Non-native invertebrates: suggestions for amendments to Schedule 9 of the Wildlife and Countryside Act 1981 and for a ban on sale for certain species

February 2015

Margaret Palmer

Saving the small things that run the planet

Buglife - The Invertebrate Conservation Trust is a registered charity at Bug House,
Ham Lane, Orton Waterville, Peterborough, PE2 5UU
Company no. 4132695, Registered charity no. 1092293, Scottish charity no. SC04004

Buglife's suggestions for amendments to Schedule 9 of the Wildlife and Countryside Act 1981: non-native invertebrate species

February 2015

Criteria for listing non-native animal species on Schedule 9[1]

1. The taxon is established in the wild in England and/or Wales.
2. There is evidence that human activity results in or is likely to result in the intentional or accidental introduction of the organism to the wild.
3. The taxon must be thought to pose an actual or potential threat to wildlife or natural biodiversity when introduced to the wild.

Asian clam *Corbicula fluminea*

Criterion 1
Corbicula fluminea is a freshwater clam native to south eastern Asia and Africa (CABI[2]). Since its arrival in the late 1990s in the Norfolk Broads, it has colonised all the major rivers in the Broads system and has spread to other river catchments, including the Thames and Great Ouse (GB Non-Natives Factsheet Editor, Biological Records Centre).

Criterion 2
The pathway of introduction to Britain is unknown, but *Corbicula fluminea* was transported from the USA into Europe via ballast water. On Ebay, living 'Golden freshwater clams *Corbicula fluminea'* are on sale for £3.25 each, for use in ornamental ponds and aquaria. This species cannot be confined, even when introduced to isolated water bodies, as the clams are spread by birds and mammals.

Criterion 3
Corbicula fluminea is an ecosystem engineer because it grows densely and has a high filtration capacity. It increases light penetration, leading to enhanced growth of water plants, and intensifies sedimentation with its droppings, so modifying freshwater habitats. *C. fluminea* can also cause serious economic damage by clogging pipes (GB Non-Natives Factsheet Editor, Biological Records Centre). This species has been assessed as posing a major environmental risk in Ireland (www.nonnativespecies.ie).

Proposal
Add *Corbicula fluminea* to Schedule 9 to regulate deliberate release to the wild and to discourage its introduction to ornamental ponds, from which the species may escape into the wild.

Virile crayfish *Orconectes virilis*

Criterion 1
Orconectes virilis is native to north and central U.S.A. An established population was identified in the River Lee in 2004 (GbNNSS Factsheet; D. Holdich, pers. com.). This population had previously been mistaken for *Orconectes limosus*, which is already

[1] Criteria from Defra. 2007. Consultation on (1) The Review of Schedule 9 of the Wildlife and Countryside Act 1981 and (2) The Ban on Sale of Certain Non-native Species.

[2] Centre for Agricultural Bioscience International's (CABI's) Invasive Species Compendium (www.cabi.org/isc)

listed on Schedule 9*. O. virilis* is known also to have been introduced to The Netherlands.

Criterion 2
A number of freshwater crayfish are now being traded in Britain as ornamentals for aquaria and ponds. The population of *Orconectes virilis* in the River Lee is thought to have originated from individuals discarded from an aquarium or ornamental pond into the wild.

Criterion 3
Orconectes virilis is rated by UKTAG as high impact and by GBNNSS as medium risk. It has the potential to out-compete the native freshwater crayfish *Austropotamobius pallipes*, which has already been driven to extinction in many catchments in England and Wales as a result of the introduction of other non-native crayfish species. *O. virilis* is a carrier of crayfish plague, which is fatal to *A. pallipes.* Crayfish are ecosystem engineers, as they are large omnivores that can alter the composition of freshwater communities. They also damage river banks by burrowing and cause increased siltation. This species has been assessed as posing a major environmental risk in Ireland (www.nonnativespecies.ie).

Proposal
Add *Orconectes virilis* to Schedule 9, in order to regulate deliberate release to the wild. Buglife recommends that all species of non-native freshwater crayfish established in the wild in England or Wales are included in Schedule 9[3].

White river crayfish *Procambarus acutus*

Criterion 1
Procambarus acutus is native to the U.S.A. and Central America. An established population was found recently in the wild in Windsor (D. Holdich, pers. com.).

Criterion 2
The pathway of introduction to Great Britain is not known, but this crayfish may have been released into the wild as a discard from an aquarium. Freshwater crayfish species are now being traded in Britain as ornamentals. *Procambarus acutus* has been introduced to Netherlands for aquaculture.

Criterion 3
If it spreads, *Procambarus acutus* has the potential to out-compete the native freshwater crayfish *Austropotamobius pallipes*, which has already been driven to extinction in many catchments in England and Wales as a result of the introduction of other non-native crayfish species. *P. acutus* is a carrier of crayfish plague, which is fatal to *A. pallipes.* Crayfish are ecosystem engineers, as they are large omnivores that can alter the composition of freshwater communities. They also damage river banks by burrowing and cause increased siltation.

Proposal
Add *Procambarus acutus* to Schedule 9 to regulate deliberate release to the wild. Buglife recommends that all species of non-native freshwater crayfish established in the wild in England or Wales are included in Schedule 9[2].

---

[3] At present, five species of non-native crayfish are included on Schedule 9. They are:
American signal crayfish *Pacifastacus leniusculus*
Noble crayfish *Astacus* astacus
Turkish / Narrow-clawed crayfish *Astacus leptodactylus*
Spiny-cheek crayfish *Orconectes limosus*
Red swamp crayfish *Procambarus clarkii*

Asian shore crab *Hemigrapsus sanguineus*

Criterion 1
Hemigrapsus sanguineus is native to the western Pacific. The first records for Great Britain were in 2014, for a few individuals near Barry in South Wales and in Kent. The species has been established since at least 2000 in Guernsey (GB Non-Natives Factsheet Editor, Biological Records Centre).

Criterion 2
This crab is believed to have reached Europe in ballast water. Other possible pathways include transport on ships' hulls and equipment or with commercially bred oysters. Natural dispersal is unlikely to account for its spread to Wales.

Criterion 3
Hemigrapsus sanguineus is a fecund, euryhaline omnivore. The potential for this species to cause ecological impact is high. It competes with native crabs (e.g. *Carcinus maenas*) and could damage shellfish production. In mainland Europe, reductions in shore crab and mussel densities have been recorded after the introduction of *Hemigrapsus sanguineus* (GB Non-Natives Factsheet Editor, Biological Records Centre). A likely cause of spread in Great Britain would be through the movement of contaminated oysters.

Proposal
Add *Hemigrapsus sanguineus* to Schedule 9 to encourage care in the transport of shellfish from contaminated areas and thus to prevent the inadvertent spread of this crab[4].

Leathery sea-squirt *Styela clava*

Criterion 1
Styela clava is native to the north western Pacific. It is established in Britain in shallow coastal waters from the Clyde southwards along the west coast of England and Wales, on the south coast of England and north to the Humber (GBNNSS Information Portal). It attaches to hard surfaces, especially in harbours and marinas.

Criterion 2
Styela clava was probably introduced to Great Britain on the hull of a warship returning from the Korean War to Plymouth in the 1950s. It was introduced to Denmark with Pacific oysters imported from the U.S.A. and could be spread within Britain in a similar way.

Criterion 3
Styela clava is a large organism that can become dominant and may exclude other sessile, filter feeding animals. UKTAG gives it a high impact rating.

Proposal
Add *Styela clava* to Schedule 9 to encourage cleaning of hulls and care in the transport of shellfish from contaminated areas, to prevent the inadvertent spread of this sea-squirt[3]. Oysters can be disinfected by brine dipping and mechanical or manual removal of infestations.

[4] The American oyster drill *Urosalpinx cinerea* was added to Schedule 9 in 2010, largely to prevent inadvertent release along with oysters.

Buff-tailed bumblebee *Bombus terrestris*

Criterion1
Nine subspecies of *Bombus terrestris* are recognised, only one of which, *Bombus terrestris audax,* is native to Great Britain. The non-native bumblebee subspecies *B. t. terrestris and B. t. dalmatinus have been* bred commercially, imported to Britain from EU countries and released for pollinating crops. These two subspecies have been recorded in the wild, but there is no conclusive evidence that they have established breeding colonies in Britain. In Ireland and Poland there is evidence that escaped subspecies of non-native bumblebee have the potential for establishment in the wild.

Criterion 2
The use for pollination or research of non-native subspecies of *Bombus terrestris* (and their hybrids) in greenhouses and secure poly-tunnels in England now requires a Class Licence from Natural England. This licence can only be used in an emergency, when commercial native bumblebees are not available. Use of hives of non-native subspecies in open situations such as orchards, gardens or allotments is not allowed. The Class Licence does not place any restrictions on the release of the native subspecies *B. t. audax*, and growers who use only the native subspecies do not need to register. Natural England strongly recommends that growers use the native subspecies. In Wales, an Individual Licence is required for the release of non-native bumblebee subspecies, and licences are only issued if the native subspecies is unavailable. *B. t. audax* is commercially bred in Belgium, Slovakia and Spain, imported and sold in Britain for use outdoors**.**

Under the terms of the licences, all reasonable steps must be taken to prevent the escape of the non-native bumblebees, but this is very difficult to achieve and the insects have escaped from greenhouses in large numbers (CABI[5]). Moreover, although colonies should be killed at the end of their licensed period of use, this does not always happen.

Criterion 3
There are two problems associated with the use of bumblebees for pollination: hybridisation and competition between native and non-native bumblebee subspecies; and the spread of pathogens and diseases to wild bees and honeybees. The GB Non-native Species Secretariat classifies non-native subspecies of *Bombus terrestris* as Medium Risk.

In Europe, non-native bumblebee subspecies are now competing with native bumblebee populations *for food and nest sites*, causing some to become extinct (CABI). In Britain, *B. t. terrestris* and *B. t. dalmatinus* might hybridise with the native subspecies. There have also been suggestions that the preference of non-native subspecies for certain plants might disrupt the balance of pollination of native plant species.

Captive-bred *Bombus terrestris* of any subspecies can harbour and transmit bee pests and diseases to other bees. Disease transmission between commercial and wild populations of bumblebees has been demonstrated *(*Fürst et al., 2014[6]*I).* In Chile and Argentina, the spread of *B. t. terrestris and B. t. dalmatinus* is associated

[5] Centre for Agricultural Bioscience International's (CABI's) Invasive Species Compendium (www.cabi.org/isc)

[6] Fürst, M. A., McMahon, D. P., Osborne, J. L., Paxton, R. J. & Brown, M. J. F. 2014. Disease associations between honeybees and bumblebees as a threat to wild pollinators. Nature 506, 364–366.

with declines in the native *Bombus dahlbommi*, with circumstantial evidence that parasite spill-over may be the causal mechanism (GBNNSS*).*

Natural England's licence for the release of non-native bumblebees requires that the insects should be free of a long list of pathogens and parasites. However, as the use of the native subspecies is exempt from the requirement to register, the only disease controls in place for *B. t. audax* are EU regulations relating to the import and disposal of bumblebee hives. These cover only three diseases (American foul brood, Small hive beetle and *Tropilaelaps* mite,) and require only visual inspections.

Proposals

1. Place the complete *Bombus terrestris* taxon on Schedule 9, thus requiring any release of native or non-native subspecies in England or Wales to be licensed. This would ensure strict controls are placed on the use of non-native subspecies and a requirement for all commercial hives, including *B. t. audax*, whether reared abroad or in the UK, to be free of pathogens and disease.
2. Require growers to register for a Class Licence for the use of the native subspecies *B. t. audax.*
3. Require growers to apply for Individual Licences for the use of any non-native subspecies of *Bombus terrestris*

Buglife's suggestions for a ban on sale for certain non-native invertebrate species

February 2015

Criteria for listing for a ban on sale[7]

Section 50 of the Natural Environment and Rural Communities (NERC) Act 2006 inserted a new Section 14ZA into the Wildlife and Countryside Act 1981, which introduced an offence of selling, offering or exposing for sale, or having in one's possession or transporting for the purpose of sale, animals or plants listed in an Order made by the Secretary of State. This offence applies to certain live animals or plants to which Section 14 applies, and includes anything from which such animals or plants can be propagated (e.g. eggs or seeds). The criteria laid down by Defra for listing an animal or a plant in an Order under Section 14ZA are:

1. The species is covered by the provisions of Section 14 of the Wildlife and Countryside Act 1981:
    a. Under Section 14(1)(a), an animal not ordinarily resident in or a regular visitor to Great Britain in a wild state.
    b. Under Section 14(1)(b), an animal of a kind established in the wild and listed on Part I of Schedule 9.
    c. Under Section 14(2), a plant listed on Part II of Schedule 9.
2. The species is known to be in trade.
3. The species is likely to spread or escape from captivity and establish itself in the wild.
4. The establishment of the species in the wild is likely to have a serious detrimental effect.

Buff-tailed bumblebee *Bombus terrestris*

Criterion 1
Of the nine subspecies of the Buff-tailed bumblebee, only one, *Bombus terrestris audax*, is native to Great Britain. There is no firm evidence that any non-native subspecies of *Bombus terrestris* has yet become established in the wild in Great Britain.

Criterion 2
Two non-native Buff-tailed bumblebee subspecies, *Bombus terrestris terrestris* and *B. t. dalmatinus*, are bred commercially in EU countries, imported and sold in Britain for pollinating crops. The importation of bumblebees from outside the EU is controlled under regulation 2003/881/EC. The use of non-native subspecies of *Bombus terrestris* and their hybrids in greenhouses and poly-tunnels in England requires a Wildlife and Countryside Act Class Licence from Natural England. This licence can only be used in an emergency, when commercial native bumblebees are not available. No licences are now issued for non-native subspecies for release to open fields, orchards or gardens. The Class Licence does not place any restrictions on the release of the native subspecies *B. t. audax*, and growers who use only the native subspecies do not need to register. *B. t. audax* is commercially bred in Belgium, imported and sold in Britain for use outdoors (see sales@agralan.co.uk**).**

In Wales, an Individual Licence is required for the use of non-native bumblebee subspecies, and licences are only issued if the native subspecies is unavailable. In

[7] Criteria taken from Defra. 2007. Consultation on (1) The Review of Schedule 9 of the Wildlife and Countryside Act 1981 and (2) The Ban on Sale of Certain Non-native Species.

Scotland, the release of non-native subspecies of bumblebee requires a licence under the Wildlife and Natural Environment (Scotland) Act 2011.

Criterion 3
Under the terms of licences, all reasonable steps must be taken to prevent the escape of non-native bumblebees from greenhouses and tunnels. However, containment is very difficult to achieve. In Ireland and Poland there is evidence that escaped subspecies have the potential for establishment in the wild. Moreover, although colonies should be killed at the end of their licensed period of use, this does not always happen.

Criterion 4
Commercially produced bumblebees, whether native or non-native, can harbour and transmit bee pests and diseases. Colonies have been shown (Graystock *et al.*, 2013[8]) to carry multiple, infectious parasites that pose a significant risk to native and managed pollinators. There is evidence of the same parasites and diseases flowing into wild bumblebee populations (Fürst et al., 2014[9]). In Chile and Argentina, the spread of *B. t. terrestris and B. t. dalmatinus* is associated with declines in the native *Bombus dahlbommi*, with circumstantial evidence that parasite spill-over may be the causal mechanism (GBNNSS).

Natural England's licence for the release of non-native bumblebees requires that the insects should be free of a long list of pathogens and parasites. However, as the use of the native subspecies is exempt from the need to register, the only disease controls in place for *B. t. audax* are EU regulations relating to the import and disposal of bumblebee hives. These cover only three diseases (American foul brood, Small hive beetle and *Tropilaelaps* mite,) and require only visual inspections.

Non-native *Bombus terrestris* subspecies may hybridise with the native *B. t. audax,* compete with native bees and disrupt the balance of wild plant pollination (CABI[10]). The GB Non-native Species Secretariat classifies non-native subspecies of *Bombus terrestris* as medium risk.

Proposals

1. Add the complete *Bombus terrestris* taxon to Schedule 9 of the Wildlife and Countryside Act 1981.
2. Ban the unlicensed live sale and supply in Britain of all *Bombus terrestris* subspecies, both native and non-native. This ban should include any stage in the life history (egg, larva, pupa or adult). Licences should routinely be issued for the sale of *B. t. audax*, but not for non-native subspecies. Co*ntrols could be put in place to require all commercial hives, including B. t. audax*, whether reared abroad or in the UK, to be free of pathogens and disease.
3. Increase the rigour of health checks on imported bumblebees of all kinds, including subspecies native to Britain. Under the Bees Act 1980, require all imports of native bumblebees to be licensed and routine inspections of

[8] Graystock, P., Yates, K., Evison, S. E. F., Darvill, B., Goulson, D., Hughes, W. O. H. 2013. The Trojan hives: pollinator pathogens, imported and distributed in bumblebee colonies. Journal of Applied Ecology, 50: 1207–1215.

[9] Fürst, M. A., McMahon, D. P., Osborne, J. L., Paxton, R. J. & Brown, M. J. F. 2014. Disease associations between honeybees and bumblebees as a threat to wild pollinators. Nature 506, 364–366.

[10] Centre for Agricultural Bioscience International's (CABI's) Invasive Species Compendium (www.cabi.org/isc)

imported hives to be carried out, with licences revoked if parasites or disease are discovered.

Chinese mitten crab *Eriocheir sinensis*

Criterion 1
Eriocheir sinensis was added to Schedule 9 of the Wildlife and Countryside Act 1981 in 2010.

Criterion 2
This crab is legally imported live, as well as being collected from English rivers, and offered for consumption in ethnic restaurants in Great Britain. There are established populations in a number of rivers in England, including the Thames and the Medway.

Criterion 3
Crabs are kept alive before being eaten, but once females become egg-bearing their culinary value decreases. There is then a great temptation to release rather than kill them, despite the fact that this is illegal under Section 14 of the Wildlife and Countryside Act 1981.

Criterion 4
The Chinese mitten crab threatens native invertebrates and fish through competition and predation, and causes siltation and damage to river banks through burrowing. It is classified by GBNNSS as a high risk species. In UK TAG's revised classification of aquatic alien species it is assessed as having a high impact on UK waters.

Proposal
Ban the sale of live *Eriocheir sinensis*. This ban should cover both imported crabs and those caught in British waters.

Asian clams *Corbicula fluminalis* and *Corbicula fluminea*

Criterion 1
Corbicula fluminalis
Corbicula fluminalis is introduced to and widely distributed in Western Europe but 'not ordinarily resident in or a regular visitor to Great Britain in a wild state'.
Corbicula fluminea
Since its arrival in the late 1990s, *Corbicula fluminea* has spread to a number of river catchments. It is not listed on Schedule 9.

Criterion 2
Corbicula fluminalis
Advertisements for the sale of *C. fluminalis* shells can be found on the internet but no proof of *C. fluminalis* being traded live in this country could be found.
Corbicula fluminea
On Ebay, living Golden freshwater clams *Corbicula fluminea* are on sale for £3.25 each for use in ornamental ponds and aquaria.

Criterion 3
Corbicula fluminalis
Corbicula fluminalis is thought highly likely to become established here within the next ten years and cause environmental damage (Roy, *et al*, 2014[11]).
Corbicula fluminea
Corbicula fluminea arrived in the Norfolk Broads in the late 1990s and has now spread to the Thames and Great Ouse. It is likely to spread further. It cannot be confined, even when introduced to isolated water bodies, as the clams are spread by birds and mammals.

[11] Roy *et al.* 2014. Horizon scanning for invasive alien species with potential to threaten biodiversity in Great Britain. *Global Change Biology*. (Epub ahead of print).

Criterion 4

Corbicula fluminalis and ***Corbicula fluminea***

Both these clams are ecosystem engineers because they grow densely and have a high filtration capacity. They increase light penetration, leading to enhanced growth of water plants, and intensify sedimentation with their droppings. Both species are intermediate hosts of the echinostomiasis fluke, which can be transmitted to humans in raw or badly cooked food (*Corbicula* soup is a popular dish in parts of Asia). *Corbicula fluminea* can cause serious economic damage by clogging pipes (BRC Non-natives Factsheet Editor). This species has been assessed as posing a major risk in Ireland (www.nonnativespecies.ie).

Proposals

These are two very similar and closely related species that co-exist as introductions in some countries. Given their similarity, as well as their almost identical scientific names, it is likely that mixed populations are on sale under the name 'Asian clam': one advertisement on Ebay describes a species of freshwater clam for sale as 'possibly' *Corbicula fluminea.*

The following measures are proposed:

1. Add *Corbicula fluminea* to Schedule 9 of the Wildlife and Countryside act 1981.
2. Ban the live sale of both *Corbicula fluminalis* and *Corbicula fluminea*.

All non-native freshwater crayfish species

Criterion 1

Non-native crayfish species that are not established in the wild are covered by the provisions of Section 14 (1) (a) of the Wildlife and Countryside Act 1981.

The following species are included in Schedule 9 and so are covered by section 14 (1) (b) of the Wildlife and Countryside Act 1981:

American signal crayfish ***Pacifastacus leniusculus***
Noble crayfish ***Astacus* astacus**
Turkish / Narrow-clawed crayfish ***Astacus leptodactylus***
Spiny-cheek crayfish ***Orconectes limosus***
Red swamp crayfish ***Procambarus clarkii***

Orconectes virilis and ***Procambarus acutus*** have recently been recognised as being established in the wild in Britain (Holdich, 2014[12]) and are not yet included in Schedule 9. They are therefore not covered by Section 14 of the Wildlife and Countryside Act 1981 in England and Wales. Keeping and movement of all non-native species in Scotland are prohibited except under licence for research and survey purposes.

Criterion 2

Astacus astacus was originally imported to Britain for aquaculture but is no longer farmed and may now be extinct in this country. There is a flourishing trade within this country and in the export market in live *Pacifastacus leniusculus* for human consumption. This species is both farmed and harvested from the wild in England and Wales. The trade is regulated under The Prohibition of Keeping of Live Fish

[12] D.M. Holdich, J. James, C. Jackson & S. Peay (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, 232-262.

(Crayfish) Order 1996[13], *Astacus leptodactylus* and *Procambarus clarkii* have also in the past been used in the catering industry.

Procambarus clarkii, *Procambarus acutus*, *Orconectes limosus* and *Orconectes virilis* have apparently been imported to Britain for the aquarist trade and the wild populations are thought to have originated from discards from aquaria. There are advertisements for live crayfish for aquaria on the Internet (e.g. for Marmorkrebs or 'blue lobster' ***Procambarus fallax* f. *virginalis***), although most of these seem to be from traders based in the United States. Marmorkrebs is known to have been on sale in the German aquarist trade in the 1990s. The extent of the illegal trade in aquarium specimens in Britain is not known, although non-native crayfish are discovered in pet shops several times a year (CEFAS, pers. com.). Only one crayfish species, the tropical ***Cherax quadricarinatus***, can legally be kept in aquaria, but crayfish may not be correctly identified by sellers or purchasers. CEFAS has recorded at least twelve species illegally traded since 1996 (see GB NNSS datasheet on *Procambarus clarkii*).

Criterion 3

Crayfish are notoriously difficult to confine and, once escaped, can travel overland as well as along water-courses. Despite stringent legislation, the Signal crayfish continues to be spread by illegal introductions as well as by natural expansion of its range. There is great temptation to dispose of unwanted crayfish (both pets and potential human food) to the wild if they are no longer wanted or needed. The Marbled crayfish *Procambarus fallax* f. *virginalis* poses a particular risk because it is parthenogenetic, so a single unfertilised female could give rise to a wild population. ***Orconectes rusticus*** is currently spreading rapidly in Germany and there are fears that it may be introduced to this country. All the established non-native species apart from the American signal crayfish are so far present in only a few sites, but Turkish crayfish already occurs in large numbers in some waters.

Criterion 4

All non-native crayfish are capable of causing ecological damage, but at present only the American signal crayfish is creating a large problem because it is so widespread. It is estimated that control and management of the Signal crayfish and repair of the damage it causes currently cost Britain over £2 million per annum[4]. The American signal crayfish has an impact on freshwater communities (including fish) because it is omnivorous and it burrows into river banks, causing siltation. It can also interfere with angling activities when present in large numbers. It is a vector of crayfish plague, to which the native White-clawed crayfish *Austropotamobius pallipes*, a globally Endangered species, is highly susceptible. This disease has been responsible for permanently wiping out many populations of the White-clawed crayfish in England and Wales.

Orconectes species and *Procambarus* species also harbour crayfish plague. *Astacus leptodactylus* can occur in large numbers and, like the Signal crayfish, can damage fisheries through predation and taking bait from fishermen's lines. *Pacifastacus leniusculus* and *Procambarus clarkii* are rated by both GBNNSS and UKTAG as high impact species and three of the other species also have high or medium risk ratings.

[13] The Prohibition of Keeping of Live Fish (Crayfish) Order 1996, made under the Import of Live Fish Act (England and Wales) 1980, makes the unlicensed keeping of non-native crayfish (apart from the tropical *Cherax quadricarinatus* in heated aquaria) an offence. There is a general licence for keeping Signal crayfish in specified areas of England and Wales in which this species is well established in the wild. Signal crayfish may be trapped under licence in England, but not released into the wild. Under a general licence, Signal crayfish for human consumption may be kept alive by fish markets, fishmongers and caterers, but must be kept in escape-proof containers and must be dead before disposal (see Application for a licence to keep non-native crayfish. Defra. Revised February 2010).

Non-native crayfish species have been assessed as posing a major environmental risk in Ireland (www.nonnativespecies.ie).

Proposals

The present regulations have not been effective in controlling the release and spread of non-native crayfish species. The following measures are proposed:

1. Add Virile crayfish *Orconectes virilis* and White river crayfish *Procambarus acutus* to Schedule 9 of the Wildlife and Countrysied Act 1981 without delay.
2. Carry out a full risk assessment on *Cherax quadricarinatus*, to establish whether or not this species should continue to be exempt from regulations on the grounds that, being a tropical species, it cannot become established in the wild in Great Britain.
3. Ban the live sale of all species of non-native crayfish[14] (including *Cherax quadricarinatus* if the risk assessment indicates that it might be capable of establishment in the wild in Britain). This ban would cover crayfish both in the aquarium trade and the catering industry. It would mean that crayfish could be sold in the catering trade only after being killed. Part of the current trade in *Pacifastacus leniusculus* for human consumption is as prepared crayfish tails and this would remain a legal way of continuing the trade.
4. If a ban on live sale were to be introduced for American signal crayfish, combined licensing arrangements under the Import of Live Fish Act (England and Wales) 1980 and the Wildlife and Countryside Act 1981 would be required - one for keeping and the other for sale. A single authority (possibly CEFAS) would be given the power to issue both types of licence. Stringent conditions could be attached to licences for keeping, for instance they should be issued only to reputable processors for the catering trade and the trappers contracted to them; they might restrict trapping to 'go areas'; and they should require the crayfish to be held securely and dispatched soon after capture. Licences for live sale should be issued only to reputable processors and then only in exceptional circumstances (e.g. for export to some countries that will not accept processed crayfish tails). These measures would regulate the market and enable the processors' premises to be inspected and compliance monitored.

Margaret Palmer
12th February 2015

[14] The sale of the native White-clawed crayfish is prohibited because it is listed on Schedule 5 of the Wildlife and Countryside Act 1981.