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

University College Cork

2009 Report



ucc

Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

OUR VISION:

EXCELLENCE

in AQUACULTURE and FISHERIES

RESEARCH and DEVELOPMENT

CONTENTS

FORWARD	4
AFDC FACILITIES AND SPECIFICATIONS	4
AQUACULTURE RESEARCH GROUP	4
SHELLFISH HEALTH AND DISEASE GROUP	5
MARINE MAMMAL & FISHERIES RESEARCH GROUP	5
MOLECULAR GENETICS RESEARCH GROUP	6
DEVELOPING RESEARCH CAPACITY	7
AFDC FUNDING – GRANT CAPTURE	7
OUTREACH	9
AFDC GOING FORWARD 2010	9
APPENDIX 1: AFDC AWARDS	10
APPENDIX 2: AFDC FUNDING – ONGOING AND NEW RESEARCH GRANTS DURING 2010	11
APPENDIX 3: AFDC PUBLICATIONS	13
APPENDIX 4: THE SUNDAY TIMES NEWSPAPER ARTICLE	17



FORWARD

The AFDC has now been in existence for 23 years. As a research centre based within the Department of Zoology, Ecology & Plant Science and affiliated to the ERI, the centre is a research cluster focusing on fisheries, aquaculture, molecular ecology and shellfish health. The centre has 5 PI's, a manager, 2 Senior Researchers, 5 Post-doctoral fellows, 12 PhD students, 3 MSc students and 4 Research Assistants. During 2009, the centre had ongoing research funding of €7,755,186, with €1,282,765 new funding brought in during the year, demonstrating that the centre was able to respond well to the downturn in national funding by focusing on other funding opportunities such as EU FP7 and ERDF INTERREG. This will continue to be a focus during 2010 as well as continuing to maximise the output of high impact publications and the training of PhD and MSc students.

THE AQUACULTURE & FISHERIES DEVELOPMENT CENTRE, UCC

The Aquaculture & Fisheries Development Centre is a 1200 m² complex with facilities to carry out fisheries and aquaculture research including two tank rooms with tropical marine system freshwater and marine recirculation units, broodstock conditioning units, shellfish on-growing units, filter-feeder broodstock conditioning units, a larval culture system and live food culture facilities. Continued upgrading during 2009 included the installation of a back-up generator and a walk-in freezer to enhance sample storage capacity at the facility. A large number of samples have been collected by The Marine Mammal & Fisheries Research Group over a number of years and this measure will help to preserve the integrity of historical samples and provide critical capacity for future sample collection.

AQUACULTURE RESEARCH GROUP - Prof. Gavin Burnell *Principal Investigator*

Post-doctoral researchers - 2; PhD students - 2

Research at the Aquaculture Research Group continued on the central theme of sustainable development of aquaculture and fisheries in Ireland. Within the group, Ms Maria O'Mahoney was awarded a PhD for a thesis entitled "Development of a novel binder for aquaculture: application of a konjac glucomannan-xanthan gum binder to formulated feed development for the sea urchin *Paracentrotus lividus* and abalone *Haliotis discus hannai*" (Supervisors: Prof. Gavin Burnell, Dr Gerry Mouzakitis, Prof. Edwin Morris). Commercialisation of the UrchinPlatter™ System continued on a global scale with Gourmet Marine Ltd. fully operational as a UCC start-up commercial enterprise. Joint research with the Marine Mammals & Fisheries Research Group focused on analyses of the diets of Bottlenose dolphin and Atlantic white-sided dolphin under the Beaufort "Ecosystem Approach to Fisheries Management".

Towards the end of 2009, Prof. Gavin Burnell became involved in the Valentia Harbour Scallop Project as a marine biology expert and scientific advisor. This project will involve collaboration between the AFDC, The Daithi O Murchu Marine Research Centre, Bantry, Co. Cork working on a scallop genetics programme and NUI Galway.

Post-doctoral researchers - 1; PhD Students - 3

Two students within the group, Jan Fermer & Katrin Prinz were awarded PhD's based on their theses "Parasitological investigations of soft sediment bivalves, with particular reference to the digenean trematode *Meiogymnophallus minutes*" and "Macroparasites in intertidal molluscs of the Irish coast: occurrence and transmission in rocky shore habitats", respectively. Both had completed their studies within 3 years with a number of publications from the theses being produced during 2009. As part of the MSc Marine Biology based in ZEPS, Ms Emer Morgan completed an MSc thesis on "An Investigation of *Cerastoderma edule* mortality in Southwest Ireland". Dr Culloty was awarded €18,399 under the ERDF INTERREG 4A Ireland: Wales Scheme for a collaborative project with Bangor, Aberystwyth and Swansea Universities on "Shellfish productivity in the Irish Sea: working towards a sustainable future". The project runs from October 2009 to December 2012. The project has appointed Dr Sharon Lynch as PDR and three PhD students will be appointed in early 2010. The project is investigating the influence of climate change on shellfish aquaculture and fisheries in the Irish Sea. The AFDC group will look at the relationship between climate change and the influence of the role of parasites and disease within shellfish in the Irish Sea. The group are working on a range of shellfish including oysters, clams, cockles and mussels. Dr Culloty was also appointed to the EU Aquaculture & Technology Innovation Platform that will input into the direction of EU strategy and research up to 2020.

MARINE MAMMAL & FISHERIES RESEARCH GROUP - Dr Emer Rogan *Principal Investigator****Post-doctoral researchers - 1; PhD students - 5; MSc students - 4***

A number of projects were on-going during 2009. Under the theme *marine mammal – fisheries interactions*, Beaufort (EAFM) PhD student Ms Gema Hernandez-Milian, investigated the diet of bottlenose dolphins and white-sided dolphins stranded on Irish coasts since 1993. This study utilized a considerable archived sample-set housed within the AFDC. The results were presented during the 1st All Ireland Mammal Symposium in Waterford in November 2009. Gema is also investigating the diet of stranded and by-caught striped dolphins in Ireland which will provide empirical data that will provide a greater understanding of the ecosystem dynamics around the Irish coast necessary for holistic fisheries management models. As part of the MSc in Marine Biology, Eavan O'Leary looked the distribution and morphometrics of mesopelagic fishes in the NE Atlantic, fitting in with the Beaufort project; Mark Hosford used tour boat to examine distribution of bottlenose dolphins in the Shannon estuary and Roisin Pinfield looked at exposure to tour boats by bottlenose dolphins in the Shannon estuary. In conjunction with Michelle Cronin in the CMRC, Sue Gregory looked at moulting patterns in harbour seals for her MSc.

Acoustic recordings using a single element hydrophone and a solid state recorder were made during photo-identification surveys for bottlenose dolphins, resulting in 6 hours of recordings collected on the west coast of Ireland. Whistle contours will be compared to the whistle repertoires between different communities of bottlenose dolphins in Irish waters as part of a PhD (A. Englund, PhD student funded by IRCSET).

Mr Hocine Benchikh began his PhD research in 2009 modelling the ecology, population dynamics, assessment and management of "the Dublin Bay Prawn" *Nephrops norvegicus* around Ireland. This project is mainly focussed on the stock assessment process through spatio-temporal investigations using geostatistical analysis tools.

A PhD study on "the life history, ecology and dynamics of the black scabbard fish, *Aphanopus carbo*, in the deep water ecosystem of the North East Atlantic" continued (Ms Ana Santos, PhD student). To date, this study has compared the size frequency distributions, sex ratio and reproductive dynamics of *A. carbo* from the NW Scotland, Ireland and Madeira. The overall aim of this project is to relate the biology of this species to current management practises, as defined under the Common Fisheries Policy, with a view to recommending appropriate management guidelines for *A. carbo* stocks in various fishing areas into the future.

Mr Deepak George Pazhayamadom is working on “the application of signal detection methods to the fisheries management system” for his PhD. This project aims to develop an alternative monitoring method for managing fisheries from the theory of Statistical Process Control (SPC) so as to put forward a sound qualitative approach that could be integrated with the existing quantitative methods in fisheries management.

MOLECULAR GENETICS RESEARCH GROUP - Prof. Tom Cross *Principal Investigator Principal Investigators - 1; Senior Researchers - 2; Post-doctoral researchers - 1; PhD students - 2; MSc students - 3; Research Assistants - 4*

2009 saw the launch of the EU INTERREG (Ireland-Wales) funded Celtic sea trout project, co-ordinated by the University of Bangor and also in partnership with the Central Fisheries Board, Queens University Belfast and the Environment Agency in the UK. This project which is worth €2.1 million (with €70,000 awarded to UCC who are co-ordinating the genetics component of the study), aims to fill a major gap in the knowledge & management of sea trout fisheries. It asks where sea trout go at sea; how their populations are interlinked, and how to optimise economic benefits whilst protecting biodiversity. A research assistant has been recruited for a duration of 30 months and a post-doctoral researcher will be employed at a later stage in the study. Other work carried out in 2009 included the progression of the SALSEA-Merge project for which UCC is genetically analysing post-smolts at sea.

Other new projects awarded in 2009 were the Ireland-Newfoundland partnership marine research award of €2,740 which will fund the Beaufort program’s PhD student (Ciar O’Toole) to travel to Canada for two months during 2010 and work with Dr Ian Fleming of Memorial University in St John’s. Another INTERREG project bid was successful, the AARC (Atlantic Arc) project in partnership with the Shannon Regional Fisheries Board and the Westcountry Rivers Trust in Cornwall, brings over €200,000 in funding to UCC. Finally, a project in conjunction with (and funded by) the Central Fisheries Board, the Conservation Limit Attainment Project, got underway. This is worth €20,000 between October 2009 & September 2010, and a research assistant (Ms. Serena Keane) was hired in October to carry out the field component of this work. A post doctoral researcher is also being funded for 3 months from this award. This work will build on the National Atlantic Salmon Genetic Stock Identification project which ran from 2006-2007 by expanding the genetic baseline.

The lab hosted two fourth year students to carry out their final year (B.Sc.) thesis work – Niall O’Sullivan worked on parental analysis of trout, while Barbara Burke worked on genetic analysis of ranched strains of Atlantic salmon. One MSc student also completed a study in the lab – Alice Antoniacomi carried out a study of temporal and spatial genetic variability in Atlantic salmon in conjunction with the SALSEA Merge project.



DEVELOPING RESEARCH CAPACITY

The AFDC has continued to develop substantial research strengths through participation in national and international research collaborations. The diversity of funding programmes awarded to AFDC researchers supports numerous research studentships (PhD and MSc) and Post-doctoral fellowships with a diversity of research backgrounds.

AFDC personnel continue to be involved in committee participation at national level such as the Marine Institute and are involved in collaborative projects with Irish and European partners. Collaborations are ongoing with colleagues in Europe, North America, Australia and Asia.

AFDC FUNDING - GRANT CAPTURE

During 2009, research projects funded externally to the value of €7,755,186 were ongoing at the AFDC. Of this figure, €1,282,765 was funding secured and commenced in the 2009 from seven new research projects. Of new funding secured during 2009, 89% was from European Union Funding programmes (FP7 & ERDF) with national sources accounting for the remaining 11% of funding secured. During 2009, Dr Sarah Culloty and Dr Jens Carlsson also received confirmation of additional funding to the value of €30,894 from the EU FP7 funding programme for a project entitled “Establishing the scientific bases and technical procedures and standards to recover the European flat oyster production through strategies to tackle the main constraint bonamiosis (OYSTERCOVER)” which will commence in 2010.

Overall, national sources accounted for 82% of funding for research projects at the AFDC, with Marine Institute support accounting for 74% of this total (Figure 1). Notably, during this period, European Union FP7 funding and ERDF funding each accounted for 5% and 13%, respectively, of the total funding allocation to the AFDC. This represents an increase from 5% total European Union funding in the 2007-2008 reporting period resulting from increased efforts to secure non-Exchequer funding since that period (Figure 2). The AFDC has responded well to the downturn in opportunities to procure national funding.

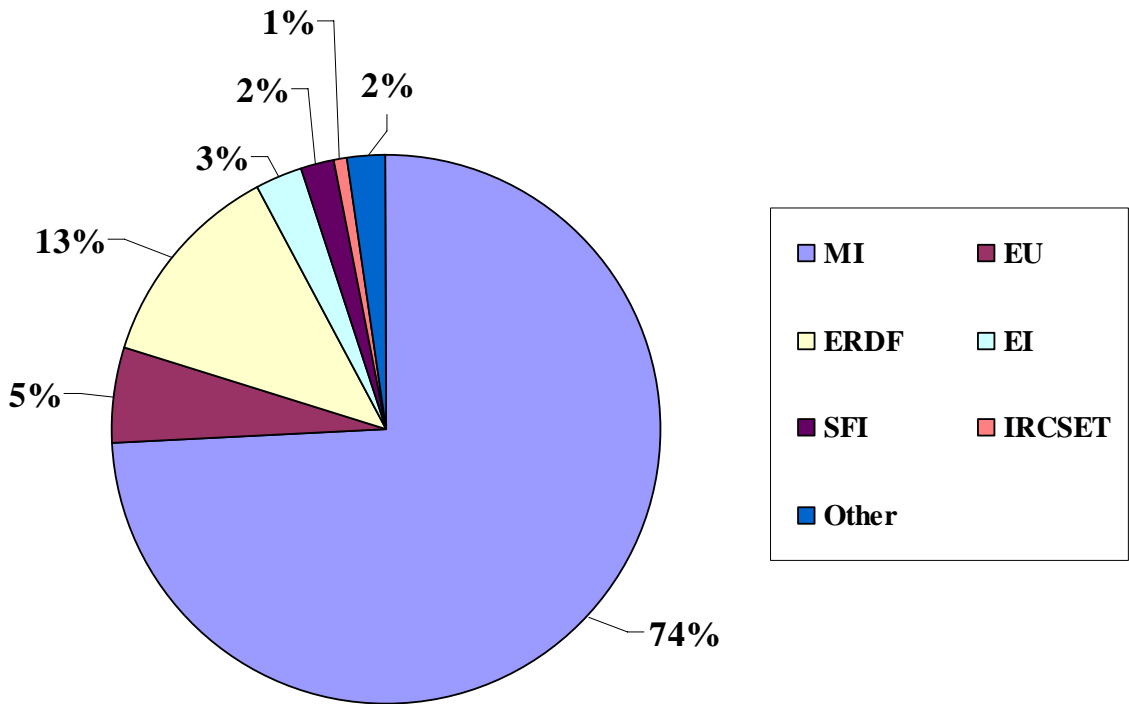


Figure 1. Allocation of research monies received during 2009 from different funding bodies

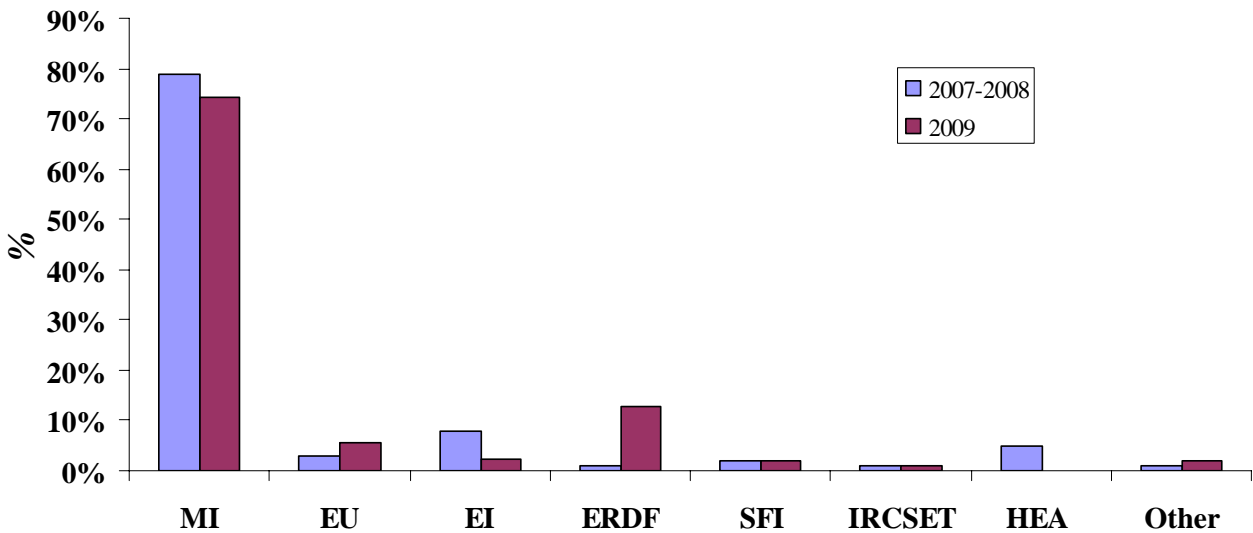


Figure 2. Comparative Funding Source Allocation, 2007/2008 & 2009

OUTREACH

During 2009, the AFDC co-hosted a series of seminars with the Department of Zoology, Ecology & Plant Science.

- Blight, A. (2009). Development of a methodology for the quantitative assessment of Ireland's inshore kelp resource. AFDC/ZEPS Seminar Series, 22nd April, University College Cork.
- Regan, E. (2009). Irish Biodiversity. AFDC/ZEPS Seminar Series, 1st April, University College Cork.
- Van Dover, C.L. (2009). Moiling for gold in the deep-sea: Environmental challenges. AFDC/ZEPS Seminar Series, 17th December, University College Cork.

A newspaper article written by Jan Battles and published in The Sunday Times on 15th November, 2009 entitled "Research shows captive-bred salmon put their wild cousins at risk" highlighted the work of the Molecular Genetics Research Group and associated research groups working on the Burrishoole River System Atlantic Salmon project. Dr Phil McGinnity (Beaufort Fish Population Genetics Principal Investigator) was quoted in this articles (Appendix 4).

AFDC GOING FORWARD 2010

The strategy for the AFDC going forward is to continue to concentrate on attracting funding with an increasing emphasis on non-national sources of funding.

APPENDIX 1: AFDC AWARDS 2009

Ph.D. Theses

Jan Fermer - “Parasitological investigations of soft sediment bivalves, with particular reference to the digenean trematode *Meiogymnophallus minutes*” (Supervisors: Dr Sarah Culloty, Dr Ruth Ramsay & Dr Tom Kelly)

Maria O’Mahoney - “Development of a novel binder for aquaculture: application of a konjac glucomannan-xanthan gum binder to formulated feed development for the sea urchin *Paracentrotus lividus* and abalone *Haliotis discus hannaï*” (Supervisors: Prof. Gavin Burnell, Dr Gerry Mouzakitis, Prof. Ed Morris)

Katrin Prinz - “Macroparasites in intertidal molluscs of the Irish coast: occurrence and transmission in rocky shore habitats” (Supervisors: Dr Sarah Culloty, Dr Ruth Ramsay & Dr Tom Kelly)

M.Sc. Theses

Morgan, E. - “An Investigation of *Cerastoderma edule* mortality in Southwest Ireland” (Supervisor: Dr Sarah Culloty & Dr Ruth Ramsay)

Pinfield, R. - “Ecotourism and habitat use of bottlenose dolphins *Tursiops truncatus* in the Shannon estuary” (Supervisor: Dr Emer Rogan)

Hosford, M. - “Habitat use by the bottlenose dolphin *Tursiops truncatus* in the Shannon estuary” (Supervisor: Dr Emer Rogan)

O’Leary, E. - “Growth data and otolith atlas for mesopelagic fishes of the Northeast Atlantic sampled aboard the Blue whiting acoustic survey 2009” (Supervisor: Dr Emer Rogan)

Gregory, S. - “Assessment of the moulting phenology of harbour seals (*Phoca vitulina vitulina* L.) in southwest Ireland using photogrammetric techniques” (Supervisor: Dr Emer Rogan, Dr Michelle Cronin)

APPENDIX 2: AFDC FUNDING – ONGOING AND NEW RESEARCH GRANTS DURING 2009

2009 Funding

Cross, T.F. & McGinnity, P. Sea Trout project: Genetic Stock Identification of sea trout stocks. EU INTERREG, 2009-2012, €59,830.

Cross, T.F. & McGinnity, P. Deel river project : Genetic Stock Identification of Atlantic salmon in the Deel river (Moy system). Marine Institute (Aquaculture and Catchment Management Services division), 2009-2010, €15,000.

Cross, T.F. & McGinnity, P. Limit Attainment Project. Central Fisheries Board, 2009-2010, €120,536.

Cross, T.F. & McGinnity, P. Ireland-Newfoundland Partnership Marine research Grant, 2009-2010, €2000.

Culloty, S.C. Shellfish productivity in the Irish Sea: working towards a sustainable future (SUSFISH). ERDF INTERREG 4A, 2009-2012, €18,399.

Sheehan, D., Davenport, J. & Culloty, S.C. Do nanoparticles induce neurodegenerative diseases? Understanding the origin of reactive oxidative species and protein aggregation and mis-folding phenomena in the presence of nanoparticles. EU 7th Framework (Prof. D. Sheehan, Biochemistry PI), 2009-2013, €67,000.

2008 Funding

Cross, T.F. & McGinnity, P. SALSEA – Merge: Advancing understanding of salmon at sea: Merging genetics and ecology to resolve stock specific migration and distribution patterns. EU RTD FP7, 2008-2011, €54,609.

Cross, T.F. & McGinnity, P. Irish cod breeding programme. Marine Institute, 2008-2015, €13,088.

Cross, T.F. & McGinnity, P. Norwegian Research Council: Natural Selection in farmed Atlantic salmon. Norwegian Research Council, 2008-2010, €3,810.

Cross, T.F. & McGinnity, P. Genetic Stock Identification of Atlantic salmon in the Castlemaine fishery, Co. Kerry. South Western Regional Fisheries Board, 2008-2010, €0,000.

Mouzakitis G. Gourmet Plus. Enterprise Ireland Commercialisation Fund 2008, 2008-2009, €201,695.

Rogan E. & E. Codling. Develop and test through simulation a suite of measures that will contribute to rebuilding depleted fish stocks in waters around Ireland. Marine Institute, 2008-2014, €25,570.

Rogan E. & E. Codling. Modelling the ecology, population dynamics, assessment and management of Nephrops (*Nephrops norvegicus*) in the waters around Britain & Ireland. Marine Institute, 2008-2011, €105,000.

Rogan E. & E. Codling. The application of signal detection methods to the fisheries management system. Marine Institute, 2008-2012, €15,000.

Rogan E. The life history, ecology and dynamics of the Black Scabbard (*Aphanopus carbo*) in the deep water ecosystem of the North East Atlantic. Marine Institute, 2008-2012, €15,000.

2007 Funding

Burnell G. & Cummins V. Beaufort Marine Research Award: Ecosystem approach to fisheries management. Irish Government NDP administered by Marine Institute, 2007-2014, €1,860,004.

Cross, T.F. & McGinnity, P. Beaufort Marine Research Award: Fish population genetics. Irish Government NDP administered by the Marine Institute, 2007-2014, €2,710,236.

Cross, T.F. & McGinnity, P. Post Smolt test survey. Genetic Stock Identification of Atlantic salmon post smolts. Marine Institute (Aquaculture and Catchment Management Services division), 2007-2010, €2,400.

2006 Funding

Davenport J. How do crabs keep their eyes clean? Lessons for advanced technology. IRCSET, 2006-2009, €72,009.

Rogan E., S. Ingram & T. Cross. Population structure of bottlenose dolphins along the west coast of Ireland. Science Foundation Ireland, 2006-2009, €155,000.

APPENDIX 3: AFDC PUBLICATIONS

JOURNALS

- Bogaards, J.A., **Kraak, S.B.M.** & Rijnsdorp, A.D. (2009). Bayesian survey-based assessment of North Sea plaice (*Pleuronectes platessa*): extracting integrated signals from multiple surveys. *ICES Journal of Marine Science*, 66, 665-679.
- Cronin, M., Zuur, A.F., **Rogan, E.** & McConnell, B.J. (2009). Using mobile phone telemetry to investigate the haul-out behaviour of harbour seals *Phoca vitulina vitulina*. *Endangered Species Research*, 10, 255-267.
- Cronin, M.A., Zuur, A.F., Ingram, S. and **Rogan, E.** (2009). *A modeling framework to optimize timing of haul-out counts for estimating harbour seal abundance*, NAMMCO Scientific Publications (In press).
- Fermer, J., Culloty, S.C.,** Kelly, T.C. & O’Riordan, R.M. (2009). Intrapopulational distribution of *Meiogymnophallus minutus* (Digenea, Gymnophallidae) infections in its first and second intermediate host. *Parasitology Research*, 105, 1231-1238.
- Kraak, S.B.M.,** Daan, N. & Pastoors, M.A. (2009). Biased stock assessment when using multiple, hardly overlapping, tuning series if fishing trends vary spatially. *ICES Journal of Marine Science*, 66, 000-000.
- Luque, P.L., Pierce G.J., Learmonth J.A., Santos M.B., Ieno E., López A., Reid R.J., **Rogan, E.,** González, A.F., Boon, J., Law, R.J. & Lockyer, C.H. (2009). Dentinal anomalies in teeth of harbour porpoises (*Phocoena phocoena*) from Scottish waters: are they linked to sexual maturation and environmental events? *Journal of the Marine Biological Association*, 89 (5), 893-902.
- Malham, S.K., Cotter, E., O’Keeffe, S., Lynch, S., Culloty, S.C.,** Latchford, J.W. & Beaumont, A.R. (2009). Summer mortality of the Pacific oyster *Crassostrea gigas* in the Irish Sea: The influence of temperature and nutrients on health and survival. *Aquaculture*, 287, 128-139.
- Maloy, A.P., Culloty, S.C.** & Slater J.W. (2009). Use of PCR DGGE to investigate the trophic ecology of marine suspension feeding bivalves. *Marine Ecology Progress Series*, 381, 109-118.
- McCarron, E., Burnell, G. & Mouzakitis G. (2009).** Growth assessment on three size classes of the purple sea urchin *Paracentrotus lividus* using continuous and intermittent feeding regimes. *Aquaculture*, 288, 83-91.
- McGinnity, P.,** Jennings, E., deEyto, E., Allott, N., Samuelsson, P., Rogan, G., Whelan, K. & **Cross, T.** (2009). Impact of naturally spawning captive-bred Atlantic salmon on wild populations: depressed recruitment and increased risk of climate-mediated extinction. *Proceedings of the Royal Society B*, 276, 3601-3610.
- Mirimin, L.,** Westgate, A., **Rogan, E.,** Rosel, P., Read, A., **Coughlan, J. & Cross, T.** (2009). Population structure of short-beaked common dolphins (*Delphinus delphis*) in the North Atlantic ocean as revealed by mitochondrial and nuclear genetic markers. *Marine Biology*, 156, 821-834.
- Murphy, S., Winship, A., Dabin, W., Jepson, P.D., Deaville, R., Reid, R.J., Spurrier, C., **Rogan, E.,** López, A., González, A., Read, F., Addink, M., Silva, M., Ridoux V., Pierce G.J. & Northridge, P.S. (2009). Assessing life history parameters of female common dolphins *Delphinus delphis* in the eastern North Atlantic, and investigating density dependent compensatory responses. *Marine Ecology Progress Series*, 388, 273-291.
- O’Riordan, R.M. **Culloty, S.** Davenport J & McAllen R (2009). Increases in the abundance of the invasive barnacle *Austrominius modestus* on the Isle of Cumbrae. *Scotland Biodiversity Records*, 2, 1-4.
- Prinz, K.,** Kelly, T.C., O’Riordan R.M & **Culloty S.C.** (2009). Infection of *Mytilus edulis* by the trematode *Echinostephilla patellae* (Digenea: Philophthalmidae). *Journal of Helminthology*, 84, 193-198.

Prinz, K., Kelly, T.C., O’Riordan, R.M. & Culloty, S.C. (2009). Non-host organisms affect transmission processes in two common trematode parasites of rocky shores. *Marine Biology*, 156, 2303-2311.

Sagarin, R., **Carlsson, J.**, Duval, M., Freshwater, W., Godfrey, M., Litaker, W., Munoz, R., Noble, R., Schultz, T. & Wynne, B. (2009). Bringing molecular tools into environmental resource management: Untangling the molecules to policy pathway. *PLoS Biology*, 7, 426-430.

Stefánsson, M.Ö., Sigurdsson, T., Pampoulie, C., Daniélsdóttir, A. K., Thorgilsson, B., Ragnarsdóttir, A., Gíslason, D., **Coughlan, J., Cross, T.F.** & Bernatchez, L. (2009). Pleistocene genetic legacy suggests incipient species of *Sebastes mentella* in the Irminger Sea. *Heredity*, 102, 514-524.

BOOKS/CHAPTERS IN BOOKS

Burnell, G. & Allan, G (Eds). (2009). New technologies in aquaculture: Improving production efficiency, quality and environmental management. Woodhead Publishing Ltd. pp 1162.

REPORTS

Carvalho, G., Helyar, S., Bekkevold, D., Volkert, F., Hanel, R., McPhee, D., Ford, M., **Carlsson, J.**, Trautner, J., Ogden, R. and Martinsohn, J. (2009). Review the current status of traceability methods in the fisheries sector based on genetics. ICES WGAGFM Report.

Coughlan, J., McGinnity, P. & Cross, T. (2009). Genetic Stock Identification of southeast Ireland rivers and prioritising small rivers for conservation. Final report to the Southern Regional Fisheries Board, December 2009.

CODA 2009. Cetacean Offshore Distribution and Abundance in the European Atlantic (CODA). Report available from SMRU, Gatty Marine Laboratory, University of St Andrews, St Andrews, Fife KY16 8LB, UK. (**with Dr E. Rogan, AFDC**)

Cross, T.F., McGinnity, P., Carlsson, J., Coughlan, J., Dillane, E., deEyto, E., Ferguson, A., Fitzgerald, R. & Prodöhl, P.A. (2009). Possible genetic interactions between reared strains and wild populations of cod (*Gadus morhua*): lessons from salmon (*Salmo salar*) common garden field experiments. ICES CM 2009/Q:10, ASC Berlin, September, 2009.

Fogarty B., **McCarthy, M.**, Duignan, L., **Culloty, S.**, Davenport, J. & Alderman, J. (2009). Demonstration of a miniaturised multichannel cytometry system and its suitability for autonomous deployment. STRIVE Programme 2007-2013 (AT/04/01/07). <http://www.epa.ie/2>

Ingram, S., **Kavanagh, A., Englund, A., & Rogan, E.** (2009). Site assessment of the water of northwest Connemara. A survey of bottlenose dolphins (*Tursiops truncatus*). Report to National Parks and Wildlife Service. University College Cork, 34 pp.

INFORMAL OR NON-REFEREED PUBLICATIONS

Cross, T.F., McGinnity, P., Carlsson, J., Coughlan, J., Dillane, E., deEyto, E., Ferguson, A., FitzGerald, R. and Prodöhl, P. (2009). Possible genetic interactions between reared strains and wild populations of cod (*Gadus morhua*): relevance of findings from salmon (*Salmo salar*) common-or-garden field experiments. *Conseils Internationale pour l'Exploration de la Mer C.M.* Doc. 2009/Q:10, 15p.

Dillane, E., McGinnity, Cross, T. & Coughlan, J. (2009). Wild or farmed? Using DNA to identify the origin of Atlantic salmon. Newsletter item, April 2009.

CONFERENCE PRESENTATIONS

Oral Presentations:

Carlsson, J., Schultz, T., Jones, R., Sobel, A., Thaler, A., Zelnio, K.A. and Van Dover, C.L. (2009). Facilitating small-scale population genetic studies at the Manus basin hydrothermal vent fields (Bismarck Sea). 4th International Symposium on Chemosynthetic-Based Ecosystems, Okinawa, Japan, 28 June - 3 July.

Coughlan, J., Carlsson, J., McGinnity, P., McCarthy, G., Campion, S., **Dillane, E.,** Prodöhl, P., Roche, W., **Cross, M. & Cross, T.** (2009). Exploiting natural resources within regional commonages: Identifying the risk to genetic complexity and biodiversity when there is large asymmetry in sizes of contributing populations. *Symposium - Integrating Population Genetics and Conservation Biology*. Trondheim, Norway, 23-26 May.

Coughlan, J. (2009). Review of results of Southern Regional Fisheries Board Genetics Project. SRFB Board Meeting, Clonmel, Co Tipperary, 31 March.

Coughlan, J. (2009). Farmed escapes introgression in Donegal rivers: Evidence from contemporary samples. NRC Project Meeting, Marine Institute, Newport, Co Mayo, 24 August.

Hsing, P.-Y., **Carlsson, J.**, Jones, R., Sobel, A., Thaler, A., Van Dover, C.L. and Schultz, T. (2009). Evolution of the Metallothionein gene family in bathymodiolin mussels. 4th International Symposium on Chemosynthetic-Based Ecosystems, Okinawa, Japan, 28 June - 3 July.

Johnston, C., Hynes, R., **McGinnity, P., Coughlan, J.,** Crozier, W., **Cross, T.** and Prodöhl, P.A. (2009). Long-term (18 yrs) genetic impact of hatchery and farm escapees on local Atlantic salmon populations in Donegal Rivers, NW Ireland. International Conference on Evolutionary Ecology of Fishes Diversification, Adaptation and Speciation, Berlin, Germany, 23-25 November.

Magee, J., Hynes, R., Igoe, F., **McGinnity, P.,** O'Donnell, L. and Prodöhl, P.A. (2009). Population evolutionary genetics of brown trout from Lough Derg, Ireland. International Conference on Evolutionary Ecology of Fishes Diversification, Adaptation and Speciation, Berlin, Germany, 23-25 November.

Magee, J., Hynes, R., Igoe, F., **McGinnity, P.,** O'Donnell, L. and Prodöhl, P.A. (2009). Lough Derg Brown Trout: A Genetic Perspective. Shannon Waters - Managing fisheries in challenging times - Conference hosted by the Shannon Regional Fisheries Board. Limerick, April.

McGinnity, P. (2009). Observations from National (Ireland) Atlantic salmon Genetic Stock Identification Project & SALSEA-Merge Project. Genetics Workshop, Celtic Sea Trout Project, Bangor Wales, 28 October.

McGinnity, P. (2009). Climate change and captive bred animals in the wild. European Science Foundation sponsored workshop, Thermal adaptation in aquatic ectotherms, 15-19 June.

McGinnity, P. & deEyto, E. (2009). The importance of spawning habitats in the design of sampling strategies for assessment of CL attainment. Central and Regional Fisheries Board Catchment Wide Electro-Fishing Workshop, Aasleagh Lodge, Erriff Fishery, June.

McGinnity, P. (2009). Using genetics as an aid to fisheries management and stock restoration. Shannon Salmon Rehabilitation Group, Limerick, April.

McGinnity, P. (2009). What can genetics tell us about the biology of the Atlantic salmon in the Moy River? Moy Salmon Festival, Ballina, July.

McGinnity, P. & Ó Maoileidigh, N. (2009). Some considerations on the use of hatcheries for management of Atlantic salmon. "Saumon Atlantique: Pour une Bonne Gestion des Habitats et des Salmonicultures de Repeuplement" Colloquium organised by ONEMA (French Ministry of Agriculture & Fisheries) Oloron-Sainte-Marie, October.

McGinnity, P. (2009) SALSEA-Merge genetics: Progress. SALSEA-Merge General Assembly, Bergen, March.

McGinnity, P. (2009). Using genetics as an aid to fisheries management and stock restoration. Shannon Waters - Managing Fisheries in Challenging Times, Fisheries Awareness Week 2009, Shannon Catchment Annual Conference, April.

McGinnity, P. (2009). Some considerations on the use of hatcheries for management of Atlantic salmon on the Slaney River. Is the Slaney salmon at a critically low level? Discussion on potential measures for its recovery. Workshop organised in Swords Co. Dublin, by the Central Fisheries Board, February.

McGinnity, P. (2009). Spring Salmon: some genetic considerations. Presentation to Salmon Watch Ireland Group, Limerick, January.

Mirmin, L., Miller, R., Ingram, S., Berrow, S., **Cross, T. & Rogan, E.** (2009). Genetic variability and isolation of a resident population of bottlenose dolphins (*Tursiops truncatus*) in the Shannon estuary, West of Ireland. 1st All Ireland Mammal Symposium, 6th-8th November, Waterford, Ireland.

Miller, R., Mirmin, L., Ingram, S., **Cross, T. & Rogan, E.** (2009). Insights into the population structure of Bottlenose Dolphins (*Tursiops truncatus*) resident in the Shannon Estuary, Western Ireland, as revealed by nuclear genetic markers. 23rd Annual Conference of the European Cetacean Society, 2-4 March, Istanbul, Turkey.

Thaler, A.D., **Carlsson, J.**, Hsing, P.-Y., Jo, P., Jones, R., Schultz, T., Van Dover C.L. (2009). Genetic variation and population structure of *Ifremeria nautilei* from Manus Basin. 4th International Chemosynthesis-Based Ecosystems Symposium, Okinawa, Japan, 29 June – 3 July.

Poster Presentations:

Hernandez-Milian, G. & Rogan E. (2009). Preliminary insights into the diet and foraging behaviour of Bottlenose Dolphins (*Tursiops truncatus*) in Ireland. 1st All Ireland Mammal Symposium, 6th-8th November, Waterford, Ireland.

From Times Online

November 15, 2009

Research shows captive-bred salmon put their wild cousins at risk

The findings of a study by Irish scientists claim conservation strategies could put wild populations at greater risk

Jan Battles

SALMON bred in captivity and released into the wild could put whole populations at risk of extinction from global warming, a new study shows.

Although it is a common conservation strategy to release captive-bred animals to boost endangered species, Irish scientists say it could put salmon at increased risk of being wiped out by climate change.

They have found that a wild population of Atlantic salmon, into which a large number of captive-bred fish was released, will be less able to adapt to the higher winter temperatures expected in 60 years' time.

The researchers concluded that captive animals should be prevented from breeding in the wild as they affect the native population's ability to adjust to climate change "to such an extent that under projected future climates, its future existence is threatened".

Their findings are likely to hold true for most fish and cold-blooded animals that are at risk from future temperature rises, and where captive-breeding programmes are used in population management.

Every year, millions of hatchery fish are released into the wild, either to maintain fisheries for anglers or in an effort to boost declining wild stocks. A research team from University College Cork, Trinity College Dublin and Dundalk Institute of Technology analysed data collected by the Marine Institute in Mayo from the Burrishoole river system, where Atlantic salmon come to spawn. It also has a hatchery from which fish are released each year.

Since 1969, a series of traps has counted the adult salmon returning from the sea to the river to lay their eggs, as well as the smolts — juvenile fish — on their way out to sea. From this, the scientists worked out the survival rate and mapped it against the number of eggs from hatchery fish in the spawning population. They compared the survival rates against water temperature for the same years.

They found that the warmer the winter, the poorer the survival rate. It also decreased as more captive-bred fish were introduced into the spawning cohort.

Philip McGinnity from UCC's department of zoology and study leader with Eleanor Jennings, said: "The winter temperatures seem to be harder on the eggs when there are a lot of hatchery fish in the population."

The eggs and young offspring of hatchery fish are less adaptable to changes in the environment because they have been pampered, with freely available food and an absence of predators. This means they don't benefit from natural selection. Their eggs are smaller than wild salmon's, as they do not need as many reserves in the hatchery. Wild-salmon eggs have adapted so as to have enough energy to survive until insects and other food are available in the spring.

As winter temperatures in the river increase — a rise of between 0.8 and 2.3 degrees Celsius is projected for January in 60 years — all eggs will have poorer survival rates, because they will hatch earlier than normal when food is not plentiful. This is more severe on the smaller eggs of hatchery fish.

The researchers believe that hatchery fish are interbreeding with wild adults, producing hybrid offspring with a medium ability to adapt to the natural environment.

Writing in the Proceedings of the Royal Society journal, the researchers said: "Our results suggest that high levels of gene flow from the hatchery can impair the adaptive capacity of the Burrishoole wild-salmon population enough to jeopardise its long-term viability.

"Rather than imposing an additional genetic load on wild populations by releasing mal-adapted, captive-bred animals, we propose that efforts should focus on optimising conditions for adaptation to occur by reducing exploitation and protecting critical habitats."



CONTACT:

The Aquaculture & Fisheries Development Centre

Department of Zoology, Ecology & Plant Science

School of Biological, Earth & Environmental Sciences

Distillery Fields, North Mall

Cork, Ireland

Director: Dr Sarah Culloty

Manager: Dr Maria O'Mahoney

Email: m.omahoney@ucc.ie; s.culloty@ucc.ie

<http://afdc.ucc.ie>