

DRAFT

[TITLE]: A STRATEGIC FRAMEWORK FOR SCOTTISH AQUACULTURE

Preface/Foreword

[For Ministerial signature once text of document is complete, following public consultation.]

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EXECUTIVE SUMMARY

[To be written once draft text is complete, following public consultation.]

PART ONE: VISION AND GUIDING PRINCIPLES

Introduction

- 1.1 This strategic framework document has been developed by the Ministerial Working Group for Aquaculture. The Group was set up following a series of preliminary bilateral meetings with stakeholder interests chaired by the Deputy Minister for Environment and Rural Development at the Scottish Executive, or one of his senior officials, throughout the first half of the year. It comprises a wide range of stakeholders in the aquaculture industry in Scotland (see Appendix 1). It accomplished its task in part through subgroup working, but also met six times in plenary session between June and November 2002 under the Chairmanship of the Minister or, again, one of his officials [, and then once more in February 2003 following consultation on the draft proposals]. The central and local government, other public body/regulatory, private sector, wild fisheries and NGO representatives on the Group all have a direct interest in the strategic framework's objectives and have all contributed to their formulation.

Strategic Environmental Assessment

- 1.2 The EU Strategic Environmental Assessment Directive (1) came into force in July 2001 and will be implemented in the UK by July 2004. As a systematic process for evaluating the environmental consequences of programmes, plans and policies,

Strategic Environmental Assessment (SEA) is widely accepted as a valuable means of integrating environmental information into decision-making.

- 1.3 While it did not directly influence the preparation of this Strategic Framework document, the Directive will impact in due course on the delivery of at least some of the actions listed in Appendix 3. Some of these will constitute *plans and programmes* in terms of the Directive, and its requirements will need to be observed in undertaking them. The Directive will help achieve sustainable development through its promotion of integrated environment and development decision-making, through the design of environmentally sustainable policies and in consideration of the best practicable environmental options.

The Vision

- 1.4 Our shared vision is that:

Scotland will have a sustainable, diverse, competitive and economically viable aquaculture industry, of which its people can be justifiably proud. It will deliver high quality, healthy food to consumers at home and abroad, and social and economic benefits to communities, particularly in rural and remote areas. It will operate responsibly, working within the carrying capacity of the environment, both locally and nationally and throughout its supply chain.

The guiding principles

1.5 The Scottish Executive has publicly committed to sustainable development, which, balancing economic progress with social justice and environmental responsibility, is a central element of the Programme for Government whose key role was reaffirmed in the Scottish Parliament on 9 January 2002. Sustainability is therefore the overarching guiding principle for our vision for aquaculture in Scotland and in preparing this document we have had regard to its economic, environmental, social, and good governance or stewardship aspects – each of which is reflected in the guiding principles below and in our consideration of the issues in Part Two.

1.6 The definition of sustainability we have employed here is that developed in 1987 by the World Commission on Environment and Development:

Sustainable development meets the needs of the present without compromising the ability of future generations to meet their needs. (2)

The economic principle

1.7 Aquaculture should be enabled to make a positive contribution to the Scottish economy through being internationally competitive in the marketplace and economically viable at a national level.

The environmental principle

- 1.8 The industry should work in harmony with nature, managing and minimising transient environmental impacts, including deleterious impacts on landscape and scenery, while preventing cumulative, long-term or irreversible changes to ecological systems.

The social principle

- 1.9 Aquaculture should foster strong community links, recognising and supporting the needs of local communities and working with community initiatives to manage local environments for mutual benefit. It must be integrated within its community, liaising locally and nationally on all appropriate matters.

The principle of stewardship

- 1.10 While the first three principles relate to outcomes, the principle of stewardship relates to how these economic, environmental and social principles are to be achieved. It is about delivering outcomes sustainably. It embraces the principles of transparency, integration, co-ordinated government and fit-for-purpose regulation, partnership and stakeholder participation, accountability, ethics and regard for animal welfare, and a culture of best practice and continuous improvement. This both reflects and develops the concept of stewardship set out in the Government's first Marine Stewardship Report (3).

PART TWO: THE CONTEXT

Background

- 2.1 Commercial aquaculture began in Scotland in the 1970s, although research and small-scale fish and shellfish production had by then been under way for some years. Since the 1970s, the industry has developed into a major employer in rural Scotland, with just under 2000 direct jobs and between 4,000 and 5,000 in the supporting sectors. Around 75% of these jobs are in the Highlands and Islands. The industry generates annually more than £500m of turnover at “farm gate” and through secondary processing, and now accounts for around 50% by value of all Scottish food exports. Production in 2001 was some 139,000 tonnes of salmon, almost 5,500 tonnes of rainbow trout, and 3,000 tonnes of cultivated shellfish. Techniques to farm alternative species such as halibut and cod are now reaching commercial fruition and the industry is keen to diversify. While much of its production arises from activities in marine waters, the trout sector and early stages of salmon rearing rely on Scotland’s high quality freshwater resources.
- 2.2 For some time, however, there has been increasing disquiet in some quarters about aspects of the finfish industry’s operations. Environmental concern has focused on the impact on wild salmon and sea trout stocks, on the seabed below finfish farms and on the wider marine ecosystem. In 2001-02 the Transport and the Environment Committee of the Scottish Parliament conducted a rolling inquiry into aquaculture (4).

Policy developments and other initiatives

- 2.3 Recent initiatives involving the Scottish Executive and other key stakeholders have been designed to improve working relationships, regulation and industry practices.
- 2.4 The Executive-chaired Tripartite Working Group (TWG), whose membership is drawn from the Executive, the fish farming industry and wild fishery interests, seeks to ensure through Area Management Groups (AMGs) and Area Management Agreements (AMAs) the maintenance of healthy wild salmon and sea trout stocks alongside a sustainable aquaculture industry.
- 2.5 The Executive's 2001 review of aquaculture regulation was designed to produce a more streamlined and transparent regulatory process. Its key proposals, now being implemented, included enhancement of the Scottish Environment Protection Agency's (SEPA) statutory powers, streamlined application processes, measures to improve control of sea lice and further work to determine the carrying capacity of coastal waters.
- 2.6 The Aquaculture Health Joint Working Group (AHJWG) was created to improve the general health, welfare and management of farmed fish. The industry's own Code of Practice to Avoid and Minimise the Impact of ISA, introduced in August 2000 (5), informs development decisions by regulators and industry.

- 2.7 A Containment Code of Practice, aimed at reducing escapes of farmed fish, was introduced in November 2000 (6). In the Spring of 2002 notification of escapes became mandatory.
- 2.8 The Aquaculture Forum, established by the Highlands and Islands Convention, informs the development of future planning arrangements, in particular at local authority level.
- 2.9 Individual agencies have developed policies and procedures to guide their respective regulatory and advisory duties. This includes the development of policy on Natura 2000 sites, which require special assessment and protection to ensure that the integrity of the specified conservation interest of the sites is not compromised.
- 2.10 The Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters, revised in December 2002 (7), offer advice, consistent with a precautionary approach, to planning authorities on potential farm locations.
- 2.11 The Executive, other public sector bodies and the aquaculture industry are all committed to improving scientific understanding of the issues surrounding aquaculture. The Executive commissions a programme of research and development on animal health and the environmental impacts of aquaculture. The Fisheries Research Service (FRS) is responsible for carrying out statutory fish and shellfish health inspections and disease control.

- 2.12 Within the European Community, aquaculture, which is regarded as an increasingly important industry, is covered by the Common Fisheries Policy (CFP). The UK is the largest aquaculture producer in the European Community, growing 30% by volume of the Community's total production, and the Scottish aquaculture industry represents 90% by value of all UK aquaculture. Under the current review of the CFP, the Commission proposes a strategy for aquaculture (8) designed to assure the availability of healthy products to the consumer, promote an environmentally sound industry and create employment in fishing-dependent areas. (See Appendix 7.)
- 2.13 The management of aquaculture must take account of the EC Habitats and Birds Directives (9, 10), particularly the listing of wild salmon and of freshwater mussels (which rely on salmonids for the distribution of their larvae) as Species of Community Interest, and particular marine habitats, under the Habitats Directive.
- 2.14 More widely, the UK is committed to a range of international agreements which guide management action. These include the OSPAR Convention (11), which seeks to prevent and eliminate pollution and to take measures necessary to protect the maritime area against the adverse effects of human activities, to safeguard human health, conserve marine ecosystems and, when practicable, restore marine areas which have been adversely affected.
- 2.15 The Government published its first Marine Stewardship Report, *Safeguarding Our Seas: A Strategy for the Conservation and Sustainable Development of our Marine Environment* in May 2002. This provides a vision for clean, healthy, safe, productive and biologically diverse oceans and seas. Its underlying principles will guide future decision-making in Scotland on activities impacting on the marine environment,

including aquaculture. They are: sustainable development; integrated management; conservation of biological diversity; robust science; the precautionary principle and stakeholder involvement. Delivery of the vision requires the adoption of an ecosystem approach to manage our use of natural resources sustainably and strategically and to maintain the health of ecosystems.

2.16 The Scottish Environment Protection Agency has developed a consenting approach under the Control of Pollution Act 1974, including the application of novel, modelling techniques, to set limits on the discharge of wastes from finfish farms to natural waters, ensuring that safe environmental standards are not exceeded. This site-specific regulatory approach is the first of its kind among the fishfarming nations and SEPA's procedures manual, available to the public, sets out clearly how it is applied. SEPA will review methods and standards as new information becomes available, ensuring its regulatory approach is underpinned by sound scientific principles.

2.17 In January 2001, the Scottish Executive published *Smart Successful Scotland (12)*. This outlines the Executive's enterprise strategy, underlining the role of the Enterprise Networks (Scottish Enterprise and Highlands and Islands Enterprise). It highlights priority areas in which Scotland must succeed if it is to achieve sustainable long-term economic growth, and groups them under the following strategic themes:

- growing businesses: supporting innovation and entrepreneurship, assisting new companies to get started and existing companies to develop further;
- global connections: encouraging Scottish companies to increase their involvement in global markets; and

- skills and learning: ensuring business has access to the skills and expertise it needs to be competitive.

Smart Successful Scotland is a comprehensive strategy, aimed at every region and every sector of the economy. Food production and advanced food processing are highly technical businesses and the production of cultivated fish products is exactly the type of high-tech industry that *Smart Successful Scotland* seeks to promote. Highlands and Islands Enterprise's strategy: *A Smart Successful Scotland, the Highlands & Islands Dimension* combines the three strategic themes of *Smart Successful Scotland* with a Strengthening Communities theme, recognising the integrated nature of economic and social development in a rural environment, and particularly in more remote and fragile areas.

The issues

2.18 In the preparation of this document the issues confronting aquaculture which the Working Group addressed were considered under the same broad heads as the guiding principles in Part One.

Economic issues

2.19 Our aspiration is to see Scottish aquaculture positioned nationally and internationally as a commercially competitive core industry, delivering products reputed for their quality and sustainability. The industry's own ambitions over the next five to eight years are to achieve the following objectives, within the principles set out in this

Strategic Framework document, and subject to their being compatible with the analysis to be undertaken, of carrying capacity:

- employment increasing from 7,000 to 9,000, permanent and skilled;
- ex-farm sales value increasing from £310m to £510m per annum;
- export value increasing from £200m to £400m per annum;
- 5 start-up companies per annum;
- 5 new products per annum;
- species diversification increasing from 5% to 15+%;
- £10m of technology transfer per annum; and
- £25m of inward investment per annum.

2.20 Quite apart from the environmental constraints, such growth would be contingent on the industry's recognising that aquaculture must continue to be responsive to the market, to retailer requirements on quality assurance and to consumers' demand for healthy products which are safety-assured and which offer good value for money. Both finfish and shellfish farming (both molluscan and crustacean) will wish to continue to develop and expand their product ranges to meet the many different market opportunities and consumer needs. The whole industry will need to be able to do this competitively in a fast-moving global market which is heavily influenced by low-cost commodity producers. Additional costs imposed uniquely on Scottish producers should be avoided wherever possible. To develop further, aquaculture will need suitable additional capacity, but this will be subject to carrying capacity limits still to be determined or management and technological advances to reduce environmental impact.

2.21 Aquaculture will need to be well-resourced. To be successful, the industry will require: competitive access to adequate commercial investment; a licensing regime which fosters sustainable, long-term investment; Government support for export promotion and trade procedures; a fish health regime which safeguards the needs of both farmed and wild fish resources; a sound research and development base, to provide both long-term R&D and closer-to-market technical innovation; well-qualified staff with opportunities for continuous skill development; an appropriate allocation of FIFG (Financial Instrument Fisheries Guidance) or other structural funds; commercially affordable insurance or alternative contingency arrangements capable of underpinning investor confidence in the context of the Government's management of fish health measures; an efficient infrastructure, which is sensitive to the industry's own requirements and to the environment; and a well-financed and stable processing sector.

Environmental issues

2.22 Scotland's coastal environment and waters are of exceptional quality. Scottish landscapes and wildlife are internationally renowned. This high quality is important not only for its own sake, but also because it underpins a certain quality of life and because it is the foundation of the Scottish tourism industry. It needs to be understood as a source of multiple benefits, providing livelihoods from different sources (including from aquaculture, which relies on good water to protect fish health and the reputation of its products) as well as space for wildlife and opportunities for recreation and enjoyment.

- 2.23 Like many other industries, aquaculture creates an environmental footprint, although this is relatively small nationally (as *The Review and Synthesis of the Environmental Impacts of Aquaculture* (13) confirms). Finfish cage-rearing techniques in particular rely on natural processes to disperse and break down waste emissions. Some impacts, such as the deposition of solids on the sea bed below, and close to, fish cages, are usually localised and transient. But fish farms may also cause wider-scale effects: for example, from nutrient emissions and the risk posed by residues of medicines and other chemicals should safe limits be exceeded or unauthorised compounds used. It is therefore important to identify and protect the sensitive or critical processes and interactions between different groups of aquatic flora and fauna, setting appropriate environmental standards to guide the regulatory process. This ecosystem approach must be further developed if informed, site-specific decisions are to be taken on further expansion without exceeding the environment's capacity to assimilate wastes.
- 2.24 The industry must work within the carrying capacity of the environment, defined in terms of its impact on water quality, on the fauna and flora of the water column and seabed, and on the landscape and scenery, taking fully into account the cumulative impact of multiple aquaculture developments.
- 2.25 It must also continue to develop efficient and cost-effective ways of reducing polluting emissions per unit of production. This may involve investment in new technology such as systems to improve feed conversion and reduce wastage, and careful management of sea-bed sediments to prevent unacceptable impacts. Such impacts may also be reduced through careful siting, design and husbandry. Development of polyculture techniques to intercept and recycle nutrients arising from

finfish farming should be trialled to identify appropriate options for Scotland's inshore waters. Environmentally sensitive aquaculture, particularly shellfish farming, should be encouraged. Where opportunities arise, the industry will demonstrate its commitment to the environment by, for example, supporting wild salmon restocking schemes.

- 2.26 A certain type or scale of development may be less appropriate in areas which are valued for their wildlife or scenery, and a small number of areas should be kept free of all aquaculture development, both because of their value as 'wild land' and so that they may act as a scientific control in assessing the impact of developments elsewhere.
- 2.27 Through appropriate planning, regulation, guidance, and the adoption of best practice and of the precautionary principle, aquaculture should be encouraged to develop in ways which can be accommodated within the overall capacity of the environment. Further expansion beyond this point cannot rely on the direct discharge of wastes and will require development of appropriate waste management methods.
- 2.28 The industry will utilise fish feeds that can be sourced sustainably. Its sources will include wild fisheries deemed sustainable by national or international regulatory authorities. It will also consider the option of using unavoidable fish industry discards and waste from fish processing and new non-marine feed sources as alternative feed stocks. An assessment of feed sources should include a multinational analysis of all the above sources.

Social issues

2.29 The aquaculture industry is of vital importance to many rural and remote communities. In some, where there may otherwise be few job opportunities, perhaps 30% or more of the workforce will be dependent on its operation. In these areas its activities will also provide a foundation for the necessary infrastructure of community life, such as the local hall, shop, petrol station or primary school, as well as the development of new housing, all of which will serve to keep these and other services in the community. The employment opportunities it generates are often complementary to the needs of crofters and others. *A Smart Successful Scotland: the Highlands & Islands Dimension* recognises the inter-relationship of economic and social development in a rural environment and the importance of considering any sector, particularly in more remote areas, in the context of its impact on the wider local community and economy.

2.30 If it is to be generally acceptable in these rural and remote locations, however, the industry must enlist community support for its activities. This may involve commitment to change to address issues where there is concern. Building better community relations means engaging in partnership initiatives and genuine consultation, with full stakeholder participation. A mature industry will develop measures to encourage understanding of its aims and will encourage scrutiny of its actions: for example, through the provision of local visitor centres, open days and other appropriate measures.

Stewardship issues

- 2.31 The industry relies on a healthy, unpolluted environment to optimise production and the quality and reputation of its products. It must acknowledge and demonstrate its responsibility for meeting appropriate standards of welfare and disease control as well as standards set to protect the environment. If they are to enjoy public confidence, these standards and the measures taken to meet them should be developed and implemented transparently, with full stakeholder participation. Transparency and demonstrable environmental standards will be further enhanced in due course by Strategic Environmental Assessments of those of the commitments encompassed by this Strategic Framework which constitute plans and programmes in terms of the SEA Directive, and a review of the standard of EIAs for individual aquaculture projects.
- 2.32 Marine aquaculture's operation need also to be considered in the context of integrated coastal zone management, which will provide a framework for co-ordinated management of the coast, its environment and its use by the businesses which rely on it. A Coastal Strategy for Scotland is being developed within the Scottish Coastal Forum. It aims to meet the standards of the ICZM recommendation 2000/413/EC (14) and will inform and guide all who have a role in managing the coastal zone.
- 2.33 Integrated working on the ecological status of our coastal waters will be further assisted by the production of River Basin Management Plans and sub-Basin plans, which will extend to three nautical miles offshore, under the Water Environment and Water Services Bill. SEPA and the other competent authorities must seek to operate better co-ordinated and integrated planning and regulatory systems, and to ensure the

involvement of all stakeholders in local river basin advisory groups, which may have aquaculture subgroups.

- 2.34 The industry must develop and implement systems for encouraging best practice and continuous improvement, which should in turn be encouraged by appropriate public incentives to reward progress. (Demonstrating progress will be crucial in proving that the Scottish aquaculture industry is meeting the commitments within this Strategic Framework document).

PART THREE: DELIVERING THE VISION

3.1 We would expect to achieve the vision set out in Part One of this document by meeting the following objectives, to secure the over-riding principle of sustainable development for Scotland's aquaculture industry.

Following the economic principle:

- to achieve an internationally competitive and economically viable industry;
- to maximise the value to the Scottish economy of the aquaculture industry and its products, both in terms of jobs and of investment;

Following the environmental principle:

- to operate within the biological, assimilative and visual carrying capacity of the environment;
- to ensure that the impact of the industry on the biodiversity, landscape and recreational uses of the sea and coast is minimised and significant impacts avoided;

Following the social principle:

- to ensure that communities are involved in the development of, and benefit both socially and economically from, aquaculture;

- to encourage more people to benefit from Scotland’s healthy, nutritious aquaculture products;

Following the stewardship principle:

- to adopt sound welfare conditions in the management of farmed stock;
- to provide appropriate regulating support and infrastructure;
- to encourage the industry to manage its operations in pursuance of these objectives, rather than relying on regulation alone to set operational boundaries; and
- to demonstrate a responsible approach through continuous improvement.

3.2 Much that is happening now in Scottish aquaculture is already contributing to these objectives. To guide the industry’s future development, however, the following priorities for action have been identified, reflecting areas where there is a need for heightened effort. (None of these implies a reduction of effort in other areas of policy activity.) The reference number against each priority below identifies it in Appendix 3, which shows in tabular form what is proposed. The relative importance of different priorities will change over time, as current challenges are effectively tackled, and new challenges emerge. We therefore propose to keep Appendix 3 under review, and revise and re-issue it every 12 to 18 months so that the degree of progress being made towards achievement of the objectives is visible.

IN PURSUIT OF THE ECONOMIC OBJECTIVES:

Commercial investment (EC1)

3.3 If the aquaculture industry is to provide sustainable benefits to Scotland, it must be able to attract long-term, commercial investment: only by so doing will it remain competitive in the global market. The industry trade associations will work with the public sector to accomplish this. The Federation of Scottish Aquaculture Producers (FSAP) proposes to prepare a plan to encourage investment in Scottish aquaculture, which will cover such issues as the length of aquaculture leases with the Crown Estate, the allocation of FIG structural funds and business threats from health legislation. Its initial report will be completed by December 2003 and recommendations will then be developed with the relevant parties.

Comparative costs of aquaculture production (EC2)

3.4 The Scottish aquaculture industry contends that its costs are higher than those of its competitors in other countries. The disparities are said to relate to direct regulatory and rental costs, as well as to imposed inefficiencies of scale deriving from regulatory constraints. The industry, the Crown Estate and the Scottish Executive will therefore consider whether an independent study should be commissioned to look at the regulatory costs of operating aquaculture businesses in Scotland in relation to the protection which is derived and the impact on competitiveness, and to compare them with those of other countries. Such a study would either dispel the myths promulgated by inefficient businesses, or would confirm that there are indeed competition

problems to be addressed. If it is to proceed, the study's terms of reference, budget and contractor would be agreed by February 2003 and the study itself completed by November 2003.

Export strategy (EC3)

3.5 Exports of Scottish aquaculture products are vital for the industry and are growth areas for high value products. They account for up to 50% of Scottish food exports. To secure and develop existing business, the industry proposes to formulate an export strategy, analysing key export markets and potential markets to identify opportunities for profitable growth and new export opportunities. The exporting companies, the trade associations and the public sector will all be involved. In the first instance a strategic analysis will be commissioned during 2003 by HIE and Scottish Enterprise in consultation with the industry, SDI and FFB, with the aim of delivering a targeted action plan for the Spring of 2004.

Downstream or whole-chain commitment

3.6 Retail and foodservice sector support for the principles set out in this Strategic Framework document, and acknowledgement that environmental best practice adds to costs, are important. Maintaining a competitive product for final consumers in a global industry such as aquaculture requires that all sections of the supply chain become partners in delivering the environmental benefits and sustainability that are sought.

3.7 The commitment of the fish/aquaculture processing sector to the principles encompassed by the Strategic Framework is also seen as important. Its purchasing decisions will often determine what retailers and the food service sector stock. Scottish aquaculture needs a viable processing sector with sufficient capacity and investment. At the same time, the Scottish fish processing sector and the jobs it supports are increasingly dependent on aquaculture products as seafish landings decline.

New species

3.8 With the decline of wild stocks, the aquaculture industry is rising to the challenge of filling the fish gap. Demand for recognised species is increasing (farmed Scottish halibut and cod have already started to arrive in the market place, and haddock will follow soon) and, as consumer preference moves closer to added value and highly processed products, and retailers look for unique selling points, opportunities to include as yet untried species will arise. The Aquaculture Health Joint Working Group (AHJWG) views the emergence of the marine finfish sector as a positive contribution to the sustainable development of the Scottish aquaculture industry.

3.9 The industry will research (and seek to anticipate) customer demands, meeting these by investment in new products and technologies appropriate to each sector. As market share and penetration increase, Scottish producers must continue to fill demand if it is not to be met by imported products - to the detriment of the home industry. It is also in this area that specific branding (e.g. organic, TQM, Orkney, Shetland, Scottish, Label Rouge) can build on quality schemes developed and agreed with partners.

3.10 Sites and development opportunities must be investigated ahead of demand. The industry would like to see an integrated, multi-species approach to sharing the coastal zone with different sectors and other users. Locally, management zones might be occupied at any time by any of the sectors (salmon, halibut, cod, haddock, trout). As an interim measure, multiple species may have to be farmed on a single site for the first three to six years of the development of a particular sector. For shellfish, a mix of individual shellfish units and shellfish farming integrated with finfish are options for the future which are already being piloted. The industry will identify means of increasing production in response to market demand within the constraints of carrying capacity (still to be determined). Longer term, it will explore ways of diversifying through further new species, assessing their potential and developing fully-costed critical paths to market for each one. Scotland can thereby build on its reputation for high quality aquaculture products, securing market share, established market recognition and increased opportunity for wealth generation.

3.11 However, as a matter of priority, the potential problems posed by the development of new species must also be assessed. The AHJWG has, as a first step, identified the following issues for further consideration in relation to interactions in the culture of fish (cod, haddock, salmon and halibut) and shellfish in Scotland.

3.12 First of these is the opportunity for cross-infection between fish species and the emergence of novel diseases. The new sectors will apply the current ISA Code of Practice where this is relevant, pending the development of a generic code applicable to all sectors with specific sections taking account of individual sectoral needs. They

will notify abnormal mortalities suspected of being caused by an infectious agent, to provide an early warning of potential problems. Feeding unpasteurised fish to farmed fish will be prohibited, to reduce the risk of VHS transmission.

- 3.13 Risk assessments will be carried out by the appropriate regulator in conjunction with the applicant to determine the need for, and the duration and timing of, fallowing in relation to the environmental and health conditions on any site, taking into account other users within the management zone.
- 3.14 All operators will be encouraged to enter into area management agreements. Modifications to existing AMAs may be required to take account of the farming of new species.
- 3.15 Containment is important in reducing the potential for disease transmission. The requirement for notification of escapes, developed primarily for salmon and trout, applies to the new species also, but the current Containment Code of Practice will be expanded to take account of the different needs of the new sector.
- 3.16 The main risks to fish health associated with the interaction between shellfish and finfish farming are those arising from passive transmission from depuration plants and relaying. (It is generally accepted that shellfish do not replicate fish pathogens.) Where these operations are undertaken, a risk assessment should be made. Shellfish growers should be involved wherever area management agreements are in prospect.

3.17 Apart from the health and welfare issues, wider environmental issues will also need to be considered, particularly the risks posed by escapes of new species for wild stocks and of any novel techniques which may be required to manage these species in cultivation. Particular care will need to be taken over the potential impact of non-native species and any which have the potential to establish in the wild in Scottish waters should be avoided. The proposed Scottish Aquaculture Research Forum (see below) will be invited in due course to consider these issues.

Adding value through differentiated products and niche markets (EC4)

3.18 Scotland's potential for differentiated products, premium brands and niche marketing opportunities can be developed. The industry is capable of achieving premium and value-adding opportunities in the market by delivering branded differentiation and niche products, but it will need to work with the relevant public sector bodies (HIE, Scottish Enterprise, SEERAD) to enhance the potential of its brands and the associated product quality standards (e.g. TQM, Label Rouge, SQT, Shetland, Orkney, Organic, Soil Association). Potential constraints and opportunities posed by specialist production systems, such as the challenge associated with organic salmon production with regard to the achievement of desirable management objectives (e.g. synchronised production and treatment, and the delivery of integrated pest management strategies) must be addressed.

Polyculture

3.19 Polyculture systems and species require full evaluation to clarify the practicalities of their application, and to determine the economic and other benefits which might result. Any study of polyculture (by which we mean nutrient budget management) must address the need to find markets, or environmentally and economically acceptable disposal routes, for all the products. We anticipate that the proposed

Scottish Aquaculture Research Forum (see below) will undertake the task of delivering the appropriate research.

Genetically modified organisms (GMO)

3.20 Although the principles of selective breeding are well established, there have been expressions of public concern about the use of genetically modified crops in the food chain and the appropriateness of their use in livestock production – in aquaculture as in agriculture. There are presently two main areas of potential application of GMO technologies in aquaculture.

3.21 The first is the use of GMO vegetable products in fish feed, where their potential value lies in their contribution to the sustainability of feed ingredients as well as to more stable feed prices. While their use is linked with consumer concern, the industry in Scotland has declared, however, that it will not use them.

3.22 The second application is the use of GMO technologies (more specifically, transgenics) in breeding fish for commercial aquaculture use. This also plays no part in Scottish commercial aquaculture production. The industry considers, however, that, were the public perception of transgenics to change, it could not ignore the potential of the technologies. Any proposal to use transgenic fish, however, would need to be approved by the Advisory Committee on Releases to the Environment. Meanwhile, Scottish aquaculture and Scottish research institutions supporting the industry will continue to develop their knowledge as the application of genetic techniques may be expected to play some role in the future.

Training and retraining (EC5)

- 3.23 Overall, the level of skill needed by aquaculture workers is expected to increase. Employers have identified skills gaps among their staff, with job-specific skills, communication and problem-solving heading the list. Demand is increasing for multi-skilled staff, including University graduates, who can work across the range of operations involved in aquaculture. Up-to-date labour market information is needed to allow identification of skills shortages and identify manpower and training needs for the future.
- 3.24 The ELLD-sponsored FutureSkills Scotland and Careers Scotland will address future skills needs and recruitment issues. A skills action plan is needed which identifies the current and future skills needs of the industry to enable the development of skills and business growth diversity to be addressed. Lantra (a former National Training Organisation) is the Trailblazer Sector Skills Council (SSC) for the Environmental and Land-based Sector. It will have a major role to play in developing such an action plan for the aquaculture industry. It already has a well-established Aquaculture Industry Group which is responsible for the development of Lantra policy for the industry and agrees work programmes – funding permitting. It is responsible for the development of National Occupational Standards (NOS), which form the basis of the vocational qualification, and has been directly involved in the promotion of aquaculture SVQs. (There are currently NVQs/SVQs in aquaculture at Levels 2 and 3.) A partnership of Lantra, SQA and HIE has been instrumental in developing

promotional materials and is now seeking to recruit employers/employees to undertake these qualifications.

3.25 As a prelude to developing a strategic approach to training and retraining, to underpin the industry's longer term objectives, Lantra proposes to undertake, with HIE funding, an assessment of current staffing levels, the qualifications held by the workforce, the skills gaps and the learning and training needs. This assessment should be completed by Spring 2003.

3.26 The skills aquaculture needs must be developed in the communities which the industry serves. This will enhance the likelihood of retaining a well-trained population in these areas, with consequent economic and social benefits to the communities concerned. This is a priority for fisheries-dependent communities and has particular relevance in the field of engineering. New operating principles such as Hazard Analysis Critical Control Points (HACCP) will become increasingly important in all food production operations and there will be a significant requirement to retrain the existing aquaculture workforce and related sectors as well as training new entrants to the industry. Training providers, in collaboration with SEELLD, will start to develop suitable course material and delivery packages in 2003-04.

Teaching Company Scheme (EC6)

3.27 The Teaching Company Scheme (TCS) operates through programmes in which academics (mainly university-based) work with companies on strategic projects lasting two to three years to institute major technical or management change. They

jointly supervise the recent, high-calibre graduates who carry out the main project work. The Scheme's success in encouraging technology and knowledge transfer is widely acknowledged.

- 3.28 Within the Executive, the Enterprise and Lifelong Learning Department (ELLD) has the lead sponsorship role. The areas in which it supports projects therefore essentially mirror DTI sectoral interests and do not include aquaculture. Nevertheless, it is clearly desirable that TCS schemes should become available to the fisheries sector. The scope for reallocating funds to facilitate this expansion will be considered as part of the internal review of science commissioning/ funding which has recently been set in train within SEERAD.

BROADBAND

- 3.29 Broadband is the best enabler of e-business and e-business means improved competitiveness. Its commercial benefits include cost reductions, developing and delivering goods and services in new ways, and enabling the availability of supplies to be checked online. For the aquaculture industry, broadband e-business might mean enhanced customer relations and faster access to global markets.
- 3.30 The industry need not wait for broadband, it is already available throughout the Highlands and Islands via satellite services and HIE can provide financial incentives, on a discretionary basis, to encourage take-up.
- 3.31 On 2 December 2002 the Scottish Executive published its updated broadband strategy. (The text is available online at www.scotland.gov.uk/connectingscotland/makingithappen.) This sets out the range of activities being undertaken in Scotland to encourage the supply of demand for

broadband, including a major new initiative to accelerate and extend the provision of DSL services.

Encouraging public confidence (EC7)

3.32 A better public understanding is needed of aquaculture and the statutory safeguards to which it is subject if the significant benefits to Scotland of a successful, sustainable industry are not to be undermined. Incomplete information or inaccurate perceptions can jeopardise public confidence in both the industry and its regulators and thereby needlessly damage sales, jobs and communities. Investment programmes, which are crucial to the delivery of a high-quality and best-practice-based aquaculture industry, can also be damaged. A campaign designed to improve the public's understanding of the industry, its governance and other relevant issues will therefore be mounted. This initiative will formally commence with the launch of this strategy and will be an on-going process.

Relationship between Seafish and the aquaculture industry (EC8)

3.33 The Sea Fish Industry Authority (Seafish) is a statutory body which provides a variety of services to the UK fish industry. An assessment is required of the relationship between Seafish and the aquaculture industry in Scotland. A forum in which this issue and possible options can be debated will be set up. It will include all the industry trade associations/organisations, some of their key member companies and Seafish. (The involvement of SEERAD and DEFRA will be sought at a later stage if necessary.) Its aim will be to reach conclusions by Summer 2003.

Structural funds (EC9)

- 3.34 The structural funding options will fall to be reassessed during the currency of this document. European structural funding under the Financial Instrument for Fisheries Guidance (FIFG) is available to the Scottish aquaculture industry for the period to 2006. There are two Scottish programmes, one covering the Highlands and Islands, the other the rest of Scotland. Competition for funds in the former area is particularly strong.
- 3.35 FIFG funding has been demonstrably successful in assisting Scottish aquaculture to develop strategic projects. The current aquaculture allocation (about 9.3% of the total UK FIFG package until 2006) is, however, inadequate to support the industry, as the over-subscription in the HIE area scheme demonstrates. A reallocation of funds would enable more high quality and innovative aquaculture projects to start in Scotland – particularly in the areas of minimising environmental impact and increasing diversification.
- 3.36 The current review of the Common Fisheries Policy, which covers aquaculture too, is likely to lead to revision of the current FIFG regulation in 2003. This will determine what funding can and cannot be used for during the second half of the 2000-06 programme. However, it is meanwhile not clear whether, or to what extent, FIFG will be available beyond 2006. Community enlargement and previous structural funds investment are both factors which suggest a reduction in future availability, and possibly in the rates of grant too.

3.37 Nevertheless, it is open to Member States to seek to influence Community thinking in revising the terms of existing, and shaping the content of future, Structural Fund regulations and SEERAD will seek to do so when the opportunity presents.

IN PURSUIT OF THE ENVIRONMENTAL OBJECTIVES:

Carrying capacity (EN1)

3.38 An understanding of carrying capacity in all its aspects will provide the necessary scientific basis on which to determine the potential size of the Scottish aquaculture industry and will underpin all other decisions for site location (as well as for subsequent regulation and management). In an industry which relies on the environment for its resources and services, development outwith carrying capacity is not sustainable and therefore not acceptable. Inputs from aquaculture, however, will require to be considered alongside anthropogenic or natural contributions of the same component within every local environment which is assessed.

3.39 The finfish sector relies on the environment's assimilative capacity to cope with the wastes arising from rearing fish in cages. This capacity to disperse and break down wastes is, however, finite and expansion of the industry must be guided by reliable predictive methods if the environment is to be adequately protected. The shellfish sector relies on a plentiful supply of natural particulate food to sustain the growing cultured biomass. Over-exploitation of the resource may result in poor growth rates and an inability to achieve marketable size, rendering sites both economically and environmentally unsustainable.

- 3.40 Without an in-depth understanding of the limits of environmental capacities, the precautionary principle which would have to be applied would constrain aquaculture development below its full potential. The industry might then be required to reconfigure, relocate or abandon farms considered too big for their surroundings and the shellfish industry might be obliged to limit activities where there was a risk of over-exploiting the resource. A more desirable outcome would ensure that the aquaculture industry was enabled to use natural resources wisely, maximising development opportunities where site characteristics permitted. To this end the Locational Guidelines for Marine Fish Farms will be kept under regular review and incrementally improved and strengthened as appropriate. When planning responsibility for marine aquaculture is transferred to local authorities, the Guidelines will become the basis for a marine National Planning Policy Guideline.
- 3.41 The public for its part should be able to have confidence that sensitive environments and priority habitats are adequately protected, without having to resort to the regulatory process, with its attendant costs for all parties, to resolve conflict. The development of environmental management systems to accommodate the needs of the precautionary principle will be encouraged.
- 3.42 A Crown Estate-funded scoping study on carrying capacity was published at the end of 2002. A working group of experts with an in-depth knowledge of oceanographic processes is now to be established, under SEPA's chairmanship, and with industry participation, to carry out an assessment of this study. It will delineate research

priorities and propose an action plan based on an ecosystem approach, identifying gaps in existing knowledge and alternative modelling strategies.

- 3.43 This new Working Group's report, with options for model development, will be available for public consultation by the Autumn of 2003. Confirmation that funding agencies will prioritise their research budgets accordingly will be sought in the same timescale. Work will then proceed to develop a modelling approach and validate it using field data by March 2005. (Predictive modelling can follow the ecosystem approach through identification of fundamental or sensitive ecological processes and assessment of assimilative capacity to ensure that relevant pollutants do not form concentrations which would interfere with the natural balance and variation of those processes.) If this proves acceptable to the regulators, it will be followed by public consultation and the adoption of an appropriate modelling approach in assessment of development proposals by September 2005. In the meantime, SEPA and the other relevant authorities will continue to act, as at present, on the basis of their best current understanding of carrying capacity as informed by the Locational Guidelines for Marine Fish Farms.

Data gathering (EN2)

- 3.44 The research teams working on carrying capacity studies will focus on modelling principles and other areas of science. However, to produce good quality carrying capacity guidelines at the local level will require significant background environmental data. It might be possible to enlist in its collection the assistance of those organisations already operating locally, many of whom will have staff who are

well trained in data acquisition and logging. (This would be their in-kind contribution to the carrying capacity study programme.) In this way a wealth of essential environmental, and possibly some vital historical, data (to which the carrying capacity study teams would not otherwise have access) might become available.

- 3.45 We anticipate that SEPA will lead this exercise, working collaboratively with fish farms, District Salmon Fishery Boards and angling clubs, SNH, local environmental groups and local and community council staff. They will identify the parameters to be routinely measured and who should record and transmit data from each location, and agree a standard reporting format and transmission timetable for the data.

Location and relocation of farms (EN3)

- 3.46 In due course, as more is known about the carrying capacity of the environment, there will be a need to assess whether some farms, particularly where consents were granted under earlier regimes, sited in poorly flushed or particularly sensitive areas, are now having a harmful cumulative impact on their environment. This is of most concern where these sites have been designated for particular interests under the EC Habitats Directive. Additionally, the siting of such farms in some cases may impact on wild Atlantic salmon and thus indirectly also on freshwater mussels, both of which are Species of Community Interest under the Habitats Directive. In several parts of the Highlands and Islands wild stocks are already severely depleted or even extinct. While the reasons for this are complex, and the influence of salmon farming is likely to be only one of several possible factors, it is important that action is taken to minimise any anthropogenic influence which might be endangering wild stocks.

- 3.47 Criteria against which to assess whether or not any farm is poorly located will be developed by SEERAD, in consultation with the industry and the other regulators. The process of devising these criteria will be inclusive and wholly transparent.
- 3.48 SEERAD will also make an assessment of the likely benefits and effectiveness of relocation of those farms which are sited close to rivers important for migratory fish, following a scoping study reviewing research and field data in Scotland and abroad on relative louse infection levels on wild salmon smolts and the proximity of fish farms to river estuaries.
- 3.49 It will publish in 2003 a paper setting out the criteria for appropriate aquaculture sites, with an explanation of the underlying scientific rationale. This will list those sites which are considered to be inappropriately located and explain why. It will consider whether alternative sites can be located near the shore-based facilities designed to support them; the proximity of sites to workforce; and the health and safety issues associated with sites' being relocated to more exposed areas or further away from their support base.
- 3.50 Bilateral meetings with affected site owners and their representatives will commence thereafter, with a view to concluding the process by December 2005.
- 3.51 Relocation may entail a cost to operators and ways of alleviating that cost, for example by increased production within the carrying capacity of a new location or by financial assistance, will be considered as the policy is developed.

Scottish Aquaculture Research Forum (EN4)

- 3.52 Research should underpin nearly all of the decisions which Scotland will make in furtherance of its aquaculture strategy over the next few years. Yet current funding is linked largely to specific research providers (FRS, SAMS, Seafish). Since the demise of the LINK aquaculture scheme, whose format levered an industry contribution and focused research to requirements, there is no source of funding with a multi-stakeholder research prioritisation committee, except the Crown Estate's with £200k per annum in the current and each of the next two years.
- 3.53 That Crown Estate Research Committee, however, might become the basis of a wider Scottish Aquaculture Research Forum (SARF), whose meetings could then coincide with the CE Aquaculture Research Committee meetings. This would require all research funders to make a budget allocation (perhaps 75% from those Government agencies with an interest, 25% from industry), part of which might be ring-fenced for technical and biological cultivation research; other legitimate research areas would include environmental impact, carrying/assimilative capacity, health and fish welfare science. The twin benefits would be an industry which was sustainably self-managed and externally regulated on a scientific basis, and a thriving Scottish research sector, within which there are several centres of excellence working on a range of key disciplines.
- 3.54 The principle of SARF will be discussed by the Crown Estate Research Committee and, if agreement is reached there, an inaugural meeting of the Forum (the existing

CE Research Committee with an independent Chairman and representation from additional aquaculture sectors) will take place thereafter to determine questions of remit, membership and research priorities (including those which have emerged from the development of this Strategic Framework for aquaculture and from groups such as CARD). We would expect that in addition to researching those matters listed in Appendix 4, SARF will examine as a matter of priority:

- risks to the environment from escapes of new species;
- the sustainability of fish feed supplies;
- the risks to farms posed by predators; and
- polyculture.

3.55 Scientific research under SARF's aegis and work on carrying capacity should focus on biological sciences. However, questions of landscape and scenic amenity and the relationship with other industries and coastal users also fall to be considered. Local authority planning zone teams and the industry will need guidance as to where aquaculture sites should be established, and on the steps which might be taken to reduce their potential impact on other users, as well as in the area of biological carrying capacity. It is therefore proposed that SARF also consider these non-biological aspects of the aquaculture industry as part of its ongoing activities.

Research priorities

3.56 Specific research priorities were identified by an Environment Subgroup of the Ministerial Working Group, and complement the priorities which were identified in the Review and Synthesis of the Environmental Impacts of Aquaculture. Many of

these are encapsulated in other priority actions described elsewhere within this document, but a summary list of the main priorities includes determination of the carrying capacity of Scotland's coastal waters for all fish and shellfish farming, including white fish developments. Some specific elements of this would include consideration of the:

- effects of waste solid matter on sediments;
- effects of waste and natural nutrients (from aquaculture and other sources) on pelagic ecology, including their influence on algal blooms and toxin production;
- effects of other wastes introduced by aquaculture on the ecosystem;
- potential for nutrient extraction through polyculture and the resultant impact on carrying capacity;
- standard of fish farm EIA;
- uptake of, and compliance with, voluntary codes of practice for the industry;
- effectiveness of voluntary measures, for example as introduced through Area Management Agreements or as Codes of Practice, in addressing impacts of salmon farming;
- effectiveness of Environmental Management Systems in delivering improvements in the environmental performance of fish farms;
- effectiveness of recently improved husbandry and feed delivery systems in reducing the environmental impact of fish farms;
- differences in environmental impact between salmon and marine species farms;
- sustainability of fish meal and fish oils;

- environmental costs of fish farming to allow objective comparison with other social/economic costs/benefits;
- reasons for wild salmon decline; and
- environmental effects of “new” marine finfish or shellfish cultivation.

A more complete summary of the research priorities identified in the Review and Synthesis of the Environmental Impacts of Aquaculture, by SAMS is at Appendix 4.

Feed sustainability study

3.57 As available stocks of most known commercial fish species for human consumption decline, aquaculture and mariculture are projected to increase dramatically in the next few years to fill the so-called fish gap – the projected shortfall in supply of fish for human consumption. In practice, however, all finfish aquaculture currently relies on wild-caught fish (industrial species such as anchovies, sardine, jack mackerel, horse mackerel, sandeel, sprat, pout, blue whiting, capelin and herring) sourced globally to produce fish meal. This raises questions about the sustainability of the industrial fisheries which supply the fish oil and protein for farmed fish feeds. A full understanding of the sustainability of fish meal/oil fed to farmed fish therefore urgently needs to be developed internationally to inform decisions about the future expansion of fish farming in Scotland, both of salmon and trout; and of more recently farmed species such as halibut and cod. At present, supplies of industrial fish are monitored and assessed scientifically by FAO and ICES, but only very limited supplies of sustainably managed fish meal or oil (and hence feed) are available which

are independently certified (for example, by Marine Stewardship Council) and the UK organic aquaculture standard has to rely on fish processing by-products.

- 3.58 Both the industry and its stakeholders need to be reassured - on the basis of the best scientific knowledge available - that ingredients used in feed supplies are sustainable and what the options are. The European Sea Foods Workshop is due to report in April 2003. In the light of its findings, the Scottish Aquaculture Research Forum will consider what further study into global aquaculture feed supplies, their sustainability and the options is necessary to provide an understanding not only of how aquaculture feed supplies might be sustainably secured in the future, but also how they might be sourced cost-effectively and in the best health interests of the consumers of Scotland's aquaculture production. Such a study is likely to require multinational participation.
- 3.59 Guided by SARF's consideration, terms of reference for a further multinational study will be discussed with other national and international stakeholders. A contractor will be appointed by Autumn 2003, with a view to a final report by the Summer of 2004.

Certification schemes (EN5)

- 3.60 Certification schemes have an important role to play, enabling trade buyers and consumers alike to be confident that the product they are purchasing meets high standards of production, welfare, environmental management and product quality. Such schemes need to be internationally recognised and be credible to both public and private stakeholders. They must be clearly communicated to consumers so that their significance and benefits are understood and to ensure they are distinguished from

non-Scottish production. Companies' commitment to environmental management systems and food certification will be encouraged. The regulators and industry will collaborate with other stakeholders to develop incentives for companies to gain competitive advantage through such commitment.

Sea lice management EN6

- 3.61 Industry, Government and wild salmonid interests will continue to work collaboratively to determine the interactions between sea lice and wild salmonids, and ensure that negative interactions are addressed through regulation and management. Given the constraints on resources, it may be necessary to attach a higher priority to some salmon stocks than others and action will be prioritised to protect these, through continued development of Area Management Agreements (AMAs) as part of the Tripartite Working Group process, through the revised Locational Guidelines and in due course through the relocation policy.
- 3.62 Consistent with the advice of the Tripartite Working Group (TWG), all fish farms will be encouraged to adopt integrated sea louse management strategies, as indeed the leading companies are already doing. These will include: synchronous year class stocking within defined management areas; regular and accurate sea louse counts; effective treatments to achieve zero, or near zero, ovigerous sea louse levels – as is happening already on some sites; and the adoption of novel techniques to reduce reliance on chemo-therapeutants.

3.63 Industry and other relevant stakeholder associations must give a strong lead if they are to secure widespread support from their members for these voluntary initiatives. SEERAD will review their overall effectiveness through audit checks carried out by the Fisheries Research Services or another suitable contractor and the TWG National Development Officer. On the basis of a comparison of this data with TWG objectives, the Executive will then consider whether regulation is necessary.

Prevention of escapes (EN7, EN8 and EN9)

3.64 *The Review and Synthesis of the Environmental Impacts of Aquaculture*, while reassuring in many of its assessments of the industry's footprint, concluded that escapes from salmon farms constitute a major threat to wild populations. For the industry too, loss of stock is a priority issue because of its financial implications. It will work to minimise escape incidents and thus curtail the impact of escaped fish.

3.65 Better information is needed on the causes of escapes. SEERAD will seek to enlist the co-operation of the industry in investigating failures resulting in escapes from both marine and freshwater aquaculture installations. The information thereby acquired will inform revised industry codes of practice for containment. Ways of implementing improved standards of construction and maintenance of aquaculture structures (cages, moorings etc) will be explored to minimise the future risk of system failure and stock escape.

3.66 An international assessment of current and prospective techniques for tracing or marking farmed fish will be conducted, involving FRS, with a report to SARF and

TWG by the Summer of 2003. Work on the potential impacts of escapes on wild fish populations that may result in increases or periodic problems with competition, predation and hybridisation and interference with fisheries management and research will continue. The different risks posed by new species escapes will be examined by SARF.

- 3.67 All fish farms will be encouraged to adopt the Containment Code of Practice. Investigation of previous incidents, now the subject of mandatory reporting to the Executive, will be carried out to detect trends or common failures which might inform reviews of the Code. The Scottish Executive will consider in the light of this whether regulation is necessary to achieve minimum standards of cage design, equipment and maintenance, and to instigate prosecution for wilful or negligent acts (or omissions) resulting in escapes. The European Commission is to consider the introduction of rules to minimise the number of escapes and this may provide in due course a statutory framework; equally, appropriate measures may be introduced in the proposed Aquaculture Bill (see below).
- 3.68 Expertise needs to be developed to enable the regulators, and local authorities in particular, to advise on matters of cage and equipment design and security under the interim planning arrangements. Appropriate guidance will be drawn up by the Highlands and Islands Aquaculture Forum, which may wish to consult and co-opt expertise from the insurance sector and those companies currently involved in cage design and supply. Fisheries Research Services will monitor compliance with the Containment Code of Practice and will investigate any failures of cage structures and

equipment which result in escapes. The Crown Estate has powers to enter and inspect fish farms and require repairs to be carried out or defects to be remedied.

Interactions with local wildlife

3.69 Aquaculture provides feeding opportunities for predators such as seals, herons, otters, saw-billed ducks and eiders, all of which are protected under existing legislation. Predation may entail significant financial losses for both shellfish and finfish farmers and frequently gives rise to calls for lethal control measures. What is needed is an objective assessment of the scale of predation and of the measures available to control it (including the selection of sites and husbandry techniques which reduce conflict with predators) so that solutions which are both consistent with domestic and European legislation and acceptable to the public can be developed. In the light of the proposed SNH scoping study, SARF will consider the issue and, if appropriate, commission the necessary research.

Environmental Impact Assessment (EN10)

3.70 Environmental Impact Assessment (EIA) aims to provide a regulatory safety net to ensure that the environmental implications of development proposals are fully considered in the assessment of whether or not development should proceed and on what basis. EIA can therefore play a major role in ensuring the sustainability of an industry.

- 3.71 There are, however, concerns that this safety net is not functioning as well as it might in relation to the aquaculture industry. For example, few Environmental Statements (ES) submitted to date under the 1999 Regulations (15) identify the cumulative impacts of fish farm developments and discharges. There is also considerable variation in the standard of ES submitted to inform EIA of fish farm developments.
- 3.72 COSLA will be invited to commission an independent review by the Institute of Environmental Management and Assessment and publish in due course guidance for developers and regulators on the minimum standards expected from fish farm EIAs. This will seek to ensure that future development of the industry proceeds on the basis of rigorous assessment of its impacts.

IN PURSUIT OF THE SOCIAL OBJECTIVES

Encouragement of local community/industry liaison arrangements (SO1)

- 3.73 Community acceptance and understanding of the aquaculture industry are vital. In some areas, companies already engage with local communities in a number of effective ways: for example, by holding fish farm open days and participating in local fishery trusts and community council meetings, and sponsoring sporting events. But there is room for wider engagement and this might be achieved in part by the establishment of community liaison groups, fisheries advisory groups or panels to deal with inter-sectoral issues, and local authority forums with community representation. Partnerships will vary from area to area depending on what already exists and what the perceived requirement is. Industry associations as well as individual companies, especially the larger ones, together with their workers,

individuals from neighbouring communities and local authorities all need to be involved. The target therefore is to have local liaison evident in the majority of aquaculture-important communities in Scotland by December 2003.

- 3.74 Local authority planning zones in due course will provide a mechanism for local community interaction with local government officers and other stakeholders, including national Government and expert groups. If local planning officers ensure that zoning decisions and framework plans emerge out of a truly inclusive process, much of the dissatisfaction of local communities may disappear. However, although good local planning decisions should dispel some of their uncertainty about aquaculture, the need for regular dialogue will remain. There will be legitimate areas for discussion and action, where the industry and community interact, which are not covered by overarching regulations or codes of practice. The establishment of any liaison arrangements will need to be well publicised and activities communicated to the wider community. Meaningful liaison may be expected to lead to a reduction in the number of objections, as well as a shorter timescale for decisions. It is therefore clearly in the industry's own best interest to make local liaison succeed.

Co-operative aquaculture ventures (SO2)

- 3.75 The principle of community ownership of aquaculture is well-established in some countries and may be worth considering for some sectors of the aquaculture industry in Scotland. Co-operatives in the seafood industry fall into two broad categories: local organisations involved in primary production within a distinct area, and national organisations which engage in the full range of industry activities such as processing,

marketing and transportation. The former might be particularly suitable for encouragement in the bivalve shellfish cultivation sector; the latter is more applicable to the full range of the industry.

- 3.76 As one tier of Scottish aquaculture, powerful local co-operatives could help companies improve efficiency and marketing and render them better able to compete. Such co-operative arrangements might also provide the opportunity for community involvement, as well as enhanced PR value for the industry. Local enterprise agencies will advise groups which express interest in the development of either type of co-operative.

Transport infrastructure

- 3.77 Transport infrastructure is vital to strong commercial activity. Businesses in remote, peripheral communities need access to the marketplace for their products through a modern transport system which sustains and connects communities and moves people, goods and services efficiently and safely. This is vital to underpinning and developing the economy of the Highlands and Islands and their links to destinations and markets throughout the United Kingdom and beyond. The joint transport strategy for the Highlands and Islands which is being developed by HITRANS, the Highlands and Islands Strategic Transport Partnership, will be key in determining the strategic transport priorities and objectives for the region. The FIG Ports facilities programme exists to assist the industry with improving local infrastructure including the provision of new piers and jetties.

New businesses (SO3)

3.78 Business diversification and start-up schemes need to be specifically developed and the potential for different activities assessed. Both existing and future supply and service requirements must be identified. Liaison with existing service and supply businesses will provide an analysis of future needs. HIE and the Local Enterprise Companies will review the schemes currently available and attempt to match these with companies' future needs, which they will also review. A position paper will be prepared for early 2004.

Regional management

3.79 River Basin Consultative Committees, established through initiatives to meet the requirements of the Water Framework Directive, will allow stakeholder involvement in the establishment of River Basin Management Plans. They will need to ensure that aquaculture is fully integrated with the other uses of Scotland's natural water resources and appropriate environmental objectives are set for inland and coastal waters.

Promotion of healthy eating (SO4)

3.80 Consumers expect food to be healthy and safe. To maximise opportunities for aquaculture within the food market, consumers must be attracted by the quality, value and safety of Scottish fisheries products so that these become the purchase of choice. Becoming market-driven rather than production-led, the industry must be integrated

with its markets in all their aspects – through existing, consumer-oriented brands such as Scottish Quality Salmon’s TQM and Label Rouge and generic seafood and other marketing and promotion mechanisms, such as organic, ‘Seafood Scotland’, Seafish and ‘Scotland the Brand’. The industry will also seek to work with HEBS and FSA as well as retailers to promote the benefits of fish products as part of a healthy, balanced diet. This will provide a platform for the development of new products and species.

3.81 The Scottish diet is typically low in fish and seafood. The recognised consumer benefits of fish as a component in a healthy diet (aquaculture products contribute omega-3 polyunsaturated fatty acids – particularly EPA and DHA) need therefore to be actively marketed, not only by the industry itself, but in conjunction with centrally funded campaigns to improve the health of the nation. Increased consumption would lead to better health and it is therefore proposed to mount a joint Industry/Scottish Executive/Seafish programme to promote fish, including molluscan shellfish, as healthy eating in Scotland. A successful campaign would be applicable across the UK and further afield, offering Scottish producers a distinct marketing advantage.

3.82 In the first instance, the industry will establish a “Healthy Seafood Eating” task force early in 2003 through action by the FSAP/Industry Trade Organisations to develop a budget and plan of action in liaison with HEBS and FSA. The campaign will be launched in the Summer of 2003 and domestic seafood consumption trends monitored annually thereafter.

Quality Assurance Schemes for Scottish fishery and seafood products

- 3.83 Scottish production of seafood is currently very diverse in terms of quality and its assurance. Some aquaculture sectors are active in this field, others are not. Scottish Quality Salmon (SQS), for instance, requires that its members be certified as complying with both product standards and Environmental Management Systems independently accredited to the international disciplines of EN 45011 and ISO 14001 respectively. With declining wild supplies and a distinct (if as yet undefined) eventual ceiling on sustainable aquaculture production in Scotland, it is essential that the industry work together to enhance its reputation for quality and thus its income from its primary production.
- 3.84 All Scottish aquaculture products will need in time to be covered by robust quality assurance schemes, fully supported where appropriate by promotional or marketing initiatives, appropriate both to customer expectations and to the species concerned. A co-ordinated approach will help confirm the quality and identity of Scottish products in the mind of the consumer. An enhanced set of quality schemes will encourage customer confidence in, and acceptance of, Scottish seafood products. Higher selling prices for primary production are less certain, but represent a worthwhile goal for the industry. The schemes should be primarily producer-funded and independently audited. To be successful, they must involve the majority of producers, be easy to understand and operate, and be accepted by all retailers.

IN PURSUIT OF THE STEWARDSHIP OBJECTIVES

Local authority Zoning Plans for coastal marine waters (ST1)

- 3.85 It is for local authorities to decide, consistent with the central Government guidance in the relevant National Planning Policy Guidelines, and after consultation with the appropriate statutory bodies, what industrial development should be permitted, and where, within their own area. When in due course controls are formally extended into marine waters, local authorities will wish to have developed, as far as possible, supplementary local guidance zoning the development of aquaculture in their area. Indeed, some local authorities have already begun to develop coastal planning expertise and non-statutory planning guidance for developers.
- 3.86 Ahead of the extension of planning powers, it is for local authorities' own judgement how soon they begin to develop local aquaculture planning guidance or coastal planning teams. While such initiatives are to be encouraged, they will depend on other competing priorities and the availability of resources. However, local authorities will wish, where possible, to publish local guidance as it is finalised ahead of the extension of planning powers. Lack of formal extension of planning powers should not prevent the development of local planning guidance or coastal planning expertise. Similarly, a lack of planning guidance should not be a reason for delaying the extension of planning controls. Aquaculture stakeholders will assist local authorities, through partnership mechanisms for integrated coastal zone management where these exist, and otherwise informally, in developing local guidance and will contribute where coastal planning teams are established.

Welfare assessment (ST2)

- 3.87 The concept of stewardship embraces care of the environment and of the fish themselves. The two are not in conflict, but occasionally there will be a tension between environmental considerations and what is required for the best care of the fish. For example, ability to treat a condition such as a sea louse infection will be constrained by absence of consent to discharge the appropriate medicine and forward planning is required on the operators' part.
- 3.88 The industry will keep its use of medicines and other chemical treatments to the absolute minimum required for fish health, welfare and good husbandry, using them wisely: for example, as part of an Integrated Sea Louse Management Strategy. Improvements to the authorisation process for novel treatments are being achieved through closer collaboration between SEPA and the Veterinary Medicines Directorate, but the environmental assessment of these compounds can be complex and cannot be short-circuited. It is important that fish farmers have access to novel treatments as soon as possible and the regulatory authorities will strive to process applications for their use expeditiously, while still ensuring that the environment is adequately protected.
- 3.89 Members of the Fish Veterinary Society (FVS) working with fish should train themselves in welfare issues through EC guidance and industry codes of practice to enable them to play a full part in safeguarding the health and welfare of farmed fish, and contributing to a healthy aquaculture industry. They should become more

involved in the recognition and control of notifiable diseases, receiving the necessary training and regular updates on developments in notifiable disease, and being involved in their control when such diseases are identified. FVS as the representative body for veterinary professionals must take the lead here, but will be supported in doing so by FRS and the Aquaculture Health Joint Working Group.

Welfare indices for aquaculture species (ST3)

3.90 Such publications as the 2001 WWF report on the aquaculture industry (16) and the Compassion in World Farming paper, *In Too Deep*, (17) serve to remind us that consumers have a legitimate interest in the welfare of animals reared for food. The EU has recognised the importance of the issue, and the Council of Europe has established a Working Group, on which Scotland is represented by FRS and FEAP. A Directive may be expected in due course.

3.91 However, we see no need to wait for that before developing our own thinking. A subgroup of the Aquaculture Health Joint Working Group, with additional co-opted members as required, will be set up by the Summer of 2003 to study the implications of fish welfare considerations for current aquaculture practices, and report by the following Summer. Its report will translate into a series of recommendations to the Scottish aquaculture industry. Building these into Codes of Best Practice will signal that welfare is being positively addressed by the industry and will position it to respond to the EC Directive in due course.

Development of industry Code of Best Practice (ST4)

- 3.92 All industries impact on their environment and the interests of other stakeholders. Those which have a robust code of practice, however, which has been drawn up in consultation with a wide range of scientific experts and stakeholders, and which clearly proscribes all questionable practices, are more likely to achieve public acceptance. A robust, audited code of practice may have the further benefit of obviating (in part) the need for detailed, costly and inflexible regulation.
- 3.93 The aquaculture industry will therefore develop by December 2003 a Code of Best Practice (to cover inter alia issues of disease control, welfare, and health and safety) and, within that, a Code of Best Environmental Practice. It will lead a team including SEPA, SNH, SEERAD, FRS, CE, FSA, Seafish, the environmental NGOs and various academic institutions. Every licensed aquaculture operator in Scotland will be expected to be formally subscribed to one or other of these Codes by the Summer of 2004.
- 3.94 Compliance should be externally monitored and audited. **(ST5)**

Waste disposal (ST6)

- 3.95 As a relatively new industry, aquaculture – and salmon farming in particular – has yet to find acceptable means of dealing with certain of the by-products of its operations. The most pressing issue is that of disposing of fish carcasses following outbreaks of disease or large-scale kills caused by jellyfish or algal blooms. Processed waste such

as the offal from salmon harvested for human consumption is less problematic. Most of it is converted into animal feeds or pet foods. Fish from mortalities, however, require to be disposed of by rendering, incineration or, exceptionally, by burial in controlled landfill. None of these methods is readily available in the Highlands and Islands. Although some fish farm mortalities are ensiled, which destroys most pathogens, the lack of approved waste disposal options has led to stockpiling around the area until they can be collected. (A significant volume is disposed of in Norway, under licence.) Stakeholders (notably HIE, local authorities and the industry) will therefore continue working collaboratively to develop by the end of 2003 a collective waste management infrastructure for the safe disposal of by-products from the industry.

Aquaculture Bill (ST7)

3.96 The statutory provisions under which aquaculture is currently obliged to operate were designed for other purposes and are not wholly apt. As legislative time permits, the Executive will introduce an Aquaculture Bill in the Scottish Parliament. Proposals for inclusion will all be subject to discussion with stakeholders once a Bill is in prospect. At that time, consideration will be given *inter alia* to whether industry compliance with higher than minimum environmental standards might be met with lighter regulatory regimes.

Water Environment and Water Services Bill

3.97 In advance of that, enactment of the Water Environment and Water Services Bill, which was introduced in the Scottish Parliament in June 2002, will enable SEPA, through amendments to the Control of Pollution Act, better to regulate fish farming and prevent any unacceptable effects. It will be possible to impose permit conditions which are more appropriate to the process, and mechanisms to require compliance with codes of best environmental practice are envisaged.

Planning Bill (ST8)

3.98 The extension of local authority planning responsibility to marine aquaculture is a primary and urgent goal. It will build greater acceptance of the industry by addressing the community's legitimate concerns about transparency and affording, through consultation, access to the consenting process. [The Executive's preferred option would be to introduce marine planning controls by way of a Planning Bill, but has undertaken to investigate the practicalities of introducing the necessary controls under the Water Environment Water Services Bill currently going through the Scottish Parliament.]

Locational Guidelines and Marine NPPG (ST9)

3.99 Local Authorities cannot prepare their local planning guidance for aquaculture in a vacuum : central guidance is required. Although they may draw upon the work of the Scottish Coastal Forum, and the principles of ICZM, they also need guidance directly

related to aquaculture issues. The revised Locational Guidelines issued in December 2002 will offer a basis for local authorities' work in the short to medium term. During 2003, SEDD will consider revising National Planning Policy Guideline (NPPG) 15: Rural Development. The role of planning and the contribution of marine and freshwater fish farming to rural development will be addressed then. Meanwhile, the Locational Guidelines will facilitate appropriate and precautionary development and local authorities for those planning areas in which aquaculture is, or may become, important should begin to develop their expertise. (Consideration locally of planning arrangements need not depend on the passage of the legislation.)

3.100 Pre-application consultation will play an important role in the consenting process, bringing together regulators, developers and other user groups in the early planning stages, identifying area priorities and directing resources to the most important issues raised by a development proposal. It will also provide an opportunity to fine-tune proposals to take account of any obvious difficulties before the formal application stage.

NPPG for freshwater fish farming

3.101 There are currently no planning guidelines in place for freshwater aquaculture. While to some this is a serious omission, SEDD is not meanwhile persuaded that there is a general need for any such guidance. However, at such time as planning policy guidance on marine fish farming is in preparation (see above), the Department will consider whether this should also cover freshwater fish farms.

Application of Scottish fish health legislation (ST10)

3.102 The current fish health regulatory regime relies upon a number of complementary EC Directives which are now the subject of review by the Commission and Community scientific experts. Directive 91/67 EEC (18), affects Scottish (wild and farmed) fish health in two ways. First, the inability to distinguish VHS (dangerous to trout in fresh water) from Marine Rhabdovirus (endemic in our coastal wild fish stocks) could conceivably lead to List II compulsory slaughter (without compensation) in farms which pose no threat. Secondly, the industry's concern that officials are applying what it regards as out-of-date principles acts as a disincentive to share information and could in theory lead to a failure to identify and quickly isolate some dangerous new disease

3.103 Through the Aquaculture Joint Health Working Group, SEERAD will discuss with the industry, before the Summer of 2003, the requirements which the existing legislation imposes on both sides, to inform in due course the UK negotiating position on revision of the Fish Health Directives.

Education programmes (ST11)

3.104 Aquaculture has a significant impact on the economic and social wellbeing of the Highlands and Islands in particular and schoolchildren there should know something about it. A learning programme might include the production of different materials on fishfarming: as a topic in the 5-14 curriculum (within the subject area of *Environmental Studies – Living Things and the Processes of Life*), to acquaint children

with the process of dealing with the complexities and controversies surrounding such an activity; as a topic in the highers course, *Managing Environmental Resources*, whose content includes aquaculture at all levels of new National Qualifications; introducing pupils to the issues in a more advanced way; to teach appropriate skills in vocational courses where these are currently insufficient for the industry's needs ; and in establishing community learning programmes designed to explore the social, economic and environmental aspects of fishfarming in a lifelong learning context. These materials will provide objective information about aquaculture as a food-producing sector and its environmental interactions. Together they will promote the industry's crucial significance to communities in fishfarming areas, in a non-partisan way, to improve levels of understanding, responsibility, critical awareness and commitment to sustainability.

- 3.105 The findings and recommendations of the recent National Debate on the Future of Education in Scotland are expected soon. Changes to the content and delivery of the curriculum may be proposed. Discussions will take place with education authorities and Careers Scotland with a view to developing materials suitable for school study modules which might be integrated into the curriculum to suit on a school-by-school or local authority area basis. The industry itself will become more proactive in encouraging this interaction. Education authorities and schools will be encouraged to adopt greater flexibility in their approaches to content and delivery to ensure that programmes are tailored to individual pupils' needs.

PART 4: IMPLEMENTATION, OVERSIGHT AND REVIEW

- 4.1 All who participated in developing this strategic framework for the aquaculture industry in Scotland have a direct interest in its implementation. Responsibility for delivery of specific aspects is explicitly assigned within this document: see Appendix 3. The Executive will chair a working group representing all the interests on the Ministerial Working Group on Aquaculture to monitor progress. It will publish, on behalf of all the stakeholders, a revised version of Appendix 3 every twelve to eighteen months so that the extent of progress made is visible. Where a target date for achievement of one or other of this document's commitments has been exceeded, the reasons for the delay will also be made explicit.
- 4.2 If over time it becomes apparent to the Working Group that the commitments listed here are no longer wholly applicable because the context has changed in some material way, a more fundamental review of this Strategic Framework document will take place and a revised list of undertakings will be put in place.

[CONCLUDING PARAGRAPH(S) TO BE INSERTED FOLLOWING CONSULTATION]

MINISTERIAL WORKING GROUP ON AQUACULTURE

Allan Wilson	Deputy Minister for Environment and Rural Development, Scottish Executive (Chair)
Lloyd Austin	RSPB, representing Scottish Environment LINK
Kenny Black	Scottish Association for Marine Science
Sandy Cumming	Highlands and Islands Enterprise
Michael Cunliffe	Crown Estate
Mark Davies	British Trout Association
Stuart Elder	Bank of Scotland, representing Committee of Scottish Clearing Bankers
Phillip Gallimore	UK Agriculture Supply Trades Association
Malcolm Gillespie	Seafish Industry Authority
George Hamilton	Convention of Scottish Local Authorities
Tricia Henton	Scottish Environment Protection Agency
Tom Inglis (from 11 Nov) 2002	Scottish Environment Protection Agency
Jamie Lindsay	Scottish Quality Salmon
Maureen Macmillan MSP	Scottish Parliament Transport and the Environment Committee
Andrew Mallison	Marks & Spencer, representing Scottish Retail Consortium
Doug McLeod	Association of Scottish Shellfish Growers
Simon Pepper	WWF-Scotland, representing Scottish Environment LINK
David Sandison	Shetland Salmon Farmers' Association
John Sargent	Retired, formerly University of Stirling Institute of Aquaculture
Michael Scott	Scottish Natural Heritage

Richard Slaski	British Marine Finfish Association
Phillip Thomas	FSA Scottish Food Advisory Committee
Tony Wall	Fish Vet Group
Andrew Wallace	Association of Salmon Fishery Boards

Secretariat

Jinny Hutchison	(Deputy Chair))	
Gordon Brown)	Scottish Executive
Graham Thompson	(to 31 August 2002))	Environment and Rural
Gordon Hart	(from 7 October 2002))	Affairs Department
Andy Rosie	Scottish Environment Protection Agency		

THE REGULATORY FRAMEWORK

The main regulatory and advisory bodies involved in aquaculture are :

- the Scottish Executive Environment and Rural Affairs Department (SEERAD);
- the Crown Estate;
- local authorities;
- the Scottish Environment Protection Agency (SEPA); and
- Scottish Natural Heritage (SNH).

SEERAD is responsible for statutory measures under the Diseases of Fish Acts 1937 and 1983 and related EC Fish Health legislation to prevent the introduction and spread of serious pests and diseases of fish and shellfish which may affect farmed and wild stocks. All marine fish farms must be registered with the Department for disease control purposes. Certain diseases must be notified to the Department and formal procedures exist for the treatment and disposal of infected stock.

SEERAD's Fisheries Research Services carries out a wide range of basic marine fish farm research and offers advice on aspects of production and disease control. SEERAD also has wider responsibilities in relation to the protection of fish, fisheries and the marine environment. It advises the Crown Estate on the implications for disease control, existing fishing interests and the inshore marine environment of applications for marine fish farm leases, and is consulted by SEPA on discharge consent applications.

The Crown Estate is responsible for the management of the territorial seabed and most of the foreshore between high and low water mark. Anyone wishing to establish a marine fish farm must apply to it for a lease of the seabed, and foreshore where appropriate, within which the marine fish farm will operate.

Following a review of these arrangements, and public consultation, it was concluded that the Crown Estate's role in authorising marine developments should be reassigned, to local authorities. The necessary planning legislation will be enacted as constraints on the Parliamentary timetable allow. Meanwhile, local authorities have the lead role in advising the Crown Estate on marine fish farm proposals under interim administrative arrangements.

Different planning arrangements apply in Shetland and Orkney. In Shetland, under the Zetland County Council Act 1974, the Council has powers to licence works in coastal waters, which it exercises in conjunction with its powers as planning authority. Under these powers, the Council has developed policies for the development and regulation of salmon and shellfish farming. Under the Orkney County Council Act 1974, the Council exercises works licensing powers within certain designated harbour areas. In the event that a works licence is granted, the applicant must also apply to the Crown Estate for a lease in the usual manner.

SEPA has a duty to promote the cleanliness of Scotland's tidal waters and to conserve, so far as practicable, its water resources balancing socio-economic elements. It is also required to promote the conservation of flora and fauna dependent on the aquatic environment. This includes safeguarding water quality and the condition of the seabed in the vicinity of fish farms. Under the Control of Pollution Act 1974, SEPA consent is required for the discharge

of effluent from marine fish farms to coastal waters. SEPA is responsible for ensuring that appropriate monitoring of the aquatic environment is undertaken, and this is achieved by applying specific consent conditions and by its own audit monitoring.

Scottish Natural Heritage is responsible for advising government on securing the conservation and enhancement of the natural heritage - wildlife, habitats and landscapes – for promoting its sustainable use, and for fostering its understanding and enjoyment by the public. When consulted on aquaculture applications, SNH takes into account proposed developments' proximity to, and potential impact on, wildlife, habitats and landscape.

Additionally, the Veterinary Medicines Directorate; the European Agency for the Evaluation of Medicinal Products; the Maritime and Coastguard Agency; the Health and Safety Commission and the Health and Safety Executive; and the Food Standards Agency all play a role in regulating the aquaculture industry:

- The Veterinary Medicines Directorate is an Executive Agency of the Department for Environment, Food and Rural Affairs protecting public health, animal health and the environment, and promoting animal welfare by assuring the safety, quality and efficacy of veterinary medicines in the United Kingdom.
- The European Agency for the Evaluation of Medicinal Products (EMA) co-ordinates the existing scientific resources of the Member States in order to evaluate and supervise medicinal products for both human and veterinary use throughout the whole of the European Union. The EMA network of partners includes the general public and the users of medicines, the pharmaceutical industry, health care professionals and international partners.

- The Maritime and Coastguard Agency (MCA) aims to develop, promote and enforce high standards of maritime safety and pollution prevention, to minimise loss of life amongst seafarers and coastal users, and to minimise pollution from ships to sea and the coastline.
- The UK Health and Safety Commission (HSC) and the Health and Safety Executive (HSE) are responsible for the regulation of almost all the risks to health and safety arising from work activity in Britain.
- The Food Standards Agency is an independent food safety watchdog set up by an Act of Parliament in 2000 to protect the public's health and consumer interests in relation to food.

ACTION POINTS

The following is a key to the implementation plan on page 74. References in brackets are to the relevant paragraphs in the main text of the document.

ECONOMIC

- EC1 - prepare plan for commercial investment (3.3)
- EC2 - consider study into production costs between competitor countries (3.4)
- EC3 - export strategy (3.5)
- EC4 - differentiated products (3.18)
- EC5 - develop skills action plan (3.26)
- EC6 - investigate feasibility of TCS for aquaculture (3.28)
- EC7 - campaign to encourage public confidence (3.32)
- EC8 - establish forum to review relationship between SFIA and aquaculture (3.33)
- EC9 - review allocation of funds to aquaculture under FIFG (3.37)

ENVIRONMENTAL

- EN1 - establish 'Experts' WG to develop modelling approach to carrying capacity (3.43)
- EN2 - develop a multi-partner environmental data-gathering programme (3.45)
- EN3 - develop policies for location and relocation of farms (3.47-50)
- EN4 - establishment of Scottish Aquaculture Research Forum (3.54)
- EN5 - certification schemes (3.60)
- EN6 - monitor sea lice levels (3.63)
- EN7 - review causes for escapes/case for minimum containment standards (3.65)
- EN8 - consider tagging of farmed fish (3.66)

- EN9 - Development of containment expertise (3.68)
- EN10 - review EIA standards and publish guidance (3.72)

SOCIAL

- SO1 - establish community liaison arrangements (3.73)
- SO2 - investigate creation of aquaculture co-operatives (3.76)
- SO3 - investigate the need for business start-up schemes (3.78)
- SO4 - establish 'Healthy Eating' Task Force (3.82)

STEWARDSHIP

- ST1 - develop local zoning plans (3.86)
- ST2 - clarify the respective roles of private and state vets on fish welfare (3.89)
- ST3 - prepare farmed fish welfare code of practice/indices (3.91)
- ST4 - prepare code of best environmental practice (health, welfare, H&S) (3.93)
- ST5 - appoint an auditor to check codes of practice compliance (3.94)
- ST6 - develop waste management infrastructure (3.95)
- ST7 - introduce Aquaculture Bill (3.96)
- ST8 - enact planning legislation (3.98)
- ST9 - introduce NPPG for marine fish farm developments (3.99)
- ST10 - review fish health legislation (3.103)
- ST11 - develop education (3.105)

IMPLEMENTATION PLAN

PRINCIPLE

Economic

Environmental

PRIORITY

Paragraph reference

CONTRIBUTOR

	EC1	EC2	EC3	EC4	EC5	EC6	EC7	EC8	EC9	EN1	EN2	EN3	EN4	EN5	EN6
Paragraph reference	3.3	3.4	3.5	3.18	3.26	3.28	3.32	3.33	3.37	3.43	3.45	3.47-50	3.54	3.60	3.63
Private Sector															
Producers				X							X	X			X
Retailers	X						X								
Trade Assoc.	L	JL	L	L	JL	X	L	X	X	X	X	X	X	X	X
SFIA							X	L					X		
Veterinary Practices															
Public Sector															
SE	X	JL	X	X	X	L			L	X	X	L	L	L	L
HIE/LEC's/SEnt.	X	X	X	X	JL							X	X		
Local Authorities	X				X		X			X	X	X	X		
CEC	X	X										X	X		
SNH							?			X	X	X	X		
SEPA							?			L	L	X	X		X
FSA							X								
Banks	X														
Voluntary Sector															
Env. NGO's							X			X	X	X	X		
Wild Fisheries											X	X	X		X
Scientific Bodies															
					X					X		X	X		X

TARGET

Dec-03 Nov-03 Spr-04 ??? 2003-04 2003 Spr-2003 Sum-2003 2003 Sep-03 Aug-03 Dec-03 Aut-03 ??? 2003

L = Lead Organisation, JL = Joint Lead, X = Other Contributors

* Variants

Social

Stewardship

EN7	EN8	EN9	EN10	SO1	SO2	SO3	SO4	ST1	ST2	ST3	ST4	ST5	ST6	ST7	ST8	ST9	ST10	ST11
3.65	3.66	3.68	3.72	3.73	3.76	3.78	3.82	3.86	3.89	3.91	3.93	3.94	3.95	3.96	3.98	3.99	3.103	3.105
		X		X	X													
							X											
X	X	X	X	L		X	X	X	X	X	L		X				X	L
							X				X						X	X
								X	X									
L	L	X	X	X			L		L	L	X	L	L	L	L	L	L	
			L	X	X	X		L					X					L
			X								X				X			
X	X							X			X					X		X
X	X		X					X			X		X					
							X											
X	X			X			X	X			X							X
X	X			X				X			X						X	
X	X										X						X	
Dec-07?	Sum-03	2003?	Dec-03	Dec-03	???	Early-04	Aug-03	Dec-05?	???	Aug-04	Aug-04	???	Dec-03	-	-	-	Aug-03	???

RESEARCH PRIORITIES (extracted from the Review and Synthesis of the Environmental Impacts of Aquaculture (<http://www.scotland.gov.uk/cru/kd01/green/reia-00.asp>))

1. The following list of research priorities is not itself in priority order; nor is it exhaustive. As the aquaculture industry develops new species, husbandry practices and technologies, some of the research needs listed may acquire a different priority and new research priorities will emerge. It is intended, therefore, that this list be kept under continuous review, along with Appendix 3, as new findings become available.
2. Although the gross effects of fish farming on sediments are relatively well understood, much remains to be done regarding the dynamics of waste input, responses from the sediments in terms of the interactions between microbial and macro-biological processes, how these influence the chemistry of the sediments, and the physical processes of oxygen supply, sediment resuspension and mixing by water currents. These interactions take place against a background of seasonal changes and the 2-year farming cycle that results in great variation in the supply of organic materials to sediments. In addition, inter-annual variability in biological factors, such as the supply of invertebrate larvae, probably have effects that are not as yet well understood. These aspects are important as they affect: a) our understanding of the assimilative capacity of sediments with respect to farm wastes; b) the ways in which chemical contaminants in sediments are redistributed to the wider environment and; c) the ways sediments consume oxygen and release dissolved

nutrients into the water column. Such studies will inform the determination of benthic carrying capacity.

3. Further studies of phytoplankton abundance and species composition in some lochs originally studied before 1984 and now the sites of major fish-farms.
4. A few key coastal sites should be chosen to bring together long-term programmes of monitoring of nutrients, phytoplankton and algal toxins, and the historic and future data collected in this way should be subject to statistical analysis and compared with predictions from mathematical models; the sites should represent a range of loadings by fish farms.
5. Inflows of nutrients from the Atlantic Ocean and the Irish Sea should be monitored in Winter and in Summer; such inputs are likely to change because of climate change as well as changes in nutrient enrichment of the Irish Sea.
6. Better understanding is needed of water movements within sea-lochs and voes, between them and coastal waters, and in coastal waters.
7. Studies of the biology, toxicology and ecology of Scottish populations of harmful algae, especially of *Pseudo-nitzschia* species.
8. Development of methods capable of detecting the presence of toxins in small samples of phytoplankton: present methodology relies on analysis of shellfish tissues, and can thus provide only indirect information about toxic algae;

9. Better understanding of the role of pelagic protozoa in coastal waters, lochs and voes; these organisms may be crucial in preventing the development of algal blooms, yet especially sensitive to pollution with metals or pesticides.
10. More information on rates of loss of nutrients from Scottish continental shelf and sea-loch waters, especially concerning the process of denitrification which takes place in organically enriched sediments.
11. Continued development of simple, robust models that can predict “undesirable disturbance to the balance of organisms and the quality of the water” as a result of inputs of nutrient and organic matter by fish farms. With priorities 2-9 above, this will inform understanding of the carrying capacity of the Scottish coast for aquaculture and other users.
12. Further study is required of the interaction of suspended-culture mussel populations with other components of the ecosystem, in terms of their scope for growth (phytoplankton availability), their impact on other suspension feeders in the food web and the potential for nutrient release from accumulated biodeposits. Such studies should be linked to the development of models to assist in calculation of appropriate stocking densities for each bivalve cultivation area and the identification of sites where mussel cultivation could be practised to advantage.
13. Fuller study of the potential benefits of integrating aquaculture species is required, using a combination of nutrient extracting species on site with nutrient enriching species, with a

view to increased productivity in the former and a net reduction in nutrient release from the latter, thus influencing carrying capacity.

14. There is a need to improve our understanding of the mechanism of toxification and depuration of AST in commercially valuable species such as the king scallop. There is little information at present on the levels and mechanisms of production of domoic acid in *Pseudo-nitzschia* species isolated locally, the reason for prolonged toxin retention in king scallops or the potential impact of the AST on shellfish physiology, fecundity and recruitment.
15. More information is required on the toxicity of emamectin benzoate, teflubenzuron, copper and zinc to benthic organisms commonly found in Scottish sea lochs.
16. More information is required on the long-term effects of cypermethrin, emamectin benzoate, copper and zinc on sediment associated organisms. In particular:
 - what proportion of the chemicals, particularly the metals, present in fish farm sediments is bioavailable?
 - is there potential for these chemicals, particularly the metals, to accumulate up the food chain?
 - what happens when a site is fallowed and the sediment biogeochemistry changes? Do the chemicals that have accumulated, and are possibly not biologically available in the organically enriched sediment, become bioavailable as chemical remediation occurs?

Are they released, and do they disperse over a wider area? Do they prevent recolonisation of impacted sites?

17. More information is required on the dispersion, fate and potential long-term effects of multiple cypermethrin treatments (at single and multiple farm sites) within a loch system.
18. More information is required on the potential effects of concurrent emamectin treatments at several farm sites within a loch system.
19. Antifoulant usage by the aquaculture industry should be quantified. Copper and zinc concentrations, speciation and toxicity in fish farm sediments need to be investigated.
20. Research is required to quantify the factors responsible for the transmission of lice between farms and wild fish. Improvements in understanding the mode and rate of transmission are essential in providing information on the relationships between infection of wild populations, lice burden on farms and separation distances between migratory fish routes and fish farms. This would also bring greater understanding of the mechanisms by which farmed fish become infected with sea lice from wild populations and from other farms and help to determine the reasons why some sites have fewer lice problems than others and therefore assist in the selection of better sites for salmon culture.
21. Continued surveillance of the presence of escaped fish in wild populations and quantification of the effects in terms of population fitness.
22. Improvements in marking or tagging fish to enable easy identification of escapees.

23. New methods for reducing the fertility of farmed fish.
24. Improved containment technologies, including technologies for reducing the costs of operation of fully contained systems.
25. Studies into the causes and ecological consequences of the decline of wild salmonids.
26. Assessment of the effects of acoustic seal scarers on cetaceans.
27. Accurate fisheries data collection and mathematical modelling of the pelagic fisheries are required in the main industrial fishing areas to ensure the sustainability of these fisheries. The influence of climate oscillations (*e.g.* El Niño) and climate change on recruitment and spawning stock compared with the impact of industrial fisheries are also very difficult to quantify and little research has been published in this area. The sustainability of the Blue Whiting fishery in the North Atlantic fishery also requires urgent research as fisheries controls are still under debate.
28. Study of the effects of near market use of plant meal and oil substitutes on fat and protein composition, flesh quality and taste in salmonids is required.
29. Studies are required on refining the vegetable oil and protein requirements of the cultured fish species relating to life stage and seasonal variations in digestibility experienced with certain vegetable oils.

30. Knowledge regarding the blending of oils, reducing the dependency of manufacturers on a few plant oils and tailoring the taste of the final product to the customer needs.

31. Information regarding nutritional studies and the implications of substitution of fishmeal and oils with vegetable alternatives on new species for cultivation, particularly cold-water species such as cod, haddock, turbot, halibut, Dover sole and lemon sole.

32. Research into the environmental impacts of new aquaculture species, including work on wastes, diseases, parasites and escapes.

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A STRATEGY FOR THE SUSTAINABLE DEVELOPMENT OF EUROPEAN AQUACULTURE (Extract)

A vision for the future

Aquaculture in the EU developed well in the last two decades and this was partly allowed by the many Community initiatives that have been taken to support this sector. The Union has a vast legal armoury on aquaculture, and activities to enhance the legal framework are progressing. However there is still room for further improvement, and the recent slowdown of growth must be addressed.

While the overall framework shows a potential for further development, aquaculture in the Union has still to cope with some problems in particular in the context of health protection requirements, environmental impact and market instability.

In the next ten years aquaculture must reach the status of a stable industry which guarantees long term secure employment and development in rural and coastal areas, providing alternatives to the fishing industry, both in terms of products and employment.

To secure employment and well-being, European aquaculture must be an economically viable and self-sufficient industry. The Market has to be the driving force of aquaculture production: production and demand are finely balanced and any increase in production in excess of the likely evolution in demand should not be encouraged. The range of products must be enlarged, better marketing strategies have to be implemented. Private investors are, and have to remain, the leading force to put progress in practice, while a key role of the public powers will be to guarantee that the economic viability be parallel to the respect of the environment and the good quality of the products.

The fundamental issue is therefore the maintenance of competitiveness, productivity and durability of the aquaculture sector. Further developments of the industry must take an

approach where farming technologies, socio-economics, natural resources use and governance are all integrated so that sustainability can be achieved.