

**ABALONE AQUACULTURE
IN WESTERN AUSTRALIA**

POLICY GUIDELINE

FISHERIES MANAGEMENT PAPER No. 133



FISHERIES
WESTERN AUSTRALIA

3rd floor, SGIO Atrium
168 St George's Tce Perth WA 6000

December 1999

ISSN 0819-4327

CONTENTS

1.0 INTRODUCTION.....	1
Abalone Aquaculture in WA	1
2.0 OBJECTIVES	1
2.1 Environmental Impact	2
2.2 Broodstock Issues	2
2.3 Translocation and genetic zones	3
2.4 Selective Breeding and Triploid Programs	4
3.0 POLICY	4
3.1 General	4
3.2 Hatchery Production	5
3.3 Land-based Culture	6
3.4 Marine-based Culture	7
3.5 Genetic Zones	8
REFERENCES.....	10

1.0 INTRODUCTION

Over the past five years, the rising demand and price for premium abalone products has created an economic environment in which abalone aquaculture has become increasingly attractive as a financial investment. While the highest returns are expected to be from the export of 'cocktail size' abalone (60–80 mm in length), there have recently been sales of larger farmed abalone suitable for canning.

Experimental or commercial abalone aquaculture is being pursued in many countries with major investments in The United States, Taiwan, China and Korea as well as in Australia. The combined total abalone aquaculture production from China and Taiwan was reported to be in the order of 2,000 tonnes and continues to rise. As cultured 'cocktail' abalone are below the legal harvest size of wild abalone, there will be limited competition between aquaculture and the wild fisheries.

Abalone Aquaculture in WA

The species of abalone that have potential for culture in Western Australia include *Haliotis roei* (Roe's abalone) *H. laevigata* (greenlip abalone) and *H. conicopora* (brownlip abalone). The brownlip is often regarded as being conspecific with *H. rubra*, the black lip abalone from the eastern states. There is also some interest in the culture of *H. asinina* (donkey's ear abalone) and *H. scalaris* (staircase abalone).

With abalone aquaculture in South Australia, Tasmania and Victoria already well established, it is believed that the Western Australian industry could develop rapidly if managed appropriately. As of July 1999, eight licences to culture abalone have been issued by Fisheries WA. Not all of these licence holders are actively trying to culture abalone yet and there is only one commercial hatchery that is operational.

The establishment of the Western Australian Abalone Aquaculture Association (WAAAA) has provided, and will continue to provide, a forum in which farmers, scientists and other interested groups can exchange information and experiences that will benefit the developing industry.

Fisheries WA is committed to the development of a sustainable abalone aquaculture industry in Western Australia. The development of this management paper to provide guidelines for abalone aquaculture, is part of Fisheries WA's commitment to the industry.

2.0 OBJECTIVES

This management paper is intended to assist proponents and Fisheries WA when considering the grant of authorisations for aquaculture licences under Section 92 of the *Fish Resources Management Act 1994* and, in accordance with the relevant assessment processes, to allow for the development of an abalone aquaculture industry in Western Australia in an environmentally acceptable manner.

Specifically, the paper provides details on some of the general issues relating to abalone aquaculture including environmental impact, broodstock and translocation issues, while the policy section details;

- the manner in which abalone can be cultured in hatchery, land-based and marine-based systems,
- the system requirements to prevent release of genetic material when holding ‘out of zone’ stock and,
- the manner in which licensed abalone farmers can distribute/sell cultured animals.

2.1 Environmental Impact

This document is not meant to be a comprehensive guide of the potential environmental impacts or effects that an abalone farm could have on the surrounding area. These issues have and will continue to be dealt with on a case-by-case basis in accordance with the relevant assessment processes with referral to the Department of Environmental Protection (DEP).

However, the following is a brief list and description of the major potential impacts;

- **Trophic Effects** - As with any aquaculture operation, there is always the potential that uneaten food stuffs and metabolic waste products (for example, nitrogenous products) could enrich the water of the surrounding environment and, in extreme cases only, have eutrophic effects. However, a recent paper that discussed the release of nitrogen in the effluent from an abalone farm (Maguire, 1998) has reported that from an environmental perspective, abalone aquaculture should be relatively low impact (providing efficient feeding and solids removal from discharge water occurs),
- **Shading from Marine-based Farms** - The structures used to farm abalone in a marine based system could cause direct shading of the seabed. While this is considered to be unlikely, it is a possible impact and must be considered,
- **Impact on the Geomorphology of an Area** - The use of artificial substrates to culture abalone could affect the sand and water movement in the area resulting in a change in geomorphology. Feed may also be ‘trapped’, which could alter nutrient levels in the water. However, any effects would be restricted to a localised area.

2.2 Broodstock Issues

The issue of broodstock collection and use is not dealt with specifically in this management paper. A separate discussion paper addressing the issues relating to taking wild stock for aquaculture purposes has been prepared and released for comment. Until specific legislation can be drafted to allow Fisheries WA to authorise the take of broodstock for aquaculture purposes, broodstock must be either purchased from licensed commercial fishermen or taken under the authority of a Ministerial Exemption issued under Part 7 of the *Fisheries Resources Management Act 1994*.

2.3 Translocation and genetic zones

The translocation of abalone into and within Western Australia has the potential to;

- i. impact upon the genetic diversity of existing stocks,
- ii. introduce pathogens and disease, and
- iii. impact on the natural environment and the biodiversity of indigenous aquatic species.

In recognition of the impacts outlined in ii) and iii) above, the policy outlined in this paper provides details of the requirements of abalone facilities to ensure that the impacts associated with the translocation of abalone and abalone farming *per se* are minimised. This includes the requirements for the filtration of water discharge to remove solids and prevent the release of genetic material and the requirement for disease testing of translocated stock.

There is currently little information available on the genetic structure of wild greenlip and brownlip abalone populations around the Western Australian coast. It is believed however, that populations may be genetically differentiated and that even some neighbouring populations of abalone should be regarded as separate gene pools. To minimise the possible risk of 'altering' the genetic structure of local abalone populations, genetic zones have been established, based on the commercial abalone catch zones. The zones have been established as a precautionary measure against any possible impact from the mixing of genetic stocks, however the need for genetic zoning may be reviewed when additional scientific information comes to light. Fisheries WA, in liaison with Murdoch University, is currently facilitating the establishment of a student research project into the population genetics of the greenlip abalone. The genetic zones are detailed in the following policy section.

In Western Australia, Roe's abalone *Haliotis roei* naturally occurs in the surf zone from Shark Bay to the South Australian border. Information on the genetic stock structure of *H. roei* based on research conducted by the Research Division of FWA indicates that there are only relatively small genetic differences between populations within the natural distribution of *H. roei* (Hancock, in press). Based on this information, it is considered that there is little need for genetic zones for this particular species.

The tropical abalone *H. asinina* naturally occurs in the north of Western Australia. Given the lack of knowledge available on the population genetics for the tropical abalone *H. asinina* it is suggested that it have its own genetic zone along the northern coastline of Western Australia. Therefore, any request to move *H. asinina* outside of the area to which it is endemic will be assessed on a case-by-case basis through the translocation process.

With respect to the translocation of other abalone species, three circumstances may arise;

- translocation of abalone from interstate,
- translocation of abalone (other than *H. roei*) between different genetic zones, and
- translocation of abalone (other than *H. roei*) within the same genetic zone.

Translocation of abalone from interstate into Western Australia, is not dealt with in this management paper and applications to translocate abalone from interstate will be assessed on a case-by-case basis through the assessment procedure developed by Fisheries WA and the Environmental Protection Agency (EPA), in accordance with Regulation 176 of the *Fish Resources Management Regulations 1995*. Any approval to translocate abalone from interstate is likely to be conditioned to ensure that the stock being introduced is disease-free and that the discharge water from any holding facility is filtered.

Applications to translocate abalone (other than *H. roei*) between genetic zones will be considered for approval on a case by case basis subject to the conditions and requirements detailed in the following policy section of this management paper. Written approval from Fisheries WA must be obtained prior to any movement of abalone (other than *H. roei*) between genetic zones.

The translocation of abalone between sites within the same genetic zone is considered low risk and there is no requirement for prior written approval, subject to other relevant approvals.

It should be noted that should additional scientific evidence on the population genetics of any abalone species come to light, the genetic zoning policy may be amended as appropriate.

2.4 Selective Breeding and Triploid Programs

The culture of triploid or selectively bred abalone derived from broodstock collected from the same genetic zone as the system they are destined for, is permitted in hatchery, land-based and marine-based culture systems.

The culture of triploid or selectively bred abalone derived from 'out of zone' broodstock is permitted in hatchery and land based systems that have a water discharge system that prevents the release of genetic material (see below), but is unlikely to be permitted in marine based systems unless the applicant can provide evidence to substantiate that the stock is unlikely to successfully reproduce in the culture environment.

3.0 POLICY

In making a determination to grant an aquaculture licence for abalone and in specifying conditions for abalone aquaculture licences, the Executive Director should take into account the policy principles set out below.

3.1 General

Due to different policy ramifications it is useful to divide abalone aquaculture into different culture methodologies as described below.

3.2 Hatchery Production

Hatcheries may maintain *Haliotis laevis*, *H. conicopora* and *H. scalaris* stock from any genetic zone in Western Australia provided stock from outside the genetic zone in which the hatchery is located ('out of zone' stock) are kept separately and the water discharge system from the 'out of zone' stock incorporates a mechanism or filtration unit that 'filters' to 200 µm nominal to prevent the release of eggs or larvae into the wild. The release of sperm into the wild is considered to be inconsequential as abalone eggs need to be less than one hour old for fertilisation to occur and given that sperm is only viable for a short period, the probability of it interacting with a viable egg from the wild is negligible (Hahn *pers. comm.*).

The method to prevent the release of genetic material may include a physical barrier, for example, a drum filter, sand filter or a rubble filter, which filters to 200 µm nominal to prevent the release of larvae and/or eggs. It is considered that a swirl separator could still allow the release of larvae and/or eggs, so this system is not considered to be a sufficient barrier.

Hatcheries may maintain *H. roei* stock from anywhere within Western Australia without the need for specific 'size' filtration, provided the hatchery is located in an area in which *H. roei* is endemic. If *H. roei* is not endemic to the area in which the hatchery is located, the specific approval of the Executive Director of Fisheries WA is required.

Spat or juveniles of *Haliotis laevis*, *H. conicopora* and *H. scalaris* to be sold to, or used in marine based systems must be progeny of broodstock from the same genetic zone as the system for which they are destined.

All abalone hatcheries will be required to install coarse filtration, sedimentation traps, settling ponds or some other mechanism approved by the Executive Director of Fisheries WA, to remove solids from the discharge water.

Mortality rates for each batch will be recorded and 150 spat per batch must be submitted for health certification prior to any sale or movement of animals from the hatchery. If a hatchery is selling or moving adult or juvenile abalone that originated from interstate, or have been bred from broodstock that originate from interstate, then 300 spat per batch must be submitted for health certification prior to any sale or movement of animals from the hatchery.

A hatchery must supply a declaration with every sale or movement of animals, setting out the source and number of broodstock, and the batch's health status.

A batch is defined as a group of animals that are, or have been, kept in the same environment (for example, a tank). This could include animals from a single spawning or animals pooled from multiple spawnings.

Any abalone leaving the licensed site, must be accompanied by one copy of a consignment note, stating the number, species and size (average) of abalone consigned. A duplicate copy of the consignment note shall, within 24 hours of the consignment, be forwarded to the local Fisheries WA Office. A third copy of the consignment note shall be retained by the licence holder on site.

3.3 Land-based Culture

Land-based systems may use spat derived from any number of broodstock from any Western Australian genetic zone provided the stock bred from 'out of zone' broodstock are kept separately and have water discharge system that 'filters' to 200 µm nominal to prevent the release of genetic material.

Land-based systems may maintain *H. roei* stock from anywhere within Western Australia without the need for specific 'size' filtration, provided the hatchery is located in an area in which *H. roei* is endemic. If *H. roei* is not endemic to the area in which the hatchery is located, the specific approval of the Executive Director of Fisheries WA is required.

All land based systems will be required to install coarse filtration, sedimentation traps, settling ponds or some other mechanism approved by the Executive Director of Fisheries WA, to remove solids from the discharge water.

Licencees wishing to use supplementary feeding of wild seaweed must designate the amount and source, and have approval for harvesting from Fisheries WA. Approval from local shires, DEP and CALM may also be required depending on the source and the amount required. It is important that the harvesting of seaweed from the wild be kept to a minimum, e.g. for supplementing the diet of broodstock abalone or for seeding land based algal production units such as *Ulva* tanks.

Licence holders must keep records of all stock on the farm including mortality and growth rates and have these available for inspection by Officers of Fisheries WA. Licence holders may be required to submit animals for health certification at the discretion of the Senior Fish Pathologist. Any abalone to be processed at a site other than the licensed aquaculture site must be sent to the processor "in-shell".

Any abalone leaving the licensed site, must be accompanied by one copy of a consignment note, stating the number, species and size (average) of abalone consigned. A duplicate copy of the consignment note shall, within 24 hours of the consignment, be forwarded to the local Fisheries WA Office. A third copy of the consignment note shall be retained by the licence holder on site.

If *Haliotis laevigata*, *H. conicopora* or *H. scalaris* abalone are being moved to an aquaculture site in a different genetic zone, 150 of the animals to be moved must be submitted for health certification prior to any sale or movement of animals from the facility. If a hatchery is selling or moving adult or juvenile abalone that originated from interstate, or have been bred from broodstock that originate from interstate, then 300 spat per batch must be submitted for health certification prior to any sale or movement of animals from the hatchery.

A declaration, setting out the source and the batch's health status must be provided with every sale or movement of animals.

3.4 Marine-based Culture

(i) Cages and Barrels

Applications for licences for culture in cages or barrels will be assessed under Section 92 of the *Fish Resources Management Act 1994* and taking into consideration Ministerial Policy Guideline No. 8 “*The Assessment of applications for authorisations for Aquaculture and Pearling in coastal waters of Western Australia*” (MPG No. 8).

The maximum size of a licence site will be 20 hectares. Operators wishing to expand beyond 20 hectares must clearly demonstrate, by way of a business or development plan, why they require a larger site.

Marine-based systems farming *Haliotis laevigata*, *H. conicopora* and *H. scalaris* may only use stock derived from broodstock collected from the same genetic zone that the system is in. No ‘out of zone’ stock may be stocked into marine based systems.

Marine-based systems farming *H. roei* may use stock from anywhere within Western Australia provided the aquaculture site is located in an area in which *H. roei* are endemic. If *H. roei* is not endemic to the area in which the hatchery is located, the specific approval of the Executive Director of Fisheries WA is required.

Licensees wishing to use supplementary feeding of wild seaweed must designate the amount and source, and have approval for harvesting from Fisheries WA. Approval from local shires, DEP and CALM may also be required depending on the source and the amount required. It is important that the harvesting of seaweed from the wild be kept to a minimum, for example, for supplementing the diet of broodstock abalone or for seeding land based algal production units such as *Ulva* tanks.

Licence holders must keep records of all stock on the licensed site, including mortality and growth rates and have these available for inspection by Officers of Fisheries WA. Any abalone to be processed at a site other than the licensed aquaculture site must be sent to the processor ‘in-shell’.

Any abalone leaving the licensed site must be accompanied by one copy of a consignment note, stating the number, species and size (average) of abalone consigned. A duplicate copy of the consignment note shall, within 24 hours of the consignment, be forwarded to the local Fisheries WA Office. A third copy of the consignment note shall be retained by the licence holder on site.

(ii) Purpose-built Artificial Substrate

Applications for licences for culture on artificial substrate will be assessed on a case by case basis under Section 92 of the *Fish Resources Management Act 1994* and taking into consideration Ministerial Policy Guideline No. 8 “*The Assessment of applications for authorisations for Aquaculture and Pearling in coastal waters of Western Australia*” (MPG No. 8).

The effect of the artificial substrate operation on the geomorphology and surrounding ecology will be an important consideration in the assessment process. Any proposal for

operations in locations where there is a likelihood of adverse impact on local wild abalone populations is unlikely to be approved.

Any operation approved to culture *Haliotis laevis*, *H. conicopora* and *H. scalaris* abalone on marine-based, purpose-built artificial substrate may only use stock derived from broodstock from the same genetic zone as that in which the system is located.

Any operation approved to culture *H. roei* abalone on marine-based, purpose-built artificial substrate may use stock derived from broodstock from anywhere in Western Australia provided the system is located in an area in which *H. roei* is endemic. If *H. roei* is not endemic to the area in which the hatchery is located, the specific approval of the Executive Director of Fisheries WA is required.

Licence holders must keep records of all stock located on the artificial substrate, including mortality and growth rates, and give prior notification of harvesting and processing activities to Fisheries WA. Any abalone to be processed at a site other than the licensed aquaculture site must be sent to the processor “in-shell”.

Any abalone leaving the licensed site must be accompanied by one copy of a consignment note, stating the number, species and size (average) of abalone consigned. A duplicate copy of the consignment note shall, within 24 hours of the consignment, be forwarded to the local Fisheries WA Office. A third copy of the consignment note shall be retained by the licence holder on site.

(iii) Seeding and Reseeding

Proposals for the seeding or reseeded of reefs, whether or not abalone occur on those reefs, would ordinarily be for the purposes of:

- i) commercial aquaculture, or
- ii) commercial and/or recreational fishery stock enhancement.

If a particular proposal results in a direct flow of benefit to the proponent (that is, ownership of stock), then the application will be assessed in accordance with the aquaculture provisions of the *Fish Resources Management Act 1994* and the consultation and assessment process set out in MPG No. 8. If such a proposal was considered to adversely impact on existing recreational or commercial fishing rights, then the application would be unlikely to be approved.

Proposals which enhance existing stocks for subsequent recreational and/or commercial fishing purposes, without any loss of existing access rights, will not be considered as aquaculture activities and will require separate consideration by Fisheries WA via the mechanisms in the *Fish Resource Management Act 1994* relating to the management of wild fisheries.

3.5 Genetic Zones

Pending further research on the population genetics of abalone, the genetic zones for southern abalone species (*Haliotis laevis*, *H. conicopora* and *H. scalaris*) are:

1. Carnarvon to Drummonds Point
2. Drummonds Point to Guilderton
3. Guilderton to Cape Bouvard
4. Cape Bouvard to Windy Harbour
5. Windy Harbour to Hopetoun
6. Hopetoun to Point Culver
7. Point Culver to South Australian Border

Genetic zoning does not apply to the culture of *H. roei* (See explanation on page 4).

Only one genetic zone exists for *H. asimina* (See explanation on page 4).

REFERENCES

- Commonwealth of Australia, 1998. *Australia's Oceans Policy*. Environment Australia, Canberra.
- Hone, P.W., Madigan, S.M. and Fleming, A.E., 1997. *Abalone hatchery manual for Australia*. South Australian Research and Development Institute, Adelaide. 33pp.
- Maguire, G.B., 1998. *Nitrogen budgets for land-based abalone farms - a discussion document*. Proceedings of the 5th Annual Abalone Aquaculture Workshop, July, 1998, Hobart.