

## ISSUE 3

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## **Aquaculture & Fisheries Development Centre School of Biological, Earth & Environmental Sciences, UCC**



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### **WELCOME**

Welcome to the 3rd issue of the *AFDC News*. The AFDC and School of BEES was delighted to welcome Minister Simon Coveney in July 2011. The Minister was given a tour of the facilities and research groups within the AFDC and School of BEES and delivered an inspirational speech to a large audience of staff, students, researchers and invited guests. The AFDC continues to play an active role in numerous national and international research projects.

### **Minister Simon Coveney Visits the AFDC & School of BEES**



**L to R: Prof. Gavin Burnell (AFDC and BEES), Minister of State Simon Coveney with Dr Sarah Culloty (AFDC Director), Prof. John O'Halloran (Head of the School of Biological, Earth & Environmental Sciences)**

The AFDC and School of BEES has a long and distinguished history of research excellence in the areas of Aquaculture and Fisheries, Plant Science and Forestry, and these have the potential to support food and energy demand in sustainable ways. This research, according to Professor John O'Halloran, Head of School, will help resolve the food energy trilemma where delivering more food from less land, which now competes with energy crops, may have major environmental consequences. "With global populations growing rapidly, there are huge risks of food shortages and enormous environmental damage, and so we need new sources of food and higher yielding crops", said Professor O'Halloran.

Minister Coveney was welcomed to the School of BEES by Professor Patrick Fitzpatrick, Head of the College of Science, Engineering & Food Science (SEFS) and Professor John O'Halloran, Head, School of BEES. The Minister's itinerary included a guided tour of the Aquaculture and Fisheries Development Centre and the other BEES research disciplines of Forestry, Agriculture and Food. The visit commenced with a Presentation by the Minister to invited guests, staff and students.

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Bottlenose dolphins (*Tursiops truncatus*) are distributed worldwide through tropical and temperate inshore, coastal, shelf and oceanic waters. My PhD research investigates variation in bottlenose dolphin vocal repertoires, how their whistles vary between different groups, communities and habitats and whether such variation is due to relatedness or levels of association between and within communities. In the spring of 2010 I had the opportunity to visit the Duke marine lab in Beaufort, North Carolina. The aim of this visit was to sample whistles from a population of dolphins, distinct from the Irish dolphins, and thus provide me with important out-group data. Additionally, the existence of different ecotypes have been well established in the waters around North Carolina and I was particularly interested to find out if dolphin vocalisations could be shown to reflect this and whether a similar pattern could be found in Irish waters. I acquired good recordings of both estuarine and coastal groups and was also fortunate to get to use some off-shore recordings made previously by researchers from the Duke lab.

Once back in Ireland I joined a survey cruise for beaked whales in the Irish continental shelf waters to increase my sample size of bottlenose dolphin recordings from Irish non-coastal areas. The total whistle repertoire dataset for my PhD includes close to 17,000 whistles catalogued of which about 5,000 are of sufficient quality to be used for analysis.

My data has shown that whistle variation is evident between the different ecotypes in the US. In Ireland, there appears to be less variation between any of the different habitats. These results were presented at the Society for Marine Mammalogy (SMM) conference in Tampa Bay, Florida at the end of November 2011.



**Bottlenose dolphins (*Tursiops truncatus*)  
fin and tail flukes with barnacle biofouling**



**Duke University Marine Laboratory**

### BEADS Project Update

Grainne Darmody, MSc, Research Assistant BEADS

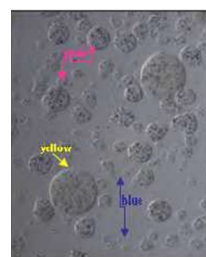
BEADS is an EU FP7 funded project under the Capacities (support for SMEs) programme, with collaboration between the AFDC and several other European partners. The UCC team includes Dr Sarah Culloty (Principal Investigator), Grainne Darmody MSc, Dr Sharon Lynch and Dr Aaron Maloy. BEADS is a follow up to a previous FP6 funded project called SPIES Detox. One of the objectives of the BEADS project and that being carried out in UCC is to determine whether microencapsulated beads can be used to provide a more targeted delivery system for probiotics or immunostimulants to European Flat oysters *Ostrea edulis*.



**Grainne Darmody  
performing laboratory  
assessments on *Ostrea edulis***

infected with the protozoan *Bonamia ostrea*.

At the 6 month milestone into the project, the second project meeting of the partners including SME, SME-AG and Research Partners was hosted by the UCC group at the Lewis Glucksman Gallery, UCC, Cork, from 6th-7th September 2011. The scientific workpackage leaders were given the opportunity to present their findings of research to date and during the meeting a progress review relative to the work programme took place and a workplan for the next 6 months was agreed. Results and feedback to-date from research partners have been positive. Currently at UCC, experimental trials are on-going within the AFDC. The next project meeting will be held in Malaga, Spain in February 2012.



Microencapsulated  
fluorescent beads



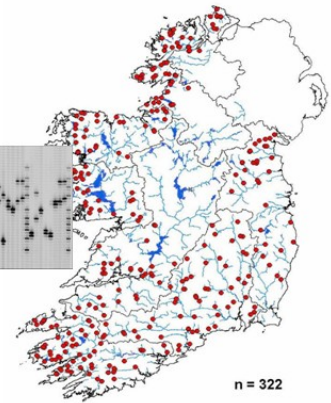
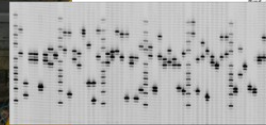
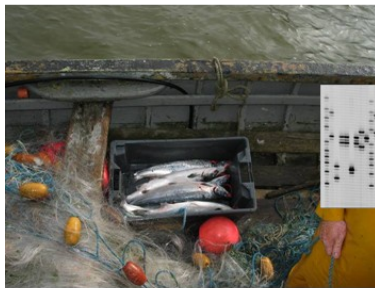
Fluorescent beads observed in shellfish digestive glands

The fluorescent beads are a proxy for the biological agent



The field of ecology has traditionally been based on visual observations but is now using a new tool - Molecular Ecology. While microsatellites and SNPs (hypervariable DNA sequences) are currently the markers of choice for most Molecular Ecology studies, the field is currently undergoing an exponential development phase with next and third generation sequencing technology and the

Holy Grail of Molecular Ecology -individual whole genome sequencing- seems to be on our door step. However, no matter which marker system is used, Molecular Ecology is uniquely adapted to answer questions in ecology that were previously beyond our reach. For instance, on an individual level, reproductive success, parentage, relatedness and pedigrees can be assessed. On a population level we can now identify populations of individuals that are reproductively isolated and estimate the level of connectivity among them (e.g. gene flow, assigning individuals to populations, number of immigrants and meta population structures) as well as elucidate their population



demographic history including time since founding and how many individuals founded them, detect bottlenecks, estimate their effective population size and identify individual genes under directional and balancing selection. On a larger scale molecular markers can be used for phylogenetics which includes identifying and quantifying relatedness among species and determine when these species first occurred. These are exciting times for a Molecular Ecologist, and with the rapid progress in technology and reduced costs for acquiring molecular data, it seems that not even the sky is the limit for where the field of modern Molecular Ecology will take us.

## An Experimental Assessment of the Saline and Thermal Tolerances of *Styela clava*

Niamh McSweeney

*Styela clava* is a solitary sea squirt, that is native to regions in the north-western Pacific. Over the past 80 years it has established itself worldwide and has proven problematic as a fouling organism in many aquaculture settings. *Styela clava* prefers salinities of 35 ‰ and requires temperatures above 15°C for spawning, however individuals can be found in low salinities of 8‰ and temperatures of -2°C. For my MSc thesis, I examined the physiological tolerances of *Styela* to selected abiotic conditions.

The experiments began in June 2011 and ran for a period of 60 days. In total, 336 animals were brought into the AFDC and were kept in constant temperature rooms. The animals were then subjected to a range of fluctuating salinities and temperatures. The results showed that there was no significant difference between the mortality rates of *Styela* during the increasing salinity, increasing temperature and decreasing temperature experiments. However, exposure to decreasing salinities had a significant difference in the mortality rate of *Styela*.



Salinity experiment



Thermal tolerance experiment



*Styela clava* (on an oyster bag)

## A Study of the Growth and Ecology of Common Carp in Ireland

Ross Macklin, PhD Student

Supervisors:- Dr Deborah Chapman & Dr Simon Harrison

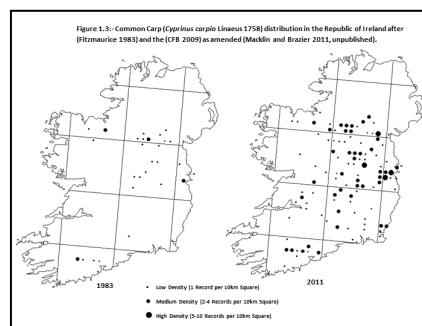


Common carp (*Cyprinus carpio*) growth assessments taking place at The Lough, Cork City

The demand for common carp (*Cyprinus carpio*) as a recreational angling species has increased substantially in the last 20 years in the U.K. and Ireland. Faster growing strains that grow to specimen size (in excess of 20lbs) are desired by anglers. The growth rate of three genetically distinct strains of common carp present in Irish lakes was tested in temperature controlled experiments (at 18°C) at the AFDC in 2010. The results showed that continental European strains of Dutch and French origin grew faster than the Irish strain. The growth rates of genetically distinct populations of common carp in several Irish lakes was also analyzed in this experiment to evaluate comparative growth curves using fin rays and scale samples. Comparisons were also made between the growth rate of Irish carp compared to European strains

and reported averages. The findings of the research will help fisheries managers choose the optimal strain of carp for recreational angling facilities.

My current research aims to investigate common carp distribution and potential impact to natural ecosystems in Ireland. Recent research has revealed that the species increased its range by 336% in the national 10km grid square network since the last published records in 1983 (Macklin & Brazier, unpublished). Further research proposes to evaluate the impact of common carp on the ecology of a fishless, naturalized lake. In addition the impact of different age cohorts of common carp on the vertical distribution of benthic prey will be examined using controlled cage experiments. The interaction between top down and bottom up processes will be elucidated by examining prey production and relating it to changes in sediment pore water chemistry and the overlying water column. The findings of the research will help in the formulation of a fisheries best practice management plan for common carp in Ireland. This will help to minimize their impact to natural lake ecosystems while at the same time accommodating the recreational demand for the species as a sport fish.



Common carp (*Cyprinus carpio*) distribution in the Republic of Ireland

## Aquaculture Talent Hatchery – insights from an e-learning experience

Maria O'Mahoney

AFDC personnel, Dr Maria O'Mahoney, Sarah O'Sullivan and James Dooley, recently took part in the pilot programme of the pan-European Aquaculture Talent Hatchery e-learning course. The Aquaculture Talent Hatchery through the Vocational Aqualabs programme ([www.aqualabs.eu](http://www.aqualabs.eu)) aims to provide training in entrepreneurship skills for early career researchers. The course, entitled "Aquaculture Entrepreneurship Mentorship", utilised a blended learning format that consisted of an e-learning component and local mentorship programme and was conducted over a 6-week duration. The challenge for each of 4 national teams was to compile a business plan for commercialisation of an aquaculture research output. Each team was given the opportunity to pitch their business plan to a panel of industry judges at the Aquaculture Europe conference 2011 in Rhodes, Greece. The ATH award was presented to the most innovative and professional team.

The course was recently showcased at the UCC Leadership Conference in January 2012 where members of academic and industrial sectors were provided with a critical appraisal of the course structure in terms of the student learning experience and success in achieving the targeted learning outcomes.



James Dooley

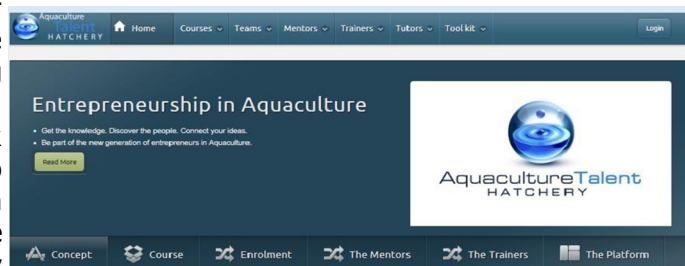


Maria O'Mahoney



Sarah O'Sullivan

### Team Ireland



### The ATH E-Learning Platform





**AFDC**

## Discovery of a New Hydrothermal Vent Site

Alicé Antoniacomi MSc, Research Assistant



**Gallery of photos from the VENTure cruise: (Clockwise from left) ROV Hollander 1; So-called ROV-shack with ROV pilots in ROV control room; Cross-section of a hydrothermal vent chimney with visible water-flow chambers, Deep sea vent shrimp of the genus *Rimicaris***

The VENTure survey to the Mid Atlantic ridge took place between July and August 2010. The expedition, led by UCC, set out to investigate the presence of hydrothermal vents located at the depth of 3 km on the ridge.

The RV Celtic Explorer departed Galway with quite heavy sea conditions and steamed South towards 45N, above the Azores. The site was reached after 5 days of navigation. The research team of geologists and biologists from UCC, Southampton University and the Geological Survey of Ireland scanned the 3km deep waters in search of traces of hydrothermal activity (water chemistry anomalies in temperature, pH and dissolved metals).

This was very similar to finding a needle in a haystack as the Mid Atlantic Ridge is an underwater mountain chain several miles wide lying in the complete darkness under 3km of water.

After a few days of transecting over the target area a strong signal began to show and the ROV was lowered to the bottom of the ocean. Thanks to the amazing expertise of the scientists and the ROV pilots on board this new hydrothermal vent site was found remarkably quickly. The vent chimneys, called black smokers, were standing perfectly structured around the hot and mineral rich water flow that seeped through the earth's crust, seeming elegantly shaped around it. Besides being geologically interesting formations, the vents were also populated with an entire ecosystem of living organisms. Areas around the chimneys were covered in thick clusters of gastropods, and shrimps were browsing; isolated camouflaged crabs and white eel-like fish were also present.

For the next week or so, during the many ROV dives maps of the sea bed were made, high definition pictures and videos were taken and biological and water samples were collected. I was extremely lucky to be part of the biology team and assist in the processing of samples. In the wet lab on-board animals were counted, categorized, measured and photographed. It has been a most instructive and inspiring experience at sea.

## New Appointments



Dr Aaron Maloy recently completed his PhD with the AFDC and Letterkenny Institute of Technology. Aaron has recently joined the Shellfish Health research group as a Postdoctoral Researcher working on EU FP7 BEADS and BIVALIFE projects.



Grainne Darmody joined the AFDC in February 2011 as a research assistant with the Shellfish Health research group. Grainne has worked on the EU FP7 funded NEURONANO project and is currently working on the BEADS project.



Jeanette Carlsson, joined the AFDC in November 2010 as Research Assistant with the Shellfish Health group working on the OYSTERECOVER project (EU FP7). Jeanette will coordinate and perform the genetic research.



Claudia Stauss joined the AFDC from February to September 2011 working on the cetacean observer programme which runs annually in County Mayo.



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