exploring the factors that impede feed intake and growth in AST systems and developing feeding strategies that use ingredients produced on-farm by UK farmers.

Consumer focus groups were undertaken throughout 2005 and 2006, in various parts of the UK, exploring attitudes towards health, food and fish. Participants discussed issues such as sustainable food production, organic fish, the health benefits associated with fish consumption and their awareness and purchase habits of tilapia. Following this, product testing was undertaken to assess the reaction to tilapia within the foodservice sector. Tilapia was well received in Devon when it was featured on the menu in a restaurant and a pub, to gauge both chefs' and customers' reaction to tilapia in their normal working and dining environment. Interviews with various fish processor and wholesale suppliers, fishmongers and restaurant chefs were also undertaken to obtain a broader spectrum of knowledge and reaction to high quality, locally farmed tilapia in Devon.

'Pan Fried Medallions of Tilapia, Oriental Vegetables & Sherry Vinegar Jus', Masons Arms, Devon, September 2006

During the summer of 2006 Sarath Kodithuwakku, from the University of Peradeniya, Sri Lanka visited Stirling to undertake three months of farming entrepreneurship research with the project team. This further disciplinary perspective explored the entrepreneurial challenges faced when diversifying from conventional agriculture; in-depth interviews with a range of agricultural farmers in Central Scotland brought light to the factors that either encouraged or prevented them and their families from adopting diversification strategies. Follow-up research is intended to explore the entrepreneurial characteristics of UK farmers who adopt small scale tilapia production as a diversification strategy. Through this multidisciplinary approach, an improved understanding is being generated of the business and market environment for small scale producers; this is particularly relevant given the current increasing interest and activity in tilapia production within the EU and elsewhere.

For further information on our project and team members please see our project web page: *http://www.aquaculture.stir.ac.uk/Systems/tilapiaProject.htm*
Further questions on our research programme are welcome through the above website or by emailing Francis f.j.murray@stir.ac.uk or Kathleen Kathleen.grady@stir.ac.uk
Details on the RELU Programme which is funding this research and other RELU projects can be accessed at www.relu.ac.uk.

Stirling Aquaculture - Update

Sue Paffrath, Researcher

In 2006 Stirling Aquaculture collaborated with the Caledonian Business School, Glasgow Caledonian University to evaluate the economic impact of the salmon parasite *Gyrodactylus salaris* (Gs) should it be introduced into Scotland. The aim of the study was to estimate the economic consequences of the introduction of Gs and to identify the costs of prevention, eradication and containment.

Gs is a freshwater ecto-parasite that infects Atlantic salmon (*Salmo salar*) and a number of other salmonid species. It is one of many salmonid-infecting gyrodactylid species, which belong to the monogenea – a larger group of relatively simple, soft bodied flatworms that are primarily fish parasites. At less than 1mm in length, Gs infests the skin, fins and gills where its attachment and grazing activity can lead to host death through salt and water imbalances. The parasite has been present in Norway for over thirty years and since the 1980s is thought to have been responsible for the loss of an estimated 300 tonnes of Atlantic salmon from Norwegian rivers.

It is generally assumed that the parasite would be introduced to a single catchment and would spread throughout the entire river system. If no action is taken to prevent transfer of Gs to other locations then, eventually, it could become established throughout Scotland. The main outcome of the study showed that should no action be taken to prevent the spread of Gs the country would see the loss of 2,000 full time-equivalent jobs, a decrease in net economic value of £633m and a reduction of £34.5m in annual household income. In addition to salmon angling, the aquaculture sector could be seriously affected by Gs. However, the sector would have the incentive and ability to invest in more biosecure facilities to protect themselves. Effectively, the economic consequences of Gs infestation would be confined to the loss of salmon angling.

Measures that would potentially reduce the probability of Gs entering the UK could be taken by the provision of disinfection stations at ports and by extensive publicity and education highlighting the dangers of the parasite. The cost of these measures is put at £6m, which is small in comparison to the potential economic and social losses. An eradication strategy might be possible depending on the size and complexity of the river system. This strategy would have implementation costs, but overall would generate economic benefits as the river recovers its full use.

A strategy of containment to prevent infestation elsewhere in Scotland might be the most appropriate policy for large, complex river systems. Such a policy might be limited to minimal exclusion focusing on the greatest transmission risks, or it could extend to the total exclusion of the public from the water.

The full Economic Impact Report, the Gs Contingency Plan and the Chair's Report can be found at the link below
http://www.scotland.gov.uk/Topics/Fisheries/Fish-Shellfish/18610/13929
and the accompanying news release:
http://www.scotland.gov.uk/News/Releases/2006/12/07101414

BBSRC Short Courses

Designed to accommodate the known time constraints of the key workers towards whom they are geared, the University of Stirling and University of Glasgow offer a series of intensive residential courses and internet-based follow-up discussion, in the areas of Feed Management and Environmental Monitoring.

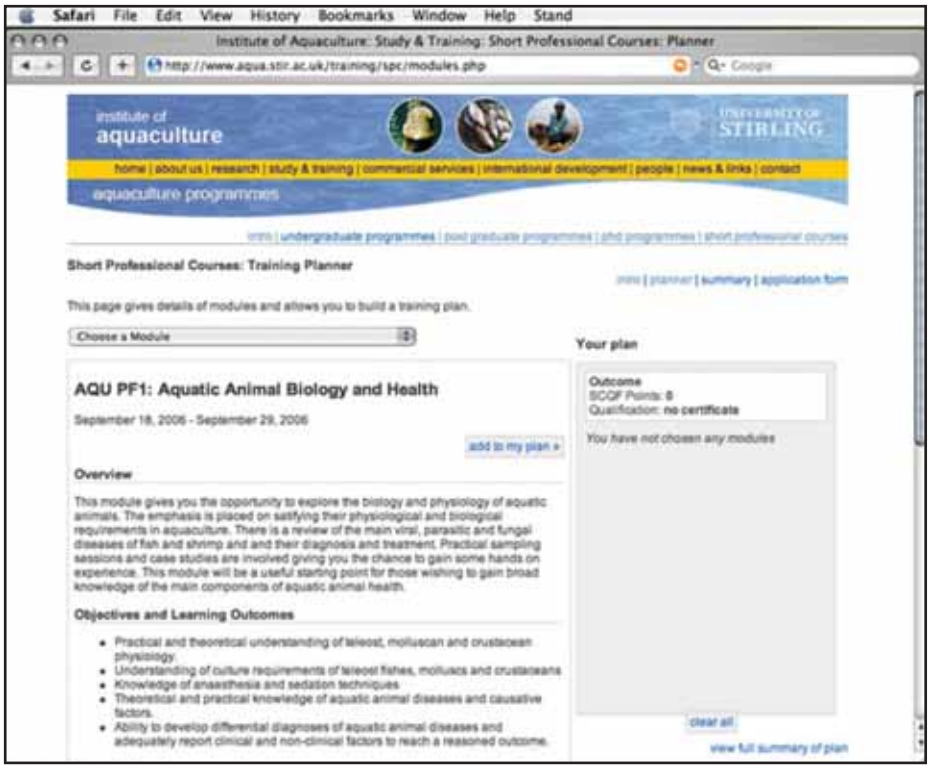
The following courses are available in 2007:
Feed management, 10-11 May
Environmental Monitoring and Management, 14-16 May

Lectures, discussions and practical exercises are given by experts from academia and industry covering issues of relevance across the sector. Feed Management deals with the biology, technology, impact and future direction of this critical area of aquaculture. Environmental Monitoring and Management concentrates primarily on the impacts of cage culture, addressing Environmental Impact Assessments (EIA) and other regulatory data requirements.

For more information please see *http://www.atc.stir.ac.uk/courses*

Over the last few years Stirling Aquaculture has become increasingly involved in specialist IT projects for companies and institutions within the aquaculture industry. Stirling Aquaculture now employs a full time web/multimedia developer who specialises in a number of different areas such as the acquisition and management of online information, W3C standards for coding and usability, and the implementation of Web 2 (or Ajax) components. This IT knowledge is underpinned by the technical expertise of the wider Institute of Aquaculture to ensure successful deployment of a range of projects.

Work undertaken in this area has ranged from simple static web sites to complex database/xml driven web-based applications and multimedia components, such as flash presentations and cd-roms. Throughout the development of these projects, a priority has been placed on the importance of standards, particularly in reference to usability and programming for the web, at a time when governments are increasingly making this a compulsory requirement for large institutional organizations.



Ajax powered module planner for www.aqua.stir.ac.uk/training/

One of the more interesting projects the group has worked on in the recent past was the creation of a multimedia touch screen exhibition for a Scottish Research Development Group project. The remit of the project was to create something that was both fun to use and which would act as an effective vehicle for capturing important data regarding the fish eating habits of visitors to the exhibition. The software created was based on open source technologies (helping to reduce costs greatly) and involved a complex dynamic approach that took into account the answers given by users in deciding which questions should be asked next. The project was set up at two important visitor attractions in Scotland and the response (and amount of data captured) was overwhelming. Indeed, so much so that one of the attractions wanted to keep the exhibition as a permanent feature. A web-based version of the quiz can now be viewed at http://www.whatfishru.com/.

The group is always looking at new ways to enhance the viewing experience of the user by taking advantage of the newest ideas in the industry. In more recent projects, this has involved the use of one of the most significant of these radical ideas: the principal of Web 2 or Ajax. Ajax can be seen as not so much a technology but rather a new way of thinking about the way data is represented on the internet. In fact, Ajax actually uses old technologies (such as xml and JavaScript), but employs them in a fresh new way that leaves behind the traditional slow, cumbersome mode of representation which relies on constant page refreshes, for a new more dynamic and immediate style. This method allows data to be refreshed and updated without the necessity of having to reload the page. In addition, these ideas have brought with them a multitude of possibilities for displaying and manipulating data that has to be seen to be believed. For example, the site at www.aqua.stir.ac.uk/training/ uses a series of widgets, such as a shopping cart style course planner, to provide the user with a fresh experience and enhanced functionality over the more conventional static style of course descriptions that previously existed.

The list of technologies the group at the Institute specialises in is comprehensive to say the least:

- Implementation of Web 2/Ajax powered components
- Development of fully featured content management systems
- Specially tailored (database driven and/or XML based) Web Applications
- W3C standards for coding and usability
- The employment of Open Source Technologies
- Deployment of Online Surveys
- CD Rom Production
- Flash Presentations
- Online Learning Tools
- Graphic Design
- Web Hosting

Further examples of the groups work can be found at the following addresses:

www.aqua.stir.ac.uk/envserv/
www.aqua.stir.ac.uk/envserv/client-tracking/
www.aquainnovation.net/aquainnovation/
www.fns-survey.stir.ac.uk