RAPID RISK ASSESSMENT SUMMARY SHEET

Updated: September 2015

White river crayfish (*Procambarus acutus acutus*)

- Freshwater crayfish, similar to the invasive *P. clarkii*. Can reach 5 inches in length.
- Currently found in a single site in Britain.
- Prefers still or slow flowing waters and mud, sand or gravel substrate.
- Potential negative impacts on native white-clawed crayfish.
- May damage riverbanks through burrowing, impacting on flood defences.

Source: Oklahoma Biological Survey 2015

History in GB

Currently known in a single site in Britain, an offshore fishery near to Windsor, England. This population is thought to have been introduced around 15 years ago. The ecology and biology of *P. acutus* suggests that it will be able to reproduce and survive within the risk assessment area.

Native distribution

Native to USA: southern Atlantic coast drainage from Geordia to Maine, Florida to Mexico and central Mississippi valley to upper Great Lakes drainages.

Source: USGS 2015

Distribution in GB

Currently known in a single site in Britain, an offshore fishery near to Windsor, England.

[distribution map currently unavailable]

Impacts

Environmental

- Potential significant impact on native protected white-clawed crayfish *Austropotamobius pallipes* if it were to come into contact, particularly if *P. acutus* was carrying crayfish plague.
- In environments with a lack of natural habitat and suitable substrate, may damage river banks and cause sedimentation of rivers through burrowing.

Economic

- Potential impact to flood defences through burrowing.

Social

- None known

Introduction pathways

Human consumption - no significant market for live *Procambarus* spp in GB so imports are rare

Aquarium trade - illegal to keep this species without a licence and most are traded as individuals so unlikely to lead to new populations.

Spread pathways

GB population has not spread since its introduction 15 years ago, possibly due to the environment it was introduced into, and distance between the population and other water courses.

Summary

	Risk	Confidence
Entry	VERY LIKELY	HIGH
Establishment	LIKELY	HIGH
Spread	INTERMEDIATE	MEDIUM
Impacts	MODERATE	MEDIUM
Conclusion	MEDIUM	MEDIUM

Information about GB Non-native Species Risk Assessments

The Convention on Biological Diversity (CBD) emphasises the need for a precautionary approach towards non-native species where there is often a lack of firm scientific evidence. It also strongly promotes the use of good quality risk assessment to help underpin this approach. The GB risk analysis mechanism has been developed to help facilitate such an approach in Great Britain. It complies with the CBD and reflects standards used by other schemes such as the Intergovernmental Panel on Climate Change, European Plant Protection Organisation and European Food Safety Authority to ensure good practice.

Risk assessments, along with other information, are used to help support decision making in Great Britain. They do not in themselves determine government policy.

The Non-native Species Secretariat (NNSS) manages the risk analysis process on behalf of the GB Programme Board for Non-native Species. Risk assessments are carried out by independent experts from a range of organisations. As part of the risk analysis process risk assessments are:

- Completed using a consistent risk assessment template to ensure that the full range of issues recognised in international standards are addressed.
- Drafted by an independent expert on the species and peer reviewed by a different expert.
- Approved by an independent risk analysis panel (known as the Non-native Species Risk Analysis Panel or NNRAP) only when they are satisfied the assessment is fit-for-purpose.
- Approved for publication by the GB Programme Board for Non-native Species.
- Placed on the GB Non-native Species Secretariat (NNSS) website for a three month period of public comment.
- Finalised by the risk assessor to the satisfaction of the NNRAP.

To find out more about the risk analysis mechanism go to: www.nonnativespecies.org

Common misconceptions about risk assessments

To address a number of common misconceptions about non-native species risk assessments, the following points should be noted:

- Risk assessments consider only the risks posed by a species. They do not consider the practicalities, impacts or other issues relating to the management of the species. They therefore cannot on their own be used to determine what, if any, management response should be undertaken.
- Risk assessments are about negative impacts and are not meant to consider positive impacts that may also occur. The positive impacts would be considered as part of an overall policy decision.
- Risk assessments are advisory and therefore part of the suite of information on which policy decisions are based.
- Completed risk assessments are not final and absolute. Substantive new scientific evidence may prompt a re-evaluation of the risks and/or a change of policy.

Period for comment

Draft risk assessments are available for a period of three months from the date of posting on the NNSS website*. During this time stakeholders are invited to comment on the scientific evidence which underpins the assessments or provide information on other relevant evidence or research that may be available. Relevant comments are collated by the NNSS and sent to the risk assessor. The assessor reviews the comments and, if necessary, amends the risk assessment. The final risk assessment is then checked and approved by the NNRAP.

*risk assessments are posted online at:
https://secure.fera.defra.gov.uk/nonnativespecies/index.cfm?sectionid=51
comments should be emailed to nnss@apha.gsi.gov.uk

Rapid Risk Assessment of: *Procambarus acutus acutus*
Author: Paul Stebbing

Version: Final (April 2016) – Draft 1 (November 2012), Peer Review (January 2013), NNRAP 1st review (February 2013), Draft 2 (January 2015)
Signed off by NNRAP: February 2013
Approved by Programme Board: September 2015
Placed on NNSS website: November 2015

GB Non-native species Rapid Risk Assessment (NRRA)

Introduction:

The rapid risk assessment is used to assess invasive non-native species more rapidly than the larger GB Non-native Risk Assessment. The principles remain the same, relying on scientific knowledge of the species, expert judgement and peer review. For some species the rapid assessment alone will be sufficient, others may go on to be assessed under the larger scheme if requested by the Non-native Species Programme Board.

1 - What is the principal reason for performing the Risk Assessment? (Include any other reasons as comments)

Response: *To rapidly assess the risk associated with this species in Great Britain*

2 - What is the Risk Assessment Area?

Response: *Great Britain*

3 - What is the name of the organism (scientific and accepted common; include common synonyms and notes on taxonomic complexity if relevant)?

Response: Commonly called the white river crayfish (*Procambarus acutus acutus*). However, the taxonomic status of this species is confusing. The white river crayfish is better described as a species complex rather than a clearly defined individual species (http://www.iucnredlist.org/details/154022/0). It has been found in ponds, creeks, rives, lakes, ditches, sloughs and burrows. The habitat that the species has been found in varies considerably, from waters with no to slow flow and substrates consisting of mud, sand or gravel (http://dnr.wi.gov/topic/EndangeredResources/Animals.asp?mode=detail&SpecCode=ICMAL14230). The species is known to burrow in response to declining water levels, and burrows are used to overwinter. The burrows generally have two entrances and are capped with mud. The species Originates from the Southern Atlantic coast drainage from Georgia to Maine and from the Florida panhandle to Mexico; central Mississippi Valley to the upper Great Lakes drainages (http://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=216). The complexes natural range covers more than half of the US and includes several sub species such as *Procambarus zonangulus* and *Procambarus blandingii cuevachicae*. Other species are very similar and are confusingly also referred to as white river crayfish, such as *Procambarus neuches.* The species is a congeneric of the invasive *P. clarkii* and are very similar to them in many ways. Given the similarity between both of these species it would be easy to confuse them.

4 - Is the organism known to be invasive anywhere in the world?

Response: It has been introduced into certain parts of North America (California, Connecticut, Maine, Kentucky, Wisconsin and New England), the Nile in Egypt and the Netherlands. However, how invasive this species is has never been studied. Given the species similarity to other invasive species (e.g. *P. clarkii*) its potential impact could include, habitat destruction through burrowing, predation on native species, and a competitive edge over other species for resources due to a high fecundity, fast growth rate and a tolerance for a

wide range of environmental conditions. It may also be a vector for the crayfish plague (*Aphanomyces astaci*), although Dutch populations where found not to carry the pathogen (Tilmans et al. 2014). So far it has not been found to have a negative impact on the ecosystem where it has been introduced (e.g. the Netherlands), however, there may be a lag period between initial establishment and impact as has been observed with other related species (e.g. *P. clarkii*).

5 - What is the current distribution status of the organism with respect to the Risk Assessment Area?

Response: One known site. Currently in an off line fishery near to Windsor, England.

6 - Are there conditions present in the Risk Assessment Area that would enable the organism to survive and reproduce? Comment on any special conditions required by the species?

Response: The ecology and biology of *P. acutus* is under studies, but commonly occurs naturally and in cultural ponds with *P. clarkii*, therefore their preferences are assumed to be similar. However, *P. acutus* is more abundant in lotic systems and is not as abundant as *P. clarkii* in eutrophic marsh or swamp lands. The natural range of *P. acutus* is much broader and more extensive than *P. clarkii*. This would suggest that the species is tolerant of a wide temperature range and has been reported to grow more quickly at lower temperatures than *P. clarkii*, but is limited to one reproductive cycle per annum and is often dominated by *P. clarkii.* It is therefore concluded that the species will be able to reproduce and survive within the risk assessment area. Soes and Koese (2010) commented that *P. acutus* is considered more likely to survive Dutch winters than *P. clarkii*.

7 - Does the known geographical distribution of the organism include ecoclimatic zones comparable with those of the Risk Assessment Area or sufficiently similar for the organism to survive and thrive?

Response: It is found over a broad climatic range, encompassing the east coast of the US and inland to the Cascade Mountains. Therefore there is an environmental overlap of its natural range and that of the risk assessment area.

8 - Has the organism established viable (reproducing) populations anywhere outside of its native range (do not answer this question if you have answered 'yes' to question 4)?

Response:

9 - Can the organism spread rapidly by natural means or by human assistance?

Response: *P. acutus* is similar to *P. clarkii* and is used in a similar fashion. In its native range the species complex is common in aquaculture, and within North America it is used as a bait species. Aquaculture and the use of the species as bait are therefore considered to be the main pathways of spread within the US. As both species are commonly farmed together then shipments for human consumption entering GB may contain both species, resulting in their escape/release into the wild. Both species may also have been imported for the ornamental trade, potentially resulting in their release. It is worth noting that *P. clarkii* has been present within GB for over 30 years and has a comparatively limited distribution, possibly as a result of the isolated location where it was originally introduced and its relatively low tolerance to cold weather. It is thought that the population of *P. acutus* in GB was introduced with Koi carp over 15 years ago (Tim Flood, Environment Agency, per. Comm.). There is potential for this species to spread to any nearby water courses through natural means as *P. clarkii* has done recently, and given the comparative tolerance of *P. acutus* to colder conditions it may be more likely to establish populations. The species is not used in aquaculture within the risk assessment area, and there is not a culture of using crayfish as bait so these pathways are unlikely to be an issue. Potential of individuals to be caught in movements of fish from the fishery where the population is currently located also

seems unlikely as movements of fish from the site are likely to be rare and precautions can be put into place to reduce the risk of this occurring if movements are made for fishery management purposes.

10 - Could the organism itself, or acting as a vector, cause economic, environmental or social harm in the Risk Assessment Area?

Response: There is a lack of evidence of this species causing impact (Soes and Koese 2010). The species is tolerant of a wide range of environmental conditions, is known to burrow in its native range, and may displace native species and carry *Aphanomyces astaci.* If the species were to spread to other environments then it may have an impact within GB.

Entry Summary

Estimate the overall likelihood of entry into the Risk Assessment Area for this organism (comment on key issues that lead to this conclusion).

Response: *very likely (although further entry is considered unlikely)*

Confidence: *high*

Comments (include list of entry pathways in your comments):

As the species has already been introduced into the risk assessment area then introduction is very likely, although the possibility of further introductions seems unlikely.

Import of live animals direct for human consumption- while this is a viable legal route of entry into GB, it is still illegal to allow their release. However, there is no significant market for live *Procambarus spp.* in GB, and are only imported on rare occasions.

Aquarium trade- *P. clarkii* (and therefore possibly *P. acutus*) are commonly found in the aquarium trade, but are illegal to keep without a specific licence. Most tend to be traded as individuals and therefore unlikely to result in the seeding of new populations. The nature of the modern aquarium trade would also make it unlikely for this species to be transported and introduced accidentally with other species.

Establishment Summary

Estimate the overall likelihood of establishment (comment on key issues that lead to this conclusion).

Response: *likely*

Confidence: *high*

Comments (state where in GB this species could establish in your comments, include map if possible):

Given that there is a breeding population of *P. acutus* in GB and there are similarities between the species and an already established invasive crayfish species (*P. clarkii*) then it is likely *P. acutus* will become established where introduced, especially considering the species broad tolerance to environmental conditions. However, if introduced with other invasive crayfish species it may not be able to establish as a result of competition effect.

Spread Summary

Estimate overall potential for spread (comment on key issues that lead to this conclusion).

Response: *intermediate*

Confidence: *medium*

Comments (include list of spread pathways in your comments):

It is known that *P. clarkii* has been present in GB waters for at least 30 years, but has not spread as extensively as other invasive crayfish species over a similar time period. With *P. clarkii* this may have been as a result of lower temperature resilience limiting reproduction. As *P. acutus* is comparatively more robust to low temperatures than *P. clarkii* this may increase its rate of spread. However, the known population of *P. acutus* in GB is thought to have been introduced 15 years ago and has not spread subsequently. This may be a result of the environment into which it was introduced, and the proximity of the population to other water courses. If the

species was to be introduced into other water courses within the risk assessment area then spread may be more rapid than currently observed with the single known population.

Impact Summary

Estimate overall severity of impact (comment on key issues that lead to this conclusion)

Response: *moderate*

Confidence: *medium*

Comments (include list of impacts in your comments):

There are no records of *P. acutus* having any significant environmental impact outside of its natural range, this does not mean that it has not had an impact that has not been observed or that it will not if there is a considerable lag phase between establishment and spread. The lack of apparent impact may be a result of the environments into which it has been introduced. Under different circumstances the species may have considerable impact, for example if this species was to come into contact with *A. pallipes* then it could have a significant impact, especially if carrying crayfish plague. In environments where there is a lack of natural habitat and suitable substrate the species may burrow leading to potential impact to flood defences, river banks and associated indirect impact through sedimentation. In comparison to other related species (e.g. *P. clarkii* and the marbled crayfish) *P. acutus* will possibly have less environmental impact than *P. clarkii*, but may potentially establish populations and spread more quickly given its tolerance to environmental conditions, despite the comparatively limited reproductive capability. This may result in *P. acutus* having less impact than *P. clarkii* but potentially over a wider area if its spread was left unchecked. Comparing *P. acutus* to the marbled crayfish is difficult as there is limited information on marbled crayfish in natural environments. Given that marbled crayfish have established populations in Italy and Germany (Marzano et al. 2009; Löwe 2010) the species is likely to have as broad a tolerance to environmental conditions as *P. acutus*. Marbled crayfish are likely to reproduce more rapidly and therefore have the potential to spread quickly (propagule pressure), they have a significant feeding rate and have been recorded to reach very high densities in the wild (Löwe 2010). Therefore marbled crayfish are likely to have more of an impact than *P. acutus.*

Climate Change

What is the likelihood that the risk posed by this species will increase as a result of climate change?

Response: *medium*

Confidence: *medium*

Comments (include aspects of species biology likely to be effected by climate change (e.g. ability to establish, key impacts that might change and timescale over which significant change may occur):
Given the already broad temperature range that this species is already found over, it would seem unlikely that this species risk would increase with climatic change. Although it may reproduce more effectively at higher temperatures.

Conclusion

Estimate the overall risk (comment on the key issues that lead to this conclusion).

Response: *medium*

Confidence: *medium*

Comments: There is a lack of information concerning this species making a desk based risk assessment difficult, especially given the taxonomic confusion, even in its native range. Reports from the Netherlands and parts of the US into which it has been introduced would suggest that it has little impact, but these are circumstantial and there are certain characteristics of this species (e.g. potential carrier of *Aphanomyces astaci*, and burrowing) which may result in it having a significant impact if introduced elsewhere in GB. Given the broad tolerance of the species to environmental conditions it is likely for this species to become established if introduced within the risk assessment area. It may be that the lack of spread from the one established population is circumstantial, with no water courses for the species to spread to in proximity to the site. If the species were introduced into an open water course then it may spread rapidly. The impact may not be as significant as other introduced crayfish species, but could potentially be over a much wider area. However, it is unlikely for further introduction events to occur. The response to this overall conclusion is therefore precautionary.

Management options (brief summary):

1 - Has the species been managed elsewhere? If so, how effective has management been?

Response: It has not been managed elsewhere as a pest species, but is managed as an aquaculture species.

2 - List the available control / eradication options for this organism and indicate their efficacy.

Response: The lack of information on the biology and ecology of this species makes speculation on potential control mechanisms very difficult and an indication of their efficacy almost impossible. However, traditional methods such as physical removal may be an effective way to control enclosed populations if suitably implemented. Other methods may be effective, such as male sterilisation or the use of chemicals, although these would need to be tested under laboratory conditions first.

3 - List the available pathway management options (to reduce spread) for this organism and indicate their efficacy.

Response: Stopping the importation of live crayfish for human consumption will help to reduce the risk of further introductions.
The introduction of legislative import controls of crayfish destined for the aquarium trade will help to more closely regulate this potential pathway.
In the specific case of the known population of *P. acutus* in GB then not allowing any movement of fish off the fishery and introducing biosecurity measures (not water) for anglers to prevent the spread of juveniles will also help in preventing further spread.

4 - How quickly would management need to be implemented in order to work?

Response: Management of pathways should be introduced immediately to prevent the further introduction and/or spread of other non-native crayfish species.
Given the slow rate of spread of this species control and eradication techniques could be implemented at a later date. However, until control/eradication methods are implemented then there is still the potential for this species to spread.

References

Provide here a list of the references cited in the course of completing assessment

List:

http://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=216

http://www.cabi.org/isc/?compid=5&dsid=67841&loadmodule=datasheet&page=481&site=144

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Seals, Eversole, Tomasso and Petrosky (2007). Effects of Temperature on Feeding Activity of the White River Crayfish *Procambarus acutus acutus*. Journal of the World Aquaculture Society 28:2 133-141M.

Soes, M. and Koese, B. (2010). Invasive freshwater crayfish in the Netherlands: a preliminary risk analysis. Bureau Waardenburg bv.

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