SOUTH WEST ABALONE GROWERS ASSOCIATION

UK Legislative Status for Abalone Culture

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Report for SEAFISH

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Authors Note

The views expressed in this report are those of the author and not necessarily representative of South West Abalone Growers Association. The information and data given is provided in good faith with the intention of helping other potential farmers. This report is intended as a guidance document to assist others in the preparation of their own site specific investigations.

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1. Scope of Document

South West Abalone Growers Association (SWAGA) aims to promote the sustainable development of abalone culture in the South West of the UK. Abalone culture is novel within the UK, the focus of historical developments being primarily confined to the Channel Islands. In consequence, abalone culture within the UK faces a range of legislative limitations some of which relate to any new aquaculture development and others which relate to its novelty.

SWAGA has always aimed to work with the various agencies in order to help establish protocols by consensus based on a transparent scientific basis. In 2003 SWAGA undertook a FIFG Networking Project (FitzGerald 2003) to establish the limitations to the development of the industry of which legislative barriers were a significant feature.

This report is produced in conjunction with two partner documents a Biotope Study (Baldock, 2007) and the Abalone Feed Requirements Study (FitzGerald 2008). These sister reports help address specific environmental issues which are outlined in Sections 2 and 5.

This legislative review has been produced as a guidance document for potential operators. Although it signposts the major legislative issues it is not exhaustive and prospective operators will need to establish site specific issues and requirements. It is also notable that there is considerable movement at present in a number of legislative areas and that any opinions provided in this report will be subject to change as interpretations evolve and regulations are updated.

SWAGA is participating in SUDEVAB (SUstainable DEVelopment of ABalone culture) a European Framework 7 SME Project due to run from 2008-2010. One work programme within this study is focused upon legislation and aims to review member states and EU legislation with a view to identifying limitations and harmonisation. Once completed the outputs from this FP7 Project with respect to legislation will be made available to industry through Seafish.

2. Abalone Native / Non-Native Status

2.1 Legislative Overview

2.1.1 ICES

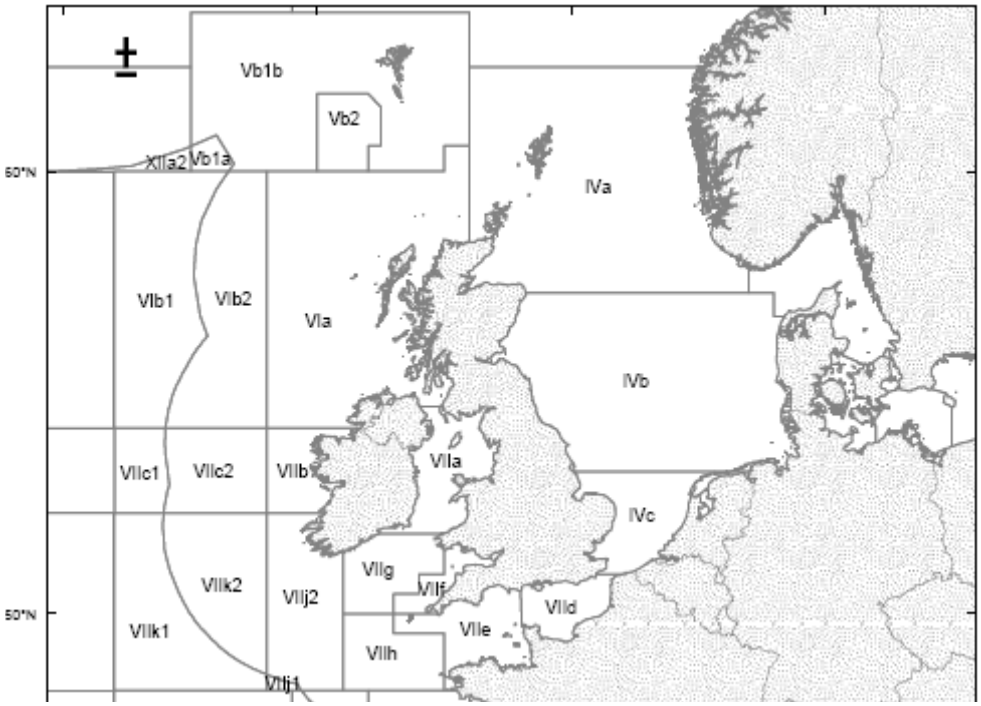
The International Convention on the Exploration of the Seas (ICES) is an organisation that coordinates and promotes marine research in the North Atlantic. ICES gathers information about the marine ecosystem, fills knowledge gaps and uses this information to help develop unbiased, non-political advice. This is then used by the 20 member countries, which fund and support ICES, to help member countries manage the North Atlantic Ocean and adjacent seas.

ICES 2004 is the latest Code of Practice for the introduction and transfer of marine organisms which sets out in ten sections a procedure for the assessment, quarantine, trials and monitoring of new introductions. This provides a phased agreed protocol for introductions including special measures for genetically modified organisms.

The process of considering a new introduction is managed by WGITMO (Working Group on Introductions and Transfers of Marine Organisms) who perform a risk assessment on a number of criteria (see ICES 2004, Appendix A and B). The Risk Assessment used includes a scoring

component on both 'Risk Estimate' and an 'Uncertainty Estimate' allowing for a precautionary approach in cases where little information exists.

In the case of the West coast of Ireland both the European abalone (*Haliotis tuberculata*) and the Japanese abalone (*Haliotis discus hannai*) were introduced via ICES procedures in the early 1980's. Spat was cultured to maturity to produce an F1 progeny and no parasites or pathogens were associated with this F1 generation. Carna Shellfish Laboratories then conducted extensive trials before culturing abalone in open waters began. In FitzGerald, 1997 contact was made with Carna to establish the extent of these trials. Monitoring revealed no evidence of recruitment to the wild (J. Mercer pers. comm.) In over 20 years of culture along the west coast of Ireland there is still no evidence of wild recruitment.



In the case of Great Britain – SW England is located in the same ICES block (Block VIIe) as the Channel Islands and the Brittany coastline as shown above. The evidence of comparable marine biota in abalone habitats within this block is considered in Baldock 2007 and is summarised in Appendix A.

2.1.1 Wildlife and Countryside Act

The Wildlife and Countryside Act 1981 (amended) is the main piece of legislation regulating the release of non-natives in Great Britain. Under Section 14(1) of this Act, it is an offence to "*release or cause to escape into the wild*" any animal which:

a) is of a kind which is not ordinarily resident in and is not a regular visitor to Great Britain in the wild state; or
b) is included in Schedule 9 Part I.

The European abalone is a native of Great Britain within Channel Island waters. Clarification on the status of this species was sought in 1996 from the Ministry of Agriculture Fisheries and Food (MAFF the predecessor of the current DEFRA) who declared "I can confirm this species is considered to be native to British waters, therefore introductions do not require licensing under the

Wildlife and Countryside Act 1981." Schedule 9 Part I is a supplementary list of nuisance non-native species within which the European abalone is also not listed (www.jncc.gov.uk/PDF/waca1981_schedule9.pdf).

This suggests that the European abalone *Haliotis tuberculata* is therefore native and able to be cultured in open coastal waters. There remains some debate as to the correctness of the distinction of whether "British waters" relate to just "Great Britain" (i.e England, Scotland and Wales) or the "British Isles" (i.e including the dependencies of the Isle of Man and the Channel Islands). The "British-ness" of the ormer remains contested by the Marine Biological Association (MBA). The MBA believe that the ormer is non-native on constitutional, historical and biogeographical grounds. A particular concern raised was not so much that the ormer would become a pest but more that management would be difficult and that significant damage would occur from 'boulder turning' during wild harvesting (K. Hiscock pers. comm.). However, low water harvesting of ormers occurs in the Channel Islands and France without reported damage in common with abalone harvesting around the world.

It is our view that the spirit of the legislation is intended to try and control non-native species that do not "fit" within the ecological array of species within British waters. To this end we have undertaken the Biotope Study to assess whether the species assemblage in the Channel Islands are dissimilar to that of SW England. The results suggest that the areas are similar with comparable species assemblages. This issue is discussed in Baldock, 2007 with an overview in Appendix B.

Until this issue is resolved SWAGA has adopted a precautionary approach and culture is not currently undertaken in waters subject to additional designations under the Habitats Directive as considered in the following section.

2.1.2 Habitats Directive

The Conservation (Natural Habitats, &c) Regulations 1994 Statutory Instrument 1994 No. 2716 is the UK enactment of the EC Habitats Directive 92/43/EEC. Article 22 of this Directive requires Member States to regulate deliberate introductions of non-native species so as not to prejudice natural habitats or wild native fauna and flora, where necessary prohibiting such introductions. In Great Britain, this is transposed into domestic legislation by Section 14 of the Wildlife and Countryside Act 1981.

Habitats and species which are included within Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites are also protected under the Wildlife and Countryside Act 1981 (as amended) and the Habitats Regulations 1994.

Through the Habitats Regulations, the UK has a duty in maintaining or restoring natural habitats and species of wild fauna and flora to a favourable conservation status within European marine sites (Special Areas of Conservation, Special Protection Areas and Ramsar sites).

Under Article 6(3) of the Habitats Directive, 'plans or projects' that are proposed within sites of international importance, e.g. SAC, SPA or Ramsar sites, have to pass a number of tests in order to determine whether it can proceed or not. These are referred to as the *Appropriate Assessment.* In the event that a new farm site, or an expansion to a farm site that required a consent, license, or other permission, was proposed within a EMS, we consider that the proposal would be a plan or project under this legislation.

In 2001-2003 Cornwall Sea Fisheries undertook a series of offshore growth/mortality trials with the ormer deployed in 5 locations around the coast of Cornwall and the Isles of Scilly. Discussions were held with Natural England (formerly English Nature) about the deployment of ormers within SAC areas. Pending the successful outcome of a Biotope Study (see Baldock 2007 and Appendix B) it was agreed that mature viable ormers would not be placed within SAC's. As a precautionary

measure only non-reproductive juveniles were deployed at the two trial sites within SAC's (the Isles of Scilly and Carrick Roads).

SWAGA is currently awaiting feedback from Natural England regarding the status of ormer culture in SAC's following the successful completion of the Biotope Report which is of relevance to SW England SAC's in the Isles of Scilly, Carrick Roads and Plymouth Sound. The 'Biotope Report' is considered a source document for use within an Appropriate Assessment.

2.3 Future Developments

The proposed Water Framework Directive (WFD) due to be administered by the Environment Agency is currently being developed by the UK TAG (Technical Advisory Group) which is drawn from a number of agencies. The WFD aims to provide integrated basin management which harmonises water quality, biological indices and the presence of non-natives within a common framework to provide an indication as to whether water bodies are 'Good', 'Moderate' or 'Bad'. The presence of prescribed non-natives within Annex B will lead to a drop in the quality indicator. Communication with the UK TAG revealed that species considered in Annex B are those known to have a demonstrable negative impact on the environment (Janet Cowden pers. comm.). *H. tuberculata* is not considered within the current Annex B of non-native species.

The proposed Marine Bill white paper has no measures for the control of non-natives which was strongly criticised by the Marine Biological Association (MBA) in their consultation response along with their consideration of *H. tuberculata* as a non-native. It is uncertain in what form, the draft Marine Bill will return to be presented to Parliament in early 2008.

The Wildlife and Countryside Act Schedule 9 is an Annex of named species subject to control within the Act. This schedule is periodically reviewed and updated to allow inclusion of new species controls (or omission of species now removed). Schedule 9 is currently being reviewed (with recent closure of the submission date for consultation) with proposals to also ban the sale of named species. It should be noted that the proposed list on Schedule 9 also includes some species such as the boar (formerly native) and sea buckthorn (native). It is uncertain whether this instrument's scope will be widened beyond the original 'native of Great Britain' status in cases where species are perceived as a 'pest'. The original ruling by MAFF (predecessor of DEFRA) considered that *H. tuberculata* is a native within the terms of the Wildlife and Countryside Act. As the ormer could not be considered a 'pest' (see Appendix B) even this evolution of the regulation should not have grounds for overturning the original ruling.

2.4 Legislative Impact on Industry

The status of the ormer as a native to British waters remains a source of uncertainty to potential culture operators on mainland Great Britain. Onshore operators within recirculation systems can effectively side-step concerns by effective control of discharges. However, the availability and price of sea shore land and facilities greatly limit the potential operating sites. Technical requirements for full salinity seawater of high quality further limit the availability of sites and preclude the cost effective development of an onshore industry in the UK. The greatest potential is therefore through offshore ormer culture which also offers the greatest opportunities for fisheries diversification and development of the rural economy.

The Great Britain strategy for non-natives is due to be co-ordinated by the Non-Native Species Secretariat (NNSS) who advocate a risk assessment basis for non-natives encompassing both conservation and economic factors. The comprehensive work already undertaken on the ormer shows that there is negligible impact risk with the potential of great economic gains. With the recent completion of the 'Biotope Report' it is hoped that this issue is now resolved.

3. Movement & Disease Controls

3.1 Legislative Overview

Two key European Directives govern the health/disease control measures:

COUNCIL DIRECTIVE 91/67/EEC of 28 January 1991
concerning the animal health conditions governing the placing on the market of aquaculture animals and products (http://www.ifremer.fr/envlit/surveillance/pdf/91-67.pdf)

COUNCIL DIRECTIVE 95/70/EC of 22 December 1995
introducing minimum Community measures for the control of certain diseases affecting bivalve molluscs (http://www.ifremer.fr/envlit/surveillance/pdf/95-70.pdf)

A number of daughter directives updating and amending aspects of the initial articles have subsequently been issued.

COUNCIL DIRECTIVE 2006/88/EC of 24 October 2006
on animal health requirements for aquaculture animals and products thereof, and on the prevention and control of certain diseases in aquatic animals
(http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_328/l_32820061124en00140056.pdf)

Recent amendments have also varied the listing of notifiable diseases and the certification of stock from third countries outside the EU in order to control changing risks and the potential of disease transfer of exotic diseases. Permanent Advisory Network on Diseases in Aquaculture (PANDA) provides expert advice to the commission on disease issues.

UK enactment of EU directives has been implemented through a number of regulations. DEFRA provide a good overview to the different measures in:

"A GUIDE TO SHELLFISH HEALTH CONTROLS An explanation of the controls governing the movement of shellfish, their eggs and gametes into, from and within Great Britain, June 2001 (Temporary)"
(http://www.defra.gov.uk/fish/fishfarm/pdf/gshctext.pdf)

In essence the key statutory instruments are:

The Fish Health Regulations 1997 (SI 1997 No. 1881)
Movements of live shellfish, eggs and gametes to Great Britain from elsewhere in the EU
These Regulations implement Council Directive 91/67/EEC and 95/70/EC (see above) and control the movement into Great Britain, from elsewhere in the EU, of all live molluscan shellfish, their eggs and gametes.

The Animals and Animal Products (Import and Export) Regulations 1998 (SI 1998 No. 190)
This Regulation implements EC directives regarding veterinary inspections of consignments imported from other Member States.

The Registration of Fish Farming and Shellfish Farming Businesses Order 1985, as amended (SI 1985 No. 1391)
Controls on shellfish farm registration and record keeping This Order makes it a requirement for anyone carrying on a business of shellfish farming to register the business with the Ministry and to keep movement records and a record of mortalities.

There are currently six notifiable shellfish diseases:

Bonamiosis caused by infestation of a protozoan parasite, *Bonamia ostreae* (disease of the native oyster, *Ostrea edulis,* and was first recorded in the British Isles in 1982.

Marteiliosis caused by another protozoan parasite, *Marteilia refringens* (a disease of the native oyster, *Ostrea edulis*, and has never been found in the British Isles.

Haplosporidiosis is a disease caused by two protozoan parasites *Haplosporidium nelsoni* and *Haplosporidium costale* both of which affect the species *Crassostrea virginica*. Never been found in the British Isles.

Perkinsosis is caused by the protozoan parasite *Perkinsus marinus* and affects *Crassostrea virginica*. The disease also affects the ormers *Haliotis rubra* and *Haliotis laevigata* when caused by the protozoan parasite *Perkinsus olseni.* Never been found in the British Isles.

Mikrocytosis is caused by the protozoan *Mikrocytos mackini* and affects *Crassostrea gigas, Ostrea edulis, Ostrea puelchana, Ostrea denselomellosa* and *Tiostrea chilensis.* Never been found in the British Isles.

Iridovirosis, caused by viruses, has been associated with *Crassostrea gigas* mortalities in North America. Never been found in the British Isles.

Of the six notifiable diseases only *Bonamia* currently applies to the UK in a few restricted areas. The UK has Approved Zone status for *Bonamia* for the whole coastline of Great Britain excluding three areas (in Cornwall, around the Solent estuary and along the coast in Essex) where the disease has been present (non-approved areas). These restrictions in the SW of England currently apply in the areas between:

-The Lizard lighthouse and Start Point in Cornwall
-Portland Bill, Dorset and Selsey Bill in West Sussex

Shellfish movements are still allowed from one 'non-approved' area to another 'non-approved' area. However, no movement is allowed from a 'non-approved' area to an 'approved area'. Although most of the notifiable diseases infect oysters the restrictions apply to all molluscs including gastropods like abalone. This has placed a major limitation on the import of abalone seed from other European non-approved zones (see Section 3.4).

In contrast, there have been a series of abalone related diseases that have generated considerable concern. European wild abalone stocks are currently threatened by several pathogens causing severe mass mortalities in wild or farmed stocks (Azevedo *et al*., 2006; Balseiro *et al*., 2006; Huchette and Clavier, 2004; Nicolas *et al.*, 2002): *Xenohaliotis californiensis, Vibrio harveyi* and *Haplosporidium* sp. The transfers of exotic abalone species to Europe (*Haliotis discus hannai*) and the transfer of infected abalone through Europe may be vectors which need special control, legislation and enforcement. The current European legislation which has mainly been developed for cultured bivalves does not protect the abalone stocks efficiently. Some diseases, i.e. *Xenohaliotis californiensis*, despite being on the OIE list (world organization for animal health) have not been added to the EC list of shellfish diseases list of obligatory self-declaration in the Directive 2006/88/CE (http://www.oie.int/eng/normes/fcode/en_titre_2.2.htm).

3.3 Future Developments

The Animal Health Directive (2006) is currently under review with a number of proposed changes. These include: more comprehensive controls on organisations that may hold or move aquaculture species and a reduction in the link to less susceptible species (Point 3: "*less stringent controls on movements of potential vector and non-susceptible species"*). As the ormer is quite biologically

distinct in its culture requirements and diet from the bivalves (which are one of the key susceptible groups considered in these Animal Health regulations), it is expected that the current *Bonamia* and *Marteilia* controls will be removed. The proposed legislation should result in a more proportionate burden of evidence between protecting animal health whilst allowing animal trade.

SWAGA has responded to the consultation exercise and broadly welcomed the proposed changes. However, SWAGA has suggested that the abalone diseases *Xenohaliotis californiensis, Vibrio harveyi* and *Haplosporidium* sp. are also controlled within the proposed legislation in order to ensure that seed imports remain disease free.

3.4 Legislative Impact on Industry

The current highly precautionary approach with respect to the oyster diseases *Bonamia* and *Marteilia* controls have placed severe restrictions on abalone culture in the UK in terms of seed (abalone spat) importation, whilst the balance of probabilities would suggest that the infective mechanism for these bivalve diseases is unlikely to affect abalone.

CEFAS attempted to build a collaborative R&D project with European partners for a study to demonstrate a lack of species cross-over (i.e. prove a negative). The resultant bid was vastly expensive and not supported by public funds, whilst the abalone industry in its infancy also has very limited private funds. The resultant impasse has put a straightjacket on development of this sector in the UK. The UK abalone culture industry is in its formative stage and there is therefore no indigenous seed produced by the UK shellfish hatcheries, as there is not perceived to be sufficient demand. In the absence of seed no-one can culture this species to create the market demand in the first place – a classic 'chicken and egg' scenario. To overcome this limitation some operators have in the past attempted to operate their own hatcheries on a part-time basis. Despite significant time and cost it is apparent that hatchery success cannot be achieved on a 'hobby' basis. The only way to change this situation is to import seed which is a route that has to date been denied as the only abalone hatchery in France is adjacent to a *Marteilia* zoned water.

The forthcoming change in the Animal Health Directive (2006) will have major implications for the development of an ormer industry in the UK. It is understood that the new regulations are due for implementation in May 2008 with a view to being in force by August 2008. From this time onwards ormer seed importation should be allowed from secure sources in mainland Europe.

4. Quality / Hygiene Controls

4.1 Legislative Overview

There are two main sources of legislation relating to shellfish:

-Shellfish Waters (for the protection of the shellfish)

-Shellfish Hygiene/Flesh (for the protection of shellfish consumers)

The original Shellfish Waters Directive (79/923/EC), adopted in 1979, was updated by the Shellfish Waters Directive (2006/113/EC) in 2006. This Directive is transposed into UK law via Statutory Instrument 1997 No. 1332 The Surface Waters (Shellfish) (Classification) Regulations 1997. These regulations administered in England and Wales by the Environment Agency require a low level of monitoring for a range of physical and chemical parameters including heavy metals and persistent organics. It should be noted that the frequency of sampling is low with quarterly or half yearly sampling according to the parameter which may be insufficient to identify intermittent pollution problems.

The Shellfish Hygiene Directive Council Directive 91/493/EEC *laying down the health conditions for the production and placing on the market of fishery products* OJ L268 24.9.91, p.15. This is transposed to a UK statutory instrument via, The Food Safety (Fishery Products and Live Shellfish) (Hygiene) Regulations 1998 SI1998 No994. In the UK shellfish hygiene is administered by the Food Standards Agency (FSA) as the agency responsible for public health protection with scientific advice from CEFAS, whilst shellfish flesh sampling is undertaken by the local responsible health authority on a monthly basis. Shellfish hygiene classifications are reviewed annually.

As microbial contamination of shellfish can make them unsafe to eat public health is protected by strict controls over the microbial content of shellfish flesh and the shellfish waters where shellfish are gathered. Classifications are based on the historical microbial quality of the shellfish flesh at a set monitoring point.

Class	*Microbial standard*	*Summary of Status*
Class D	>46,000 E.coli/100g	Prohibited – unsafe for human consumption
Class C	<46,000 E.coli/100g	Can be marketed for human consumption after relaying in Class B or A area for 2 months, or heat treatment (cooking).
Class B	<4600 E.coli/100g	Can be marketed for human consumption following depuration or heat treatment (cooking).
Class A	<230 E.coli/100g	Can be consumed without further treatment

4.2 Future Developments

The Shellfish Waters Directive will be repealed in 2013 by the EC Water Framework Directive. When this occurs, the Water Framework Directive must provide at least the same level of protection to shellfish waters (which the WFD classifies as protected areas) as the Shellfish Waters Directive does.

The Shellfish Hygiene Directive presents concerns that the current legislation is not appropriate for ormers (see Section 4.3). SWAGA is a partner within SUDVAB a EU Framework 7 Programme for SME's. This programme includes a work package to assess the relationship between abalone and filter feeders in terms of the microbial content. SUDEVAB will also assess the harmonisation of legislation between EU Member States to establish whether the same national interpretation is applied in France, Ireland and Spain.

4.3 Legislative Impact on Industry

Most of the legislation in place, especially concerning hygiene and consumer protection, has been designed to specifically address problems associated with the main cultured bivalves such as mussels and oysters. For filter feeders such as bivalves the overall quality of the flesh and the quality of the rearing waters are inextricably linked. Consequently, the microbial content of the flesh and the receiving waters tend to mirror each other (see Section 4.1). However, as a grazing gastropod, abalone are considered less likely to bioaccumulate toxins as they do not filter seawater for feed. In consequence, it is probable that there is not the same link between flesh quality and water quality.

For example, in a clean water site (Class A for bivalves) abalone could be fed poor quality seaweed obtained from a contaminated source so giving a lower flesh quality than would be expected for the waters. Conversely, in a less clean site abalone could be fed seaweed from a 'clean' source and likewise not reflect the water quality in the culture area. Furthermore, it is possible that abalone could be cultured in an area using a variety of feed sources giving rise to a range of flesh quality according to diet. In essence, abalone may be influenced by what it eats rather than by where it eats.

It is suggested that the Animal Feedstuff Regulations may be more appropriate whilst end product microbial quality would still protect food safety issues.

Under the current regulations there is a danger that failure to meet Class A levels would create a serious problem for abalone culture operations as the target market is not for a cooked product and there is no depuration protocol available to clean living abalone.

5. Environmental Assessment / Planning Controls

5.1 Legislative Overview

5.1.1 Habitats Directive

The EC Habitats Directive 92/43/EEC is enacted in the UK via the Conservation (Natural Habitats, &c) Regulations 1994 Statutory Instrument 1994 No. 2716. This regulation is also considered in Section 2.1.2 in terms of the non-native issue yet abalone culture in SAC areas will also be required to undergo Appropriate Assessments in terms of both feed seaweed sourcing and aquaculture faeces loading.

The use of seaweed is considered in depth in an accompanying 'Feed Requirements report' which is considered a source document for use within an Appropriate Assessment. This report considers seaweed sourcing from beach cast, wild harvesting and direct culture in addition to the use of artificial feeds. The selection of appropriate feed sources will be a site specific judgment which will need to be negotiated with Natural England on a case by case basis. Variables will include the availability of local feed sources, the size of the proposed aquaculture operation and the proximity to potentially sensitive conservation features.

The release of faeces from culture operations will also be of importance and will also need to be assessed on a site specific basis according to proposed biomass loading, hydrodynamics and proximity to designated features. Literature values of faecal production for use in this respect are available from a number of tank based studies. This topic is also included as a research area within the forthcoming EU SUDEVAB programme.

5.1.2 Fisheries and Environment Protection Act (FEPA)

The control of 'deposits' or 'articles' on the seabed is controlled by the Food and Environment Protection Act 1985 which is administered by the Marine and Fisheries Agency (formerly the Marine Environmental Consents Unit (MCEU) of DEFRA). FEPA licensing is primarily concerned with controlling sea dumping issues which in most circumstances would not be of relevance to abalone culture. However, the distinction becomes a little more muddled when waste by-products are used in containment systems.

Rubicon Marine is currently exploring marine deployment applications for rubber side walls (the rubber/steel bands) of used tyres. These materials could be well suited for cage construction being strong, dense, and cheap with limited risk. Portsmouth University has undertaken comprehensive leach testing of tyre bales in marine settings demonstrating minimal heavy metal and hydrocarbon release. It is uncertain whether the use of these materials in offshore cage culture will require FEPA licensing.

5.1.3 Coast Protection Act

Offshore culture in sea cages placed on the seabed will require compliance with the Coast Protection Act (CPA) to protect navigation interests.

Under Section 34 of the Coast Protection Act 1949 (as amended principally by Section 36 of the Merchant Shipping Act 1988) the consent of the Secretary of State for Environment, Food & Rural Affairs is required for the following operations:

-the construction, alteration or improvement of any works on, under or over any part of the seashore lying below the level of mean high water springs;

-the deposit of any object or materials below the level of mean high water springs;

Section 34 of the Act imposes restrictions on works which may be detrimental to the safety of navigation. However, the introduction of environmental regulations extended Section 34 in some circumstances such that account must additionally be taken of potential environmental effects.

The CPA is administered by Marine and Fisheries Agency (formerly by the Marine Environmental Consents Unit – MCEU) at Whitehall.

Permission is also required by the Crown Estate for the deployment of structures upon the seabed.

5.1.4 Environmental Impact Assessment

The Environmental Impact Assessment Directive (97/11/EC) requires an EIA to be carried out in support of an application for development consent for categories of project listed in the Directive at Annexes I and II.

> Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment.
>
> OBJECTS SUBJECT TO ARTICLE 4 (2)
>
> 1. Agriculture, silviculture and aquaculture
>
> (a) Projects for the restructuring of rural land holdings;
>
> (b) Projects for the use of uncultivated land or semi-natural areas for intensive agricultural purposes;
>
> (c) Water management projects for agriculture, including irrigation and land drainage projects;
>
> (d) Initial afforestation and deforestation for the purposes of conversion to another type of land use;
>
> (e) Intensive livestock installations (projects not included in Annex I);
>
> (f) Intensive fish farming;

A proposed abalone culture operations will need to operate ‘due diligence’ with plans that incorporate assessments of waste management issues, construction and operational disruption, and potential impact on local designations including heritage and aesthetic requirements. The needs of any such studies will be dictated on a site specific basis.

Waste water discharge to sewer (trade discharge) will be administered by the local Water Utility Company whilst discharge to a receiving water will be administered by the Environment Agency.

5.2 Future Developments

The proposed Marine Bill will provide a radical change to offshore planning and environmental protection. It incorporates criteria for the establishment of Marine Protection Areas (MPAs) and streamlines planning requirements for offshore power generation. Although some nearshore MPA designations could stifle marine developments with an increased burden of restrictions the original Net Benefits white paper also aimed to create sites open for complimentary marine users (e.g. potting and angling). On this basis the low impact, low culture density objectives for abalone culture could be complimentary to MPA needs (see Section 5.3)

The forthcoming Water Framework Directive (WFD) due to be administered by the Environment Agency is currently being developed by the UK TAG (Technical Advisory Group) which is drawn

from a number of agencies. The WFD aims to provide integrated basin management including transitional estuarine and coastal waters. Although the WFD has a long lead in period with implementation due in 2013 the draft basin plans are due by the end of 2008 with the final plans presented by the end of 2009. Along with the proposed Marine Bill the WFD will deliver the UK's commitment to Integrated Coastal Zone Management (ICZM) which will guide future offshore planning.

5.3 Legislative Impact on Industry

The pressure of compliance with the vast array of requirements will be strongly site specific i.e. according to local designations. Some environmental / planning issues will be encountered with all offshore planned developments e.g. with respect to feed requirements and conflict with other marine users. The utilisation of seaweed obtained from the environment is considered in more depth within the 'Feed Requirements report' and will also be addressed in the forthcoming EU SUDEVAB programme.

The use of the seabed for aquaculture purposes is problematic. Within sheltered inshore waters there is high competition for space with recreational users which are perceived to have a higher earning potential than from aquaculture. Offshore waters will present potential conflict with fishermen particularly in areas where mobile gear is operated.

Legislative developments in this field (Section 5.2) could be of great benefit to offshore culture of abalone. In particular the drive for Marine Protection Areas (MPAs) could be highly beneficial if they are closed to mobile gear but open to use by sustainable low impact fixed gear operations. It is possible that low intensity culture operations, perhaps in association with long line seaweed culture, could be supportive of the overall objectives from MPA's. The Marine Bill also seeks to ease planning restrictions to the offshore power generating sector. It is possible that offshore aquaculture could be a complimentary economic activity to offshore power generation.

6. Summary

Legislation across a number of key areas has a strong influence on the potential for ormer culture to succeed within the UK. The prime legislative issues are:

-Native / Non-native Status
-Disease / Movement Controls
-Shellfish Hygiene Regulations
-Environmental Assessment / Planning

Although the ormer, or European abalone, is native to the Channel Islands it is not found on mainland UK. In 1996 MAFF ruled that the ormer would not require licensing under the Wildlife and Countryside Act which therefore enables culture in open waters. Although evidence indicates that recruitment is highly unlikely, assessments have been made into the potential impact of the ormer if it were to become established in the wild. A Biotope assessment has shown that 'ormer' sites and 'non-ormer' UK sites are biologically similar. It is proposed therefore that the ormer ecologically fits with the species assemblage in SW England.

The current movement controls primarily for oyster related diseases have presented a significant barrier to the importation of ormer seed from France. The proposed changes to the Animal Health Directive (2006) to remove the link to less susceptible species should allow importation of ormers from France from August 2008.

Shellfish hygiene control measures designed for filter feeding bivalves are not appropriate for grazing ormers. The current regulations group all molluscs together regardless of their feeding mechanism or the potential for bioaccumulation. The implications for an ormer microbial sample not achieving Class A would put an affected operator out of business as depuration protocols do not exist. Research work is currently planned as part of the forthcoming EU SUDEVAB programme to investigate the link between microbial water quality and flesh quality between bivalves and the ormer. Legislative harmonization is also sought with other EU Member States to ensure common practice.

Environmental assessment and planning controls present a significant burden upon potential ormer culture businesses. This is particularly the case when the utilisation of seaweed resources is considered. England has largely lost its seaweed harvesting heritage whilst authorities in other countries such as Ireland and France appear to interpret our common EU Directives more favorably. The 'Feed Requirements report' produced in conjunction with this report aims to help new aquaculture operators explore a range of feed options on a site specific basis.

Legislation is not static. A number of amendments to old regulations and presentation of new laws, such as the proposed Marine Bill, will create new and different challenges and opportunities. It is also suggested that the perception and interpretation of legislation may be variable and not always subject to transparent reasoning or a balanced scientific rational.

SWAGA will continue to try and work in collaboration with the various agencies and authorities on problem areas in order to reach a common consensus. Ironically, if this process and approach to prove unsuccessful then individuals working in isolation are more likely to be unaware of or unwilling to embrace this approach.

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Appendix A - Potential to Impact UK Species Habitat and Diversity

A1 Spawning Potential

Spawning potential is the first of many barriers that a species must overcome in order to have any potential to recruit new individuals to a wild community.

The 1997 MAFF study compared the temperature regime from various points around mainland UK with the Channel Islands and the West coast of Ireland and concluded that a similar profile existed between these ormer culture areas and SW England. This issue was further investigated in the 2001-2003 sea trials for Cornwall Sea Fisheries when the temperature profiles from a number of offshore sites were measured and compared against St. Peter Port temperatures. In essence, the temperature profile does not vary on a North – South basis but from East – West due to Gulf Stream influence on western shores providing milder winters (and cooler summers).

Peck (1983) considered that the ormer required 1200 degree days conditioning (assuming a biological zero point of 7.5ºC). This temperature requirement is reached within mainland UK waters.

A2 Recruitment Potential

Recruitment is the second barrier that a species must overcome before individuals can grow to form an established adult population.

The ability to 'recruit' a new ormer to a potential "feral" wild population relies on a number of factors:

-*fertilisation of gametes*. Broadcast spawners such as the ormer face grave difficulties in achieving successful fertilisation with a low population density. Sperm and eggs are diluted to the degree where the rates of contact and viability are reduced. The lower the potential success of fertilisation, the lower the corresponding rate of reproduction in the next generation, leading to a decrease in population levels and ultimately a stock crash. This phenomena is called depensation or the 'Allee' effect.

-successful settlement. Following fertilisation the planktonic larvae of the ormer drift within the water column for 3-10 days without feeding. In this period the larvae must find a suitable substrate for settlement before it can start feeding. This is a phase of very high loss especially if settlement cannot occur at the start of the 3-10day period as the larvae are surviving on stored energy reserves. Another significant stage of mass mortality occurs within a month of settlement when the juvenile ormer is around 1mm and can no longer graze individual diatom cells effectively. The ormer relies on a bacterial gut fauna to secrete cellulose to break down seaweed cell walls. For this reason adult mucus slime trails are used to coat settlement plates in hatcheries. In an open sea environment without adult ormers to provide this probiotic seeding juvenile ormers are likely to struggle to obtain sufficient nutrition even in the presence of abundant food.

-*survival of juvenile life stage.* In the event that a fertilised ormer is successful in settling on a suitable substrate there will still be great difficulties in surviving to adulthood e.g. due to a number of predators and less glycogen food reserves to over-winter. A major tank experimental study by Peck (1983) and reported in Peck (1989), shows a long term lower lethal temperature limit of 8.5°C for *H. tuberculata*. In Peck (1983) energy budget calculations were made which showed that between 8-9°C no absorption of food took place even though the animal continued to ingest food. These studies were performed on adult ormers of >20mm length – it is therefore probable that juvenile ormers with less food reserves will be even more susceptible to cold. Nie, *et al.* (1996) studied the survival of a

natural stock of *H. discus hannai* in Northern Chinese waters, from which it was observed that juveniles of shell length <8-10mm died at ambient temperatures, while individuals with longer shell lengths survived. It is therefore likely that year 1 juvenile ormers are more susceptible to lower winter temperatures that adult ormers.

For any potential recruits to then contribute to establishment in the wild it must then be able to generate a self sustaining population. This is even harder to achieve than recruitment as in addition to the barriers to initial recruitment any individual animal would also have to overcome additional factors:

-*Harmonisation of spawning*. Ormers synchronise spawning with sperm acting as a stimulant to induce other males and gravid females. This is important to achieve spawning at the same time as sperm only remains viable for a short period. In hatchery operations sperm of greater than half an hour is not used due to the reduced fertilisation efficacy associated with older sperm. Sperm viability is a function of the very limited energy reserves with each gamete.

-*Critical mass for fertilisation*. Fisheries management in the setting of Maximum Allowable Catch for broadcast spawners is dependant on a certain density of contributing adults. Dr Willerton from the University of Plymouth under took a study on behalf of Guernsey Sea Fisheries to assess the density of sustainable population recruitment. In the unlikely event that adult ormers were recruited and scattered far and wide across the seabed a local population would be too far apart to achieve critical mass for self sustaining fertilisation.

A3 Impact Potential

In the event that spawning and recruitment have been overcome and a wild population is established it is necessary to assess whether there would be an impact upon the existing habitat.

As considered in the previous Section the evidence from literature and the observations from the West Coast of Ireland would suggest that despite spawning that recruitment is unlikely. However, within the precautionary principal it is necessary to consider the potential impact of an established ormer population should recruitment be successful.

The basis for this assessment was to perform a Biotope Assessment as agreed with Natural England. This study, reported in Baldock 2007, consisted of a species comparison between ‘ormer’ areas (in Brittany and the Channel Islands) against ‘non-ormer’ SAC sites in SW England (Isles of Scilly, Carrick Roads and Plymouth Sound). Areas selected for comparison were sub-littoral rocky bottom habitats. The combined data set included 348 taxa recorded at 105 survey stations. Hierarchical agglomerative cluster analysis was performed on the data set which showed that at the 40% similarity level ‘ormer’ and ‘non-ormer’ sites were comparable. Ecological comparisons also showed that the many known predators of the ormer are commonly found in SW England.

It is concluded therefore that in the unlikely event of successful recruitment there are no grounds to indicate that a negative impact will result from the presence of ormers in the waters of SW England.