and Stock Enhancement in South Africa and The Guidelines and Potential Areas for Marine Ranching and Stock Enhancement of Abalone (H*aliotis midae*) in South Africa, as set out in Schedule 1 and 2 hereto , for general information.

TINA JOEMAT-PETTERSSON

MINISTER OF AGRICULTURE, FORESTRY AND FISHERIES

Schedule 1

GENERAL GUIDELINES FOR MARINE RANCHING AND STOCK ENHANCEMENT IN SOUTH AFRICA

Department of Agriculture, Forestry and Fisheries

April 2010

agriculture,
forestry & fisheries

Department:
Agriculture, forestry & fisheries
REPUBLIC OF SOUTH AFRICA

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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, stock enhancement and ranching have been used in other countries to sustain continued production from the marine environment. In light of the collapse of a number of fisheries in South Africa, and the concomitant negative socio-economic effects for coastal fishing communities, stock enhancement and ranching should be considered as a fishery management tool to restore and/or enhance fishery production. The emerging of the South African aquaculture industry, which is capable of mass producing seed, potentially provides the necessary technology and capacity to undertake the release of stock into the sea.

The Food and Agriculture Organisation's (FAO) guidelines on "Putting into practice the ecosystem approach to fisheries" views stock enhancement or ranching as a last resort and "should only be considered when other forms of management are incapable of restoring populations to acceptable levels. It should be coupled with effective control of fishing capacity and other appropriate management measures.

The FAO guidelines are a tool to be used only if:-

1) Natural recruitment has dropped to such a level that the natural population cannot sustain itself, and/or the population is unlikely to rebuild to historical levels of productivity if left alone. The implication is that reseeding is a short-term intervention to rebuild a stock to a self-sustaining level of production.
2) There is a social need to establish a new fishery based on the introduction or transfer of a species, for example, abalone ranching on the West coast beyond the range of *Haliotis midae*. This option will only be considered if an ecological risk assessment shows that the ecological risks are acceptable.

It is recognised that:-

1)The "precautionary principle" applies to stock enhancement and ranching activities and hence other resource management tools (e.g. size limits, maintaining a minimum spawner biomass, biological reference points) to ensure sustainable fishery production will be prescribed where applicable.

2) As an emerging activity in South Africa, ranching and stock enhancement initiatives have a significant opportunity to learn from mistakes made in other countries and avoid serious biodiversity impacts that have occurred elsewhere.
3) The genetics of the broodstock and released seed need to be managed so that genetic profile of the wild stock is not significantly changed.
4) Biosecurity measures will be developed to minimise the risk of disease transmission, or introduction of associated organisms, between the hatchery and wild stock.

1.1 Definitions

The following are applicable in terms of implementation of these Guidelines:

Harvesting:

Systematic catching of ranched animals. The removal of animals in terms of sampling, inspections and mortalities does not fall under the term harvesting.

Marine aquaculture:

The farming of marine aquatic organisms including fish, molluscs, crustaceans and plants in controlled or selected marine aquatic environments, with some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated (Nash, 1995).

Marine ranching:

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

Restocking:

The release of cultured juveniles into wild population(s) to restore severely depleted spawning biomass to a level where it can once again provide regular, substantial yields. This may also involve re-establishing a commercial species where it is locally extinct due to over fishing, or release of juveniles reared in "conservation hatcheries" to help restore endangered or threatened species (Bell et. al., 2008).

[1] Cited in Borg 2004

Site (Concession area):

A geographically set area defined in the permit where a Holder has the exclusive right to seed and harvest the ranched species.

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 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, 2004 (Act No. 10 of 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 into the Republic as a result of human activity.*

"alien species" *means-*

(a) a species that is not an indigenous species; or

(b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.

"invasive species" *means any species whose establishment and spread outside of its natural distribution range-*

(a) threaten ecosystems, habitats or other species or have demonstrable potential to threaten ecosystems, habitats or other species, and

(b) may result in economic or environmental harm or harm to human health.

1.2 Objectives of Ranching and Stock Enhancement

The primary objectives of 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.

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 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 or stock enhancement projects would be evaluated on their merits.

1.3 Legislative and Policy Framework

The guidelines for stock enhancement and marine ranching are published in terms of the provisions and objectives of the Marine Living Resources Act, 1998 (Act No. 18 of 1988). Other relevant legislation and policies include:

- The Marine Living Resources Act: Policy for a Sustainable Marine Aquaculture Sector in South Africa (2007),

- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004),
- The FAO Code of Conduct for Responsible Fisheries, FAO: 1995.

The Department may develop regulations to implement these guidelines.

1.4 Vision

Economic opportunity for coastal communities through ranching operations, restoration or enhancement of fishery production by means of the release of cultured fish or shellfish.

1.5 Guiding Principles

In light of the novelty of the stock enhancement/ ranching resource management arrangements, the following guiding principles flowing from the above policies and legislation are applicable:

1.5.1 Equity

A core principle informing the development of stock enhancement and ranching is that of equity. Past inequalities combined with the decline of South African fisheries have compromised the viability of coastal livelihoods based on these resources creating hardship for coastal fishing communities. Coastal communities should thus be the primary beneficiaries of opportunities for the marine-based component of stock enhancement and ranching. The beneficiaries should be individuals from disadvantaged communities adjacent, or close to the location of proposed projects. At the same time it is recognized that the aquaculture component of stock enhancement and ranching is a capital and technology intensive enterprise, and that industry partners may require a fair return on their investment and risk.

1.5.2 Partnerships

Whilst prioritizing historically disadvantaged fishing and coastal communities, stock enhancement and ranching development should be fostered in partnership between these communities, government, aquaculture industry, research, and educational institutions and others involved in the supply chain.

1.5.3 Economics

Stock enhancement and ranching must be able to directly and indirectly contribute to basic food security as well as to the growth of the local and national economy through being competitive and sustainable whilst creating gainful employment and livelihood opportunities.

1.5.4 Seeding and Harvest Rights

Stock enhancement and ranching within the near shore will be undertaken based on the principles of designated and preferential user rights.

In terms of ranching, the Department will consider applications for seeding and the successful applicant will be authorized to seed and harvest within the designated sea area. Seeding will be undertaken only with a valid permit that will be issued with specific conditions. The harvesting of the resources will be done with a harvesting permit that will be issued once the stock assessment has been undertaken in areas where the species released occurs naturally. The Department will determine the minimum harvesting size and quantities in consultation with the right holder. Harvesting will only be undertaken once the seeded animals reach the legal size limit. In areas where a species does not occur naturally (e.g. Northern Cape in the case of abalone), there will be no size limits for harvesting but harvesting will only be undertaken with a harvesting permit. If the stock moves out of their designated ranching area the right holder has no right to retrieve it. The sea bed area in which sedentary stock are seeded will not be owned by the right holder, and the rights of other users of the area (e.g. recreational, vessels, fishing) will still be valid, unless they are restricted by the Minister in terms of the Marine Living Resources Act.

In terms of stock enhancement, once a fish is released from a hatchery into the sea, it is no longer the property of the releasing agent or last owner. It becomes part of a wild stock, subject to use rights allocated by Government.

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

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 such activities. Therefore, it is necessary to determine "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 of risk is the 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 of risk is when a species whose reproductive biology is well understood is introduced into an area outside its natural range where it is known that successful reproduction cannot occur.
4. An even higher level of risk is the translocation of an indigenous species outside of 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 the introduction of alien species that have the potential to be invasive in that particular environment.

The Department of Agriculture, Forestry and Fisheries (the Department) will only consider proposals for enhancement and ranching that fall within the first four levels of risk.

Other risks include the following:

- User group conflicts (e.g. with "conventional" fishing and recreational activities, etc.).
- The potentially harmful ecological and environmental impacts by related activities, 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 must be undertaken to assess proposals. Proposals to undertake an introduction

must 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 must contain a full description of the proposed activity with 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 must 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 must 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 must 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 must provide clearly defined objectives and associated performance targets to be monitored within the framework of other activities in the area. The targets must therefore be realistic and measurable.

3.3 Economic feasibility

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

3.4 Involvement of Historically Disadvantaged Communities

Proposals are required to involve and benefit historically disadvantaged communities in the area of the proposed stock enhancement or ranching activity, and will be evaluated on the extent of the social and economic benefit they generate. The creation of economic opportunities for previously disadvantaged individuals in other components of the value chain (e.g. hatchery operations, processing, other related services) must be outlined in the proposal.

3.5 Access and Resource sharing issues

Proposals must 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 must be addressed prior to embarking on a stock enhancement or ranching initiative.

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.

3.6 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 an Environmental Assessment (EA) in respect of ranching or stock enhancement under the National Environmental Management Amendment Act, 2004 (Act No. 8 of 2004) and regulations. The assessment will be evaluated and authorized by the Department. The EA 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 regards to the above (environmental assessment and management plan), the following environmental issues should be addressed:

3.6.1 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 must be determined before 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 can be an indicator in this regard.

3.6.2 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 must be considered and addressed.

3.6.3 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 a different set of survival traits of the hybrids. Proposals must comply with the following directives:

- 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.

3.6.4 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). In addition, the World Organisation for Animal Health (OIE) Code of Practice must be used in translocating animals in South Africa to assist with the identification and containment of existing (listed) and potentially new diseases. 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 competent persons/ institutes whose tests will be certified according to government requirements.

Proposals should include a thorough review of non-target species that could accompany the introduction or transfer. The following important issues must be addressed:

- 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.

The introduced or transferred organisms used as broodstock for the production of seed 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 must be declared disease and parasite 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 being released 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).

3.6.5. Social Impact

An assessment of the social impact of the project must be provided including:

1) The socio-economic benefits in terms of investment, jobs and income;
2) Identification of potential social conflicts arising from the enterprise and recommendations on how to mitigate/ manage them. The applicant should advertise and hold at least one public meeting regarding the proposed project in the local area. The advertisement should run for at least 1 month in the local news papers and public areas such as municipality offices. The issues raised in the public participation process should be addressed in the proposal to be submitted. All comments should be attached to the proposal.
3) The distribution of benefits (jobs, income) in terms beneficiaries.

3.7 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 releasing agent would need a contingency plan to be in place for such an eventuality. A catastrophic event may be a natural or accidental crisis that may lead to loss of stock, infrastructure or damage to the natural environment.

3.8 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 in some areas 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. ROLE OF GOVERNMENT IN ESTABLISHING STOCK ENHANCEMENT AND RANCHING PROJECTS

It is recognised that Government has a key role to play in facilitating the establishment of ranching projects and that includes:

- Grant ranching or stock enhancement authorisations.
- Undertake research on ranching.
- Monitor and assess ranching projects.
- Enforce compliance with permit conditions and relevant legislation.
- Investigate the provision of industrial incentives for investment in ranching.
- Identify and allocate ranching sites (concession areas).

5. PILOT 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.

6. 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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Enquires pertaining to this guidelines document may be directed to the Department of Agriculture, Forestry and Fisheries, Branch: Fisheries

Attention: Marine Aquaculture Management Directorate

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www.daff.gov.za

Schedule 2

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

Department of Agriculture, Forestry and Fisheries

April 2010

agriculture,
forestry & fisheries

Department:
Agriculture, forestry & fisheries
REPUBLIC OF SOUTH AFRICA

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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. 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 led to the closure of the commercial abalone fishery in February 2008.

Since the 1980s, farming of abalone has developed rapidly and production levels are now in the order of 1000 tons (in 2009). 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 Reciefe 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 Agriculture, Forestry and Fisheries (the Department) has developed Guidelines for Marine Ranching and Stock Enhancement in South Africa.

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

At this stage, the enhancement of abalone in areas where recruitment has not collapsed will not be considered. In instances where information is readily available, the enhancement of abalone in areas where stocks have not depleted below 20% of pre-exploitation levels will not be considered.

The Guidelines for Marine Ranching and Stock Enhancement 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

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.

2. KEY ISSUES FOR ABALONE RANCHING

Parties who are interested in undertaking abalone ranching and stock enhancement 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 an Environmental Assessment (EA) 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 and Stock Enhancement 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 and Stock Enhancement 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

[1] Cited in Borg 2004

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 beneath the sea urchins.

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 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 above. Ranching or stock enhancement 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. In areas where information is readily available, ranching or stock enhancement initiatives will only be considered if the resource has declined to below 20% of pre-exploitation levels. This applies in particular to areas that support or once supported viable populations of abalone.

These issues will need to be thoroughly addressed in the RA or EA 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

Stocking densities should not exceed the environmental carrying capacity of the area. While the carrying capacity of an area is unlikely to be reached during pilot ranching operations, an estimate of projected carrying capacity is required to determine seeding numbers. In the case of *H. midae* an indicator that may be of use is the average density of 3 abalone per m^2 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 $0.08/m^2$ to $11.45/m^2$ along some transects. The monitoring of abalone density must form a key component of the independent research and monitoring that accompanies the stock

enhancement or ranching operation. The Department's abalone research division could provide advice and feedback on managing abalone density and habitat carrying capacity as ranching and stock enhancement projects develop.

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. The objective of breeding for ranching or stock enhancement is to retain as many wild alleles in the hatchery breeding population as possible, and not mix the genetic profiles of different stocks.

Proposals should therefore 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 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.

(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 and 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 government veterinarians or other competent persons/ institutes whose tests will be certified in accordance with government requirements. Prescribed "Guidelines for Translocating Abalone" must be followed. These requirements must be formalised into a hatchery specific "biosecurity" protocol which must be approved by the Department.

2.2 Resource sharing and user conflict

Apart from all the other resource user issues that need to be considered (see Guidelines for Marine Ranching and Stock Enhancement 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 where a commercial abalone fishery is/was in existence preference will be given to commercial abalone right holders. In these areas, exclusive harvesting rights will be allocated and the harvesting will be managed and regulated in accordance with the wild fishery, and no distinction will be made between seeded and wild abalone. 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.

The sea bed area in which sedentary stock, such as abalone, are seeded will not be owned by the right holder, and the rights of other users of the area (e.g. swimmers, vessels, fishing right holders) will still be valid, unless they are restricted by the Minister in terms of the Marine Living Resources Act.

The applicant should identify potential social/user conflicts arising from the project and make recommendations on how to mitigate/ manage them. The applicant should advertise and hold at least one public meeting regarding the proposed project in the local area. The advertisement should run for at least 1 month in the local news papers and public areas such as municipality offices. The issues raised in the public participation process should be addressed in the proposal to be submitted. All comments should be attached to the proposal.

2.3. Seeding and Harvest Rights

Ranching and stock enhancement within the near shore will be undertaken based on the principles of designated and preferential user rights. In terms of ranching, the Department will consider applications for seeding and the successful applicant will be authorised to

seed and harvest within the designated sea area. Seeding will be undertaken with a valid permit that will be issued with specific conditions. The harvesting of the resources will be done with a harvesting permit that will be issued once the stock assessment has been undertaken in areas where the abalone released occurs naturally. The Department will determine the minimum harvesting size, quantities and time in consultation with the right holder. Harvesting will only be undertaken once the seeded abalone reaches the legal size limit. In areas where abalone does not occur naturally (e.g. Northern Cape), there will be no size limits for harvesting but harvesting will only be undertaken with a harvesting permit. If the stock moves out of their designated ranching area the right holder has no right to retrieve it.

In terms of stock enhancement, once a fish is released from a hatchery into the sea, it is no longer the property of the releasing agent, it becomes a public good. It becomes part of a wild stock, subject to use rights allocated by Government. The exclusive use right is now the asset of the designated right holder(s).

2.4 Economic viability

Proposals should provide information on the economic feasibility of the proposed activity, such as a cost benefit analysis. 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.

2.5 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.

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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.

2.6 Enforcement

The applicant should develop an enforcement plan since illegal harvesting (poaching) will no doubt be a problem. The plan should involve the Department, the right holder, the local community and other key law enforcement agencies. The primary responsibility for protection of seeded stock lies with the right holder. The allocation of exclusive harvesting rights should aid in enforcement of compliance and this management approach will be favourably considered.

Traceability protocols (i.e. 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 OR STOCK ENHANCEMENT

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, 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 Strategic Environmental Assessment (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 (concession areas) are allocated adjacent to one another, buffer zones (approximately 1 - 10 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 Areas (MPAs).

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 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 coastline area of the Groen-Spoeg National Park including a buffer zone of 5 km either side will 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 the size of the populations 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 northern-most 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 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 Hangklip 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 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 reseeding protocol, e.g. by reseeding 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 is complemented by 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 and stock enhancement.

The area around Bird Island is a marine protected area and therefore will not be considered for ranching or stock enhancement 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 in 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 (DAFF 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 (See paragraphs 4.2 and 6 below, for areas to be considered for pilot projects). 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 Proposed Areas for Abalone Ranching Pilot Projects

The areas outlined below will be considered for pilot projects.

Northern Cape:

Area NC 1
+- 60 km

		Latitude	Longitude
NC1a	Boegoeberg Noord	28°45'41,35"S	16°33'41,93"E
NC1b	Beach north of North Point	29°14' 7,65" S	16°51'14,08"E

Area NC 2
+- 32 km

		Latitude	Longitude
NC2a	Rocks outside south end of McDougall Bay	29°17'34,23"S	16°52'32,08"E
NC2b	Rob Island	29°43' 7,12"S	16°59'50,45"E

Area NC 3
+- 43 km

		Latitude	Longitude
NC3a	Beach at Kleinzee	29°40'43,9"S	17° 3' 3,5" E
NC3b	Swartduine	30° 2'52,04S	17°10'39,69E

Area NC4
+- 40 km

		Latitude	Longitude
NC4a	Skulpfontein	30° 6' 8,15S	17°11' 8,03E
NC4b	2 small rocks 200m from shore	30°25'56,26"S	17°20' 5,43E

Buffer zone	Namibian boarder	17 km →	NC1
	NC1	7 km →	NC2
	NC2	13 km →	NC3
	NC3	6 km →	NC4

Western Cape

WC 1

Maasbaai +- 8km

		Latitude	Longitude
WC1a	Sandy beach north of Cape Hangklip	34°22'52,35"S	18°49'33,91"E
WC1b	Sandy beach east of Maasbaai	34°22'49,44"S	18°51'22,82"E

WC 2

Betty's bay +-10km

		Longitude	Latitude
WC2a	Jock-se-baai	34°21'22,65"S	18°56'14,53"E
WC2b	Sandy Beach at Bettys bay	34°20'34,38"S	19° 2'16,02"E

WC 3

Hawston +- 8km

		Longitude	Latitude
WC3a	Sandy beach west of Hawston	34°23'58,68"S	19° 7'27,22"E
WC3b	Sandy beach at Onrus	34°25'12,00"S	19°10'49,17"E

Buffer zones

From	Sandy beach east of Maasbaai	34°22'49,44"S	18°51'22,82"E
To	Jock-se-baai +- 8km	34°21'22,65"S	18°56'14,53"E

From	Sandy Beach at Bettysbay	34°20'34,38"S	19° 2'16,02"E
To	Sandy beach west of Hawston+-10km	34°23'58,68"S	19° 7'27,22"E

From	Sandy beach at Onrus	34°25'12,00"S	19°10'49,17"E
To	Onwards to Next zone in the Eastern Cape		

Eastern Cape

EC 1 +- 15km

		Lattitude	Longitude
EC 1a	Skoenmakerskop MPA	34° 2' 46,05" S	25° 32' 33,39" E
EC 1b	Cape Receife	34° 2' 0,33" S	25° 42' 18,43" E

EC 2 +- 50 km

		Lattitude	Longitude
EC 2a	Hamburg	33° 17' 1,94" S	27° 29' 31,54" E
EC 2b	East London	33° 1' 28,13" S	27° 55' 50,53" E

EC 3 +- 65 km

		Latitude	Longitude

EC 3a	Cintsa	32° 50' 2,61" S	28° 6' 56,0" E
EC 3b	Mazeppa Bay	32° 9' 25,28" S	28° 39' 19,91" E

4.3 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

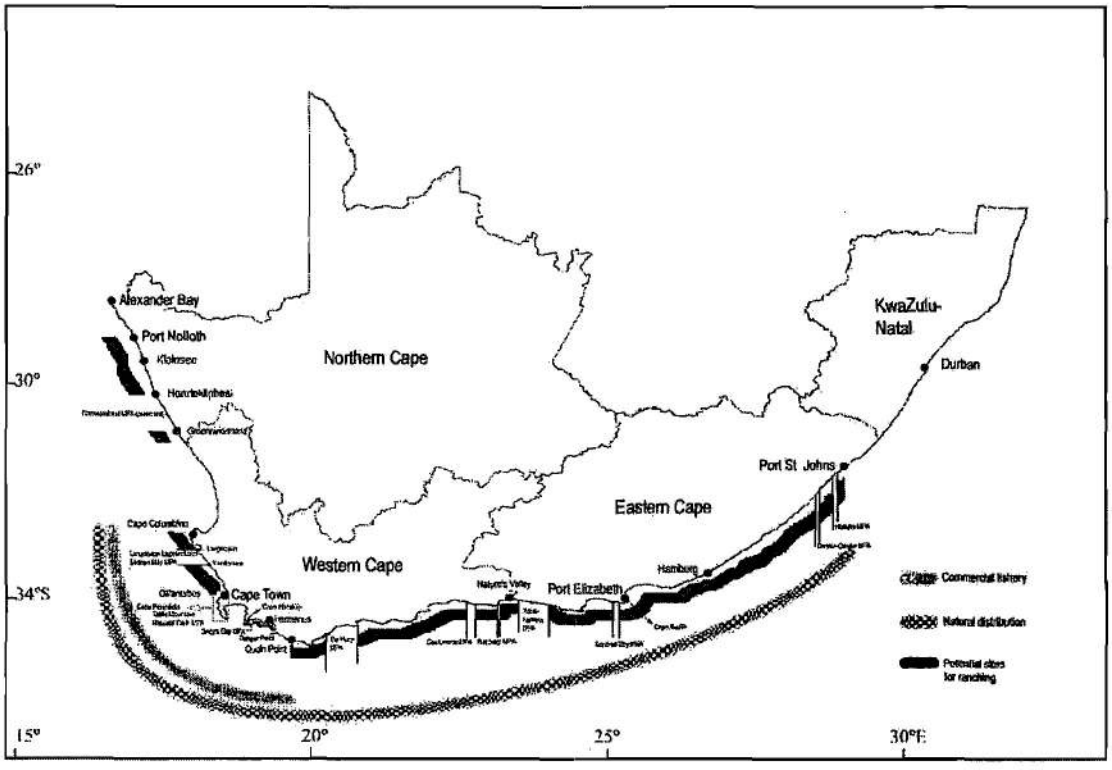
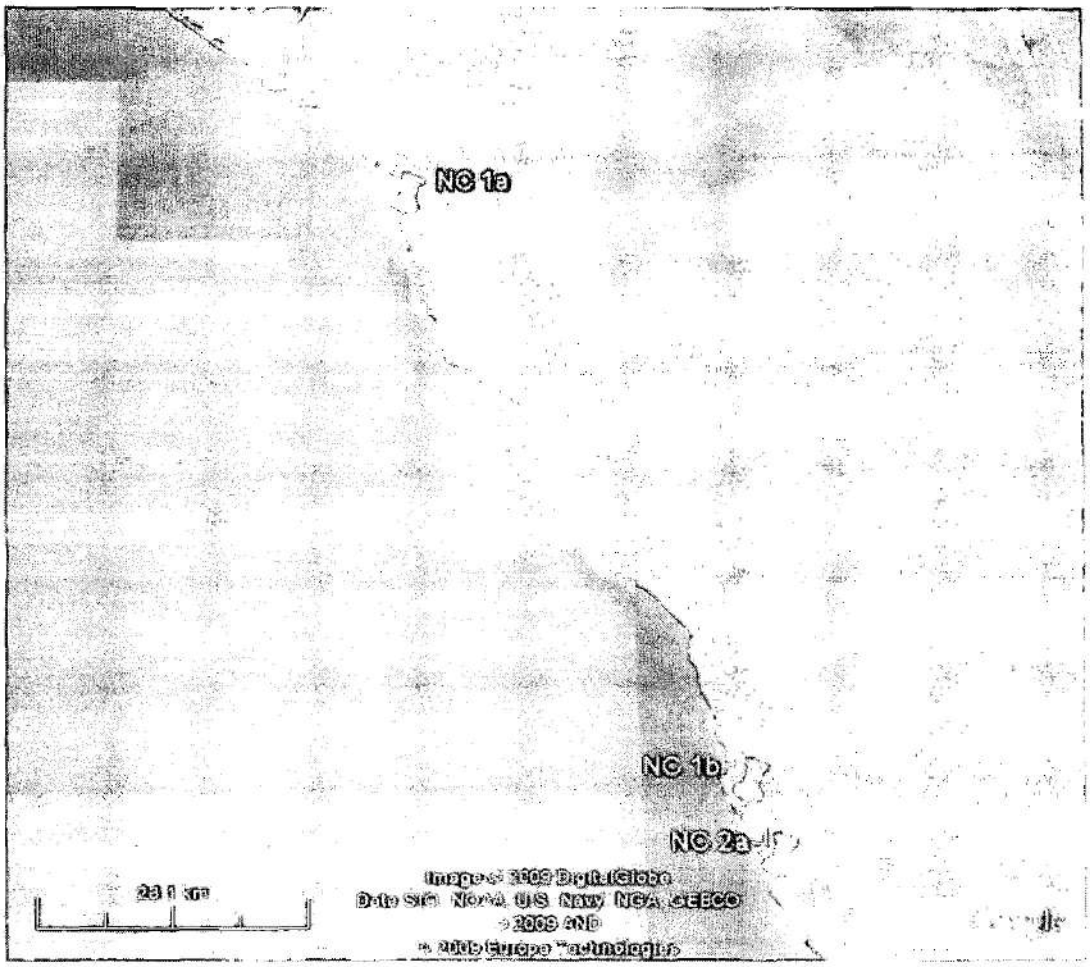


Fig.1 Map of South Africa indicating the natural distribution range of *H. midae*, the abalone commercial fishing grounds and potential areas for abalone ranching or stock enhancement.

6. MAPS OF ALL AREAS TO BE CONSIDERED FOR PILOT PROJECTS

Area 1: Northern Cape



Northern Cape Ranching Area 1 – **NC 1**

Buffer zone between Point NC 1a and the Namibian boarder is +- 17km

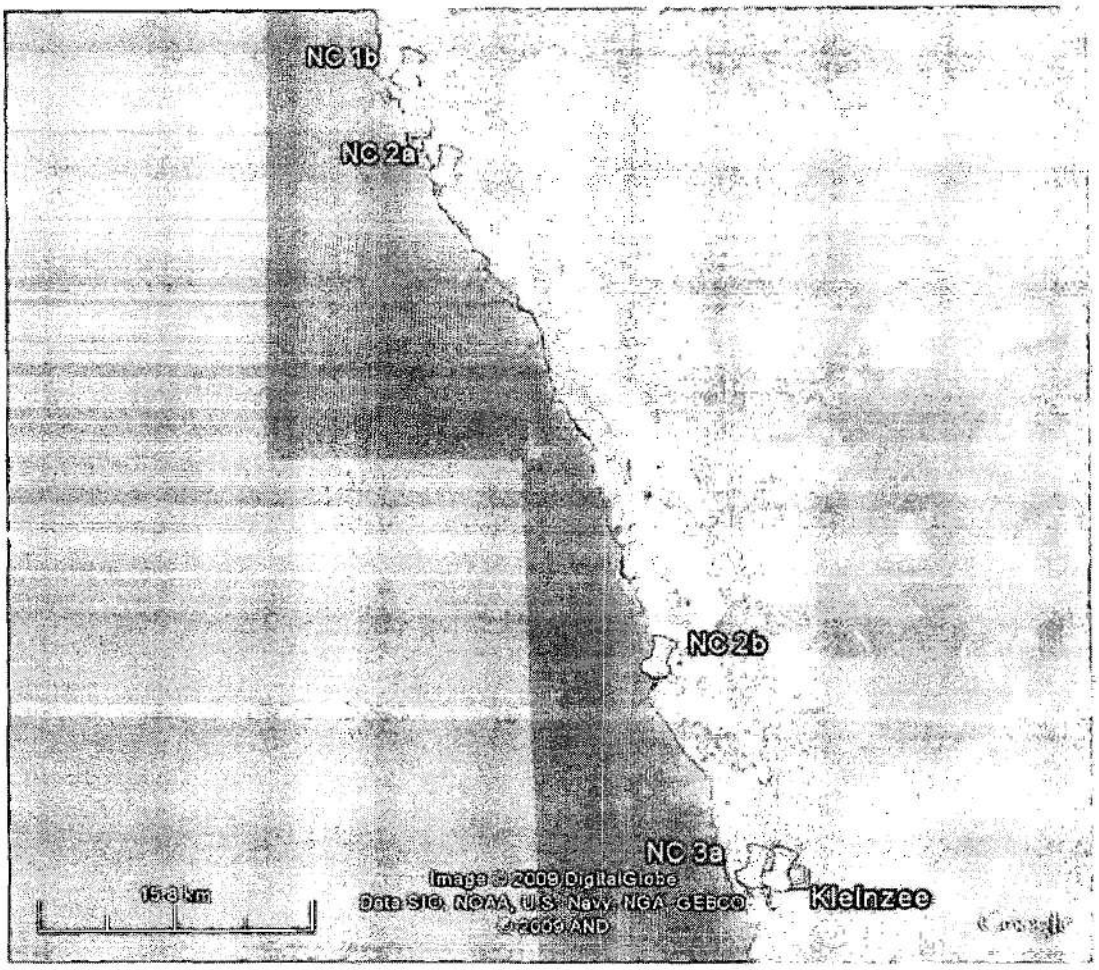
Buffer zone between NC 1 and NC 2 is +- 7km. (Area north and south of Port Nolloth)

Area NC 1

+- 60 km

		Latitude	Longitude
NC1a	Boegoeberg Noord	28°45'41,35"S	16°33'41,93"E
NC1b	Beach north of North Point	29°14' 7,65" S	16°51'14,08"E

Area 2: Northern Cape



Northern Cape Ranching Area 2 – **NC 2**

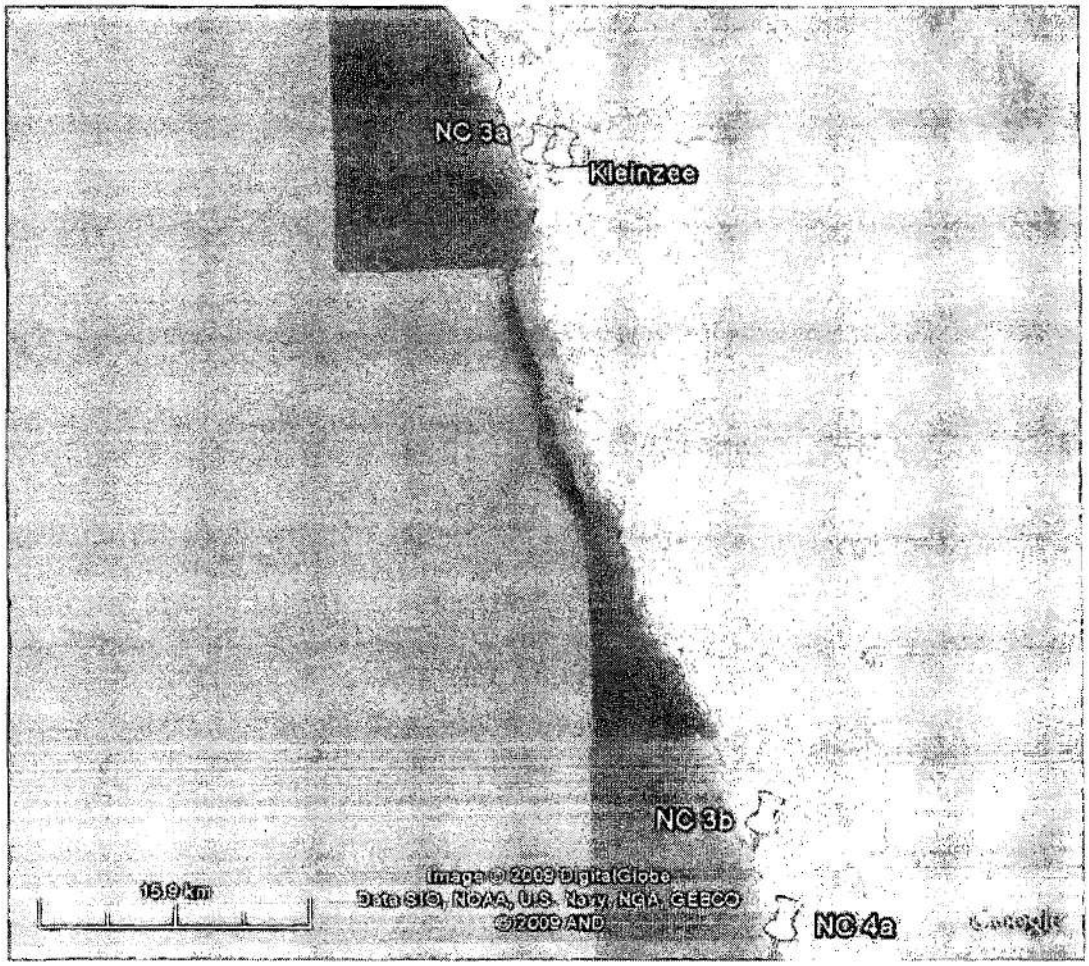
Area from just south of Port Nolloth to 13km north of Kleinzee.

Buffer zone between NC 1 and NC 2 is +- 7km. (Area north and south of Port Nolloth)
Buffer zone between NC 2 and NC 3 is +- 13km

Area NC 2
+- 32 km

		Latitude	Longitude
NC2a	Rocks outside south end of McDougall Bay	29°17'34,23"S	16°52'32,08"E
NC2b	Rob Island	29°43' 7,12"S	16°59'50,45"E

Area 3: Northern Cape



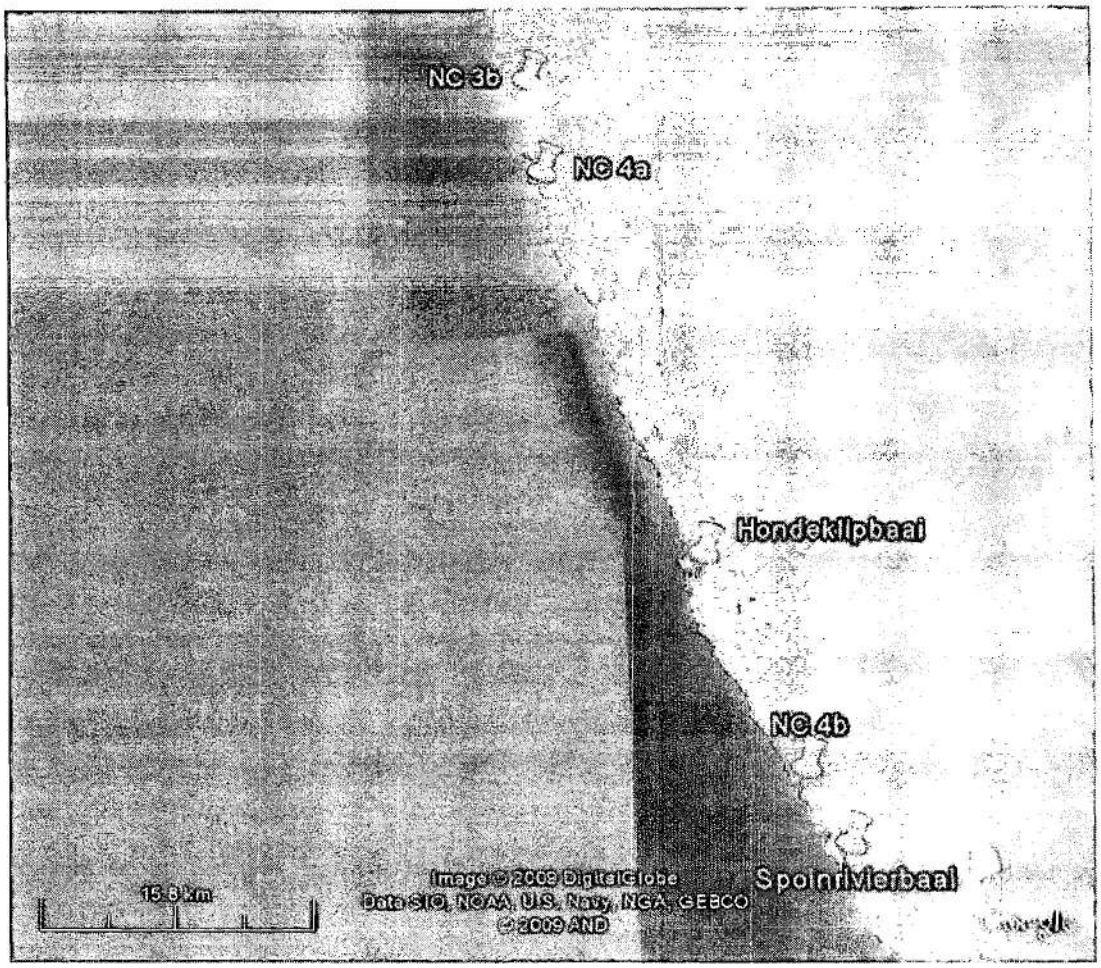
Northern Cape Ranching Area 3 – **NC 3**

Buffer zone between NC 2 and NC 3 is +- 13km
Buffer zone between area NC 3 and N C4 is +-6km

Area NC 3
+- 43 km

		Latitude	Longitude
NC3a	Beach at Kleinzee	29°40'43,9"S	17° 3' 3,5" E
NC3b	Swartduine	30° 2'52,04S	17°10'39,69E

Area 4: Northern Cape



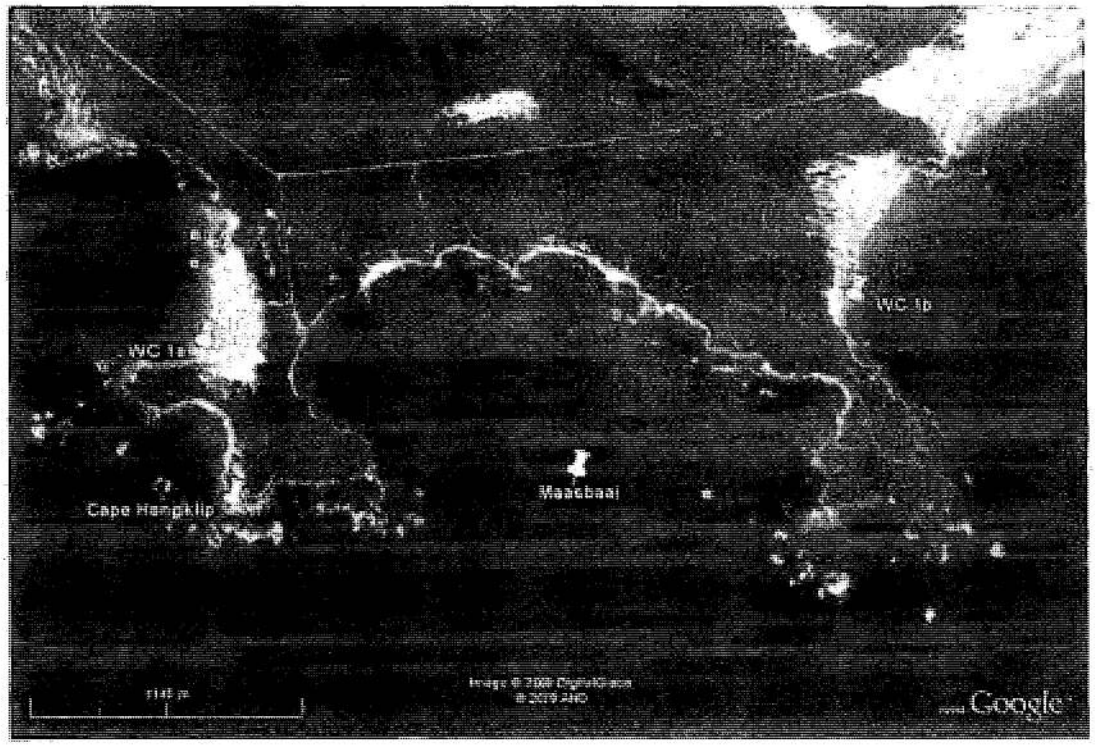
Northern Cape Ranching Area 4 – **NC 4**

Buffer zone between NC 3 and NC 4 is +- 6km
Buffer zone between NC 4 and Spoinrivierbaai is +- 5km

Area NC 4
+- 40 km

		Latitude	Longitude
NC4a	Skulpfontein	30° 6' 8,15S	17°11' 8,03E
NC4b	2 small rocks 200m from shore	30°25'56,26"S	17°20' 5,43E

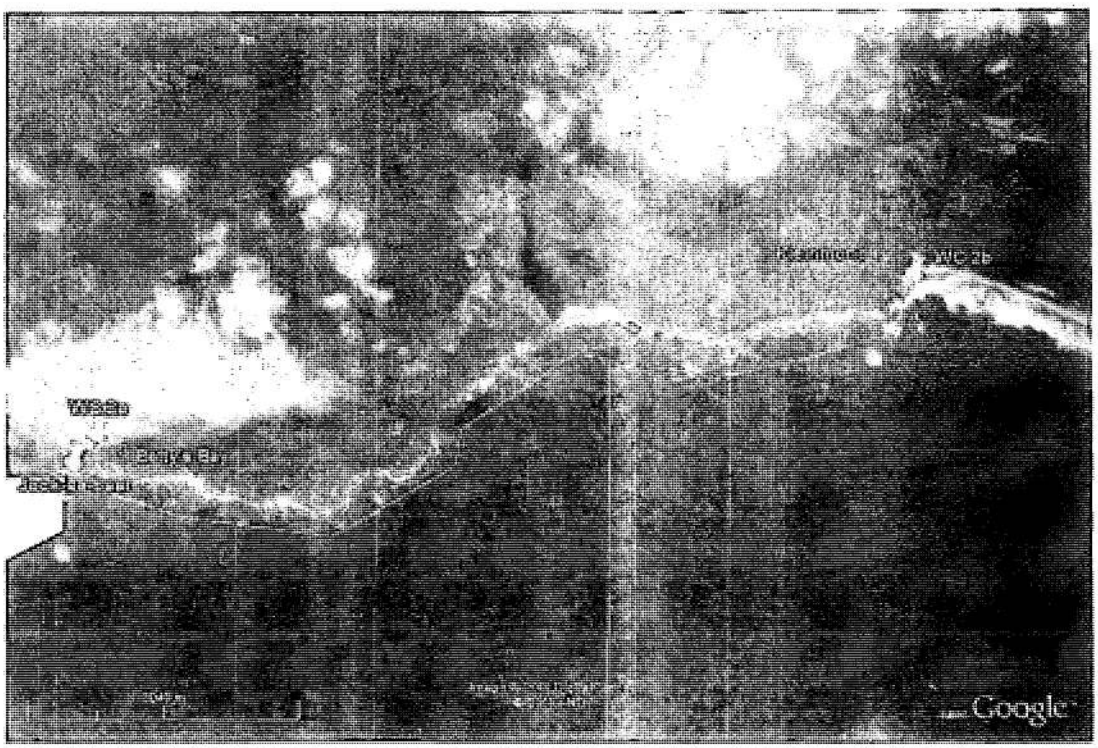
Area 1: Western Cape



WC 1
Maasbaai
+- 8km

		Latitude	Longitude
WC1a	Sandy beach north of Cape Hangklip	34°22'52,35"S	18°49'33,91"E
WC1b	Sandy beach east of Maasbaai	34°22'49,44"S	18°51'22,82"E

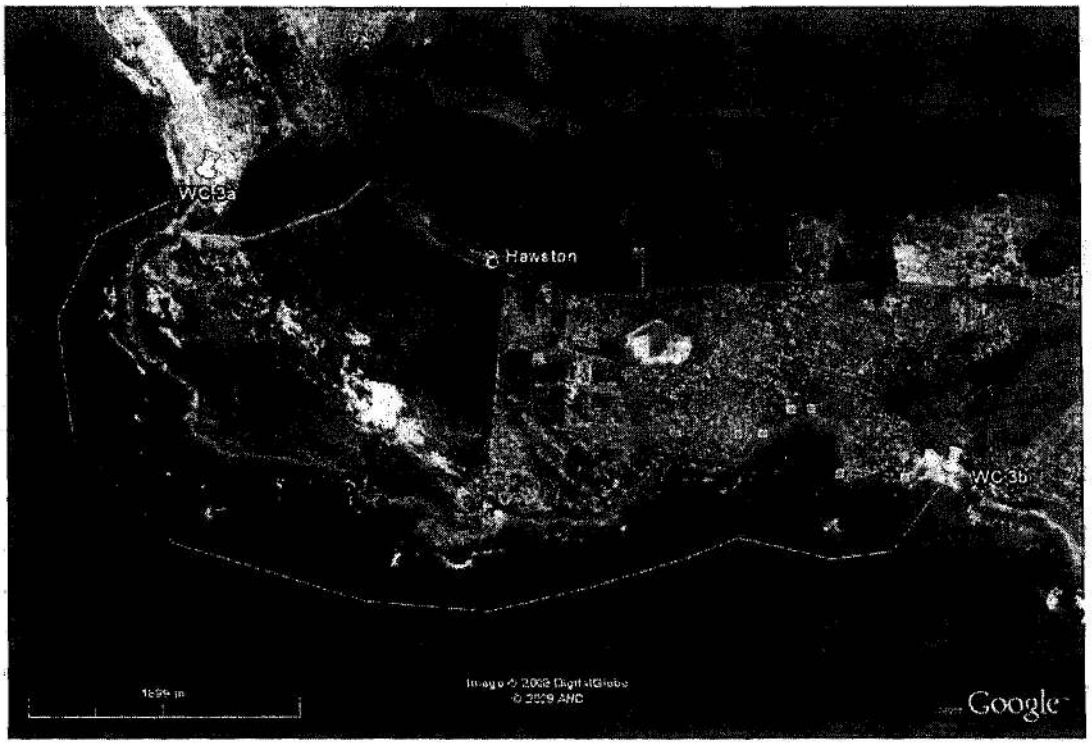
Area 2: Western Cape



WC 2
Bettysbay
+- 10km

		Longitude	Latitude
WC2a	Jock-se-baai	34°21'22,65"S	18°56'14,53"E
WC2b	Sandy Beach at Bettys bay	34°20'34,38"S	19° 2'16,02"E

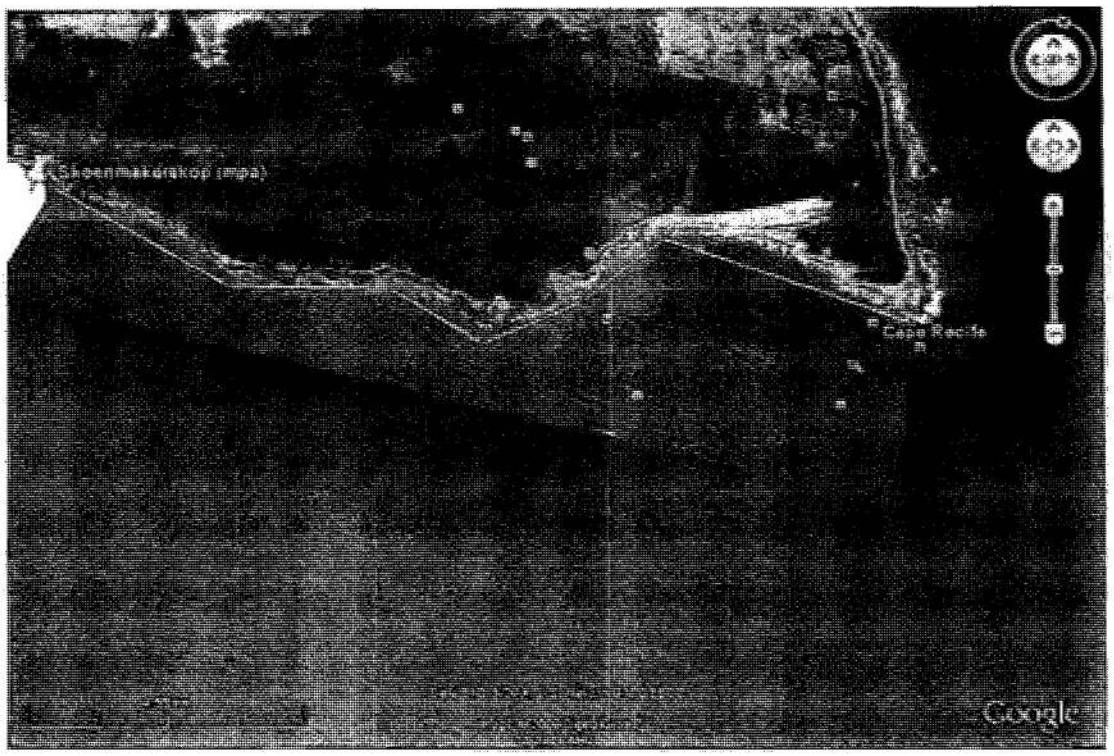
Area 3: Western Cape



WC 3
Hawston
+- 8km

		Longitude	Latitude
WC3a	Sandy beach west of Hawston	34°23'58,68"S	19° 7'27,22"E
WC3b	Sandy beach at Onrus	34°25'12,00"S	19°10'49,17"E

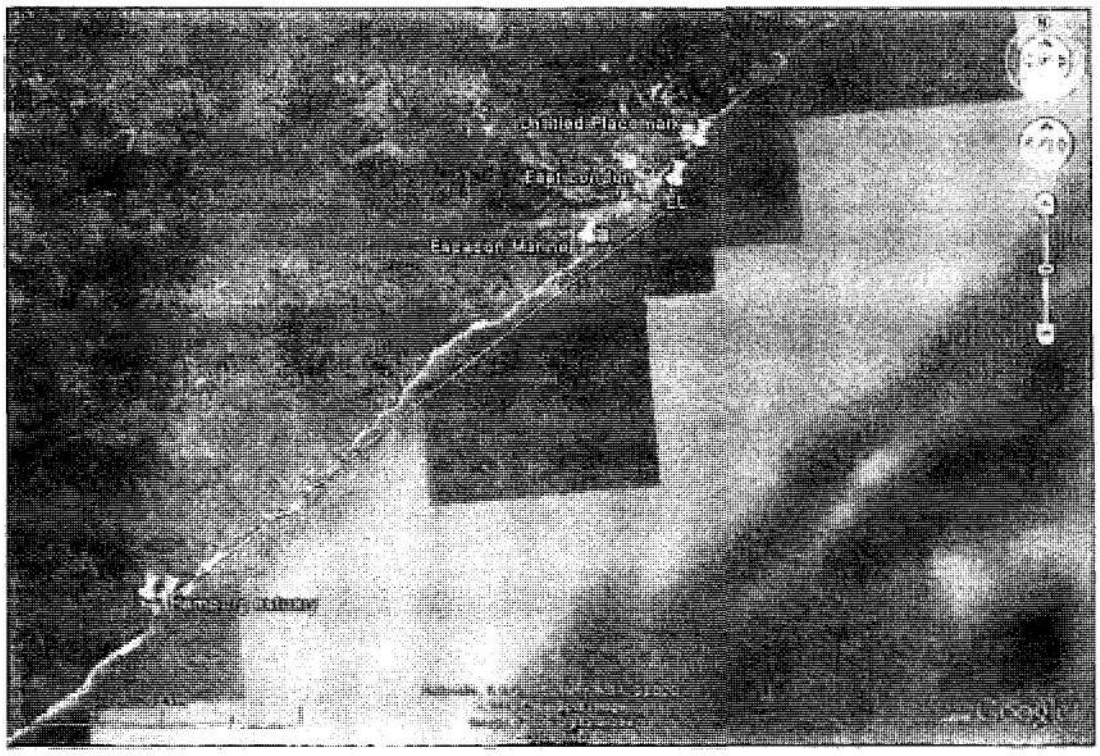
Area 1: Eastern Cape



EC 1 +- 15km

		Latitude	Longitude
EC 1a	Skoenmakerskop MPA	34° 2' 46,05" S	25° 32' 33,39" E
EC 1b	Cape Receife	34° 2' 0,33" S	25° 42' 18,43" E

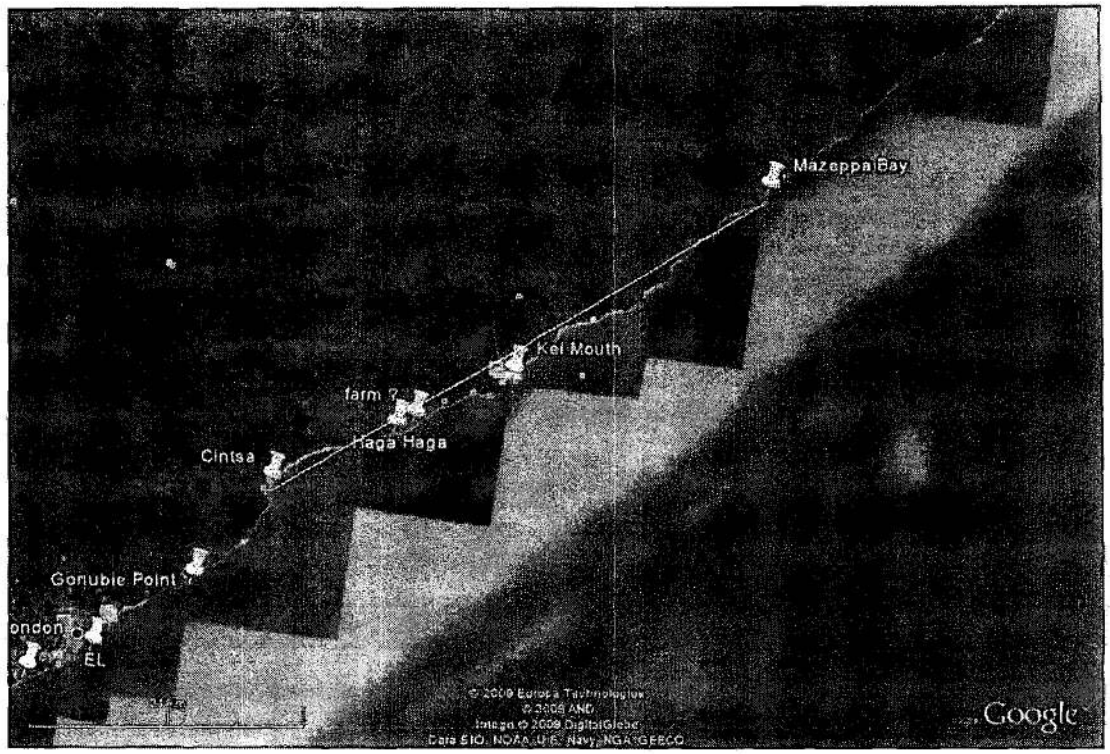
Area 2: Eastern Cape



EC 2 +- 50 km

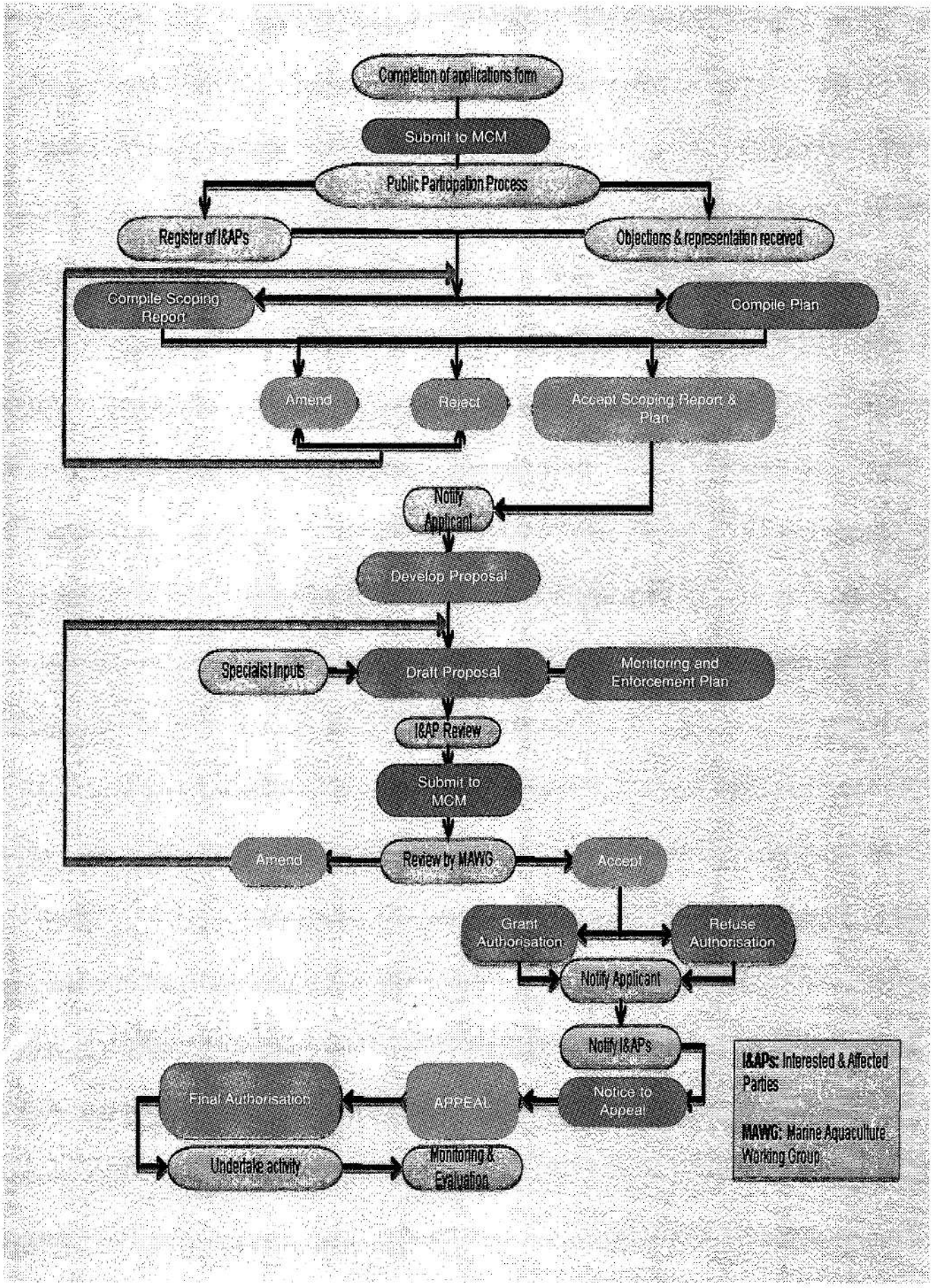
		Latitude	Longitude
EC 2a	Hamburg	33° 17' 1,94" S	27° 29' 31,54" E
EC 2b	East London	33° 1' 28,13" S	27° 55' 50,53" E

Area 3: Eastern Cape



EC 3 +- 65 km

		Latitude	Longitude
EC 3a	Cintsa	32° 50' 2,61" S	28° 6' 56,0" E
EC 3b	Mazeppa Bay	32° 9' 25,28" S	28° 39' 19,91" E


Completion of applications form
Submit to MCM
Public Participation Process
Register of I&APs
Objections & representation received
Compile Scoping Report
Compile Plan
Amend
Reject
Accept Scoping Report & Plan
Notify Applicant
Develop Proposal
Specialist Inputs
Draft Proposal
Monitoring and Enforcement Plan
I&AP Review
Submit to MCM
Amend
Review by MAWG
Accept
Grant Authorisation
Refuse Authorisation
Notify Applicant
Notify I&AP's
Final Authorisation
APPEAL
Notice to Appeal
Undertake activity
Monitoring & Evaluation
I&APs: Interested & Affected Parties
MAWG: Marine Aquaculture Working Group