

Investigating the Spey hatchery programme: what contribution does it make to the fishery and considering the management implications

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RIVERS & FISHERIES TRUSTS OF SCOTLAND
Safeguarding Scotland's Rivers & Lochs

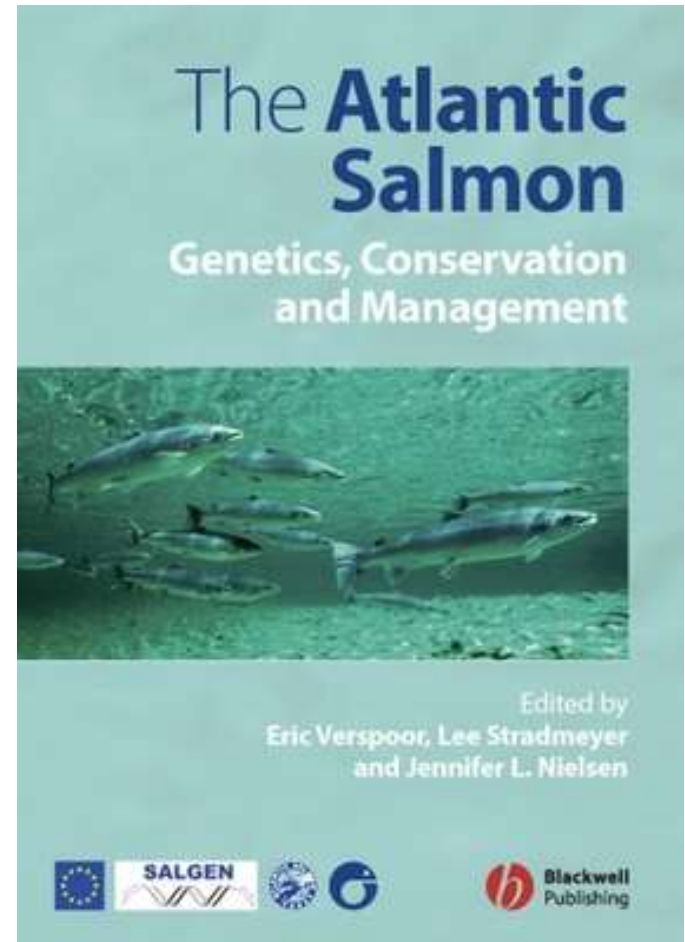


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Hatcheries

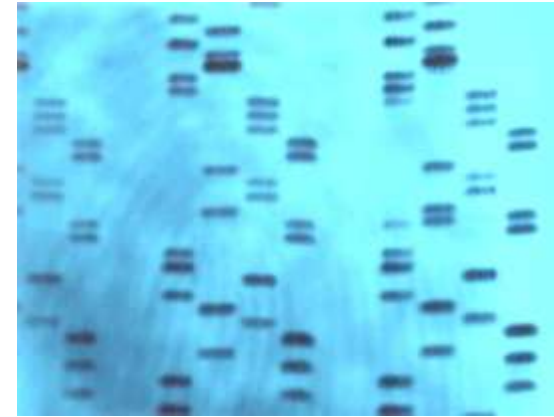
(Cross et al. 2007)

- Scenarios for stocking include
 - *reintroduction*
 - *rehabilitation*
 - *enhancement*
 - *mitigation*
- Genetic considerations?
- Genotyping of broodstock would allow:
 - Evaluation of stocking success
 - Identification of siblings (inbreeding avoidance)



Individual identification

- Each individual carries a unique “DNA fingerprint”



- Cases of genetic “paternity”

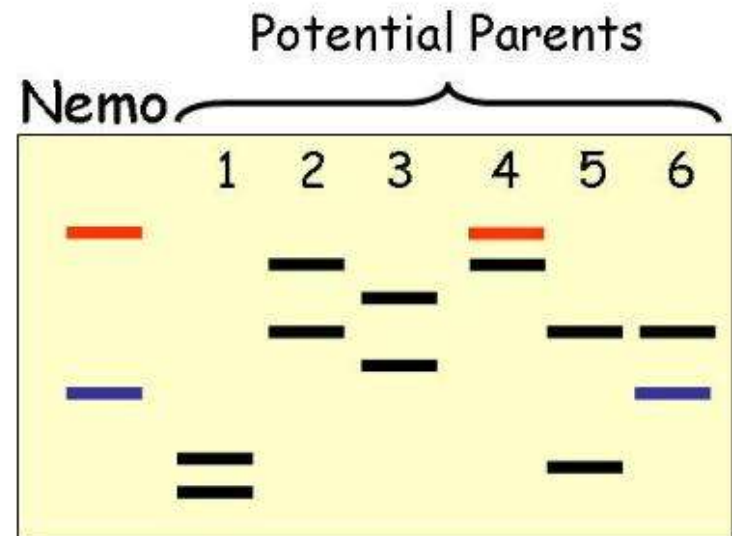
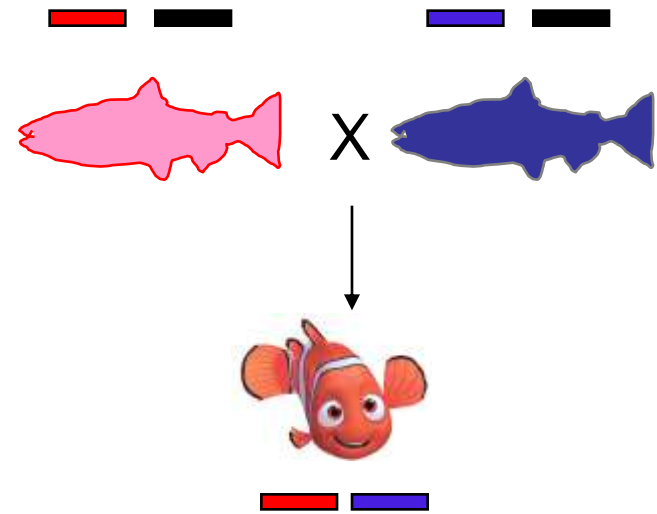
- Related individuals

- Forensics



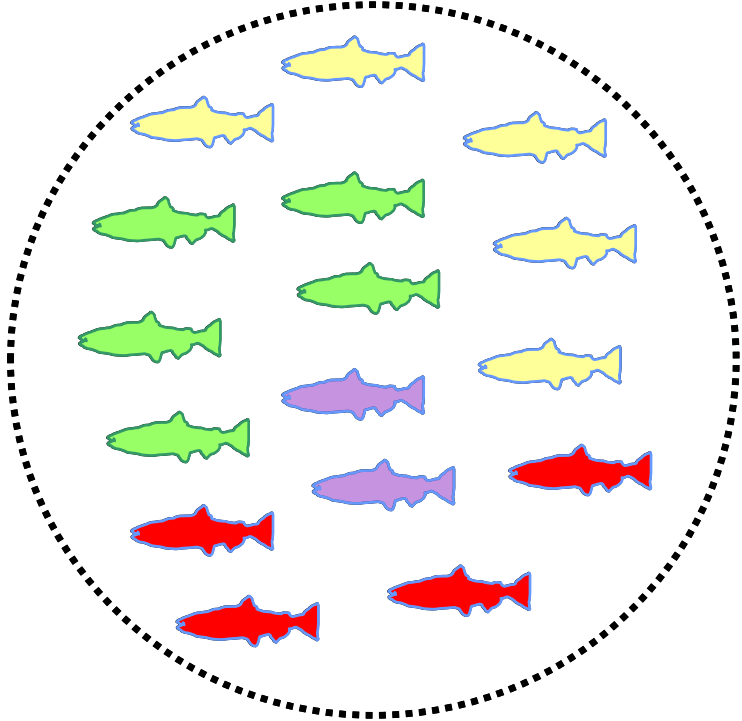
Parentage assignment

- Single genetic marker
- Each parent passes on 1 of their 2 copies
- Offspring gets 1 copy from mother + 1 copy from father
- Applied across multiple markers (17) makes most 'parents' **VERY** unlikely

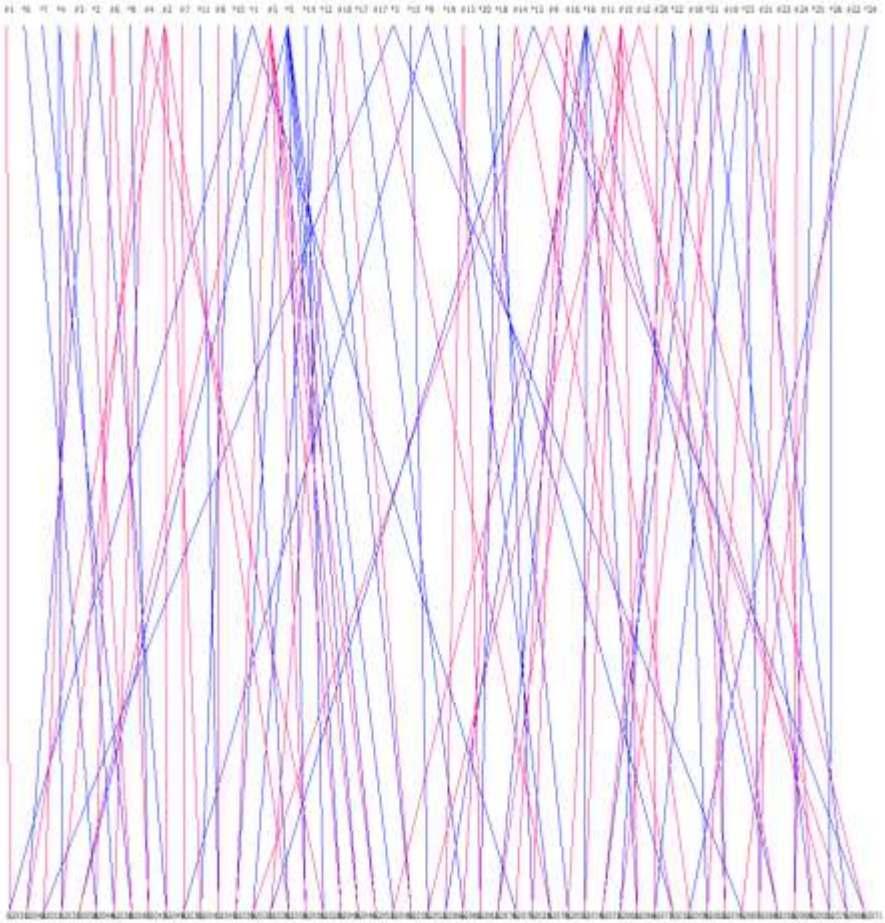


Assigning genetic parentage

1. no parents sampled

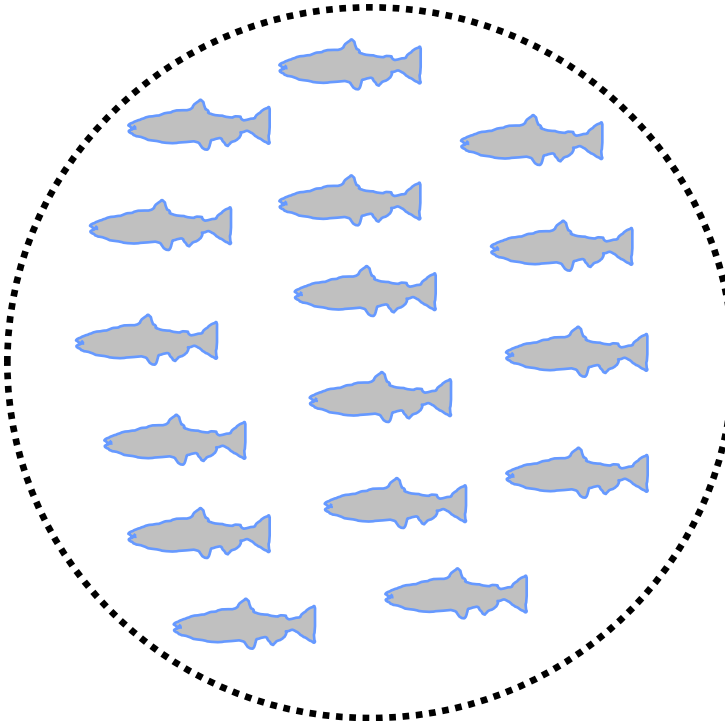


Sample of juveniles



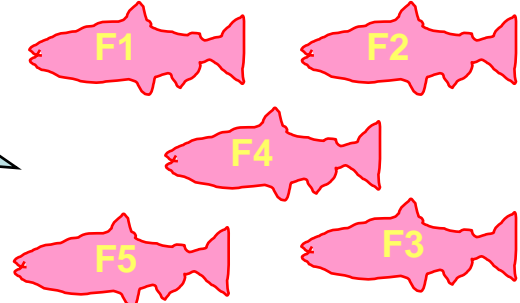
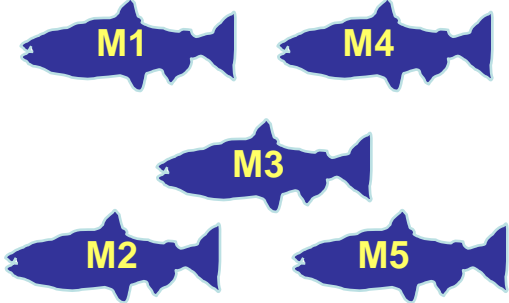
Assigning genetic parentage

2. possible parents sampled

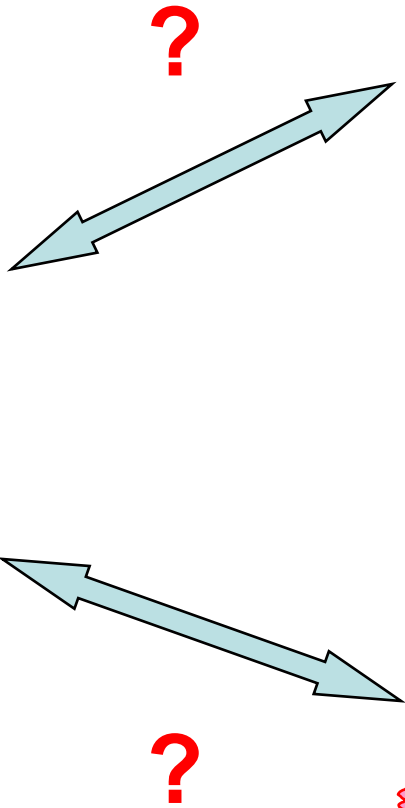


Sample of juveniles

Sample of adult males

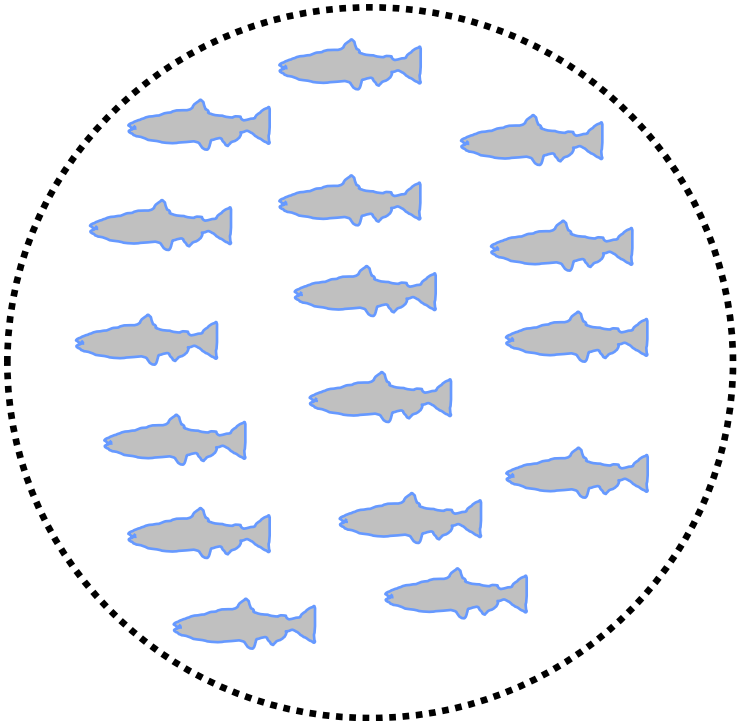


Sample of adult females

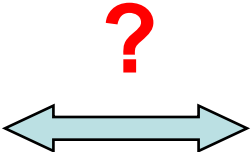


Assigning genetic parentage

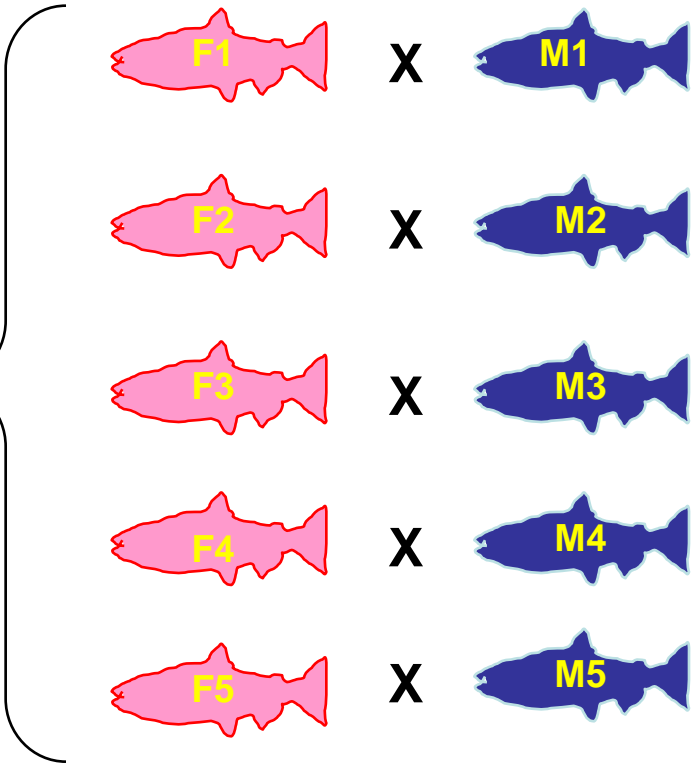
3. All parents sampled + breeding records



Sample of juveniles



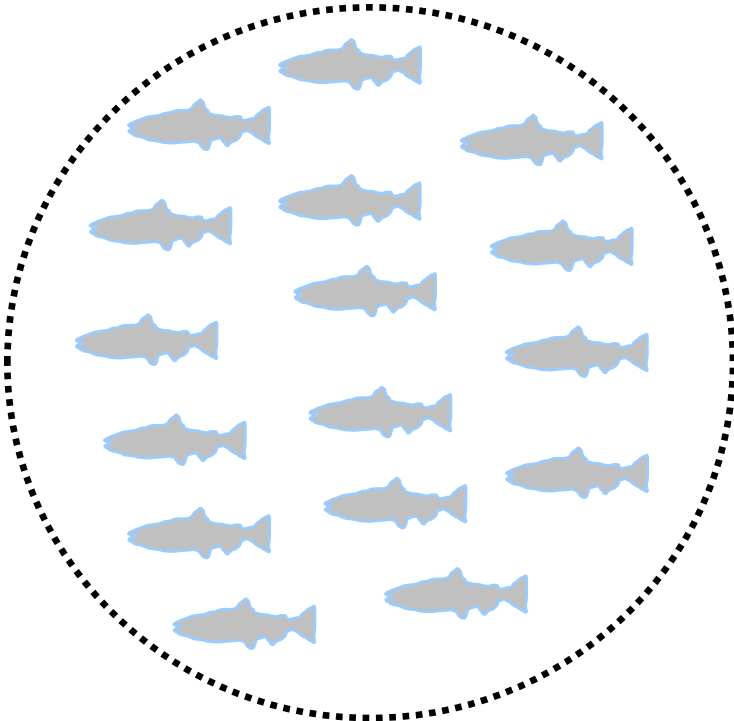
Hatchery breeding records



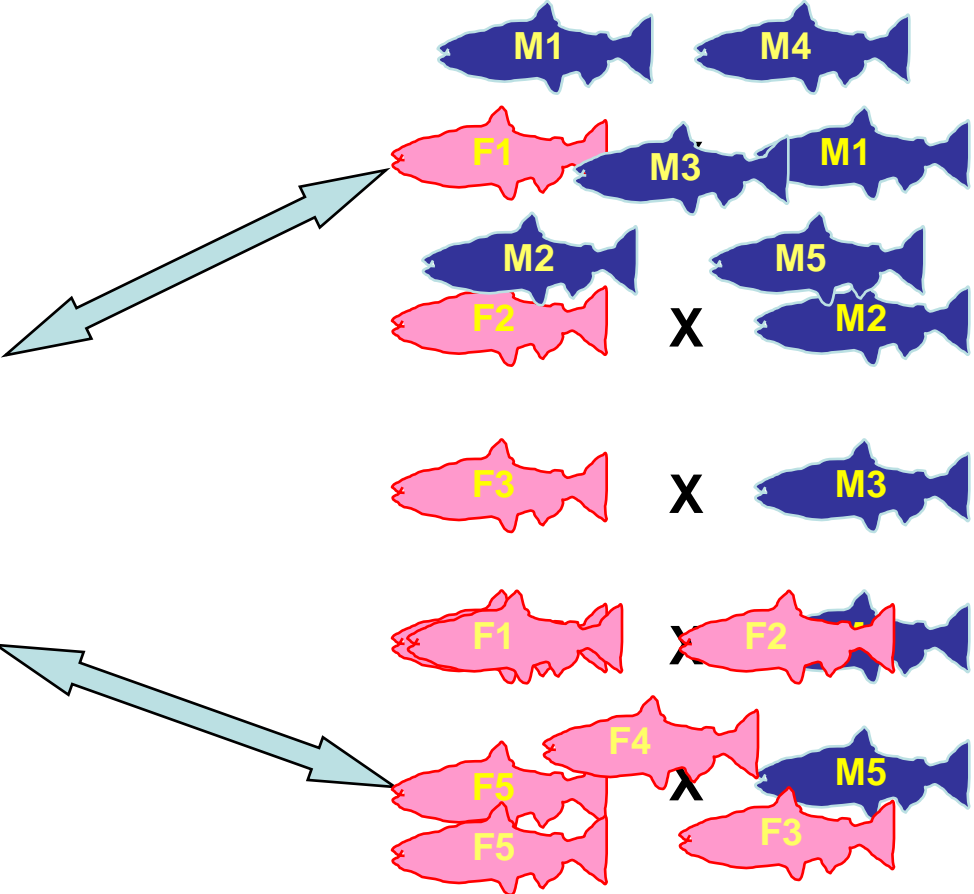
Sample of broodstock

Assigning genetic parentage

Sample of adult males



Sample of juveniles



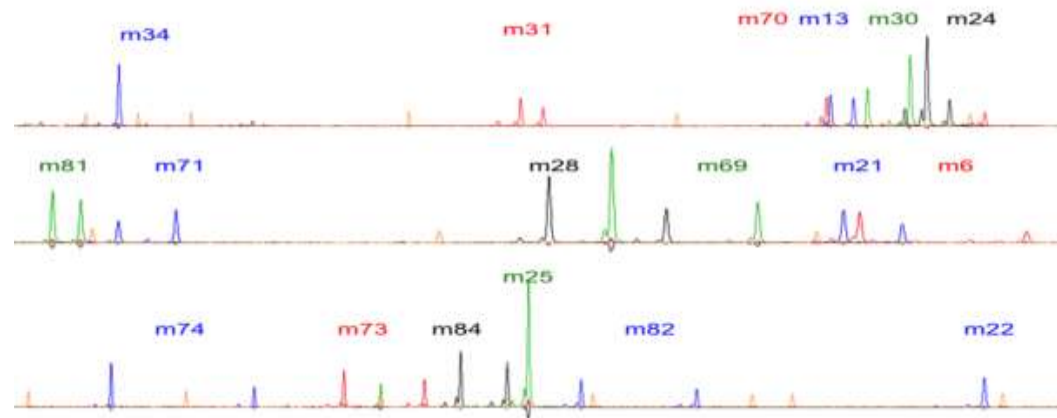
confirm with breeding records!!!
Sample of adult females

Sample summary

<i>Year</i>	<i>Rod-catch</i>	<i>Broodstock (male)</i>	<i>Broodstock (female)</i>
2004	-	195	218
2005	-	235	185
2006	-	234	258
2007	163	246	229
2008	301	158	164
2009	257	104	116
2010	83	157	171
TOTAL	804	1329	1341

The genetic markers

Marker	Number of variants
SP2201	35
SP2210	13
SPG7	26
Ssa202	16
SsaD144	38
SsaD157	35
SP1605	12
SP1608	59
SP2216	20
Ssa171	27
Ssa14	4
Ssa289	9
SP3016	18
Ssa197	29
SsaD48	66
SsaD71	55
SsaF43	12



- Error rate in generating “genetic fingerprint” (< 1%)
- Prob. of 2 individuals having same genetic profile ~ 3.5×10^{-32}
- Prob. of 2 FULL-SIBS having same genetic profile ~ 5.5×10^{-9}

Results of genetic parentage analysis

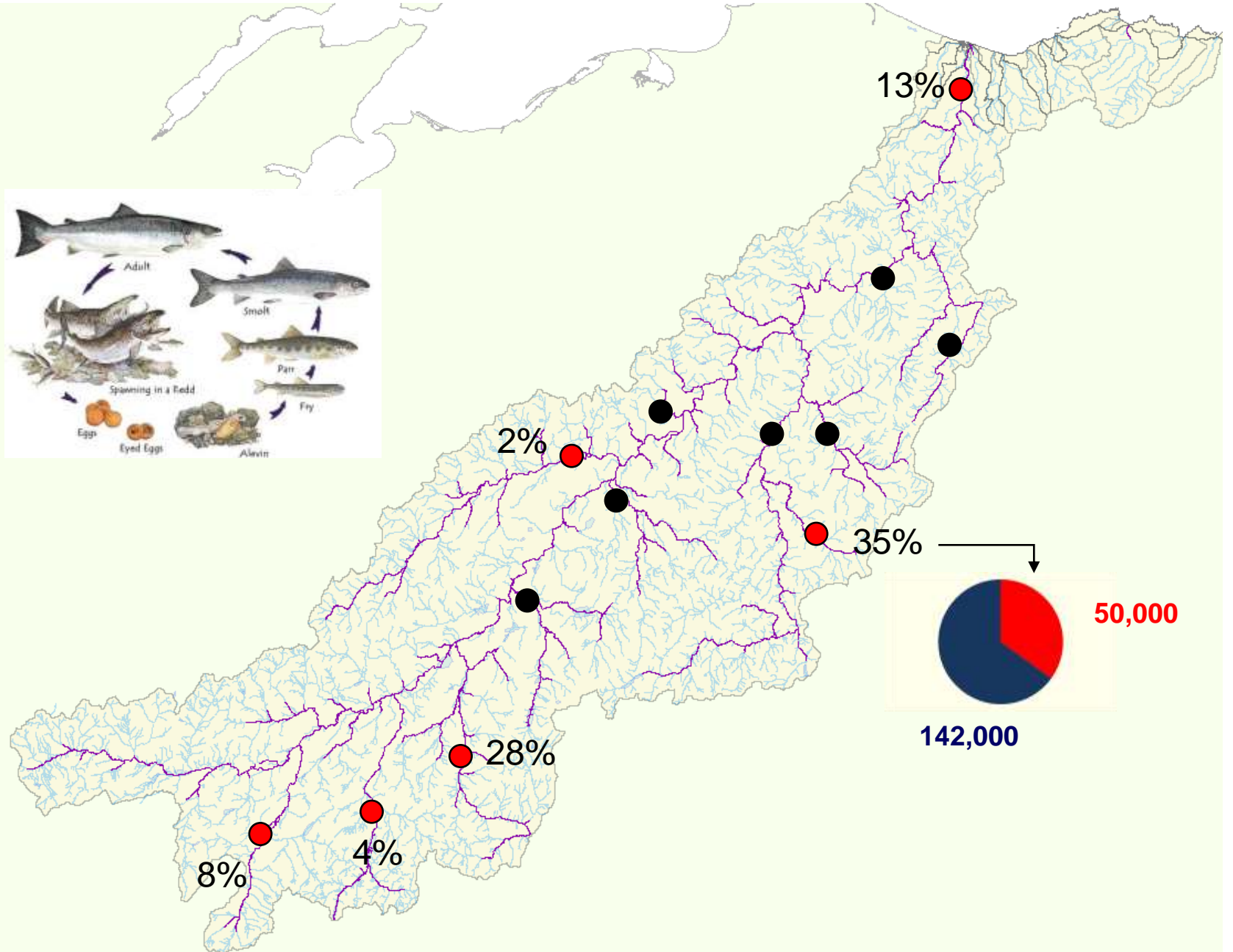
Year	Rod-catch sampled	Assigned both parents (hatchery)	Confirmed by breeding records	Broodstock sampled 'offspring'	Assigned both parents (hatchery)	Confirmed by breeding records
2007	163	0	N/A	475	0	N/A
2008	301	1 (0.3%)	YES	322	1 (0.3%)	YES
2009	257	1 (0.4%)	YES	220	7 (3.2%)	YES
2010	83	0	N/A	328	0	N/A
TOTAL	804	2		1345	8	

2009 Results

Offspring	Location	Putative Mother	Confidence	Putative Father	Confidence	Crossed in hatchery
B4187	Rod (Macallan beat)	K3243 (Sandbank)	95%	K3071 (Sandbank)	95%	YES
X2273	Broodstock (f) Upper mainstem	J3915 (Tulchan Hatchery)	95%	J3916 (Tulchan Hatchery)	95%	YES
X2310	Broodstock (f) River Avon	K3159 (Sandbank)	95%	K3160 (Sandbank)	95%	YES
X2327	<ul style="list-style-type: none"> • All cases with both parents assigned were consistent with breeding records! • assignment of one parent • cut-off level • mismatches? • post-hatchery spawning? 					
X2388						
X2439						
X2376						
X2389						
B4132	Rod (Upper Arndilly beat)	-	-	K3226* (Sandbank)	95%	N/A
X2487	Broodstock (m) Castlegrant beat	K3628 (Tulchan Hatchery)	95%	K3604 (Tulchan Hatchery)	95%	YES

*No mismatches, **2 mismatches

FASMOP juvenile baseline samples (% sample assigned to hatchery)



Summary

- *POWERFUL* tool for detecting hatchery offspring
- Rod catch: ~0.5% could be assigned back to the hatchery (slightly higher broodstock)
- % juvenile samples assigned to hatchery-origin (Tool for monitoring?)
- Other hatcheries?
- Management implications?

FASMOP: Management Implications for the River Spey



23rd March 2011

The Spey Fishery Board's Hatcheries

- The SFB operates two hatcheries – our own at Sandbank in Glenlivet, the other at Tulchan which is owned and operated by the Estate, at their expense, but under the supervision of the Board.
- 1.1 million Salmon fry currently being produced – previously 2.2 million. Capacity reduced as areas opened-up by CASS Life.
- Full-time Hatchery Manager and Part-time Assistant (60%).
- A 24hrs a day, 7 days a week, 365 days a year commitment.
- Costs up to £120,000 per annum to operate – for one hatchery.



The Genetics Project for the Spey

iii. Hatchery Influence:

- To date we have said that we are confident our Hatcheries are not causing any harm .
- We have yet to be able to determine whether they are actually doing any good, rather than just not doing any harm.
- Expect FASMOP to use the unique genetic make-up of our Hatcheries' Salmon broodstock to trace their offspring and determine whether our hatcheries are benefitting the rod fishery.

Aims of the SFB's Stocking

- Our Stocking Policy's main aim is to maximise the number of smolts from the Spey catchment that go to sea, following an apparent increase in marine mortality and impact upon the number of fish returning to the catchment (2002 Annual Report).
- So are we doing any good, rather than just not doing any harm?



From an economic point the answer has to be “No!”

But that's not the only consideration.

Stocking on the Spey: Next Steps

- Scientific opinion towards stocking has hardened in recent years.
- Why, then, do many anglers and ghillies continue to look upon hatcheries as the panacea of fishery management?
- We as Fishery Managers need to improve our communication.
- Any decision we take on our stocking policy will involve science, politics and common sense. We have to take people with us!

Stocking on the River Spey: Next Steps

- FASMOP results presented to the Spey Foundation Committee in February 2011.
- We will be undertaking a thorough review of our stocking.
- Our review may involve other interested stakeholders; we need to carry people with us!
- But we are only at the start of this journey. No decision has yet been made.
- We're working on it; we're just not there yet.

Thank You!