Executive Summary

North American Signal Crayfish (*Pacifastacus leniusculus*) is an Invasive Non-Native (INN) alien invertebrate species which has successfully become established in many waters throughout the UK. There are many concerns relating to their impact on native species in particular due to their burrowing activity in banksides, competing with fish species for habitat, grazing pressure on aquatic plants and predation on invertebrates, fish and fish eggs. They can successfully colonise a wide variety of habitats.

North American Signal Crayfish (ASC) are identified in the Species Action Framework (SNH, 2007) as one of the six non-native species identified as posing a great threat to native biodiversity. This Framework priorities prevention, early detection and mitigation measures where appropriate.

While ASC have populated extensive areas of England and parts of Wales their distribution in Scotland is still believed to be fairly limited. Work undertaken in 2009 found ASC to be established in 58 km of river length in Scotland, although this study added that the methods used would probably not pick up low density ASC populations. In Dumfries and Galloway the first record of ASC was made in two tributaries of the Kirkcudbrightshire Dee in 1996. By 2004 crayfish were present in the Water of Dee (between Loch Ken and Glenlee) and were starting to be reported as a nuisance by anglers in Loch Ken.

In recent years, particularly since the mid noughties, there have been increasing numbers of complaints made by anglers that they were catching numerous crayfish as by-catch when pike angling in Loch Ken and that it was becoming increasingly difficult to angle successfully due to bait interference from crayfish. The crayfish population in Loch Ken is the largest known in Scotland and is unusual in that it is located within such a large water body.

During March 2008 local hoteliers around Loch Ken organised a press conference to highlight the problems that crayfish were causing when fishing Loch Ken. They reported that local hotels were losing substantial revenue due to visiting anglers cancelling their trips to Loch Ken.

While many reports and studies have shown the difficulty and expense in attempting crayfish eradication programmes this is not an option in large water bodies such as Loch Ken. In Loch Ken it is important to consider possible strategies to limit the impacts from crayfish on natural biodiversity through controlling their spread and controlling their numbers where they are already established.

Funding was secured by Marine Scotland to undertake a five month research project (between 27/04/09 and 25/09/09) to increase the understanding of the Loch Ken crayfish population and to investigate possible control trapping of crayfish in Loch Ken.

The agreed objectives of the project were to:

- Find an effective method to undertake large scale trapping of crayfish in Loch Ken.
- Map the distribution of crayfish within Loch Ken.
- Start to understand in more detail the crayfish population within Loch Ken.
- Examine effectiveness of undertaking a heavy trapping programme of crayfish.
- Consider merit and cost of undertaking a longer term control programme of crayfish in Loch Ken.

The main findings from the project were:

- An initial 14 day trial was undertaken to find an effective trap type for catching crayfish within the loch environment. The prawn creel trap caught the greatest number of crayfish while all trap types caught a similar length profile of crayfish. The prawn creels were also durable enough for use with a hydraulic creel hauler and self shooting system to allow 400 traps to be fished daily.
- Trapped crayfish (including berried females) were effectively killed on the boat using an industrial boiler.
- The whole length of Loch Ken was trapped to examine crayfish distribution. Crayfish were found to be present only from head of Loch Ken down to Parton House (NX 708689). This is an approximate length of 9500 m of the loch; almost two thirds.
- A 56 day heavy trapping programme was undertaken in the North end of Loch Ken which caught an estimated 659 300 crayfish.
- The heavy trapping programme found a reduction in the number of crayfish caught over time, in particular the male component of the population.
- While the male component of the population appeared to reduce, the female component did not. This is believed to be due to seasonal variation in female catchability.
- Size of male crayfish reduced during the trapping period suggesting larger male crayfish were caught first by the traps.
- Environmental changes in the loch, particularly water flows controlled by the Galloway Hydro Scheme, had a strong influence on daily crayfsh catches.
- Following the heavy trapping, anglers reported a noticeable reduction in bait interference from crayfish.
- The issue of how to dispose large numbers of crayfish remains a key issue for any future large scale trapping work.
- The crayfish population was estimated by a Mark and Recapture study and was found to be more effective at looking at impacts on the population than catch data alone due to issues of seasonal variation in crayfish behavior and vulnerability to being trapped.
- Mark and Recapture work showed a reduction of up to 60.2 % in the male crayfish population following the heavy trapping study. This work also suggested a possible crayfish density of between 1.06 – 9.05 crayfish per m^2.
- The marked crayfish were found to move up to 800 m in two weeks.
- A total of 719 532 crayfish were caught and killed during the five month study weighing between 17 988 – 21 586 kg.

It is recommended that the programme of trapping should continue on Loch Ken for a further three years for various reasons including:

- 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.