AS-ISK v2

Taxon and Assessor details	
Category	Invertebrates (freshwater)
Taxon name	*Dikerogammarus villosus*
Common name	killer shrimp
Assessor	dp
Risk screening context	
Reason and socio-economic benefits	
Risk assessment area	Adda
Taxonomy	
Native range	
Introduced range	
URL	

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	No	D. villosus does not have any economic value or provide any social benefit. It is not used in environmental services https://www.cabi.org/isc/datasheet/108309#tomeansOfMovementAndDispersal	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	No	D. villosus does not have any economic value or provide any social benefit. It is not used in environmental services.	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	https://www.cabi.org/isc/search/index?q=dikerogammarus	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	expert judgment	Medium
5	2.02	What is the quality of the climate matching data?	Medium	expert judgement	Medium
6	2.03	Is the taxon already present outside of captivity in the RA area?	Not applicable	D. villosus does not have any economic value or provide any social benefit. It is not used in environmental services https://www.cabi.org/isc/datasheet/108309#tomeansOfMovementAndDispersal	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	https://www.cabi.org/isc/datasheet/108309#tomeansOfMovementAndDispersal Natural dispersal of D. villosus occurs by active migration (Nesemann et al., 1995; Vaate et al., 2002; Jazdzewski and Konopacka, 2002; Josens et al., 2005). The speed of active D. villosus upstream range extension may reach up to 40 km/year, or approximately 100 m/day (Josens et al., 2005). Shipping has been identified as the primary vector for accidental introductions of D. villosus over large distances (e.g., Vaate et al., 2002; Jazdzewski and Konopacka, 2002; Dick, 2009). Intentional introductions of D. villosus, though possible, have not been reported. Nesemann H, Pöcki M, Wittmann K J, 1995. Distribution of epigean Malacostraca in the middle and upper Danube (Hungary, Austria, Germany). Miscellanea Zoologica Hungarica. 49-68. Vaate A bij de, Jazdzewski K, Ketelaars H A M, Gollash S, Velde G van der, 2002. Geographical patterns in range extension of Ponto-Caspian macroinvertebrate species in Europe. Canadian Journal of Fisheries and Aquatic Sciences. 1159-1174. Jazdzewski K, Konopacka A, Grabowski M, 2005. Native and alien malacostracan Crustacea along the Polish Baltic Sea coast in the 20th century. Oceanological and Hydrobiological Studies. 175-193. Josens G, Vaate A bij de, Usseglio-Polatera P, Cammaerts R, Cherot F, Grisez F, Verboonen P, Bossche J P vanden, 2005. Native and exotic Amphipoda and other Peracarida in the River Meuse: new assemblages emerge from a fast changing fauna. Hydrobiologia. 203-220. Dick JTA, 2009. Dikerogammarus villosus, the amphipod. Available at: Invasive Alien Species in	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The species is present in the lower part of the river Adda and it could easely colonise the upper part	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	https://www.cabi.org/isc/datasheet/108309#todistribution	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	https://www.cabi.org/isc/datasheet/108309#toimpactSummary	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	No	https://www.cabi.org/isc/datasheet/108309#toimpactSummary	Medium
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	https://www.cabi.org/isc/datasheet/108309#toimpactSummary	Medium
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	https://www.cabi.org/isc/datasheet/108309#toimpactSummary	Medium
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	https://www.cabi.org/isc/datasheet/108309#toimpactSummary	Very high

15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Not applicable	not applicable	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	https://www.cabi.org/isc/datasheet/108309#tobiologyAndEcology	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	https://www.cabi.org/isc/datasheet/108309	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	https://www.cabi.org/isc/datasheet/108309	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	https://www.cabi.org/isc/datasheet/108309	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA area?	No	https://www.cabi.org/isc/datasheet/108309	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	OVCHARENKO, M., BACELA, K., WILKINSON, T., IRONSIDE, J., RIGAUD, T., & WATTIER, R. (2010). Cucumispora dikerogammari n. gen. (Fungi: Microsporidia) infecting the invasive amphipod Dikerogammarus villosus: A potential emerging disease in European rivers. Parasitology, 137(2), 191-204. doi:10.1017/S0031182009991119	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	No	https://www.cabi.org/isc/datasheet/108309#toidentity	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	https://www.cabi.org/isc/datasheet/108309	Very high
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	https://www.cabi.org/isc/datasheet/108309#toidentity	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	https://www.cabi.org/isc/datasheet/108309	Very high
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	https://www.cabi.org/isc/datasheet/108309	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	https://www.cabi.org/isc/datasheet/108309	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	https://www.cabi.org/isc/datasheet/108309	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	the species is already present in the lower part of the river Adda and in the river Po	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	https://www.cabi.org/isc/datasheet/108309#tobiologyAndEcology	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	https://www.cabi.org/isc/datasheet/108309#tobiologyAndEcology	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	https://www.cabi.org/isc/datasheet/108309	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	https://www.cabi.org/isc/datasheet/108309	Very high
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	4	months https://www.cabi.org/isc/datasheet/108309	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	>1	https://www.cabi.org/isc/datasheet/108309	Very high
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	It is possible that it colonises wetlands or small tributaries nearby the RA area	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Yes	Shipping has been identified as the primary vector for accidental introductions of D. villosus over large distances (e.g., Vaate et al., 2002; Jazdzewski and Konopacka, 2002; Dick, 2009). Vaate A bij de; Jazdzewski K; Ketelaars HAM; Gollash S; Velde G van der, 2002. Geographical patterns in range extension of Ponto-Caspian macroinvertebrate species in Europe. Canadian Journal of Fisheries and Aquatic Sciences, 59:1159-1174. Jazdzewski K; Konopacka A; Grabowski M, 2005. Native and alien malacostracan Crustacea along the Polish Baltic Sea coast in the 20th century. Oceanological and Hydrobiological Studies, 34:175-193. Dick JTA, 2009. Dikerogammarus villosus, the amphipod. Available at: Invasive Alien Species in Northern Ireland. http://www.habitas.org.uk/invasive/species.asp?item=50005	High

38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	https://www.cabi.org/isc/datasheet/108309#tobiologyAndEcology	Very high
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	https://www.cabi.org/isc/datasheet/108309	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	https://www.cabi.org/isc/datasheet/108309	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	https://www.cabi.org/isc/datasheet/108309	Medium
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be rapid?	Yes	https://www.cabi.org/isc/datasheet/108309	Very high
43	7.09	Is dispersal of the taxon density dependent?	No	https://www.cabi.org/isc/datasheet/108309#tobiologyAndEcology	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	the spcies can survive out of the water 32. Bacela-Spychalska, K.; Grabowski, M.; Rewicz, T.; Konopacka, A.; Wattier, R. The 'killer shrimp' Dikerogammarus vil-losus (Crustacea, Amphipoda) invading Alpine lakes: overland transport by recreational boats and scuba-diving gear as po-tential entry vectors?. Aquat Conserv 2013, 23(4), 606-618. https://doi.org/10.1002/aqc.2329	Medium
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being considered.]	No	https://www.cabi.org/isc/datasheet/108309	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	No	https://www.cabi.org/isc/datasheet/108309	Very high
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	https://www.cabi.org/isc/datasheet/108309	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	https://www.cabi.org/isc/datasheet/108309	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA area?	Yes	potentially there are predators of this species like fish. https://www.cabi.org/isc/datasheet/108309#tonaturalEnemies	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	No change	expert judgement	Medium
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	No change	expert judgement	Medium
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	No change	expert judgement	Medium
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	expert judgement	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	No change	expert judgement	Medium
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	expert judgement	High

Statistics	
Scores	
BRA	**40.0**
BRA Outcome	**High**
BRA+CCA	**44.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**17.0**
1. Domestication/Cultivation	*0.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**23.0**
4. Undesirable (or persistence) traits	*7.0*
5. Resource exploitation	*7.0*
6. Reproduction	*0.0*
7. Dispersal mechanisms	*4.0*
8. Tolerance attributes	*5.0*
C. Climate change	**4.0**
9. Climate change	*4.0*

Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**14**
Environmental	**14**
Species or population nuisance traits	**22**

Thresholds	
BRA	**13.25**
BRA+CCA	**13.25**
Confidence	
BRA+CCA	**0.85**
BRA	**0.88**
CCA	**0.58**

Date and Time
14/09/2022 22:30:20