

My view from working alongside the Lark Angling and Preservation Society (LAPS) in Suffolk, UK and from studying crayfish since 2004 is summed up by the following abstract I have written for the National Crayfish conference to be held in Yorkshire in August 2015:

**Control and Management of Non-Native Crayfish in the UK:
An opinion on a dichotomy**

ABIGAIL E STANCLIFFE-VAUGHAN, Anglia Ruskin University, Cambridge, UK
Postgraduate Researcher - MPhil

Crayfish related conservation objectives in the UK are currently two-fold. **First** - the conservation of native *Austropotamobius pallipes* populations and their captive breeding for potential re-stocking. **Second** the control of non-native crayfish (primarily *Pacifastacus leniusculus*) which is so vital to the health of our native freshwater species and habitats. If control and management of *P. leniusculus* remains contentious populations will undoubtedly continue to grow and spread, even without human assistance.

But, are the conservation of native crayfish and the protection of our freshwaters diametrically opposed? The debate has moved swiftly from the scientific (does trapping work) to the social and emotive (what people will or will not do in response to different initiatives). If those involved in the debate on native crayfish conservation and non-native crayfish control lobby in opposite directions what can (or will) policy and law makers do?

Non-native crayfish control and management is achievable via trapping (look to America, Sweden and Finland for evidence of population crashes in exploited areas), and there are currently no other viable options. However, the funding needed to remove non-native crayfish from over 87% of river catchments is not available, yet there is an appetite for crayfish consumption which is not met by the UK industry but by imports of non-native crayfish from China. Non-native crayfish are a good example of a species that, by way of trapping and consumption, can fund its own removal, and assist with awareness-raising at the same time but this option is being blocked.

P. leniusculus were introduced by the UK Government in the 1970's yet it is still deemed acceptable to speculate on what people "might do", (e.g 'a market for UK *P. leniusculus* will lead to more introductions?') rather than what is actually happening (ever growing and expanding populations of non-native crayfish populations plus introductions) and to fail to consider what is practically possible and financially achievable.

The joint briefing from SEPA and SNH outlines current action in Scotland (keywords only):

"SNH only issues licences for ... surveys to monitor their Spread/ research projects. SEPA and SNH are tackling the spread of crayfish through the Check, Clean Dry awareness campaign for anglers and boat users... raise people's awareness of the threat...the methods by which signal crayfish are being spread to new locations within Scotland are coming under increased scrutiny."

These statements from the SNH/ SEPA joint submission indicate that practical action to control or manage non-native crayfish in Scotland is currently non-existent.

The submission from the Galloway Fisheries Trust, the Clyde River Foundation, the Nith Catchment Fishery Trust and the River Annan Trust notes that:

“A crayfish barrier was constructed to prevent the spread of signal crayfish from the River Clyde to the River Annan. This innovative construction, specially designed with the ecology of signal crayfish in mind is the first of its type in the UK.”

The cost of these two barriers, spaced 20 m apart, was stated in 2011 as being £50,000 with Colin Bean quoted in the local press as saying:

"We can't prevent them from becoming a problem in rivers where they currently exist, but at least this would give us some hope that we can control their spread in the future."

Signal crayfish have excellent movement, survival out of water and climbing abilities which will render any 'barrier' a short term containment option only. The combined use of a barrier to slow spread and trapping to limit population size and spread may be more effective though the costs of installing 'barriers' in all vulnerable areas would be considerable. In order to state the scientific case for trapping I will first refer to a report mentioned in the submission from SNH/ SEPA by Ribbens and Graham (2009) referring to a trapping project on Loch Ken itself. According the SNH/ SEPA report:

"An external reviewer for this project concluded that: whilst providing some valuable scientific data, the trapping project has not provided a clear justification for continued trapping effort as a means of control."

The conclusions in the report itself (included below) differ substantially from the statement above and from the River and Fisheries submission (co-authored by Jamie Ribbens of Galloway Fisheries Trust one of the two authors of the original report):

“The initial five month research has indicated that a heavy trapping programme may be able to have a significant impact on the present crayfish population. The crayfish population in Loch Ken is expected to continue to expand if nothing is done. It is important to understand how crayfish progressively colonise a large stillwater body to assist in future control programmes on similar waters. There is strong public support from local and visiting anglers for further work. There is a potential risk that this crayfish population could be a source for further introductions around Scotland due to the large number of visitors to the loch. There has been an economic cost to Scotland through the loss of visiting anglers. Concern regarding future impacts of crayfish on juvenile salmon further downstream. Work to date suggests that crayfish are degrading habitats within the loch which, in conjunction with predation, may in time reduce the fish populations of Loch Ken. This work is of local, national and international interest.”

Full conclusions available here <http://egenda.dumgal.gov.uk/aksdumgal/images/att7227.pdf> and here <http://gallowayfisheriestrust.org/PDF/ExecutiveSummaryofLochKenASCrayfishStudy.pdf>

Trapping (and the sale of catch to fund the trapping) is a viable means of control and management. Demonising a global management/ research and harvesting technique is naïve and fails to take into account the honest endeavours (and experience) of 'trappers' (see the National Institute of Crayfish Trappers website - www.nict.org.uk) as **THERE ARE CURRENTLY NO OTHER VIABLE MEANS OF CONTROL**. It has now been demonstrated in the USA, Finland and Sweden (Hein et al, 2006 & 2007; Jussila et al, 2014; Sandström et al, 2014) that trapping does not lead to population explosions or increases in biomass. Hein et al.'s 2007 study titled **“Intensive trapping causes massive population decline of an invasive crayfish”** makes this plain. The Finnish and Swedish studies on population crashes do not relate the removal of *P. leniusculus* over many years to declines though the fact remains that all of the study areas have been

commercially trapped. Currently crayfish consumed in the UK are imported from China whilst UK caught *P. leniusculus* are exported to Sweden – global crayfish madness.

The following observations were made about mechanical control (trapping) by Stebbing et al., (2012):

“Mechanical control

- Targeting all life stages equally (unbiased trapping) is the most successful strategy, and could result in eradication. Otherwise types of trapping (size biased, sex biased) are unlikely to eradicate crayfish populations.
- Unbiased trapping would require new traps designs or a combination of different designs used simultaneously, and would be fairly labour intensive.
- The most effective trap design, bait and trapping regime for the removal of different life stages of crayfish should be established, preferably a regime that is easily followed and applied by stakeholders and the voluntary sector, under guidance from experts.
- A method of calculating maximum sustainable yield for crayfish populations should be developed to aid more effective management.
- The effects of exploitation at varying degrees on crayfish population dynamics should be determined.
- The crayfish trapping industry should be engaged with to discuss control mechanisms, trapping regimes and trap design.
- An economic analysis of the value of the crayfish industry in GB should be conducted. “

Further comments made by SNH/ SEPA deserve scrutiny:

“Elsewhere in the UK, intensive trapping in the rivers Stour, Evenlode and Thame has also failed to either eradicate signal crayfish or prevent their further spread.

These remarks possibly refer to research carried out by Wright and Williams (2000) (Stour) and Moorhouse and colleagues (2010, 2011a, b; 2014) (Evenlode and Thame) but fail to accurately represent the aims and findings of the respective research studies with trapping levels that do not come close to those attained by professional trappers. Time and space do not permit a thorough interrogation of the many flaws in the assessment of trapping as a removal method so I will reluctantly move on to statements about what SNH and SEPA “believe” about peoples motivations and behaviour:

“SNH does not issue licences for catching signal crayfish to eat or to sell because this creates incentives for people to move them to new areas/ ...we believe it will encourage the spread of crayfish to new areas/... where trapping attracts a financial gain SNH and SEPA believe that this creates an incentive for people to move animals to new locations in order to take advantage of this/...A number of studies have demonstrated that the establishment of crayfish fisheries has led to an increased spread to new areas”

I am not aware of any studies that have demonstrated ‘increased spread’? Returning to the submission from the Rivers and Fisheries Trusts who state:

“The number of waterbodies with crayfish populations in Scotland is still small and currently licences to trap are limited to scientific research. In contrast, in England and Wales where a licence for trapping crayfish for human consumption can be obtained, the animals are now widespread.”

To suggest that the current distribution and spread of *P. leniusculus* in England is the fault of commercial trappers is dangerously wrong. *P. leniusculus* populations are the result of a Government initiative started in the 1970s coupled with a complete lack of any control since. Introductions were made principally in the south of the country (David Rogers Associates, 2012) their spread ever northwards (towards Scotland) should not be ignored nor should the causes be misconstrued. The increasing spread of *P. leniusculus* is already being felt regardless of borders or policies, and can be predominantly attributed to the species themselves. Though ‘accidental’ introductions by humans can never be totally avoided (with incidences allegedly reported in both England and Scotland in spite of differing legislation) other UK predators should also be borne in mind e.g. *Mustela vison* (mink), *Lutra lutra* (European otter), *Ardea cinerea*, (grey heron) and *Anas platyrhynchos* (mallard) (Holdich et al., 2004; Banha and Anastácio, 2011; Capinha et al., 2013).

If the UK public fail to be enthralled by policies that make no sense ('there is a damaging edible crustacean wreaking havoc on our waterways, one widely on sale in shops and restaurants, and the best policy is to do nothing') can they really be blamed for being less than receptive to wider messages?

The summation of the effect of signal crayfish as reported by SNH/ SEPA is sound:

"Signal crayfish are an aggressive predator which has a serious impact on native wildlife such as salmon and trout and amphibians. Signal crayfish feed on fish and amphibian eggs, tadpoles, juvenile fish, aquatic invertebrates, detritus and aquatic vegetation. They reduce native salmon and trout populations and are partly blamed for amphibian declines in England. The diversity of aquatic invertebrates is reduced and food webs are altered in sites containing signal crayfish, which may affect food availability for dragonflies and wildfowl. Signal crayfish burrow into river banks and can cause bank erosion, but no evidence of impacts on river walks or farm land in Scotland has been brought to SEPA's attention."

These impacts have been observed, felt, researched and deliberated over in England for some time now with local projects on the River Lark (and the Clyde by UCAPA) demonstrating how effective control with traps can be. It is not easy, it takes a lot of effort and a lot of time but it is possible and necessary. Regulating trapping is something that a lot of thought has gone into but before dealing with the technicalities of how a local initiative can be safely managed we must get past pontificating about what people may and may not do and deal with the problem in hand. Unmanaged *P. leniusculus* populations will continue to grow, and to spread, which will seriously affect the very aspects of Scotland that those against this initiative seek to protect. Let us not be meeting in 20 years' time so that those of us fighting the battle in England can say "we told you so".

Crayfish trapping is not the enemy, uncontrolled *P. leniusculus* populations and a failure to take action is.

References:

- Capinha, C., Brotons, L. and Anastácio, P., 2013. Geographical variability in propagule pressure and climatic suitability explain the European distribution of two highly invasive crayfish. *Journal of Biogeography*, 40 (3), pp.548-558.
- David Rogers Associates, 2012. *Control of crayfish plague in England and Wales*. London: Department of Environment, Food and Rural Affairs.
- Hein, C.L., Roth, B.M., Ives, R.A. and Vander Zanden, M.J., 2006. Fish predation and trapping for rusty crayfish (*Orconectes rusticus*) control: a whole lake experiment. *Canadian Journal of Fisheries and Aquatic Sciences*, 63 (2), pp.383-393.
- Hein, C.L., Vander Zanden, M.J. and Magnuson, J.J., 2007. Intensive trapping causes massive population decline of an invasive crayfish. *Freshwater Biology*, 52 (6), pp.1134-1146.
- Holdich, D.M., James, J., Jackson, C. and Peay, S., 2014. *The North American signal crayfish, with particular reference to its success as an invasive species in Great Britain* : Ethology Ecology & Evolution.26 (2-3) pp.12.05.2014.
- Jussila, J., Makkonen, J., Kokko, H. and Mäkinen, P., 2014. Numerous population crashes of wild signal crayfish (*Pacifastacus leniusculus*) in southern Finland. *Freshwater Crayfish*, 20 (1), pp.73-79.
- Moorhouse, T.P. and MacDonald, D.W., 2010. *Immigration rates of signal crayfish (Pacifastacus leniusculus) in response to manual control measures* : Freshwater Biology. pp.1015.
- Moorhouse, T.P. and Macdonald, D.W., 2011a. The effect of removal by trapping on body condition in populations of signal crayfish. *Biological Conservation*, 144 (6), pp.1826-1831.
- Moorhouse, T.P. and McDonald, D.W., 2011b. *The effect of manual removal on movement distances in populations of signal crayfish (Pacifastacus leniusculus)* : Freshwater Biology. pp.25 March 2012.
- Moorhouse, T.P., Poole, A.P., Evans, L.C., Bradley, D.C. and Macdonald, D.W., 2014. *Intensive removal of signal crayfish (Pacifastacus leniusculus) from rivers increases numbers and taxon richness of macroinvertebrate species* : Ecology and Evolution. pp.08/05/2014-494 - 504.
- Ribbens, J.C.H. and Graham, J.L., 2009. *Loch Ken (Kirkcubrightshire Dee) American Signal Crayfish Trapping Project*. Wigtownshire, Scotland: Marine Scotland.

- Sandström, A., Andersson, M., Asp, A., Bohman, P., Edsman, L., Engdahl, F., Nyström, P., Stenberg, M., Hertonsso, P., Vrålstad, T. and Granéli, W., 2014. Population collapses in introduced non-indigenous crayfish. *Biological Invasions*, 16 (9), pp.1961-1977.
- Stebbing, P.D., Longshaw, M., Taylor, N., Norman, R., Lintott, R., Pearce, F. and Scott, A., 2012. *Review of methods for the control of invasive crayfish in Great Britain*. Weymouth, UK: Centre for Environment, Food and Aquaculture Science.