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@fera.gsi.gov.uk

GB NON-NATIVE ORGANISM RISK ASSESSMENT SCHEME

For more information visit: www.nonnativespecies.org

	Name of Organism:	***Pseudorasbora parva* - Topmouth gudgeon**	
	Objectives:	Assess the risks associated with this species in GB	
	Version:	FINAL 30/03/11	
N	**QUESTION**	**RESPONSE**	**COMMENT**
1	What is the reason for performing the Risk Assessment?		Request made by GB Programme Board
2	What is the Risk Assessment area?	Un-infested catchments of England, Scotland & Wales	Northern Ireland is ignored, as it is covers itself via the 'All Ireland' initiative to deal with NNS.
3	Does a relevant earlier Risk Assessment exist?	YES (Go to 4)	
4	If there is an earlier Risk Assessment is it still entirely valid, or only partly valid?	PARTLY VALID OR NOT VALID (Go to 5)	The previous risk assessment on this species (see Copp *et al.* 2005a, 2005c) was undertaken in 2004, prior to the outcome of a large body of research. The present assessment is intended to re-assess the species in light of new knowledge.
A	**Stage 2: Organism Risk Assessment SECTION A: Organism Screening**		
5	Identify the Organism. Is the organism clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank?	YES (Give the full name & Go to 7)	Topmouth gudgeon (*Pseudorasbora parva*), also know under various names, mostly English translations of foreign common names (stone moroko, false rasbora, or clicker barb), is native to eastern Asia, including Japan and Korea.
6	If not a single taxonomic entity, can it be redefined?		
7	Is the organism in its present range known to be invasive, i.e. to threaten species, habitats or ecosystems?	YES (Go to 9)	One of most invasive fish species currently reported on in Europe (e.g. Copp *et al.* 2005b).
8	Does the organism have intrinsic attributes that indicate that it could be invasive, i.e. threaten species, habitats or ecosystems?	YES or UNCERTAIN (Go to 9)	Scored as highly invasive (i.e. rejected) by the FISK (Fish Invasiveness Scoring Kit (see Copp *et al.* 2005a, 2005c, 2009). See the attached report of a FISK re-assessment undertaken in November 2007.
9	Does the organism occur outside effective containment in the Risk Assessment area?	YES (Go to 10)	Pinder *et al.* (2005).
10	Is the organism widely distributed in the Risk Assessment area?	YES & Future conditions/management procedures/policies are being considered (Go to 19)	Pinder *et al.* (2005).
11	Does at least one species (for herbivores, predators and parasites) or suitable habitat vital for the survival, development and multiplication of the organism occur in the Risk Assessment area, in the open, in protected conditions or both?		
12	Does the organism require another species for critical stages in its life cycle such as growth (e.g. root symbionts), reproduction (e.g. pollinators; egg incubators), spread (e.g. seed dispersers) and transmission, (e.g. vectors)?		
13	Is the other critical species identified in question 12 (or a similar species that may provide a similar function) present in the Risk Assessment area or likely to be introduced? If in doubt, then a separate assessment of the probability of introduction of this species may be needed.		
14	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?		
15	Could the organism establish under protected conditions (e.g. glasshouses, aquaculture facilities, terraria, zoological gardens) in the Risk Assessment area?		
16	Has the organism entered and established viable (reproducing) populations in new areas outside its original range, either as a direct or indirect result of man's activities?		
17	Can the organism spread rapidly by natural means or by human assistance?		
18	Could the organism as such, or acting as a vector, cause economic, environmental or social harm in the Risk Assessment area?		
19	This organism could present a risk to the Risk Assessment area and a detailed risk assessment is appropriate.	Detailed Risk Assessment Appropriate GO TO SECTION B	See response to Q8.

20	This organism is not likely to be a harmful non-native organism in the Risk Assessment area and the assessment can stop.		

B	SECTION B: Detailed assessment of an organism's probability of entry, establishment and spread and the magnitude of the economic, environmental and social consequences			
	Probability of Entry	**RESPONSE**	**UNCERTAINTY**	**COMMENT**
1.1	List the pathways that the organism could be carried on. How many relevant pathways can the organism be carried on?	very many - 4	LOW - 0	Five pathways: 1) Intentional transfer and introduction by humans (e.g. release of aquarium, garden or live bait specimens); 2) Contaminant of fish consignments (i.e. the unintentional presence of the species in consignments of fish moved from one location to another); 3) Unintentional transfer and introduction by humans (e.g. angling gear, as contaminant of live bait taken from one water and used elsewhere); 4) Unintentional transfer and introduction (of eggs) by birds; 5) Natural dispersal. See Copp *et al.* (2007b)
1.2	Choose one pathway from the list of pathways selected in 1.1 to begin the pathway assessments.	Fish consignment contaminant		TMG entered and dispersed around Europe as a contaminant of consignments of target fish species, initially Asian carp species, then common carp, then ornamental species (e.g. golden orfe). See Bănărescu (1964); Copp *et al.* (2005b).
1.3	How likely is the organism to be associated with the pathway at origin?	moderately likely - 2	MEDIUM -1	A paper by Copp, Vilizzi & Gozlan (submitted - b), which examines associations between fish movements and TMG occurrence has demonstrated that the likelihood of introduction is dependent upon consignment origin and the type of consignment (i.e. coarse *vs* . salmonid; ornamental *vs* . angling variety/species). TMG occurrences are most significantly associated with the trajectories of golden orfe movement, then sunbleak, then European catfish, then Atlantic salmon, then grass carp.
1.4	Is the concentration of the organism on the pathway at origin likely to be high?	moderately likely - 2	LOW - 0	Depends on location. At contaminated sites, densities can be very high (Beyer 2004; 2008).
1.5	How likely is the organism to survive existing cultivation or commercial practices?	very likely - 4	LOW - 0	Species does well in aquaculture (Beyer 2004; reviewed in Beyer 2008).
1.6	How likely is the organism to survive or remain undetected by existing measures?	moderately likely - 2	LOW - 0	Small-bodied species, able to hide amongst other fish. Also, species can be confused with other species of similar size and pigmentation, e.g. *Leuciscus souffia* (see Copp *et al.* 2007b).
1.7	How likely is the organism to survive during transport /storage?	very likely - 4	LOW - 0	Species is very robust and known to survive even short periods of toxic chemicals (see Allen *et al.* 2006).
1.8	How likely is the organism to multiply/increase in prevalence during transport /storage?	unlikely - 1	MEDIUM -1	Depends upon the period of storage - during short periods, no; during extended period in the correct season (e.g. summer), then possibly yes.
1.9	What is the volume of movement along the pathway?	major - 3	LOW - 0	Fish movements are in large quantities (see Copp *et al.* 2007b, and Copp *et al.* submitted - a).
1.10	How frequent is movement along the pathway?	often - 3	MEDIUM -1	Using England as an example, fish movements are frequent (see Copp *et al.* 2007, and Copp *et al.* submitted - a & b). The level of fish movements in other parts of GB were not available to the Risk Assessor when the cited studies were undertaken, but movements of salmonids in Scotland are thought to be frequent, and Copp *et al.* (submitted - b) found a significant association between TMG occurrences and Atlantic salmon movements in England, so the pathway of movement is demonstrated for a species relevant to Scotland.
1.11	How widely could the organism be distributed throughout the Risk Assessment area?	very widely - 4	LOW - 0	The susceptible area has been estimated at 104,232.82 hectares (see attached file: UKNNRA_EconRisk_P_parva_Jan05.xls).
1.12	How likely is the organism to arrive during the months of the year most appropriate for establishment ?	very likely - 4	LOW - 0	Fish movements are normally during the cooler months of the year, but given the relatively mild UK climate, introductions during winter are unlikely to affect immediate survival, and the species would be *in situ* and ready for reproduction in the next vegetative season.
1.13	How likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) or other material with which the organism is associated to aid transfer to a suitable habitat?	very likely - 4	LOW - 0	Fish movements (in which TMG are likely to occur as a contaminant) in the UK are generally to still waters, which are the locations where the species is most likely (in the UK) to establish populations (Copp *et al.* submitted a & b).
1.14	How likely is the organism to be able to transfer from the pathway to a suitable habitat?	very likely - 4	LOW - 0	As a contaminant, the species is introduced directly to the receiving water body along with the target fish (i.e. the species being moved intentionally).

	Probability of Establishment	RESPONSE	UNCERTAINTY	COMMENT
1.15	How similar are the climatic conditions that would affect establishment in the Risk Assessment area and in the area of current distribution?	very similar - 4	LOW - 0	The species' establishment throughout the UK is evidence of this (Pinder *et al.* 2005). A recent study (Britton, Davies, Godard & Copp, submitted) reveals a relatively good climate match between E&W and the native range of TMG.
1.16	How similar are other abiotic factors that would affect establishment in the Risk Assessment area and in the area of present distribution?	very similar - 4	LOW - 0	The species' establishment throughout the UK is evidence of this (Pinder *et al.* 2005; Beyer 2008; Beyer *et al.* 2007, etc.).
1.17	How many species (for herbivores, predators and parasites) or suitable habitats vital for the survival, development and multiplication of the organism species are present in the Risk Assessment area? Specify the species or habitats and indicate the number.	very many - 4	LOW - 0	The susceptible area has been estimated at 104,232.82 hectares (see attached file: UKNNRA_EconRisk_P_parva_Jan05.xls), which is over 50% of the freshwaters of the UK.
1.18	How widespread are the species (for herbivores, predators and parasites) or suitable habitats vital for the survival, development and multiplication of the organism in the Risk Assessment area?	widespread - 4	LOW - 0	The species' establishment throughout the UK is evidence of this (Pinder *et al.* 2005; Beyer 2008; Beyer *et al* . 2007, etc.).
1.19	If the organism requires another species for critical stages in its life cycle then how likely is the organism to become associated with such species in the risk assessment area?	N/A	LOW - 0	
1.20	How likely is it that establishment will not be prevented by competition from existing species in the Risk Assessment area?	likely - 3	LOW - 0	The species is a voracious predator of zooplankton etc. and takes other species' eggs, and is a facultative parasite, with some evidence to suggest it impedes the reproduction of other species (Britton *et al* . 2007, 2008).
1.21	How likely is it that establishment will not be prevented by natural enemies already present in the Risk Assessment area?	very likely - 4	LOW - 0	Biological resistance was examined in the doctoral research of K. Beyer (2008) and was found to be insufficient (i.e. well below that required) to prevent establishment.
1.22	If there are differences in man's management of the environment/habitat in the Risk Assessment area from that in the area of present distribution, are they likely to aid establishment? (specify)	likely - 3	LOW - 0	Most of the waters deemed suitable to TMG are not designated sites of conservation interest, and as such are less likely than protected sites to attract the resources required for eradication (if infested by TMG). Indeed, the EA's TMG eradication decision matrix specifically scores down non-conservation sites, reducing the likelihood of eradication action. A paper on this decision-making process for control is Britton, Davies, & Brazier (submitted manuscript) is currently under review. There may be variations within the UK as to the allocation of resources, in particular when TMG is first reported in that area (e.g. a first report in Scotland might provoke an eradication action even in a non-conservation water simply to keep Scotland 'TMG free').
1.23	How likely is it that existing control or husbandry measures will fail to prevent establishment of the organism?	very likely - 4	LOW - 0	Copp *et al.* (submitted - b) has demonstrated the association between fish movements (in particular golden orfe) and TMG occurrence. As golden orfe from the original infestation site (in Hampshire) were sold through ornamental wholesalers, the fish (and the contaminant TMG) were moved outside of Section 30 controls, and other sites and stocks (of golden orfe and of other species) were contaminated with this species. Fish from some of these contaminated sources were eventually moved under Section 30 controls, hence the observed statistical association. Since fish farms are not being shut down, nor prohibited from selling fish after being found to have TMG on site, there are effectively no measures being used to prevent establishment of the species in other waters. Also, consignments from outside the UK are checked for contents only randomly or following 'tip offs', so further imports of the TMG as a contaminant could enter without detection. See papers by Gozlan, by Beyer, by Pinder, by Copp for more details.
1.24	How often has the organism been recorded in protected conditions, e.g. glasshouses, elsewhere?	occasional - 2	LOW - 0	The species was previously sold in the ornamental trade as 'clicker barb', but the numbers of locations of sale is unknown and the number of TMG originally imported (as a contaminant of target fish consignments) and the number of contaminated import consignments are unknown.
1.25	How likely is the reproductive strategy of the organism and duration of its life cycle to aid establishment?	very likely - 4	LOW - 0	The species is a nest guarder, has a short life span and matures early (at age 1). In the UK, the most likely species to establish are nest-guarders (unpublished results from R.E. Gozlan; see also Gozlan *et al.* 2002).
1.26	How likely is it that the organism's capacity to spread will aid establishment?	very likely - 4	LOW - 0	Dispersal is both by natural and human-assisted means, which provides the species with novel environments, and in some cases multiple introductions to the same water, thus enhancing genetic diversity and the species' likelihood of establishment without encountering a genetic bottleneck.
1.27	How adaptable is the organism?	very adaptable - 4	LOW - 0	TMG is one of the most adaptable, tolerant and thus invasive species in Europe (Copp *et al.* 2005b; Pinder *et al.* 2005; Gaviloaie & Falka 2006). See also www.fishbase.org
1.28	How likely is it that low genetic diversity in the founder population of the organism will not prevent establishment?	likely - 3	LOW - 0	Although no genetics work on this species is known to have been undertaken in the UK at the time of the RA, the persistence of the species at most sites suggests no founder population genetic constraints, but there is at least one case where this may have been a factor (Copp *et al.* 2007a).
1.29	How often has the organism entered and established in new areas outside its original range as a result of man's activities?	very many - 4	LOW - 0	TMG is well known to have been introduced to new areas as a result of human activities, in particular via fish stocking exercises (Copp *et al.* 2005b; Pinder *et al.* 2005; Gaviloaie & Falka 2006). See also www.fishbase.org

1.30	How likely is it that the organism could survive eradication campaigns in the Risk Assessment area?	unlikely - 1	LOW - 0	Although temporarily resistant to rotenone (Allen *et al.* 2006), TMG eradications in the UK appear to have been successful, including those using drain-down and liming as an alternative to rotenone (Britton & Brazier 2006; Britton *et al.* 2007, 2008). These eradications have been limited to small water bodies, and it is well known that the effectiveness of rotentone (and other) eradication methods decreases with increasing size of water body or water course. As the question does not allow for any distinction between different types of water body, the response is given with regard to those ecosystems types (i.e. smaller water bodies) in which eradication has been attempted in the UK. To respond otherwise would not reflect the existing knowledge for the UK, albeit limited to specific water body sizes.
1.31	Even if permanent establishment of the organism is unlikely, how likely is it that transient populations will be maintained in the Risk Assessment area through natural migration or entry through man's activities (including intentional release into the outdoor environment)?	N/A	LOW - 0	

	Spread	RESPONSE	UNCERTAINTY	COMMENT
2.1	How rapidly is the organism liable to spread in the Risk Assessment area by natural means?	slow - 1	MEDIUM -1	Spread is mainly by human-assisted means (see Pinder *et al.* 2005), with natural dispersal dependent upon situation (Beyer 2004; Beyer 2008); specifically, the movements of TMG out of infested fisheries (both fish farms and angling amenity water bodies) and into adjacent streams has been measured quantitatively via drift-net sampling. Because tagging of the species is currently not viable (due to tag rejection; see Stakėnas *et al.* 2009) the dispersal of the species within the receiving stream has been assessed indirectly via the electrofishing of downstream stretches to determine the species' downstream distribution patterns (as a means of assessing how far it spreads from the point of origin). The data suggest that it does spread, but there is little evidence of in-stream reproduction (in contrast to the species' native range), and that movement upstream has yet to be demonstrated from field data. There is little evidence of new populations being reported in locations that appear to be due to natural (rather than human) dispersal of the species.
2.2	How rapidly is the organism liable to spread in the Risk Assessment area by human assistance?	rapid - 3	LOW - 0	Spread is mainly by human-assisted means (Copp *et al* . 2005b; Pinder *et al.* 2005; Gaviloaie & Falka 2006).
2.3	How difficult would it be to contain the organism within the Risk Assessment area?	difficult - 3	LOW - 0	In view of the species ability to tolerate poor conditions, its known ability to hide under the gills of larger fish during transport, and the commonness of fish movements between waters, the species could to be moved outside England & Wales to adjacent areas.
2.4	Based on the answers to questions on the potential for establishment and spread define the area endangered by the organism.			British Isles, including Ireland.

	Impacts	RESPONSE	UNCERTAINTY	COMMENT
2.5	How important is economic loss caused by the organism within its existing geographic range?	moderate - 2	MEDIUM -1	There is no hard evidence, but eradication costs are high (see attached file: UKNNRA_EconRisk_P_parva_Jan05.xls) and there are suggestions that the reproduction of native species is inhibited in infested waters (Britton & Brazier 2006; Britton *et al.* 2007).
2.6	Considering the ecological conditions in the Risk Assessment area, how serious is the direct negative economic effect of the organism, e.g. on crop yield and/or quality, livestock health and production, likely to be? (describe) in the Risk Assessment area, how serious is the direct negative economic effect of the organism, e.g. on crop yield and/or quality, likely to be?	major - 3	MEDIUM -1	There is no hard evidence, but eradication costs are high (see attached file: UKNNRA_EconRisk_P_parva_Jan05.xls) and there are suggestions that the reproduction of native species is inhibited in infested waters (Britton & Brazier 2006; Britton *et al.* 2007).
2.7	How great a loss in producer profits is the organism likely to cause due to changes in production costs, yields, etc., in the Risk Assessment area?	moderate - 2	MEDIUM -1	Fish farmers are obliged to modify the management practices of their farms when infested by TMG, as the species interferes with the target fish species and contaminates the consignments.
2.8	How great a reduction in consumer demand is the organism likely to cause in the Risk Assessment area?	minor - 1	HIGH -2	No assessment has been carried out, but it is assumed to have some impact at the local scale, in particular as regards angling amenity (decrease in angler interest in waters infested by TMG). All depends on what one defines as 'consumer demand'. Since common carp and salmonids are the main angling species in most of the UK, and based on current patterns of TMG establishment, TMG establishment is not likely to take place in Scottish salmonid streams. Thus, the main area of 'consumer demand' is in carp fisheries. As these are generally stocked (i.e. not dependent on natural reproduction), the apparent impediment to reproduction placed by TMG on other fish species is thus irrelevant to carp.
2.9	How likely is the presence of the organism in the Risk Assessment area to cause losses in export markets?	very unlikely - 0	LOW - 0	The export of fish from the UK is unlikely to be affected.
2.10	How important would other economic costs resulting from introduction be? (specify)	moderate - 2	LOW - 0	There are considerable costs associated with eradication (see attached file: UKNNRA_EconRisk_P_parva_Jan05.xls), with some additional costs to government associated with the licensing/surveillance (e.g. ILFA) of the sites found to be infested by TMG.
2.11	How important is environmental harm caused by the organism within its existing geographic range?	moderate - 2	LOW - 0	The species is the healthy host of non-native diseases (Gozlan *et al.* 2005; 2006) and is suspected of inhibiting the reproduction of native fishes (Britton & Brazier 2006; Britton *et al.* 2007). However, evidence from France suggests that in relatively low densities TMG has no impact on native fishes (Carpentier *et al.* 2007).
2.12	How important is environmental harm likely to be in the Risk Assessment area?	major - 3	LOW - 0	The species is the healthy host of non-native diseases (Gozlan *et al.* 2005; 2006); the laboratory investigations of Gozlan's team have demonstrated that exposure of sunbleak (a non-native fish to the UK but native to, and threatened in parts of, Continental Europe) resulted in the eventual death of the sunbleak due to the 'rosette agent' carried by TMG. Not all populations of TMG in Western Europe carry this pathogen (see Carpentier *et al.* 2007), but it is prevalent in UK populations. Rosette agent is known to be a threat to native salmonids in the UK, and Gozlan is currently undertaking laboratory studies to assess the impact of the rosette agent on native non-salmonid freshwater fishes. TMG is suspected of inhibiting the reproduction of native fishes, given that none of the species in the water body were observed to recruit during the period of TMG infestation and that recruitment of native fishes re-commenced after TMG was successfully eradicated from the pond (Britton & Brazier 2006; Britton *et al.* 2007). Therefore, the likely harm in the RA area is considered to be sufficiently high that the EA has in fact put together a so-called 'eradication matrix' that is used to aid decision makers in deciding whether an TMG population invading a water body poses a sufficiently high threat to native species and ecosystems to warrant the expenditure of resources to eradicate the species from that water body. Although there have been incidental fish eradications (i.e. single water bodies by a species), TMG is the only non-native freshwater fish species to have raised sufficient concern that it has resulted in a more formalized eradication framework.
2.13	How important is social and other harm caused by the organism within its existing geographic range?	minor - 1	HIGH -2	No formal assessment has been made, but this is currently considered to be of minor impact, limited to scientific and public perceptions of the decline in ecological value of natural ecosystems/amenities.
2.14	How important is the social harm likely to be in the Risk Assessment area?	minor - 1	LOW - 0	No formal assessment has been made, but this is currently considered to be of minor impact.
2.15	How likely is it that genetic traits can be carried to native species, modifying their genetic nature and making their economic, environmental or social effects more serious?	very unlikely - 0	MEDIUM -1	Although the species has been forced experimentally to cross-breed with another European cyprinid (Gozlan & Beyer 2006) the young were not viable, and there is no evidence of genetic contamination of fish species native to Europe.
2.16	How probable is it that natural enemies, already present in the Risk Assessment area, will have no affect on populations of the organism if introduced?	very likely - 4	LOW - 0	Biological resistance (by brown trout and chub) was examined in the doctoral research of K. Beyer (2008) and was found to be insufficient (i.e. well below that required) to affect adversely TMG, which has a short life span and matures early (at age 1). Other predators exist in the UK, e.g. northern pike, but there is no evidence from other infested countries that these predators eliminate TMG completely from invested waters.
2.17	How easily can the organism be controlled?	very difficult - 4	LOW - 0	See papers by Britton and Brazier (in the attached bibliography), which explain that rotenone eradication is costly and complicated (for health and safety reasons) to employ.

2.18	How likely are control measures to disrupt existing biological or integrated systems for control of other organisms?	moderately likely - 2	MEDIUM -1	Rotenone is known to affect invertebrates and amphibia, so any use of these species as biological agents to control other species would be affected. Grass carp, which are sometimes used for weed control, are also susceptible to rotenone. The interaction of rotenone (a natural plant extract) with other chemical agents is unknown.
2.19	How likely is the organism to act as food, a host, a symbiont or a vector for other damaging organisms?	very likely - 4	LOW - 0	See papers by Gozlan *et al.* 2005; 2006 for details on TMG as a healthy host of the rosette agent.
2.20	Highlight those parts of the endangered area where economic, environmental and social impacts are most likely to occur	Conservation areas and angling amenity waters		

Summarise Entry	very likely - 4	LOW - 0	It is here already and widely dispersed (Pinder *et al.* 2005a).
Summarise Establishment	very likely - 4	LOW - 0	It is established already, though occurrence in some locations does not necessarily lead to establishment, especially if removed when found (Copp *et al.* 2007a).
Summarise Spread	rapid - 3	LOW - 0	It is spreading more or less rapidly (see Pinder *et al.* 2005a).
Summarise Impacts	major - 3	LOW - 0	See comments here above in 2.5 to 2.19, as well as Copp *et al.* (2005a), Gozlan *et al.* (2005; 2006) and in particular Britton *et al.* (2007; 2009).
Conclusion of the risk assessment	HIGH -2		
Conclusions on Uncertainty		LOW - 0	

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