

# Reviewing the success of *Margaritifera* translocations



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# What I will cover?



- Background to the review
- Published codes on translocations
- Reasons for translocating *Margaritifera*
- Translocation results for *Margaritifera* from mussel researchers in Europe – case studies
- Factors leading to poor translocation results in *Margaritifera*



# Background to review

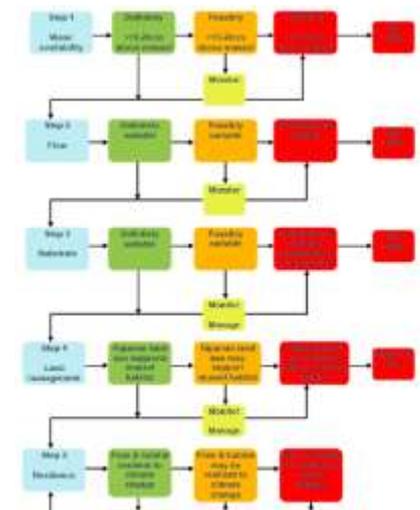


- Natural England requires the production of a translocation method statement/guidance document
- Review carried out by Ian Killeen /Evelyn Moorkens (March 2016)
- To carry out a wider review of existing knowledge and experience with translocations, in particular:
  - Published codes on translocations
  - History of translocation results for *Margaritifera* in Europe / America
  - Studies needed in advance of the translocation process
  - Factors leading to poor translocation results in *Margaritifera*
- Develop a protocol for translocation and subsequent monitoring in England

# Published codes



- IUCN guidelines for reintroductions and conservation translocations (2013)
- A code for conservation translocations has been produced for Scotland (National Species Reintroduction Forum 2014)
- A screening tool for identifying potential receptor sites (Natural England 2012)
- Chartered Institute of Ecology and Environmental Management
- European Committee for Standardization (CEN)



Screening tool for assessment of potential pearl mussel receptor sites

# Reasons for translocations



- Captive breeding (strategy driven)
- Bankside encystment (strategy driven)
- Imminent danger from accidental damage or pollution event (emergency driven)
- As mitigation measures from direct or indirect damage from permitted plans or projects (legally driven)
- To aggregate widely dispersed mussels within river (strategy driven)
- Movement within a river to areas of rehabilitated habitat (-ve effects removed in conservation projects (receptor site strategy driven)
- Movement within a river from reaches with no host fish to places with better host fish populations (donor site strategy driven)
- To move mussels upstream from estuarine habitats or from the lowest point of rivers beyond which survival is unlikely (donor site strategy driven)

# History of translocation results for *Margaritifera*



- Translocations of *Margaritifera* have notoriously poor results, but have rarely been published outside of grey literature, and rarely with exact enough details to allow analysis of causal factors of loss.
- Most of the published material refers not to *Margaritifera*, but to less sensitive unionid mussels.
  - provide useful guidance on relocating translocated mussels
  - deal with handling and transport protocols for mussels
  - behavioural responses to disturbance
  - receptor habitat choice in the translocation process
- The papers are particularly helpful in providing robust methodologies for monitoring studies

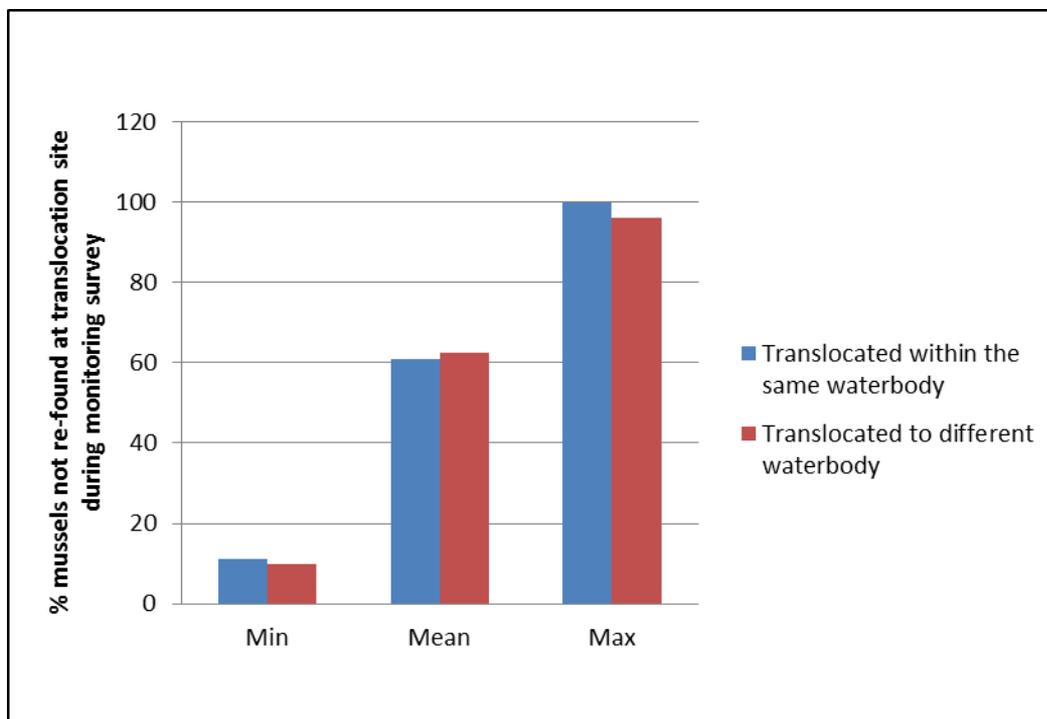
# Translocation results for *Margaritifera*



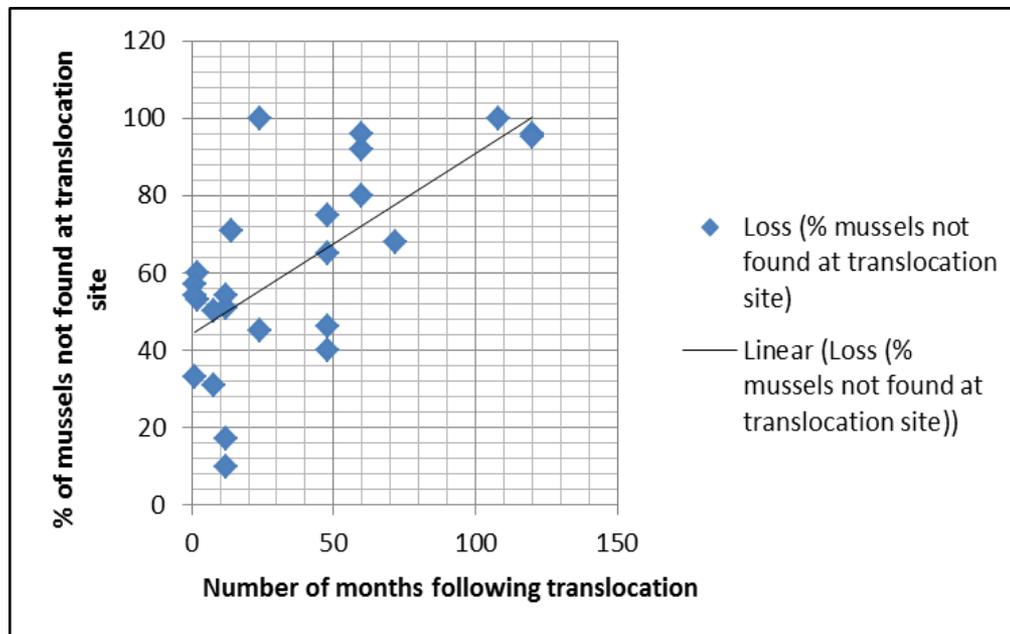
- From the 25 examples with sufficient information, the overall mean loss from receptor sites amount to 62%\*
- Monitoring recounts having been undertaken from as little as 3 weeks post translocation up to 10 years post movement

Country	Catchment/ River	Translocation reason	Date of translocation	Date of monitoring	Outcome (as numbers re- found unless otherwise stated)	Notes	Reference
England	Torridge, Devon	Return after captive breeding	June 2014	August 2014	At least 60% loss	Mussels & river in relatively poor condition	Killeen 2015
Germany	River B, Bavaria	Motorway construction	1995	+ 5 years	60% found (242/400)	Movement was 3km upstream to similar habitat	Schmidt, unpublished report
Ireland	River B, Kerry	Bridge upgrade works	Sept 2013	+8 months	69% found (35 of 51)		Moorkens pers. comm.
Scotland	Deeside	Reintroduction to tributary	2005	+ 5 years, + 10 years	20% re-found after 5 years, 5% re-found after 10 years	100 mussels moved	Sime pers. comm.
Scotland	Lochaber	Reintroduction	2009	+ 1 year, + 6 years	49% re-found after 1 year, 32% re-found after 6 years	200 mussels moved	Sime pers. comm.
Sweden	River D	Reintroduction	2007	2008-2012	65% loss (of 300) from site 1, 40% loss (of 400) from site 2	Frozen bed part implicated in the loss	Olofsson pers. comm.

## Comparison of percentage of mussels re-found between intra and inter-river translocations



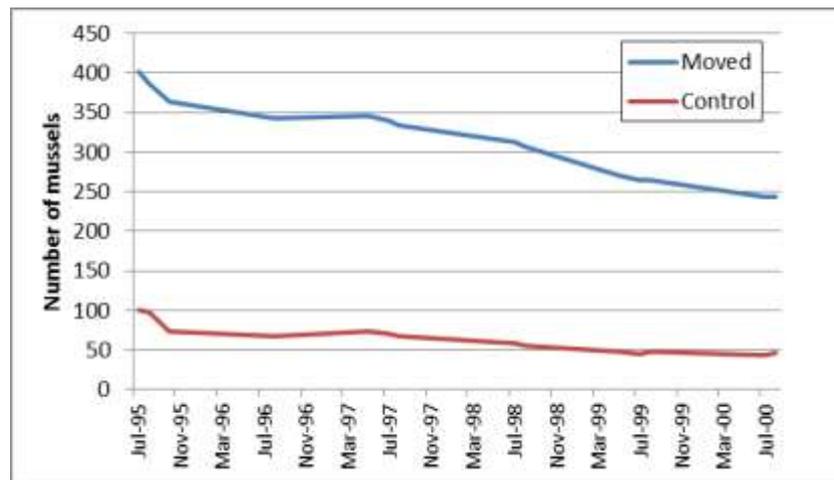
## Comparison of percentage of mussels re-found and length of time after translocation



# Germany: River B (Bavaria) - Relocation



- In 1995 a total number of 4,894 mussels were moved from downstream of the road crossing into a river section with similar water chemistry 3 km upstream.
- A total of 400 translocated mussels were individually marked together with a control group of 100 already resident at the new site.
- Over the monitoring period, 39.4% of the translocated mussels were lost, compared to a loss of 54.4% of the unmoved mussels.



# Sweden: River D (Västerbotten) – Reintroduction



Mussels were taken from two different rivers, 550 mussels from one donor population and 150 mussels from a second donor population.

- Mussels were placed at two different sites.
- At each site 100 mussels were marked.
- Five days after the mussels were placed in the water they were checked for survival and the survival was checked every year from 2008-2012 .
- No monitoring has been carried out since 2012.

Year	Site1			Site 2		
	Live mussels	Dead	Overall % loss	Live mussels	Dead	Overall % loss
2008	300	0	0	400	0	0
2009	169	6	43.7	342	2	14.5
2010	147	3	51	310	6	22.5
2011	89	3	70.3	220	66	45
2012	105	0	65	241	9	39.8

# Factors leading to poor translocation results



It is difficult to isolate key causes of problems for survival of mussels in the translocation receptor site. Key issues that can contribute to losses:

- Stress levels of donor mussels
- Similarity and quality of receptor site
- Collection and handling / transfer journey
- Flow pattern differences in donor / receptor habitats
- Flow conditions on the day or subsequent days
- Water temperature
- Genetic suitability (mussels and fish)
- Physical disturbance ('pearl fishing' risk)
- Future prospects



- Condition of mussels is clearly of great importance - the worst translocation outcomes in the short term are associated with the movement of mussels that are already stressed.
- Correct choice of receptor site on a macro and micro scale - presents the greatest challenge for long term translocation success.
- If an inappropriate receptor site is chosen the mussels would probably be safer in their original location.



# Balancing the benefits and dangers of translocation



- The evidence available to date from translocations made for various reasons underline how high risk it is as a management tool.
- Cosgrove and Hastie (2001) concluded that mussel translocation *“has been little used and should be considered experimental and last resort”* is still as relevant fifteen years later.
- Actions that increase the number of mussels with a new generation of juveniles and thus lower the risk of translocation are more desirable than moving adult mussels.
- Where mussels are needed to be translocated between sites in the wild, the choice of donor and receptor sites should be very carefully assessed and documented both before, during and after translocation under a long-term monitoring scheme.

# Conclusions



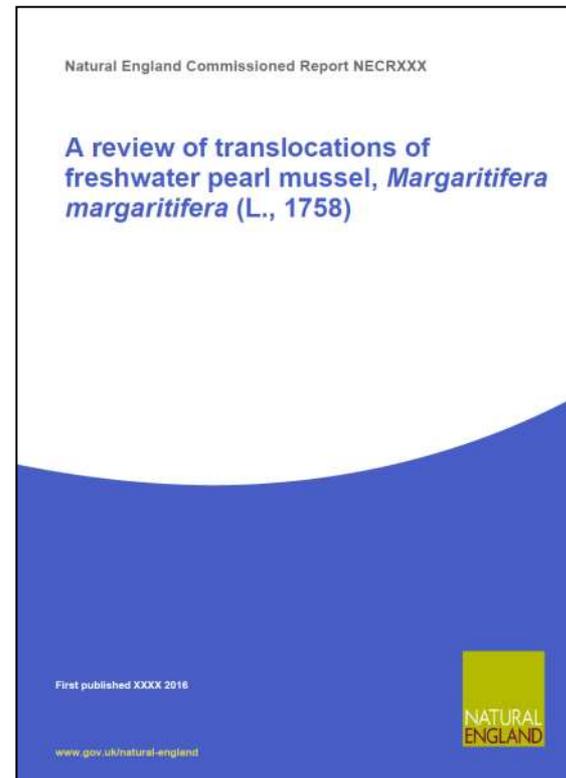
While the guidance provided is quite onerous, the risk to the population of poor translocation choices is further damage. The reward for choosing sites and undertaking translocations wisely could be saving a population of a critically endangered species from extinction, and that would be a “*wonderfully rewarding outcome*”.



# Project report



<http://publications.naturalengland.org.uk/>



- Thank You



Any Questions?