

**Proceedings of the Third Annual
Invasive Species Ireland Forum**

‘Celebrating Success, Learning From the Past’

Monday 6th and Tuesday 7th April 2009

The Queen’s University of Belfast
Medical Biology Centre

1. Background

The 2009 Invasive Species Ireland Forum was hosted by The Queen's University of Belfast. The Forum was organised by the Invasive Species in Ireland project and funded by the National Parks and Wildlife Service and the Northern Ireland Environment Agency. Registration for the Forum was open to all interested stakeholders and parties.

Presentations were given from government agencies, NGO's, private sector, and universities. The event and the following open debate, was tailored to provide the audience with information on progress since the last Forum; an overview of progress in Ireland; and help identify challenges and facilitate progress in the future.

2. Invasive Species Ireland Forum 2009 Programme

6th – Evening Session (5.30-8pm)

Session	Location	Time
Registration and poster session	Foyer, Medical Biology Centre, Queen's University Belfast	17.30 – 18.00
Presentation by Guest Speaker – Dr. Jill Key	Lecture Theatre 1, Medical Biology Centre, Queen's University Belfast	18.00 – 19.00
Poster Session and Reception	Foyer, Medical Biology Centre, Queen's University Belfast	19.00 – 20.00

7th – ISI Forum (10-5.30pm)

Chair: Matthew Jebb, National Botanic Gardens			
Session	Title	Speaker	Time
Registration			9.00 – 10.00
Session 1: IAS Legislative Framework and Information Management	Introduction to Forum and Phase II of ISI	Graham Seymour, NIEA	10.00 – 10.15
	Review of legislation relating to invasive species	Sharon Turner, QUB	10.15 – 10.35
	WFD and invasive species	Phil Boon, Scottish Natural Heritage	10.35 – 10.55
	The National Invasive Species Database	Colette O'Flynn, National Biodiversity Data Centre	10.55 – 11.15
Coffee			11.15 – 11.30
Session 2: Current and Emerging Issues	Biological control for invasive weeds in Ireland: with special reference to the current Japanese knotweed and Himalayan balsam programmes	Dick Shaw, CABI	11.30 – 11.50
	Climate change and plant invasions	Bruce Osborne, UCD	11.50 – 12.10
	Rapid Response Mechanisms	Olaf Booy, GB Non-Native Species Secretariat	12.10 - 12.30
	Control of aquatic invasive species and restoration of natural communities in Ireland	Joe Caffrey, CFB	12.30 – 12.50
Lunch			12.50 – 14.00
Session 3: Tackling invasive species: lessons learnt and sharing good practice	Invasive species and our transport networks	Paul Murphy, EirEco	14.00 – 14.20
	Rats, weeds and awareness - How the BTCV Natural Talent apprenticeship scheme has helped promote good practice in Northern Ireland	Lyn Byrne, BTCV	14.20 – 14.40
	A strategy for tackling invasive species: The National Trust	Maurice Turley, The National Trust	14.40 – 15.00
	Approaches to managing invasive agricultural and forestry pests in Northern Ireland	Archie Murchie, AFBINI	15.00 – 15.20
Coffee			15.20 – 15.40
Session 4: Current research in Ireland	Distribution and the development of measures for the control of <i>Gunnera tinctoria</i> on Achill Island, Co. Mayo, Ireland	Cristina Armstrong, National Botanic Gardens	15.40 – 16.00
	Long-term implications of plant invasions: the significance of the soil seed bank	Margherita Gioria, UCD	16.00 – 16.20
	Pacific Oysters (<i>Crassostrea gigas</i>) in Strangford Lough, Northern Ireland	Claire Guy, QUB	16.20 – 16.40
	Development of a range of native aquatic species for commercial sale in the nursery industry in Ireland as substitutes for invasive species	Noeleen Smyth, National Botanic Gardens	16.40 – 17.00
Panel Discussion/Open Forum to close			17.00 – 17.30

3. Invasive Species Ireland Forum 2009 Abstracts

Monday 6th April Evening Lecture 6pm

Partnerships and cooperation for the management of invasive species

Jill Key

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We are seeing a huge wave of successes in invasive species management worldwide with ever larger islands tackled and more issues addressed. These achievements are not uniform, however. Invasive species are a cross-cutting issue but typically their management is the responsibility of a single sector with no mechanism to share issues and resources between sectors, or to link research, management and policy. There is a growing body of expertise but invasive species workers are often professionally isolated and consequently it is difficult to sustain achievements. This is especially true for Small Island Developing States, yet islands are centres of biodiversity which are disproportionately impacted by invasive species in comparison to their size and population, and typically understaffed for the task. The unpredictable nature of both invasive species impacts and their management further complicates the situation. The benefits to be gained from collaboration and peer-learning are clear.

This presentation illustrates the issues and achievements of partnerships for collaboration using two examples from island ecosystems, the multi-institutional committees of the Galapagos Islands and the Pacific Invasives Learning Network, a participant driven peer-learning network for the Pacific region. In both cases success was due to the presence of dedicated coordinators, starting small to let the initiatives grow at their own pace, focusing on early successes and defining strategic goals – picking battles they could win, gaining confidence and winning political support. Partnerships allow coordination of work between sectors and collaboration to tackle common issues; by this means they provide the necessary mechanism for sustainable, wide scale and long term invasive species management.

Tuesday 7th April

Session 1 IAS legislative framework and information management

Review of legislation relating to invasive species

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The Invasive Species in Ireland report highlighted the requirements and provisions for dealing with invasive species at a variety of legislative levels. However, the report stopped short of formulating new policy or addressing requirements for legislative reform. A review of legislation and governance was undertaken which identified a wide range of issues that need consideration such as:

- Fragmentation of legislative provisions leading to a high degree of legal complexity and uncertainty in reviewing, administering and enforcing legislation and policy relating to IAS
- The absence of an overall guiding policy in IAS operating in either jurisdiction or for the island as a whole
- No lead agency tasked with co-ordinating policy development, risk assessment, data management or regulatory action on IAS in either jurisdiction or for the island as a whole
- Inconsistent approaches to preventing the introductions of IAS
- Problematic legal definitions
- Lack of transparency and consistency concerning risk assessment processes undertaken by the various agencies
- Inconsistent implementation of the polluter pays principle
- Development of economic instruments as methods of control
- Inconsistencies concerning the availability of legal defences
- Lack of clarity concerning the control of hybrids, lichens, fungi and micro-organisms
- Weak mitigation controls and information management systems

There are several options for law reform that could be pursued such as the development of dedicated primary legislation, enact a core piece of legislation designed to clarify essential common elements of the system of environmental control of IAS, or review legislation with a view to more complete compliance with the CBD with publication of detailed guidance for officials and others affected by the legislation.

Invasive non-native species and the Water Framework Directive

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The EC Water Framework Directive (WFD), introduced across the European Union in 2000, contains no explicit reference to invasive non-native species. Annex 2 of the WFD does, however, require Member States to identify and assess the impact of human pressures on water bodies, and guidance from the European Commission makes it clear that alien species should be treated as an environmental 'pressure' when implementing the Directive. Despite this, it appears that relatively little attention has been paid to these issues by European Member States. In the UK, however, work began in 2002/03 by the UKTAG Alien Species Group to compile guidance for use in water body characterisation, status classification and river basin planning. Work in the UK has comprised four main issues:

(1) Definitions. A basic requirement of this work is a broad consensus on how 'non-nativeness' should be defined. Definitions published by bodies such as IUCN are not necessarily agreed

universally, and some countries amplify such definitions by setting historical dates before which all recorded species are considered to be native.

(2) Lists of aquatic alien species. Definitions of terms relating to non-native species are not merely of semantic interest; they are crucial for making decisions under the WFD, either when using alien species data in ecological status classification or for establishing programmes of measures.

(3) Classifying ecological status. There are several options for using alien species data in classification. In summary, these are to modify the status class based on the presence and impact of established alien species, or to assume that the impact of alien species is already accounted for in status classification using the tools designed for assessing other pressures. An alternative approach might be to omit alien species from ecological status classification altogether but to report on alien species pressures for each water body using 'biopollution indices' alongside the status classification.

(4) Programmes of measures. Classification that highlights non-native species problems is of little value unless there are ways of tackling them. This may require a range of different approaches: risk assessment for species believed to pose a threat, early detection and monitoring, new research on controlling individual species, preventing new invasions through legislation, promoting adequate biosecurity measures, and raising public awareness.

These four main areas of work are the subject of an EU-wide debate through the auspices of the European Commission's ECOSTAT group. A questionnaire distributed to all Member States (due for completion by the end of March 2009) should provide the information needed for further discussions, especially on a common European approach to using alien species when classifying the ecological status of water bodies.

The National Invasive Species Database – a tool for tackling the threat of alien species

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The need for a national inventory of invasive species has been widely recognised and recommended:

- Convention on Biological Diversity, COP 6 Decision VI/23
- Bern Convention: European Strategy on Invasive Alien Species (2003)
- Global Invasive Species National Implementation Phases (GISP)
- Invasive Species in Ireland report (2006)

In response to such recommendations, the National Invasive Species Database was established in 2008 by the National Biodiversity Data Centre. The aim of the Database is to provide centralised up-to-date information on the distribution of invasive species in Ireland. In order to do this, validated invasive species records are entered into the database and then made publicly available on the Data Centres interactive Biodiversity Maps website.

The Data Centre is initially concentrating on collating data for priority species (these include terrestrial, freshwater and aquatic species). The freshwater component was the first to be developed due to the provision of EPA STRIVE funding of an all-island collaborative project on Alien Invasive Species in Irish Water bodies. To date, records have been collated and are displayed for 23 species with many more soon to be entered into the Database. Access to records displayed against many relevant GIS layers on the publicly available mapping system, provides a tool that can be used by many to assist in tackling the threat of invasive species in Ireland.

The continual collection, collation and display of invasive species records is crucial to the long-term establishment of this database as a central tool, and to ensure that it can play a key role in informing national, regional and local invasive species initiatives in Ireland. The Data Centre currently has an active collaboration with state agencies such as NPWS, EPA, CFB and the Heritage Council. However, in order to strengthen the value of the database formalised agreements for the timely submission of datasets should be integrated into terms and conditions of all Government funding programmes, tenders and research grants. This action is supported in the Invasive Species Ireland – The Way Forward review paper (2008). The ISI review also highlighted that ‘efforts should also be focused on getting submission of old datasets as this will enable analysis of spread and range changes’.

A supporting website for the database has been developed <http://invasivespecies.biodiversityireland.ie>. The website provides information on the database, highlights the priority invasive species that records are required for and links to the interactive species distribution maps. For every additional record that is submitted, a clearer picture of the status of that invasive species in Ireland is generated.

Session 2

Current and emerging issues

Biological control for Invasive Weeds in Ireland: with special reference to the current Japanese knotweed and Himalayan Balsam programmes

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Independent of taxon, all non-native invasive species have lost most if not all of their usual natural enemies during translocation. This fact has long been the basis for classical biological control of weeds, whereby highly specialised, co-evolved natural enemies, usually arthropods or fungal pathogens, from the centre of origin of the target, are released for their permanent suppression in their introduced range. Whilst this tried and tested approach has been used for a century against weeds the world over, it has never been officially considered for use in a European country until now. Biological control has celebrated many successes worldwide and has learnt many lessons on the way. Its image has changed as techniques have been refined and the European public, and their elective representatives, have become more aware of this option. The potential of biological control must be considered in the light of current moves away from chemical control techniques and the requirements of the Water Framework Directive.

This paper will introduce the biological control techniques and opportunities available for exotic weeds in UK and Ireland using current biocontrol programmes against two of our worst weeds as case studies: namely Japanese knotweed (*Fallopia japonica*), for which the release of a sap-sucking psyllid could soon become a reality, and Himalayan balsam (*Impatiens glandulifera*), for which a biocontrol project is now well into its second phase. Other targets such as giant hogweed (*Heracleum mantegazzianum*), *Rhododendron ponticum*., bracken (*Pteridium aquilinum*), *Azolla filiculoides* and floating pennywort (*Hydrocotyle ranunculoides*) are used to highlight some of the challenges, both scientific and political, facing the use of natural enemies in the UK.

Climate Change and Plant Invasions

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Climate change, particularly increase in temperature in temperate regions, is often thought to favour plant invaders. Whilst this is a plausible hypothesis, given that many plant invaders of temperate regions originated from warmer climates it is based on a relatively limited amount of experimental evidence. Given the complex nature of climate change itself and the complexity of potential climate change responses we should probably be more cautious of simplistic predictions, particularly at the ecosystem level. In order to examine the impact of climate change on plant invasions I report on field simulations over 2-3 years on areas with and without invasive species, using passive enclosures that, on the basis of model projections, provide realistic increases in temperature (maximum of >30C) and reductions in water availability (~33% reduction in soil water content). Two species were examined, one an introduced invader, *Fallopia japonica*, the other, *Pteridium aquilinum*, a native invader. Climate simulations resulted in a decrease in the productivity of the introduced invader, *F. japonica*, but had no effect on *P. aquilinum*. The effect of climate change simulations on co-occurring species, also varied with a reduction in associated, mainly grass, species in areas associated with *P. aquilinum*, but had little effect in areas associated with *F. japonica*. This indicates that *P. aquilinum* may benefit from climate change but only indirectly, as its relative productivity at the ecosystem level may increase. However, climate change simulations had no impact on species diversity. These results indicate the potential complexity of the response of plant invasions to climate change that may be species-specific and site-dependent. These results argue for more direct experimental approaches to understand the impact of climate change on plant invasions.

Rapid Response Mechanisms: plans and progress in GB

Olaf Booy

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The Convention on Biological Diversity sets out a three-stage approach to tackling invasive non-native species:

1. Firstly, wherever possible prevent invasive non-native species from getting in
2. Where this fails, react quickly to eradicate any newly establishing population
3. If they become widely established provide control and management to limit the impacts they have.

In relation to the other stages, stage two (rapid response) is relatively achievable and provides substantial, long term benefits if undertaken correctly. However, for rapid response to be effective it requires careful but expedient planning followed by decisive action.

With no clear responsible agency, but numerous interested parties, the challenge of developing a Great Britain wide strategy for delivering rapid response is considerable. This presentation outlines the key stages under consideration within GB and outlines our progress so far.

Control of aquatic invasive species and restoration of natural communities in Ireland (CAISIE)

Joe Caffrey

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Aquatic invasive species are a major threat to biodiversity in Irish freshwater ecosystems and their adverse impact will continue to increase unless effective eradication and control methods are developed and information on the methods disseminated widely. This presentation will give an overview of the spread of high impact invasive species in Ireland and control efforts to date with a particular focus on *Lagarosiphon major* in Lough Corrib.

A large scale project aimed at controlling high impact aquatic invasives in Lough Corrib and the key dispersal corridors of the Grand Canal and Barrow Line and restoring native communities has been funded by Life+ and the National Parks and Wildlife Services. The three year project has recently started and an overview of the planned activities will be presented.

Session 3 Tackling invasive species: lessons learnt and sharing good practice

Invasive Species and our transport networks

Paul Murphy

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As invasive species have the potential to significantly impact national biodiversity and road infrastructure, the National Roads Authority has developed specific guidance for the treatment of the predominant species likely to be encountered during the construction and maintenance of national road schemes. Many of the plants we classify as invasive are those that have evolved to grow in nutrient-poor or highly dynamic environments (such as volcanic slopes) and so have the capacity to survive and indeed thrive in disturbed environments. Many are also problematic due to their capacity to reproduce asexually by fragmentation of a rootstock (e.g. Japanese knotweed) or through massive seed production (e.g. giant rhubarb). These characteristics have enabled many invasive species to flourish and spread along the road network within the country.

This NRA report provides guidance on the control and management of invasive plant species (and noxious weeds) on national roads in Ireland. The approach adopted in dealing with these problematic plants on road schemes is applicable to most development sites and should provide a valuable reference for the construction industry and those involved in invasive species control.

Rats, weeds and awareness - How the BTCV Natural Talent apprenticeship scheme has helped promote good practice in Northern Ireland.

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The BTCV Natural Talent Apprenticeship Scheme is aimed at training the next generation of naturalists through a unique mentoring scheme. For a number of years it has been of concern that we are losing specialist skills from the conservation sector and it is hoped that this apprenticeship scheme will go some way to helping fill this skills gap.

Since beginning my apprenticeship in December 2007 I have carried out a considerable amount of work on invasive alien species management in Northern Ireland. The majority of my projects have been community focused most notably the Rams Island Rat Eradication and the Ballinderry River Non-Native Invasive Plant Control Programme. I have also worked towards developing tools to help raise awareness with the public about the invasive species issue. These include games for children, leaflets and workshops for adults and 'call to action' articles in the local press. In this talk I will outline the methodology and current progress of the projects, discuss the methods used to enthuse and engage the community and how I gained and retained their support for the projects. I will look at the different techniques and focuses needed when dealing with local government compared with those used for community projects. Finally I will talk about the difficulties and obstacles that arose during the planning and implementation of these projects and how these were overcome.

A strategy for tackling invasives: The National Trust

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The problems created by invasive species and the impacts on areas of high conservation value are well documented. The National Trust NI manages over 12,000 Ha of countryside and coast, which includes – land within 22 designated areas, over 600 Ha classed as a NI priority habitat, as well as numerous priority and site specific species of conservation interest. The impacts and potential threat posed by existing and new invasive species have huge implications for the Trust.

The control of invasive species has been an historical practice at many National Trust properties and is built into management plans; however there has not been an overall strategic approach that tackles the invasive problem at a regional level. The size of the problem posed by invasive species has not been documented, namely the amount present and the species involved. In addition, the consequences for the Trust in terms of time involved, resources and capital investment needed to tackle invasives are unknown. Also and crucially, the risk associated with current and new potential invasives and their impacts for future management planning has not been investigated.

To address some of these issues the Trust are currently undertaking a project that aims to gain an understanding of the scale and the threat posed by invasive species on land under Trust's management. It is hoped the information obtained will form a baseline of 'what and where, and how did it get there' from which strategic judgements can be made, and actions carried out based on sound judgements from scientific analysis. As highlighted on many occasions the successful eradication of invasive species depends on working in partnership. By consultation with catchments area plans, NIEA, ISI and others, it is envisaged the information gained from this project can be shared and be used to inform others of good practice.

The specific example of Glastry Ponds, a major site of *Hydrocotyle ranunculoides* (floating pennywort), will be outlined. The relative success of the various methods of control of species will be discussed. This project was a joint partnership between NIEA, Rivers Agency and The National Trust.

Approaches to managing invasive agricultural and forestry pests in Northern Ireland

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Invasive alien species are a major problem for both agriculture and ecosystem functioning. Agriculture has a head start in many aspects of dealing with invasive alien pests. In the UK/Ireland, this originates with the Destructive Insects Act 1877, which was formulated to deal with the threat of the Colorado potato beetle (*Leptinotarsa decemlineata*). Legislation has developed from this time, to take reasonable precautions against the entry of injurious species, whilst at the same time allowing international trade. Modern legislature is developed around the International Plant Protection Convention (IPPC), an international treaty signed by 164 governments. Within the European Union, Council Directive 2000/29/EC establishes the protective measures to maintain plant health. The Plant Health Order (Northern Ireland) 2006 implements these control measures. In Northern Ireland, potential pathways for the introduction of invasive pests are monitored by DARD Quality Assurance Branch and Forest Service Inspectors at points of entry. Any recovered material is examined and identified at the Agri-Food and Biosciences Institute. During the past five years, these have included instances of Colorado potato beetle, non-indigenous *Liriomyza* leaf miners, the tobacco whitefly (*Bemisia tabaci*), the potato tuber moth (*Pthorimaea operculella*) and 8-toothed spruce bark beetle (*Ips typographus*).

In addition, since 1993 DARD/AFBI has undertaken annual forest surveys for invasive alien pests as required by EU directive.

The situation regarding invasive pests is dynamic. New pest problems may become apparent and distribution of pests may become so widespread as to negate border controls, or the definition of a plant pest may be reinterpreted. Scientific advice is provided to the EC via the European and Mediterranean Plant Protection Organisation (EPPO). One example of a problematic pest with particular relevance to Northern Ireland is that of the New Zealand flatworm (*Arthurdendyus triangulatus*). This species is not a direct plant pest but affects soil fertility indirectly by predated and reducing earthworm populations. Indirect pests, such as *A. triangulatus*, and increasing emphasis on protecting biodiversity have prompted EPPO to establish a panel on invasive alien species in general. However, there is still a danger of regulatory bodies abdicating a responsibility for species that are not easily categorised.

Session 4 Current research in Ireland

Distribution and the development of measures for the control of *Gunnera tinctoria* on Achill Island, Co. Mayo, Ireland

Cristina Armstrong¹, Bruce Osborne² and Deirdre Cunningham³

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Gunnera tinctoria was probably introduced in to Ireland over 100 years ago as an ornamental plant. Currently, on the west coast of Ireland, it is considered an invasive plant species. On Achill Island the problem is significant and if measures are not introduced there is the likelihood of further range expansion. During the last three years a research project has been undertaken to investigate possible means of control using herbicides and mapping the current distribution.

After preliminary greenhouse experiments, showing the potential of herbicides to inhibit the growth of *G. tinctoria*, field experiments in Dooega, Achill Island were carried out, using glyphosate-based herbicide RoundUp. Two different methods of application were used, "cut and paint" and "cut and injection", these methods of application are localised, and therefore have a lower environmental impact. The success of the herbicide and the efficacy of different methods of application were recorded over 3 growing seasons. Results have shown that the use herbicide is relatively successful in controlling *G. tinctoria*, after two years, regrowth was observed and re-applications were required. Early applications of both herbicides in the field were found to be non-effective compared to those applied in late summer.

The results of the current distribution of *G. tinctoria* on Achill and Clare Island, has helped to identify the areas most susceptible to invasion, and the possible means of spread. It is found to colonize a variety of habitats such as, grassland, roadsides, coastal cliffs, waterways, quarries and bogs. The mapping establishes a baseline for future monitoring of this species in Ireland and in combination with the chemical control experiments has provided the information to develop best management practices for landowners. In conjunction to this a leaflet was produced to provide information on control methods and to help increase public awareness on the impact of *G. tinctoria* on the Irish landscape.

Long-term implications of plant invasions: the significance of the soil seed bank

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Soil seed bank dynamics could play a central role in supporting biological invasions by alien plants. Despite increasing appreciation of the ecological and evolutionary importance of soil seed banks, little information is available on their role in successful invasions. In this study, we investigated the impact of three major plant invaders (*Gunnera tinctoria*, *Fallopia japonica*, and *Heracleum mantegazzianum*) on soil seed bank communities. A comparison of the seed bank of invaded and adjacent uninvaded communities was made using the seedling emergence approach, at different spatial scales (site, plot, and soil depth). Results showed that invasions profoundly affected both the transient as well as the more permanent component of soil seed banks. Invaded seed banks were significantly less diverse and abundant compared to uninvaded ones, whilst dominance was higher and independent of the reproductive strategy of the invaders.

Invaded communities mainly comprised seeds of agricultural weeds, such as *Urtica dioica*, *Ranunculus* and *Rumex* species, as well as a large number of *Juncus* species, supporting the notion that more homogeneous communities are found in invader areas. *Gunnera tinctoria* formed a large persistent seed bank ($32,120 \pm 31,837$ seedlings m^{-2} in May and $28,308 \pm 16,176$

in October), making its eradication an unrealistic objective. Conversely, *Heracleum mantegazzianum* formed only a transient seed bank ($9,762 \pm 390$ seedlings m^{-2} , in October) and relied exclusively on recruitment from the seed bank for regeneration, suggesting that this species could be successfully removed from a site if dispersal was avoided. The results of this study also showed that *F. japonica* had the greatest impact on seed bank communities, despite its more recent colonization and despite not setting viable seeds in Ireland. Among the implications of this study is that disturbance associated with any attempt to remove these invaders from a site would promote the germination of undesirable weeds. Even where removal was feasible, seeds of desired species would have to be sown to restore seed banks that had been depleted by the invasion processes.

Pacific Oysters (*Crassostrea gigas*) in Strangford Lough, Northern Ireland.

Claire Guy and Dai Roberts

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C. gigas was introduced into Strangford Lough at licensed aquaculture sites in the 1970s. It was believed that unfavourable temperature conditions would prevent the species from breeding naturally. In the mid 1990s naturally settled *C. gigas* were reported in the Lough. This research addresses wild populations of *C. gigas* in Strangford Lough with the aim of investigating its distribution, reproductive cycle and potential impacts on the native biota. To date the distribution of the species in the Lough has been ascertained as well as a population structure which suggests that recruitment does not occur every year. Preferences in settlement substrata do not appear to suggest competition between the oyster species for substratum. Survey work is ongoing and a pilot eradication scheme has been initiated.

The range expansion of species is a common issue worldwide and has been seen to have major deleterious ecological implications in some areas. It is often felt that the establishment of populations of invasive species is partly facilitated by the delay of decisive action whereby the window of opportunity when the populations are small and in a lag growth phase is missed. The initiation of a *C. gigas* cull while populations are relatively low is an attempt to take advantage of the lull period before a potential rapid population expansion. The low population densities lend themselves to the methodology of hand removal which will minimise the impact on other populations in the Lough. Other methods such as dredging or removal by heavy plant machinery would be inappropriate for an area such as Strangford Lough which is protected by EU legislation.

In terms of implications for management in the area it is recommended that *C. gigas* should culled annually in the attempt to arrest the population increase of this highly invasive species in a globally important ecosystem. In addition, the results of this pilot cull will be used to develop a management strategy for Strangford Lough which may well be applicable elsewhere. The use of polyploid oysters within the aquaculture sector would reduce the risk of further spread of the species as a direct result of aquaculture

Development of a range of native aquatic species for commercial sale in the nursery industry in Ireland as substitutes for invasive species

Noeleen Smyth

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Many of the commercially available plant species available to stock water features for the landscape and horticulture industries in Ireland have become a source of invasive species into Irish natural freshwater systems, for example, *Hydrocotyle ranunculoides*, *Azolla filiculoides*, *Crassula helmsii*, *Myriophyllum aquaticum*, *Lemna minuta*, *Lagarosiphon major* among others.

The horticulture industry in Ireland is currently being made aware of the negative impacts of invasive species (www.invasivespeciesireland.org) and many horticultural growers are worried about their future livelihoods with few alternative species available for cultivation. There is a clear need to develop an alternative species range that both fulfil commercial ornamental use and support Irish biodiversity.

Many of the aquatic invasive species in Ireland are in the process of being banned by national legislation and many growers are in need of research into the provision of suitable alternative species for the trade. Support for this project to develop range of alternative species for the horticultural industry is required. This project aims to carry out a suite of experiments, which will assess the suitability of a range of native species with high ornamental and biodiversity value such as *Butomus umbellatus*, *Hippurus vulgaris* and the waterlilies, *Nuphar lutea* and *Nymphaea* spp. as ornamentals for commercial cultivation. One of the main outputs from the project will be the production of guidelines for horticultural growers on a suite of suitable native species and their propagation methods for ornamental horticulture production.

4. List of Attendees

First Name	Surname	Organisation	Email
Cristina	Armstrong	National Botanic Gardens	cristina.armstrong@opw.ie
Catherine	Bertrand	Mourne Heritage Trust	Catherine.Bertrand@mourne.co.uk
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