Consultants Report on Attendance at C-Mar Annual Workshop on 15-16 Sept 2005 at Marine Biology Station, Portaferry

I attended this workshop (a) to maintain useful contacts for those developing a mariculture industry in the islands (b) to keep abreast of latest developments in mariculture and report to those interested in the islands (c) to report on progress with developments in aquaculture in Ireland.

A programme (plus abstracts) and attendees list is appended.

The workshop consisted of three sessions:

1. Developments in scallop aquaculture
2. General aquaculture and offshore fisheries
3. Seaweed – industrial applications

1. Scallop Aquaculture

(a) Overview

This is a rapidly developing market in Ireland as scallops (*Pecten maximus*) grow better in Ireland than GB (can enforce a minimum landing size of 110 mm here as opposed to 100 mm in England/Scotland). There is a big European shortfall in supply over demand. Currently 500t are landed in Ireland (value €700k).

Under EU directives (EC91/492) there needs to be fortnightly monitoring for toxic algae. Current research is in the area of bycatch studies, substrate habitat monitoring (generally higher densities are found on rougher substrates – more young scallops on rough stony ground, older ones on sandy/gravely substrate). Future research priorities are – age-based stock assessments; growth in relation to long term temperature trends and effects of stony ground on trawling efficiency. Multi-beam acoustic surveys are being carried out to address some of these.

(b) Industry perspective (Jerry Gallagher)

Jerry is Ireland's largest scallop producer (N-W Donegal). He seems to be dynamic, highly motivated and up-to-date with latest developments. He is interested in developments in the Falklands. He sees the biggest problem being the sporadic and unreliable nature of seed (eg. in 1996 and 1999 no spat was produced).

As well as lack of spat (the main drawback to scallop production) Jerry Gallagher also sees problems such as: variability of settlement; TBT in restricted waters; lack of confidence; lack of investment and starfish.

Currently he sells 200 tonnes of scallops harvested from 325 ha (800 acres) at a maximum price of €5 per kilo. He could sell far more as there is little competition and high demand both locally and for export but he needs more support, co-operation and a solution to the seed supply problem. 40-50 mm seed scallop are worth up to 50p to him.

A report from a failed scallop farm in Orkney highlighted lack of consistency of spat supply as the main reason for failure.

In *Norway*, they produce 500 tonnes/year – all diver harvested (no dredging). There are 40 active licences granted to 20 'growers'. Six are approved for 'sea ranching' as part of a 5 year programme.

Year 1	–	Hatching production of 15 mm spat
Year 2	–	Suspension culture 40-60 mm
Years 3-5	–	Bottom culture, "sea-ranching" to >100 mm

Sea ranching is seen as a way of combining commercial harvesting with strict environmental integration (e.g. open access to harvesting grounds). The Norwegian system of seedling production is a continuous flow-through production settlement system. They have good links between the University (Bergen in this case) and Industry. A land-based nursery is necessary though has higher running costs. Crabs eat more (56%) cultivated scallop than wild (8%) scallops. Future issues for Norway will be environmental.

(c) Developments in Nursery Design

Most people see hatchery production as the only long-term viable means of producing spat. Paul Connellan (Co. Mayo) has carried out work on nursery design in a BIM (Government) funded project. The programme has six main elements:

(i) Broodstock investigations – covered algal species mix, algal ration, water quality, spawning stimulants.
(ii) Larval rearing
(iii) Settlement enhancement – looked at Netlon meshes
(iv) Density dependent settlement – mesh bags
(v) Nursery regimes
(vi) Transfer methods and stage optimisation

2. General Aquaculture

Papers were presented on the 'Seafish Inshore Group', good practice guidelines for live crustaceons, environmental assessment; support to industry; bivalue hygiene regulations; inshore fisheries and aquaculture research. See abstracts and attendee lists for contacts.

3. Seaweeds

Matt Dring gave an overview of current QUB work on seaweeds.

(i) Rope aquaculture of a red seaweed – dulse – to establish a seaweed farm.
(ii) Purification of effluents from integrated fish farms (including project on antibacterial products of seaweeds).
(iii) Aquaculture of a red coralline algae for hydroxyapatite (for bone repair).
(iv) Seaweeds as biofilters for N&P from urban sewage treatment water and heavy metals from waste.
(v) Reducing environmental impact of sea-cage fish farms through seaweed.
(vi) Internal nutrient content of seaweeds as a monitor of status of coastal waters.

(vii) Use of seaweeds for nitrate removal from agricultural runoff into coastal and estuarine waters.

Some specific and related projects were discussed in more detail.

Interesting points to emerge were:

- Biofouling algae and mussels gradually clog filters and nets for cultured species – these are potentially valuable and can be used in integrated aquaculture systems (combining the cultivation of fish with that of filter feeders and seaweeds).

- Trials in Northern Ireland and Scotland have used red seaweed (*Palmeria palmata*) to feed urchins, the Israelis have used nutrients from seaweeds to feed abalone and urchins.

- Rope culture of *Palmeria* (in Northern Ireland) is now well advanced to the commercial phase.

Steps: 1. Seed string lines with pure tetraspore culture.
2. Put long lines out in shallow bags – *Palmeria* grows well on these.

Returns	**kg/m^2**	**kg/100m longline**	**£/longline**	**£/ha**
Palmeria (edible red seaweed)	30	3,000	1,500	15,000
*Laminaria** (*a brown kelp)	240	24,000	12,000	120,000

- In West Clare Lucy Watson (BIM) is developing a manual based on technology transfer of existing research for commercial culture of a brown seaweed *(Alaria).*

This has good potential for abalone culture (6kg/m of seaweed on ropes).

Higher value macro-algal products

(a) John Spence has shown a lot of interest in importing seaweeds from the Falklands in the past to see if they can yield some higher value products through specialised processing for natural bio-stimulants. He has just set up a high-tech R&D company in Donegal (Oilean Glas. Teo.) with the objective of reviewing the local seaweed industry. Initially they are concentrating on horticulture products and are developing partnerships (e.g. with universities, development boards etc.). They use a process which retains key bioactivities using off-the-shelf food processing equipment.

Some examples of developments include control of Root knot nematode in turfgrass using extracts from brown seaweeds and of neutraceutical compound development. They have discovered potentially valuable insecticide and anti-bacterial properties.

They (contact John Spence) would still be very interested in exploring potential value of compounds in Falkland Islands seaweeds (perhaps on a partnership basis?). Samples could be air dried at room temperature for convenient transport.

There is a good summary paper on 'Brown Macroalgae' by Hennequant *et al.* of Oilean Glas in the Journal: Aqua Feeds: Formulation and Beyond, Vol. 1, Pt 4, 2004, 19-23. Email Frank (fhennequant@eircom.net) for a copy. He is a project manager and Scientific Officer with Oilean Glas.

(b) Charlie Yarish (University of Connecticut) presented a paper on the use of economically important seaweeds to bio-remediate finfish effluent for integrated aquaculture systems in the US. Aquaculture in the US faces big problems from coastal zone use conflicts, licensing issues, compliance with environmental regulations and waste generation. Kelp had a huge effect on removal of Nitrogen from fish farm waste. Seaweeds hold the answer to developing a balanced ecosystem.

Examples of seaweed biofilter use in Chile quoted were *Gracilaria &* Turbot; Macrocystis & salmon.

He sees a great future for such integrated systems with seaweed as the key.

(c) Nutritional value of seaweeds in Ireland. Scientists at Galway University now have year round monthly nutrient profiles of many seaweeds. Some of the red seaweeds have high Omega 3-fatty acids. From this, seaweeds have a potential role as a new source of nutrients. They are still very willing to do (independent) nutrient profiling of samples of Falkland Islands seaweeds. Currently they get €800/wet tonne for Carragenen.

Two important reports are now available.

1. Strategic Review of the Feasibility of Seaweed Aquaculture in Ireland (by Astrid Werner, Declan Clarke, Stefan Kraam). The Marine Institute, Galway Technology Park, Parkmore, Galway, Ireland, (email: institute.mail@marine.ie); or a PDF version can be downloaded from http://www.marine.ie.marinatdi/

2. "The role of Kelp in the Marine Environment", published by the Marine Institute and available at www.npws.ie/PublicationsLiterature/IrishWildlifeManuals.

   A good overview and optimistic report of the future for brown seaweeds.

Summary and Recommendations

Overall this was an interesting workshop with some useful developments which may be of interest to those involved in any potential aquaculture development in the islands.

Recommendations include:

a. John Spence of Oilean Glasteo in Donegal is very keen to include Falkland samples in his programme of extracting bio-active compounds from seaweeds. This could be done as a partnership (perhaps involving an FI Company or QUB?).

b. The Marine Institute at Galway (contact Stefan Kraan) are willing to nutrient-profile Falkland seaweeds.

c. Scallop developments in Ireland can offer a lot of valuable information on culture and production.

d. Integrated aquaculture developments offer many good practice examples and opportunities for the Falklands.

e. The first commercial rope-culture of a red seaweed production system is now running well in Northern Ireland.

f. Estimates of finfish hatchery costs in Ireland can be obtained from declan.clarke@nuigalway.ie.

If I can help with following up any of these developments I would be happy to do so.

Jim McAdam
UKFIT, Oct 2005

Attachments: Abstracts of Papers; Delegate list.