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Crayfish NEWS

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Inside this issue:

Assessing the Riparian Habitat Requirements of the White-clawed Crayfish, *Austropotamobius pallipes* (Lereboullet, 1858) in Northern Ireland

Enjoying the beautiful Irish weather! (Taken by Gary Broad, 2008).

The white-clawed crayfish, *Austropotamobius pallipes* (Lereboullet, 1858) is recognized as a vulnerable species (IUCN, 2006), and it appears in the red data book list of many of the European countries where it is found (Souty-Grosset, 2005). This provides some protection by ensuring that local governmental agencies designate areas as being under legal protection due to the conservation importance of species, or the presence of unique habitats in the area, thus affording some assistance in promoting the continued presence of vulnerable species in a country.

Ireland is assumed to contain large populations of *A. pallipes* (Reynolds, 1998), and is the only species of crayfish found in Ireland (Souty-Grosset, 2006). Due to the absence of alien crayfish and the relative cleanliness of the freshwater habitat, Ireland is considered a stronghold for the species (Reynolds, 1998). Recently, there has been concern over the status of Irish *A. pallipes* populations, due to localized pollution events and habitat destruction, possibly from anthropogenic activities such as intensive agricultural and industrial practices, poor wastewater treatment and ongoing arterial drainage schemes for the purposes of flood alleviation. Surveys carried out in the past few years have shown declines in previously sturdy crayfish populations in Fermanagh (Bradley, 2008; Wilson, 2008), which has lead to increased concerns over the future status of *A. pallipes* in Ireland.

To assess the current status of *A. pallipes* in an Special Area of Conservation (SAC) in Mid Ulster, an intensive survey was carried out by **Naomi Wilson** from Queens University Belfast, and Mark Horton from Ballinderry Fish Hatchery, Cookstown. This survey included looking at the entire Ballinderry River catchment, the upper reaches of which has

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James M. Furse
IAA President *(Australia)*

President's Corner

Dear IAA members:

Another year is rapidly drawing to a close and as always 2008 has been a busy one. There were a couple of notable events during 2008 in the IAA, and as mentioned on page 3, one of these was Jim Fetzner being awarded Honorary Life Member status in the IAA. Congratulations Jim, a richly deserved award.

Of course the other notable event of 2008 was IAA17 in Kuopio, Finland, and manuscripts can still be submitted for Freshwater Crayfish 17. The deadline for submission has been extended to January 15th, 2009, and of course authors are welcome to submit work that was not presented at the IAA17 symposium. All manuscripts will need to be submitted electronically through the IAA Manuscript Submission and Tracking System (MS&T) (http://iz.carnegiemnh.org/FCEditor/), furthermore a new, detailed set of instructions to authors are available from the MS&T website, and I encourage all authors to download, read and follow the instructions while preparing your manuscripts. There are other useful resources available, including a Freshwater Crayfish Endnote Style, reference guides and other helpful hints, so be sure to have a quick look, as there are some timesaving resources provided.

The set-up of the IAA on-line credit card payment facility (PayPal) that I mentioned in the last Crayfish News is continuing, however due to a goodly amount of rather complicated and unavoidable "red-tape", we do not anticipate this facility becoming available until the earlier part of 2009: it will be worth the wait though.

I am aware a number of IAA members have been heavily involved in assessing a large number of freshwater crayfish species reports, for possible inclusion in the IUCN Red List of Threatened Species. With around 200 species requiring assessment, this is a major project for Nadia Dewhurst, Mala Ram and their team at the Zoological Society of London. Many thanks to all IAA members who have kindly volunteered to act as assessors for this milestone project involving our beloved freshwater crayfish: it will be interesting(?) to see the results of this project when available in 2009.

Finally, Christmas is just around the corner, and I would like to wish everyone a safe, restful, happy, festive season, and a successful and Happy New Year for 2009.

My very warmest regards to you all from the hot and humid Gold Coast. H

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The International Association of Astacology (IAA), founded in Hintertal, Austria in 1972, is dedicated to the study, conservation, and wise utilization of freshwater crayfish. Any individual or firm interested in furthering the study of astacology is eligible for membership. Service to members include a quarterly newsletter, membership directory, bi-annual international symposia and publication of the journal *Freshwater Crayfish*.

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In addition to the IAA Officers, the board includes **Arnie Eversole** (USA), **Paula Henttonen** (Finland), **Jay Huner** (USA), **Julian Reynolds** (Ireland), **Stephanie Peay** (UK) and **Alastair Richardson** (Tasmania).

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This issue edited by James W. Fetzner Jr.

New Honorary Member of the IAA

It is my very great pleasure to announce that on the 19th of November 2008, at a small ceremony attended by the entire staff (more than 100 people) of the Carnegie Museum of Natural History in Pittsburgh (PA), Dr. James W. Fetzner Jr. was advised of his Honorary Member status of the IAA, and presented with his IAA Honorary Member wall plaque.

The presentation of the award to Jim was conducted on behalf of the IAA by Dr. John E. Rawlins (Head of Section, Invertebrate Zoology, Carnegie Museum of Natural History - Jim's Boss), and I am assured that Jim was "surprised" to say the least.

Jim's nomination to Honorary Member status was on the basis of his enormous contributions to the IAA and crayfish biology, and Jim joins a short but highly distinguished list of Honorary Members of the IAA.

Over a relatively short time-frame Jim has been responsible for numerous features and facilities that make all IAA members research and lives much easier, all of which he has done in his own time. Jim's sterling efforts include (but are not limited to): a thorough redesign/update of the IAA website, obtaining the originals, scanning them, and making available on-line the out-of-print volumes of *Freshwater Crayfish*, designing and implementing the IAA Manuscript Submission and Tracking System *and* online voting system, editing *Crayfish News*, and co-editing *Freshwater Crayfish 16*.

In addition, Jim has been a highly active officer and board member of the IAA since 2006 (and of course is the current President-elect), and has been very heavily involved in the recent updates to the IAA Bylaws and various other essential but very much "behind the scenes" administrative processes that keep the IAA functioning for all its members.

Jim Fetzner (right) is presented with his honorary IAA membership by John Rawlins (left) at the November staff meeting at the Carnegie Museum of Natural History in Pittsburgh, PA, USA..

Jim, on behalf of all members of the IAA I would like to express our most sincere thanks to you for your dedication and enormous contributions to the International Association of Astacology, and I know that the entire IAA joins me in congratulating you warmly on this most deserved award.

Finally, many thanks to John Rawlins, Jay Huner and Bill Daniels for their assistance in the stealthy organisation and presentation of Jim's award. H

James Furse
December 2008

IAA18- Columbia, Missouri, USA

As 2008 comes to a close, we find ourselves reflecting on what a wonderful time we had this August in Kuopio, Finland. IAA meetings are such special events, because of the topics discussed and the people who attend the symposium. So despite our lingering melancholy, we continue to prepare for IAA18 in 2010. Meeting space, lodging, and the location of the closing banquet have all been secured. A general outline of the symposium program has been completed. Social activities are coming together, including several options for post-conference tours. Updates to the IAA18 website will be made in early 2009. Please continue to visit the site (http://muconf.missouri.edu/IAA18/index.html) for all your planning needs! In closing, we would like to wish everyone, a very happy, peaceful, and healthy New Year! H

The IAA18 Organizing Committee

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Short Articles

The First Record of *Pacifastacus leniusculus* in Croatia

Croatian freshwaters are naturally inhabited by four native European crayfish species (*Austropotamobius torrentium*, *Austropotamobius pallipes*, *Astacus astacus* and *Astacus leptodactylus*) (Maguire and Gottstein Matočec, 2004). In 2003, an invasive non-native American crayfish, *Orconectes limosus* was discovered in eastern Croatia, in marshes of the Nature Park Kopački rit (Slavonia) (Maguire and Klobučar, 2003). It got there through the Danube River from Hungary, and after establishing itself in the marshes, it slowly started spreading westwards into the Drava River, where populations of *Astacus leptodactylus* (natively distributed in that part of the Drava River) have been recorded.

It was known that in the Mura River in Slovenia (which borders Croatia to the west), another non-native American species exist; the signal crayfish *Pacifastacus leniusculus*. It was never purposely introduced into Slovenia, but it has spread into its waterways from Austria. It was recorded for the first time in the Mura River in 2003 (Bertok et al., 2003). Since that time, it has spread downstream to the Ščavnica River in the direction of Croatia. Croatian astacologists were monitoring the Mura River in the border area, expecting signal crayfish to enter Croatia, and on the 22nd of October it was caught in the Mura River, one kilometre downstream from the border of Slovenia, Hungary and Croatia. We are expecting it to spread downstream toward the Drava River, and continuous monitoring will be implemented. H

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An Explanation of the Working Wetlands Conservation Initiative

Background:

Working agricultural lands in the southern United States and California, primarily rice and/or crawfish farming, contribute significantly to the habitat requirements of migrating waterfowl and other wetland-dependent wildlife. For example, of the estimated six million birds wintering in Southern Louisiana, 75 percent of the habitat is provided on the crop producing land along the Gulf Coast. The remaining 25 percent is supplied by the marsh habitats along the Gulf. Similarly, agricultural production in the Central Valley of California is critical to wintering bird populations.

Millions of other waterbirds including waders, shorebirds, gulls, terns, rails, moorhens, gallinules, coots, gulls and terns benefit from working wetland habitat. The working wetlands in southern Louisiana and southeastern Texas are invaluable habitat as the result of the integration of crawfish within the rice landscape. This ensures that moist soil and shallow water habitat is available throughout the year to support resident, breeding, wintering and migrant birds.

Rice acreage in the region exceeds 800,000 acres and crawfish acreage approaches 200,000 acres. Rice is cultivated in the warm months from spring into fall. Crawfish is cultivated from fall into spring. The two crops compliment each other. Although little crawfish is cultivated in California, feral populations of the same species cultivated in Louisiana and Texas, the red swamp crawfish, are present throughout the state's rice production areas and provide significant macroinvertebrate food resources for predaceous waterbirds. There is a direct correlation between geometric increases in wading bird populations – egrets, herons, night-herons, ibises, and spoonbills – in Louisiana and the development of the state's crawfish industry over the past half century.

Current trends in agriculture are positive for the production of crops along the Gulf and in California. However, these very factors place habitat quantity and quality for waterfowl and other wetland-dependent wildlife at risk by replacing beneficial crop systems with crop systems that leave no residual habitat, or maintain the moist-soil conditions necessary for production of beneficial plant materials, invertebrates, small fish, crawfish and related habitats. The decline in available habitat on agricultural producing land will concentrate the birds on fewer acres resulting in degraded habitat quality, increased risk of avian disease outbreaks and population decline.

Of special concern is the loss of coastal and interior wetlands in southern Louisiana. Since 1950, over 1.5 million acres of coastal wetlands have been loss along the Louisiana coast. Waterbirds have responded favorably to the working wetlands immediately adjacent to this coast as has been

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documented by a number of studies.

Similar to the Grassland Reserve Program's annual payment for a "broader" natural resource benefiting management on working grasslands, a payment for working wetland management on cropland will enhance the habitat essential to sustaining waterfowl and other wetland-dependent wildlife. The historic contribution of agricultural production areas for meeting waterfowl and other wetland-dependent wildlife habitat needs, as wetland conversion reduced the native habitat, is well documented. Public participation in a "working lands concept" will extend the beneficial use of these lands to the greater benefit of society in providing habitat requirements without restricting much needed agricultural production.

Recommendation:

The Natural Resources Conservation Service will establish under the authorities of the Wildlife Habitat Incentives Program (WHIP) and the Environmental Quality Incentives Program (EQIP) a "working wetlands" pilot program for working agricultural lands providing waterfowl and other wetland-dependent wildlife habitat through water management practices. Key components of the pilot program effort will be:

- The program will be offered in rice and/or crawfish production areas of Southern Louisiana, Texas and California;
- Annual per acre cost-share and/or incentive payments will be available for up to 5 years for program participants completing working wetland-management practices;
- The payment will be for wetland-management practices that provide benefits to waterfowl and other wetland-dependent wildlife;
- Payments will be offered for three different payment levels as related to the length/period of habitat availability and quality of management (forage/diet and water);
- Payment ranges will be established in the range of $25 to $50/acre/year as established by the state conservationist in consultation with the State Technical Committee. The rates will be based on actual costs of the practices in the respective states.

Note:

The Working Wetlands Habitat Initiative was submitted to the U. S. Department of Agriculture in August 2008. No final action has been taken as of this writing (October 2008). Organizations, no matter how large or small, are encouraged to support the initiative. To do so, they should direct inquiries as follows:

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Current/Potential Supporters:

American Farm Bureau
Baton Rouge Audubon Society
California Association of Conservation Districts
California Farm Bureau
California Outdoor Heritage Alliance
California Rice Commission
California Waterfowl Association
Delta Waterfowl
Ducks Unlimited
Fermata, Inc.
Louisiana Association of Conservation Districts
Louisiana Crawfish Farmers Association
Louisiana Farm Bureau
Louisiana Rice Growers Association
Louisiana Rice Producers Group
Mississippi River Trust
National Association of Conservation Districts
Texas Association of Conservation Districts
Texas Farm Bureau
Texas Rice Industry for Conservation and the Environment
Texas Rice Producers Association
USA Rice Producers Group
USA Rice Federation
US Rice Producers Association H

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A Safe Refuge for White-clawed Crayfish in a Stream in North Yorkshire?

Most of the remaining populations of white-clawed crayfish (*Austropotamobius pallipes*) in England are in the north, in Cumbria, Yorkshire and Northumberland. Most of the once extensive populations in the south have been lost to crayfish plague (*Aphanomyces astaci*) or have been replaced by invading populations of introduced American crayfish, especially signal crayfish (*Pacifastacus leniusculus*). Even in Yorkshire, where there are still extensive streams and rivers with abundant populations of the indigenous species, there are expanding populations of signal crayfish in every one of the major river catchments. The losses are due to competition, rather than crayfish plague in these rivers, as described in Peay and Rogers (1999) and Bubb et al. (2005). The on-going loss of range means that white-clawed crayfish populations are expected to become locally extinct in these rivers and their tributaries, except where there are major barriers to colonisation by signal crayfish.

There is growing interest in England in establishing new populations of white-clawed crayfish in "ark sites", isolated

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Volunteers search for white-clawed crayfish in a de-watered section of stream.

Crayfish traps re-set after dewatering – in case we missed some in the banks.

sites set up to provide long-term refuges for the threatened crayfish. Only a few have been set up so far, mainly in enclosed water bodies, but more are planned. The first translocation of white-clawed crayfish to an ark site in a stream was carried out in the southwest of England by Sibley et al. (2006), (reported in Crayfish News 28(4)).

In 2007, work started in a small tributary of the River Ribble, North Yorkshire, to rescue and relocate white-clawed crayfish at the leading edge of an invading population of signal crayfish. The first translocation moved just over 500 white-clawed crayfish to another stream in the catchment. The receptor stream formerly had an abundant population of white-clawed crayfish, but it had been lost to an outbreak of crayfish plague in 2001. The source of the outbreak was suspected of being stocked fish. The first monitoring survey in 2008 has confirmed that the re-introduced crayfish have survived, bred and spread out upstream and downstream. Great care was taken in handling and checking the crayfish to be certain that only white-clawed crayfish were moved. Unfortunately, there are no barriers to prevent the colonisation of the main river Ribble by signal crayfish and eventually the tributary where indigenous crayfish were re-stocked is expected to be invaded by signal crayfish too.

The aim was to find a more secure area for white-clawed crayfish in the catchment. We searched for a watercourse in the catchment where white-clawed crayfish were not found, but where we had reasonable confidence that if a population was introduced, the area would be safe from signal crayfish. We identified a section of watercourse upstream of a high waterfall. This section was surveyed and no crayfish were found, despite potentially highly suitable habitat for crayfish and good water quality. It seemed that the waterfall had been an effective barrier to natural colonization by white-clawed crayfish and so we hope it will be a barrier to signal crayfish too. The upper part of the stream is perennial, fed by limestone springs and, like the area occupied by the existing population of crayfish, it runs through un-improved grassland and wetland. There is no angling and virtually no public access.

In September 2008, we finally had a dry spell of weather, after a wet summer. By that time, agreement of the landowners had been obtained and the necessary authorizations were in place to move a protected species. Aided by keen volunteers, we rescued many crayfish by manual searching during controlled de-watering of part of the donor stream. A pump and sandbag dam was rigged to temporarily divert the flow around a short section of the stream and as the water fell the team left no stone un-turned in the search for crayfish. The white-clawed crayfish were taken, recorded, very carefully checked for species, and obvious signs of porcelain disease (those with thelohanisis were not taken). Checked crayfish were put into crates with water and grass for relocation. Some of those rescued were unusually bright blue in color, rather than the more common brown. The few signal crayfish found at this their downstream limit were removed and killed. We also caught white-clawed crayfish by trapping. At the new site, the white-clawed crayfish were distributed among stones and beneath undercut banks. Three batches were moved, a total of just over 500 crayfish. This new population will be monitored as well, to see how it develops and

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spreads.

In the meantime, the signal crayfish population will continue to expand and it seems inevitable that the species will claim all but the most isolated parts of the Ribble catchment over time. By acting now to set up ark sites, we have the best chance of conserving the white-clawed crayfish for the future. H

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White-clawed crayfish being introduced at their new site, well away from signal crayfish.

White-clawed crayfish – some of those rescued were an attractive blue colour, rather than the more usual brown.

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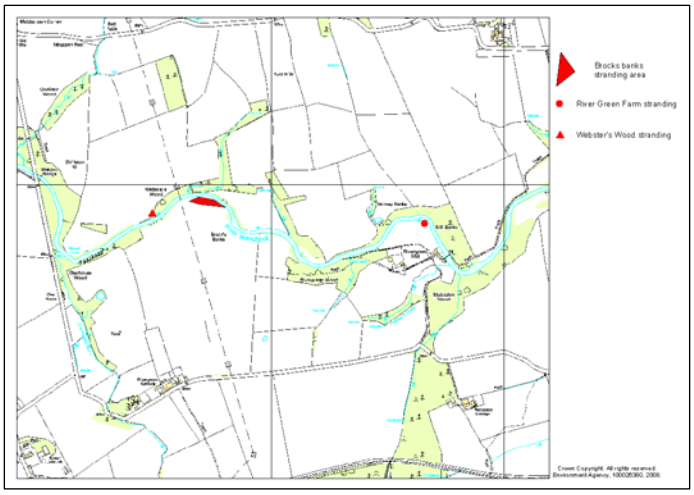
Report on a Major Stranding of Crayfish at Meldon, River Wansbeck, UK

Background

On the 6th of September 2008 the River Wansbeck in Northumberland suffered the biggest flood in living memory. The town of Morpeth was extensively flooded and the river floodplain was inundated throughout the catchment. The Wansbeck is home to an internationally important population of white-clawed crayfish, a protected species.

On Tuesday, 16th September, the Environment Agency received a message from a fisherman, who reported that crayfish were stranded in a field beside the Wansbeck at Brocks Banks, about 0.5 km downstream of the road bridge at Meldon Hall.

The site comprised a stubble field, sloping down steeply



Map showing the River Wansbeck where sampling took place.

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Stranded crayfish.


Crayfish to be returned to the river.

towards the river with a floodplain of about 100m width on the right bank. It could be seen that the floodplain area had been inundated during the flood of the 6th of September.

Crayfish were spread along approximately 100m of the field, over a width of about 20m. Living crayfish were concentrated in the few remaining puddles in the plough furrows, and a mix of living and dead crayfish were lodged amongst the stubble. Overall, it appeared that about half of the crayfish were still alive.

It was clear that few of the crayfish would get back to the river unaided, and they would all die in situ unless they were rescued.

A total of 8 buckets of crayfish were picked up by EA staff. All size classes were present and it appeared that there was a higher survival rate of the smallest crayfish, (although it would be more difficult to spot the smallest ones if they were dead). Some of the crayfish had dug burrows and others had found their way into the existing vole burrows. Crayfish were packed into some of these holes and had to be carefully dug out by hand.

Other crayfish were under stones or wrack, and amongst vegetation. The largest concentrations were in the puddles in the furrows. Here the crayfish were packed together with the larger animals around the edge and smaller ones in the centre. The ponds were quite easy to harvest.

Table 1. Estimated numbers of crayfish.

Site	Rescued	Live	Dead
Brockbanks	4000-8000	10,000	10,000
Webster's Wood	150	150+	300
Rivergreen Mill	?1000	?1000	negligible
Total	**5000-8000**	11,150	10,300

It was estimated that there were 500 to 1000 crayfish in each bucket giving a total of 4000 to 8000 returned to the river. There were about 20,000 in the field, of which about half were still alive.

The catchment was searched for other stranding sites. Using local knowledge, maps and aerial photographs, physically similar sites to Brocks Banks were pinpointed and visited. At Webster's Wood, a stranding in an old river channel was found opposite and just upstream of the Brocks Banks site. About 50 crayfish adults and 100 juveniles were returned to the river. Between 300 and 400 dead crayfish were found at this site.

At River Green Farm the farmer had already returned a significant number of crayfish to the river. These had been stranded on the floodplain upstream of the farm.

Learning points

- Following major flood events on crayfish rivers, consideration should be given to proactively checking adjacent low lying areas for stranding.
- For a search and rescue mission to be worthwhile, it needs to be carried out as soon as possible after the flood.
- The rescue described above took about 70 hours to perform and involved 7 staff undertaking rescue, 2 staff searching for additional stranding sites and one incident co-ordinator. This was in the immediate aftermath of the flood, when there was an existing high demand on EA time.
- It may be worth preparing contingency plans for rescues with the use of LIDAR data to identify the most likely stranding sites.
- Any future strandings should be shared to improve our understanding of where and when these events happen.
- Flood storage or wetland creation sites need to be carefully designed on crayfish rivers to ensure they do not operate as stranding sites during flood events.
- Other protected species are also vulnerable to stranding. These include Freshwater Pearl Mussel and fish. H

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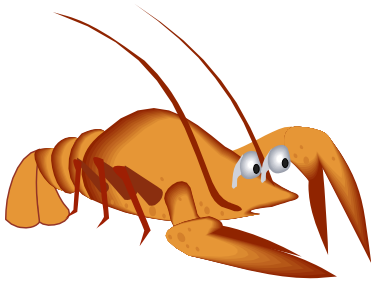

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been designated as an SAC. Although only recently adopted as an SAC, this area, which covers 58.8 hectares in total, has already seen several conservation projects for local priority species, where both the local community and experts have been working together to promote the well being of the river in terms of riparian habitat and the species diversity found there. Although *A. pallipes* is not listed as a selection feature of the Upper Ballinderry River SAC (H734 792), it is known to have a minimal presence in the area. With recent efforts into enhancing local populations in Ireland and several new breeding programs being initiated throughout Northern Ireland (Ballinderry, Florence court, Fermanagh and Dundrum, Newcastle), there is need to assess the current condition of crayfish populations, and whether there are distinct habitat features that *A. pallipes* prefer. Also, with the uncertainty as to the extent of crayfish range in the Ballinderry River and the presence of crayfish in the SAC, this survey can determine the true distribution of *A. pallipes* in the Ballinderry River system.

Site description

The Ballinderry River is situated in mid Ulster, with the catchment covering 420 km^2. Originating in the Sperrin mountains, it flows through a catchment of diverse land use, before flowing into Lough Neagh. There are five major tributaries to the Ballinderry River (Killymoon, Claggan, Rock, Lissan and Ballymully) and these were also included in the survey.

Methods

Sixty eight sites were randomly selected on the main river and its tributaries. At each site, a 30m stretch of river was measured out, which was subdivided into 5 sections (termed habitat assessment units), each 6 m in length. At each habitat assessment unit, five measurements were made of water depth and flow rate, and one measurement of dissolved oxygen concentration, pH, water temperature and EC using hand held measuring probes. Canopy cover, main vegetation types and riverbank descriptions were made by qualitative assessment and placed into classes. A macroinvertebrate sample was also taken from the 30m transect and was used to estimate Average Score per Taxon (ASPT) at each site.

Either a trapping or kick sampling method was carried out to collect any crayfish present at the survey sites. The method employed was chosen based on water depth and habitat condition of the site. Net creels were used to trap crayfish. Ten were tied at a distance of 3m apart along a weighted line of 30m (Figure 1). These were baited with fresh pork liver and placed overnight in the water. Creels were deployed for one night and collected the following morning. Any crayfish caught were measured for carapace length (CL) and total length. Weight, gender, as well as the presence of injury or disease, were also recorded. The presence of other priority species (otters and *Ranunculus* sp) was also noted. Any crayfish caught kick sampling (5 min kick sample at 5 places along the 30m stretch) were treated the same as those caught in creels.

Figure 1. The trapping protocol used for collecting crayfish involved attaching ten collapsible creels along a 30m length of lead weighted line, with 3m between each trap (Taken by Naomi Wilson, 2008).

Findings

Crayfish were found at 6 sites out of the 68 surveyed. Only one population was found within the SAC. However, sites having a higher presence of crayfish were found outside the protected area. Presence of *Ranunculus* sp and otters were found at many of the sites sampled, occasionally co-occurring with crayfish. Invasive species, such as Giant Hogweed and mink, were also found in significant numbers. Remains of crayfish were found in otter spraint at some sites. This survey also found the most northerly known natural presence of *A. pallipes* within its range (H85 83). With Northern Ireland being the northern limit of the species, this site can be considered as the upper northern limit of the species so far found.

Some crayfish also displayed signs of Porcelain disease, though this disease is seen as being common in the species, its occurrence in the Ballinderry populations was relatively low. There was no evidence of crayfish plague (caused by the fungus *Aphanomyces astaci*) in any of the populations (confirmed on site by expert) – this disease can cause elimination of populations in a water system within two weeks of introduction (Reynolds, 1998). Some injuries were observed on several individuals (damaged carapaces, amputated chelae, etc.). Some of these could be attributed to fights among conspecifics trapped together in creels during the trapping night. The greatest numbers of injuries noted were seen in creels that had over 10

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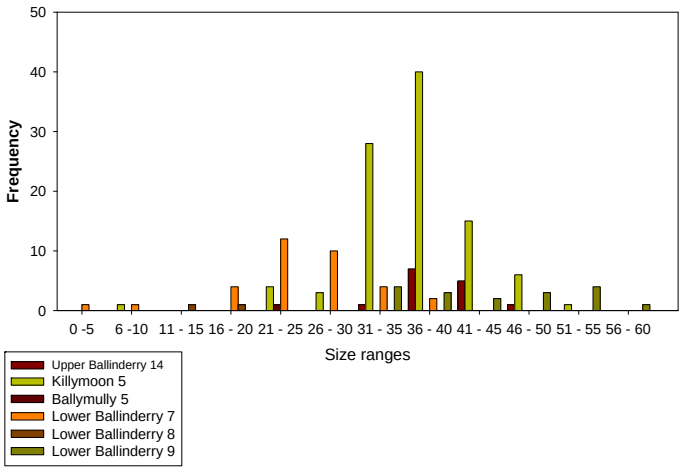

Figure 2. Comparing the Carapace length/CL sizes of the populations found at the six sites where crayfish were found. All sites show a normal distribution curve of sizes, although there is between site differences in position of curve on graph plot..

crayfish, with the wounds and amputation sites still fresh when creels were checked the morning of collection.

Equal numbers of males and females were captured in the traps at the six sites. Collection of crayfish by kick sampling only occurred at two out of the six sites with crayfish present, those netted being smaller than those collected using the trapping protocol. At four of the six sites (those sites where kick sampling did not produce a catch), there was no evidence of juveniles or hatchlings (crayfish with carapace length <15mm; Peay, 2003; Figure 2). This does not mean that there were no young of year (YOY) or juveniles in these sites. Juveniles could have been present at other areas of the habitat that were not sampled, or in areas inaccessible to both the trapping and kick sampling protocol, such as deep within burrows or in steep undercut banks. The capture of smaller crayfish in creels may not have occurred due to the presence of larger conspecifics, which could generate competitive exclusion of the smaller individuals. The mesh size of the netting

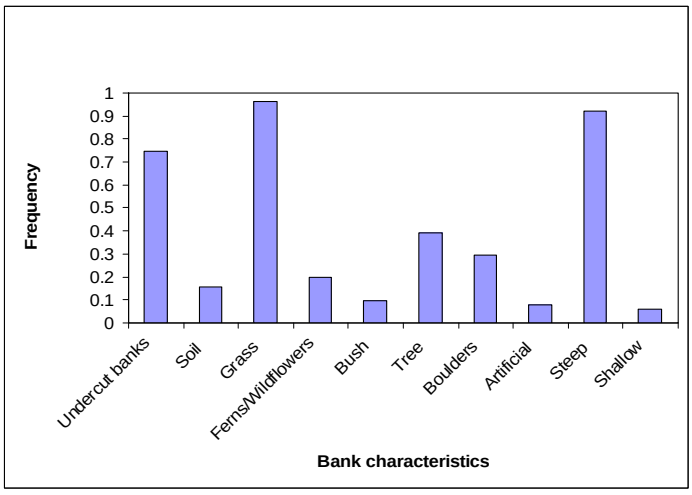

Figure 3. Bar chart showing comparison of habitat features seen in sites containing crayfish.

on creels could also have permitted escape of smaller crayfish into the water, a route which could not be taken by larger members of the population. There is also evidence that juveniles and older conspecifics do not occupy the same shelters or sites within a habitat (Thomas, 1987; Grandjean, 2003). Thus, areas where large crayfish were trapped may not contain younger/smaller specimens. At the two sites where crayfish were caught by kick sampling, the habitat units where the crayfish were netted did not provide any success by trapping.

Analysis of the water chemistry data (repeated ANOVA) showed that there were no significant differences between tributaries in terms of oxygen and water temperature. However, there were significant differences found for EC and pH ($F_{(1,6)}$ = 6.038, $F_{(1,6)}$ = 8.34 for EC and pH respectively; both P = 0.001). This noted difference could indicate that tributaries may differ in terms of their water quality. Electrolyte concentrations can increase after a pollution event has occurred, such as agricultural runoff or waste from livestock husbandry. Several sites along the tributaries that possessed high EC levels had either livestock along the proximity of the riverbank, or had active poultry farming close by. Effluent from these sites could enter nearby rivers, creating a pollution event, which effectively raises local water pH and EC levels. pH level rises when there is a significant presence of cations (positive ions released through breakdown of certain compounds, such as those used in fertiliser), and is one of the first factors to change after a pollution event. This change can be either temporary or permanent, but depends on the extent and duration of the pollution event that caused the change. There is also the possibility that the difference between tributaries in terms of EC levels could be due to the underlying geology. Tributaries that lie over glacial clay (Claggan and Rock) would naturally have high EC values. The tributaries that had the highest EC values were Lower Ballinderry (section of river that flows straight into Lough Neagh), and Killymoon, which is formed by the merging of the Claggan and Rock. This may suggest that the high EC levels found in the river cannot be entirely attributed to natural causes (such as geology).

Habitat features of the sites were crayfish were collected were analyzed using Sigma Plot and ANOVA. Results indicate that crayfish were more likely to be found in areas where there were steep under cut banks with grassy vegetation (see Figure 3).

Austropotamobius pallipes is thought to prefer areas of high water quality (Grandjean, 2003), although there is now growing evidence that they are not as intolerant to waters of poor quality as was previously assumed. Crayfish were also caught at sites containing high EC values, although these high values may have been a temporary increase. As EC levels can rise due to an increase in ions in the water, it does not indicate which compounds are causing the raise. Water samples collected from each site were tested for both the presence and concentration of sulphates, nitrates, nitrites, phosphates and ammonia, using a multi-test kit purchased from a local aquarium shop. Water hardness (Calcium carbonate) was assessed by carrying out titrations on the water samples.

A point should also be made that during the 3 months

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Figure 4. Collection of white clawed crayfish using the trapping method (Taken by Naomi Wilson, 2008).

Figure 5. Main fieldworkers on site – Gary Broad, Naomi Wilson and Mark Horton (left to right). (Taken by Alan Keys, 2008).

when the fieldwork of the survey took place, two major flooding events occurred. These happened within two weeks of each other, and both raised the water levels of the sampled rivers by approximately 2 – 4 feet. The maximum change in water levels occurred in the lower part of Ballinderry, which receives water from all five upstream tributaries. Water levels did not return to pre flood levels until two weeks after the last flooding event. During this time, fieldwork could not be conducted. Flooding of the river affected the habitat of several of the study sites that were visited prior to the floods. The excess floodwaters could have removed crayfish from several of these sites. This effect has been assumed, since these sites are locally known to contain healthy populations of crayfish, but trap catches failed at these sites shortly after the flooding events. Since no survey method is 100% effective, the lack of crayfish present at some sites could be due to the inability of the survey protocol employed to detect them.

The analysis from this survey still needs to be completed, so only a general outline of the findings can be presented here. Once completed, this work will be published.

Conclusions

Based on this survey, it should be suggested to the local government environmental agency (NIEA) to look into increasing the range of the SAC at its next assessment (due 2009). This is due to the large, healthy populations of *A. pallipes* found outside the protected area. If future assessment of the SAC leads to the increase of its range, local community groups and projects could assist in conservation efforts for the white-clawed crayfish (Figure 4), lead by Mark Horton from the local fish hatchery.

Analysis of the habitat features shows that *A. pallipes* prefers steep undercut banks, that could allow for the animals to burrow into the banks for shelter, and protection from adverse conditions in the habitat (Peay, 2003). Future work involving reintroduction of individuals into sections of Ballinderry River should assess the habitat features of prospective introduction sites, based on these findings.

Thanks are given to Gary Broad, Alan Keys, Frank Mitchell, James Horton, Lyn Byrn and Heather Black for their help with the field work (see Figure 5). H

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Meeting Announcements

Pre-announcement

Regional European Crayfish Workshop: Future of Native Crayfish in Europe

7-10 September 2009
Písek, Czech Republic

On behalf of the Organizing and Scientific Committees we would like to invite you to the Regional European Crayfish Workshop: Future of native crayfish in Europe, which will be held during 7-10 September 2009 in Písek, Czech Republic.

The workshop will be organized by the Research Institute of Fish Culture and Hydrobiology, University of South Bohemia (RIFH USB), with a focus on, among other things, conservation, reintroduction, culture, risk assessment and management of indigenous crayfish species, biology of indigenous and non-indigenous crayfish species, environmental and ecological impacts of non-indigenous crayfish species, and crayfish diseases. The workshop should be the meeting place for all involved in the above areas of crayfish research, making a bridge between academia and industry.

Keynotes, oral presentations and poster sessions will provide the forum for the dissemination of information during the workshop. Authors of selected abstracts from the proceedings of the workshop will be invited to submit a full paper for publication in a special issue of the journal entitled "Knowledge and Management of Aquatic Ecosystems".

A number of technical excursions, such as to crayfish localities in the Sumava National Park, the Crocodile ZOO, and the experimental research facilities at the RIFH USB at Vodnany, are planned.

The venue of the workshop is the old Malt-House in the town Písek, South Bohemia. Písek is considered to be of prehistorical origin, with a well-preserved, picturesque medieval centre, and the oldest bridge (Písek Stone Bridge) in the Czech Republic.

The Organizing Committee will do their best to make your stay in the Czech Republic a professional and personal (South Bohemian panorama, Czech beer) experience, which you will remember with joy.

More information regarding registration, abstract submission (including guidelines, etc.) will be available in early 2009 on the Workshop's website (http://www.vurh.jcu.cz/).

Organizing Committee:
Pavel Kozák
Tomáš Policar
Václav Nebeský
Miloš Buřič
Antonín Kouba
James Sales

Scientific Committee:
Catherine Southy-Grosset
Julian Reynolds
Leopold Füreder
Zdeněk Ďuriš
Adam Petrusek
Pavel Kozák
Tomáš Policar
James Sales

International Symposium

Conservation Biology of Freshwater Crayfish: New Challenges from Japan, East Asia

We are pleased to announce that the international symposium "Conservation Biology of Freshwater Crayfishes: New Challenges from Japan, East Asia" will be held at Ikebukuro Sunshine City, Tokyo, Japan, on 20 September 2009.

This symposium is open to everyone who is interested in freshwater crayfish, from amateur naturalists, company employees, government officers and professional researchers. The official language will be English. This symposium will be held as a satellite symposium of The Crustacean Society Summer Meeting in Tokyo, Japan (20-24 Sept. 2009), although it is financially independent.

We invite proposals of papers for the symposium from all over the world. The following items are guidelines. The submitted abstracts of the proposed papers will be under peer review by the organizing committee of this symposium, and accepted papers (a total of four papers) will be presented at the symposium.

1. Speakers may be PhD students, professional scientists, amateur naturalists, and government officers who study or work on the conservation of crayfish.
2. Presentations should be on any subject with aspects of conservation biology of crayfish.
3. Each presentation is allotted 30 minutes, including a few minutes discussion.
4. Each speaker will be financially supported for their hotel accommodation close to the venue (a room for one person, three nights around 20 Sept. 2009) and one economy-class, round-trip, discount ticket (for example, IATA-PEX, ZONE-PEX, APEX, IIT, and GIT).
5. A title (maximum 25 words) and an abstract (shorter than 300 words) of the proposed presentation, together with a list of your recent papers in this field, should be submitted as an attached file on e-mail to the symposium organizer, Tadashi Kawai (kawaita@fishexp.pref.hokkaido.jp). Before submission, please visit

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the web-page of this symposium at the TCS Tokyo Meeting web-site (http://wwwsoc.nii.ac.jp/csj4/TCSFirstPage 1.html) and carefully read the aim and scope of this symposium.

6. **Deadline for submissions is 15 January 2009**.
7. We plan to publish a proceedings volume after the symposium. We welcome the submission of full-length manuscripts to the proceedings volume (but this is NOT mandatory).

Hoping to see you in Tokyo, Japan, next year !

Dr. Tadashi Kawai (Chair)
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Books & Multimedia

Flusskrebse
Biologie - Ökologie - Gefährdung

New book on freshwater crayfish (in German).

Details:
Flusskrebse: Biologie – Ökologie – Gefährdung
Edited by Leopold Füreder
Folio-Verlag
Veröffentlichungen des Naturmuseums Südtirol, Bd. 6
Hardcover, 144 S., durchgehend farb. Abb., 20 x 27 cm
€ [D/A] 28,00 / € [I] 26,50 / sFr 48,20
ISBN 978-3-85256-406-7
Available: February 2009

FÜREDER, Leopold (Ed.), with contributions by Laura Aquiloni, Francesca Gherardi, Elena Tricarico, Sanja Baric, Josef Dalla Via, Giorgio Carmignola, Christoph Dümpelmann, Leopold Füreder, Heike Perlinger, Christine Rangger, Daniela Sint, Martin Weinländer, Willigis Gallmetzer, Harald Gross, Daniel Hefti, Max Keller, Maria Luise Kiem, Peter Jean-Richard, Chris Lukhaup, Yoichi Machino, Ivana Maguire, Massimo Morpurgo, Robert Patzner, Reinhard Pekny, Manfred Pöckl, Holger Schulz, Ralf Schulz, Catherine Souty -Grosset, Thomas Stucki, Bertha Thaler.

All indigenous European freshwater crayfish species are threatened by various impacts. This is especially true in areas where land-use and other anthropogenic activities have altered freshwater habitats. The new book, edited by Leopold Füreder, gives an overview and update on the distribution and ecology of indigenous and non-indigenous freshwater crayfish species in Europe. Their fascinating biology and ecological interactions within the aquatic ecosystems are presented based on the latest scientific results. Besides the general biology and distribution in the Alpine and circum-alpine countries, particular emphasis is put on new insights into the biogeography of indigenous species from population genetics, or the diversity of parasites and symbionts on crayfish. From several regions in Germany, Austria, Italy and Switzerland, interesting examples from the implementation of species protection programs are provided, including the experiences in crayfish breeding for harvest and re-introductions.

With many exciting pictures and detailed explanations, the book addresses interested people in natural sciences, fishermen, students, academics and specialists in freshwater biology, zoology, ecology and engineering. The authors are either experienced scientists in the relevant disciplines, officials in nature conservation and administration, or crayfish breeders. The results and experiences from our own research and projects were integrated into this comprehensive textbook, as well as the suggestions of other crayfish specialists. H

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