



# Brown Trout Population Structure & Genetic Stock identification of the Moy Catchment

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CONFIDENTIAL

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**Population Structure and Genetic Stock Identification of Trout (*Salmo trutta*)  
from the Moy Catchment**

**INTERIM REPORT**

Karen Delanty, Martin F. O' Grady and Fiona L. Kelly

Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

Caroline Bradley and Paulo Prodöhl

Beaufort Fish Genetics Group,

School of Biological Sciences, Queen's University Belfast

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Cover photo: Brown trout in the River Suir at Cahir, Co. Tipperary © Inland Fisheries Ireland

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Inland Fisheries Ireland in partnership with Queen's University Belfast are co-project leaders for this study.

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## 1. Introduction

The wild brown trout (*Salmo trutta*) displays a remarkable level of variation in its external appearance, behaviour, ecology, biology and many other aspects of its life-history. The realisation that much of this variation has a genetic basis, has led scientists to also study the genetic make-up of brown trout in the recognition that there is enormous genetic diversity within and among brown trout populations, which is of great importance for both management and conservation of the species.

Since 2006 Inland Fisheries Ireland (IFI) have commissioned a number of genetic based studies of brown trout, in selected catchments across Ireland (e.g. Mask, Corrib, Sheelin, Ennell, Suir, Boyne) to understand more about how genetic diversity is distributed among populations in order to assist in making the correct and most cost effective management decisions (e.g. is a particular tributary stream contributing more fish to a lake or river main channel than any other stream, or is there one genetic strain in a catchment completely different and unique than all others, if so how can IFI manage this) (EREP, 2014; O'Grady and Delanty, 2014). This ongoing work is providing IFI with valuable information for fisheries management purposes.

In 2014, IFI in collaboration with Queen's University Belfast (QUB) began a three-year research programme to examine the genetic diversity of brown trout in the Moy catchment in tandem with two other catchments.

The main objectives of the Moy Brown Trout genetic study are:

- To investigate if there are a number of discrete genetic stocks within the Moy catchment.
- To understand how important each genetic group/stock is to the fishery.
- Examine the behaviour and other processes occurring within individual populations and between populations over their life span.
- Estimate the percentage contribution of the various sub-catchments to the Loughs Conn/Cullin adult brown trout stock (Lake mixed stock identification)



- Investigate if there are any “Roscrea” type hatchery genes in the Loughs Conn/Cullin lake samples
- Investigate if there is any evidence of “Roscrea” hatchery genes in the Castlebar River
- Investigate if there is any genetic evidence to suggest that the cropping of trout from above the falls in the Clydagh river and their introduction to other rivers has impacted on the genetics of trout from donor rivers.
- Estimate the percentage contributions of the various sub-catchments to the Moy sea trout stock
- Estimate what proportion of the adult sea trout sample from the Moy estuary are not Moy Catchment fish
- Investigate if the Moy arterial drainage scheme impacted on the genetic diversity of brown trout within the Moy catchment .

Preliminary results from the first phase of the genetic analysis are presented in this report. A final report will be available mid 2017.

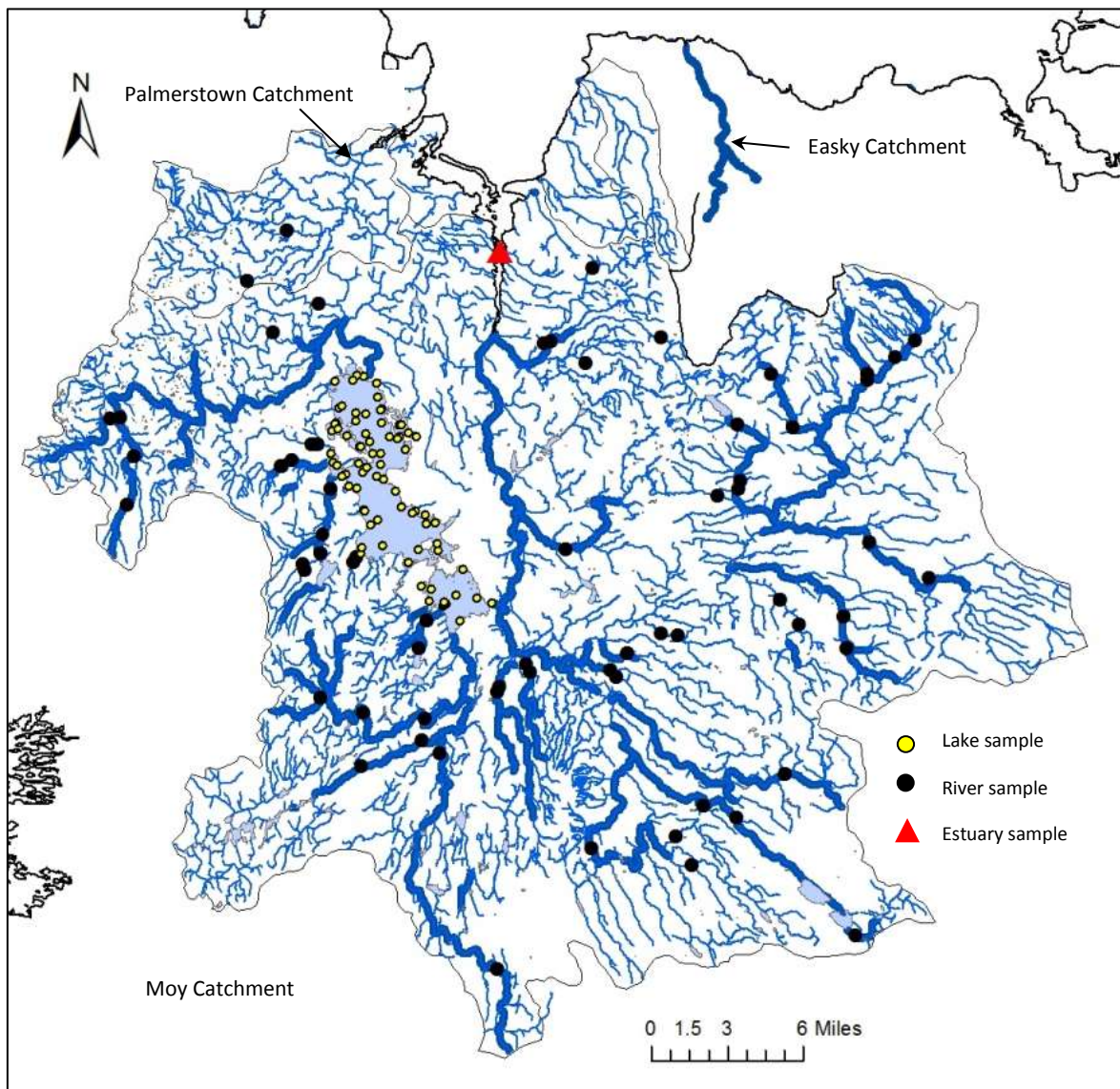
## **2. Methods**

### Fish samples

Where possible 50 one year-old trout were captured by electrofishing in each tributary sub catchment from each of the three rivers (Fig. 1). A small sample, comprising of non-destructively collected scales, was retained from each individual fish for genetic analysis. To ensure that samples provided a proper representation of brown trout inhabiting those catchments, sampling was carried out as extensively as possible covering both main channel and associated tributary rivers. This extensive sampling also minimised possible family bias which is known to take place when large number of samples are taken from few locations. Location details of all sample sites were recorded by taking a GPS reading. The number of scale samples taken from each catchment is shown in Table 1. Scale samples were taken from the River Moy main channel, 27 tributary streams, Lough Conn and Cullin and from two neighbouring catchments, i.e. the Palmerstown and Easky rivers (Fig. 1). In addition anglers from the Lough Conn and Cullin Anglers Association kindly agreed to forward scale

samples and relevant location details to IFI as part of this study (Table 1). A sea trout sample from the Moy estuary was also provided to the project from local anglers.

Prior to the fish scales being processed, all sampling information was collated and transferred to IFI's electronic database.



**Fig. 1. Location of all sampling sites in the Moy catchment to date (additional samples were taken on the Easky, this is not shown on the map).**



**Table 1: Number of fish samples collected in the Moy catchment to date**

<b>Moy Catchment</b>	<b>Number of samples</b>
Number of river samples (main channel and tributary)	1240
Number of additional neighbouring catchment samples (Palmerstown & Easky)	100
Number of IFI caught lake samples	50
Number of angler caught lake samples (Conn & Cullin)	400
Number of estuary samples	41
<b>Total number of samples collected</b>	<b>1831</b>

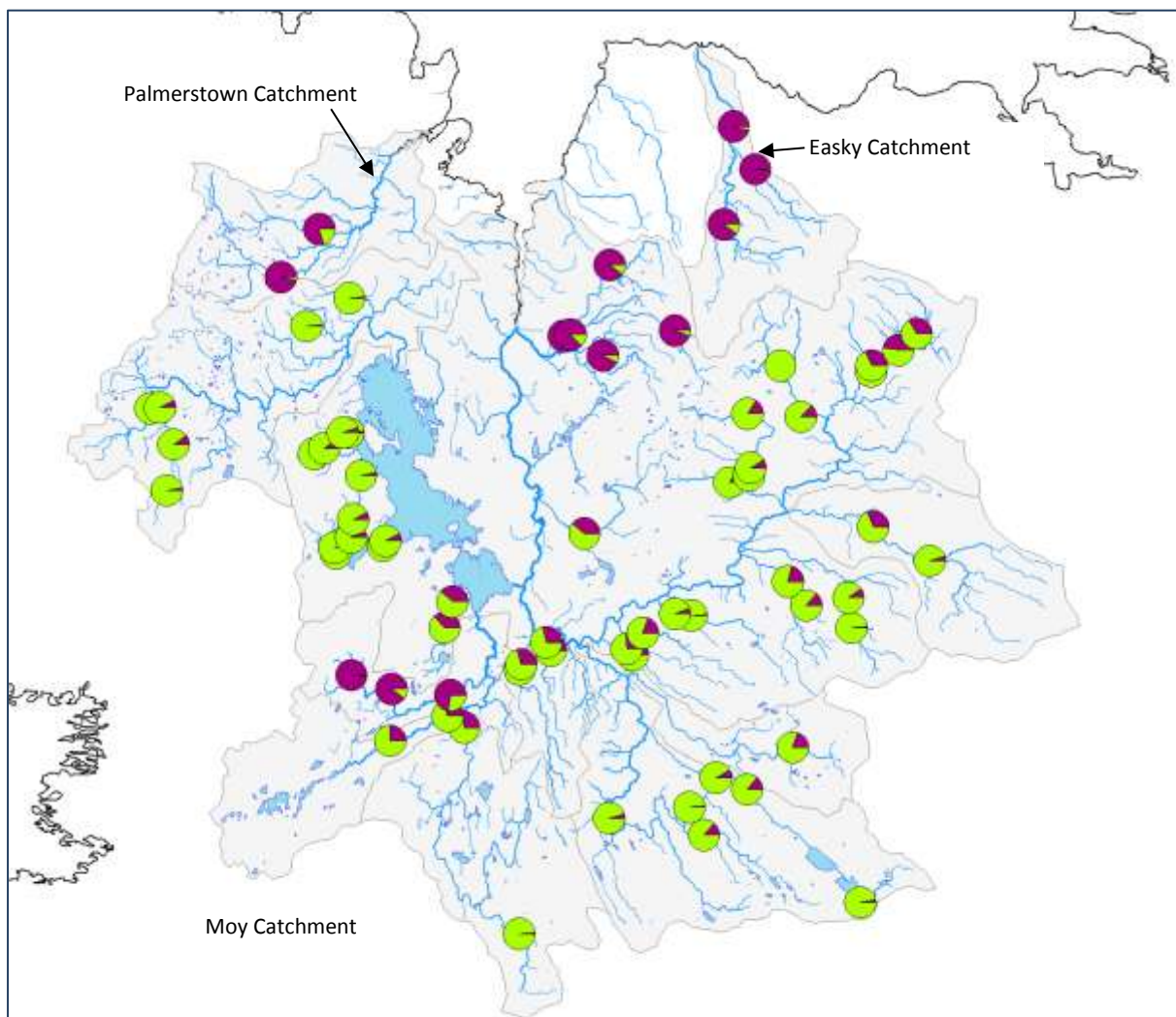
#### Genetics – DNA profiling

DNA was extracted from each fish sample and DNA profiling (genetic testing or DNA fingerprinting) carried out. Genomic DNA was extracted using the Promega Wizard SV 96 genomic DNA purification system and subsequently transferred to 96 well microtitre plates for storage at -20°C and subsequent genetic analysis. Genetic analysis (i.e. DNA profiling) was carried out using a panel consisting of 22 microsatellite marker loci developed at QUB. This DNA fingerprinting based technique has been routinely used for parentage analysis (i.e. identification of individuals to families), identification of population genetic sub structuring and also to identify the source population to particular individuals (e.g. genetic stock identification and/or individual assignment). The data obtained was then analysed using specific computer software for genetic analysis.

### **3. Progress to date and preliminary results**

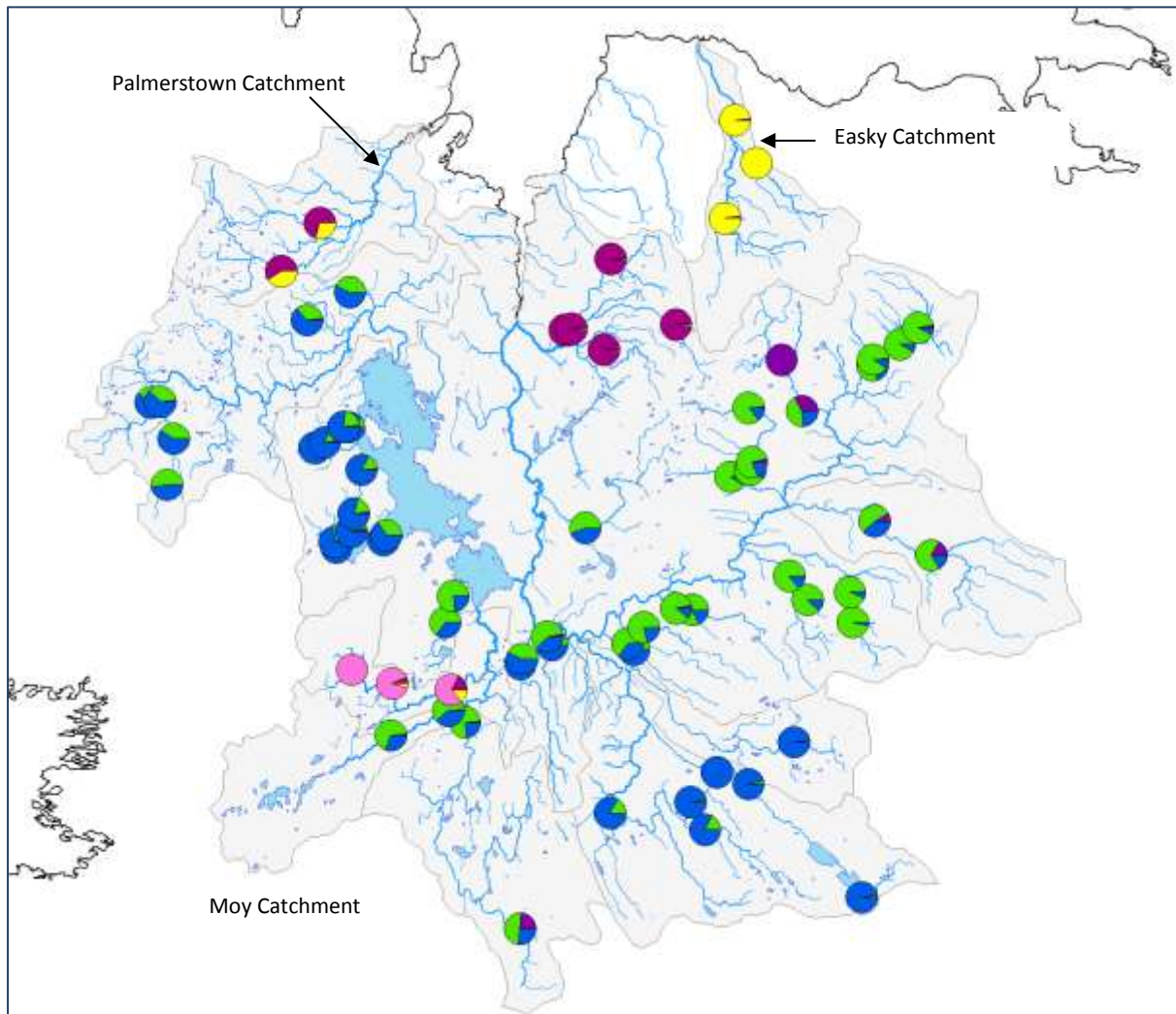
- a. Early difficulty with Moy samples has been overcome; thus additional samples have been collected from relevant tributaries and the main channel where insufficient number of samples and/or sampling sites were identified. Additional sampling also involved securing a larger sample of sea-trout scale samples. Additional scale samples have also been provided from the IFI archival collection of scale samples.

- b. Statistical analysis of genetic data is under way by QUB.
- c. Preliminary STRUCTURE analysis of the genetic data indicate that there are two distinct genetic groups within the Moy catchment (a distinct brown trout (green dominant) and sea trout population (pink dominant)) (Fig. 2)
- d. There is also clear evidence for further population substructuring within several of the larger Moy sub-catchments (pink and green mix) (Fig. 3).



**Fig. 2. Preliminary STRUCTURE genetic analysis of trout samples for the Moy Catchment – (Different colours represent distinct genetic profiles).**





**Fig. 3. Preliminary STRUCTURE genetic analysis of trout for the Moy Catchment –**

**(Different colours represent distinct genetic profiles).**



#### **4. Next Phase (January 2016 to June 2017)**

Additional fish scale samples were collected from a number of locations in 2015 (e.g. Easky, Moy estuary (sea trout) and River Moy main channel (adult brown trout). These samples will be sent to Queen's University Belfast in early 2016 for genetic analyses and included in the over-all results. Lake samples that have been processed will now be analysed for genetics and the data interpreted. It is expected that all samples will have been processed and all lab work completed by mid-2016. Statistical analysis of the data along with interpretation of such analysis will be reported in the Final Report expected in June 2017.

#### **5. References**

EREP (2014) <http://www.fisheriesireland.ie/EREP/brown-trout-genetics-and-fisheries-management-in-ireland.html>).

O'Grady, M.F. and Delanty, K. (2014)

<http://www.fisheriesireland.ie/images/dmdocuments/IFI%20Corrib%202012%20survey%20report%20final.pdf>

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**Inland Fisheries Ireland**  
3044 Lake Drive,  
Citywest Business Campus,  
Dublin 24,  
Ireland.

**Web:** [www.fisheriesireland.ie](http://www.fisheriesireland.ie)  
**Email:** [info@fisheriesireland.ie](mailto:info@fisheriesireland.ie)

**Tel:** +353 1 8842 600