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Black Sea
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IASON BSB-1121

IAS Risk Assessment Report Under Current and Climate Change Projections

11.2022

Project funded by
EUROPEAN UNION

Output number:	**D.T1.9.1**	Date:	09.2022
Title:	**IAS risk assessment report under current & climate change projections**		
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Project:	**IASON** - *Invasive Alien Species Observatory and Network Development for the Assessment of Climate Change Impacts in Black Sea Deltaic Protected Areas*		
Programme:	**BSB**	Project Number:	**1121**
Start date:	07.2020	End date:	12.2022
Lead Partner:	LP - Danube Delta National Institute for Research and Development (DDNI), Romania		
Project Partners:	PP - Danube Delta Biosphere Reserve Authority (DDBRA), PP - Institute of Marine Biology of the National Academy of Sciences of Ukraine (IMB), PP - International Hellenic University (IHU), PP - Karadeniz Technical University (KTU-MSF), PP - International Business and Economic Development Center (IBEDC)		
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Contents

1. INTRODUCTION (KTU-MSF)

Our world has been threatened by many vectors such as chemical and biological pollution, overpopulation, and climate change. These threats, which occur directly or indirectly, will force human beings to struggle with great problems in the future. While human beings have the chance to live much more comfortably with technological development, they also cause changes that may threaten the future of the world they live in, both themselves and the plants and animals living around them. One of the most important threats to human being and biodiversity are considered invasive alien species.

The EU regulation (EU No: 11141/2014) has explained the introduction of the species from their natural habitat to another that the appearance of alien species, whether animals, plants, fungi, or micro-organisms, in new locations is not always a cause for concern. However, a significant subset of alien species can become invasive and have a serious adverse impact on biodiversity and related ecosystem services, as well as other social and economic impacts, which should be prevented. Some 12 000 species in the environment of the Union and in other European countries are alien, of which roughly 10 to 15 % are estimated to be invasive.

The definition of the **alien species** is "a species, subspecies, or lower taxon, introduced outside its natural past or present distribution; includes any part, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce" and **invasive species** is " an indigenous or nonindigenous species that spreads, with or without the aid of humans, in natural or semi natural habitats, producing a significant change in composition, structure, or ecosystem processes or causing severe economic losses to human activities " (CBD COP6 Decision VI/23; Copp et al. (2005a) respectively).

There can be considerable confusion with respect to the definitions and delimitations of the terms in use to describe risk analysis and associated processes such as risk assessment. The wide explanation for the “Risk assessment” can be defined as “the evaluation of entry, exposure and consequence” (Roy et al., 2014).

The risks such IAS pose may intensify due to increased global trade, transport, tourism, and climate change. The threat to biodiversity and related ecosystem services that invasive alien species pose takes different forms, including severe impacts on native species and the structure and functioning of ecosystems through the alteration of habitats, predation, competition, the transmission of diseases, the replacement of native species throughout a significant proportion of range and through genetic effects by hybridisation. Furthermore, invasive alien species can also have a significant adverse impact on human health and the economy (EU 1141/2014).

In the project, IAS species have been investigated in six Black Sea countries' deltaic areas. The significance of IAS species was selected in the six deltaic areas for understanding their impact, and these species will also be used for raising public awareness in these deltaic areas. The impacts of IAS on biodiversity, and socio-economy are investigated and the outputs of these studies will be shared with deltaic inhabitants either face to face and/or through the observatory on their phone application.

There are many methods to analyse the invade the IAS species. Modern risk analysis takes its root in radiology and the development of the nuclear power industry. These protocols were subsequently adapted to assess a range of hazards, like alien species (Panov et al., 2009).

Some scientists have used Convention on Biological Diversity (CBD) as a guide to assess the risks of alien species invasion. The principle of the CBD is for the prevention, introduction, and mitigation of impacts of alien species that threaten ecosystems, habitats, or species (CBD COP6 Decision VI/23 2002) which includes 3 main
principles;
1. precautionary approach (eradication, containment, and control)
2. 3-stage hierarchical approach (preventing the introduction, early detection, and rapid action)
3. Ecosystem approach

DPSIR (driving forces-pressures-state-impact-response) is another risk assessment method recommended by The European Environmental Agency's

Another method that we selected to apply to our IAS to analyse their risk level is called "Minimum standards for the risk assessment of alien species" (Roy et al., 2017).

2. METHODOLOGICAL APPROACHES FOR THE IAS RISK ASSESSMENT

In the project "IASON" project, the methodology which is used for the assessment of the the IAS risk assessment in the selected IAS in the selected deltaic/protected areas is called "A minimum set of standards for the risk assessment of alien species" (Roy et al., 2917).

Roy et al., (2017), to produce a risk assessment methodology, used a method which was based on "EU regulation 1143/2014", related international conventions, and scientific expert decisions. And in the project risk assessment evaluation, we

applied this method to our selected area and IAS species. "A minimum set of standards for the risk assessment of alien species method" has 14 descriptors;

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits):**

The species description should be sufficient to understand the risk assessment without additional documentation. This is essential for decision-makers to ensure they have rapid access to the relevant information for their needs.

2. **Likelihood of introduction, establishment, spread and magnitude of impact:**

The risks of "introduction", "establishment", "spread", and "impact" are the four main components of alien species risk assessments.
a-b) The risks of *introduction* and *establishment* are usually expressed as "likelihood,"
c) The risks of *dispersal (spread)* are expressed as "likelihood," "rate" or "rapidity"
d) The risks of *impact* are expressed as both "likelihood" and "magnitude" of a detrimental effect.

This minimum standard is relevant for full risk assessments and only in part (spread and magnitude of impact) for assessments that consider impact alone.
Assessors should use the best available evidence but transparently document where information may be lacking. It may take into account extrinsic factors, such as pathways and propagule pressure.

3. **Description of the current and potential distribution, spread and magnitude of impact:**

The description of "current" and "potential distribution" within the invaded range coupled with information on "spread" capacity and the "magnitude of impact" contributes to the classification of an alien species as **invasive** or **not**. This minimum standard expands descriptively on the previous minimum standard, providing an overview of documented information, and is critical for both full risk assessments and impact assessments.

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional:**

Information on the mode of introduction including pathway information (CBD, 2014 in Roy et al., 2017) is essential for informing IAS management strategies. All pathways of entry and spread should be considered for a given species, and pathway

categories should be clearly defined and sufficiently comprehensive to ensure interoperability with other assessments.

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes:**

The environmental impact should consider negative effects on biodiversity (genetic and species) as well as on the structure and function of natural or semi-natural ecosystems (habitat diversity, succession, food web, nutrient and energy cycles).

Assessment of adverse socio-economic impacts by alien species should cover a range of possible socio-economic consequences, encompassing relevant economic sectors and aspects of human health, including broader well-being. As per the general nature of risk assessments, the assessment should focus on the negative/adverse impacts to inform decision-makers of the potential risks, with possible socio-economic benefits of IAS outlined qualitatively in the general description.

6. **Assessment of adverse impacts with respect to ecosystem services:**

The Common International Classification of Ecosystem Services (CICES) (http://cices.eu/), is currently commonly endorsed as the preferred classification system. In the common classification of ecosystem services, it is foreseen that assessment would be at the qualitative and descriptive level to meet this minimum standard.

7. **Assessment of adverse socio-economic impacts:**

Assessment of adverse socio-economic impacts by alien species should cover a range of possible socio-economic consequences, In the general nature of risk assessments, the assessment should focus on the negative/adverse impacts to inform decision-makers of the potential risks, with possible socio-economic benefits of IAS outlined qualitatively in the general description.

8. **Status (threatened or protected) of species or habitat under threat:**

Threatened species and habitats are those that are “critically endangered,” “endangered” or “vulnerable” according to the Red Lists (www.iucnredlist.org/technicaldocuments/categories-and-criteria).
It is feasible that any impact on a threatened species or habitat could be more critical, or perceived as being more critical than on species and habitats of “least

concern" because threatened species and habitats of specific conservation concern may be less resilient in the face of biological invasions (Stohlgren et al., 1999 in Roy et al., 2017).

9. Possible effects of climate change in the foreseeable future:

Alien species may be in the process of **establishing** or **expanding** when they are first assessed, so it is essential to consider not only the current situation but also predictable changes in the foreseeable future. Alien species may benefit from climate change, and therefore, risk assessments should take possible effects into account. For instance, climate change can alter patterns of human transport, changing the propagule pressure of species with the potential to become invasive (Hellmann, Byers, Bierwagen, & Dukes, 2008 in Roy et al., 2017). Climate change may also prolong the optimal climatic conditions for successful colonization or provide conditions that are closer to the climatic optimum of IAS (Walther et al., 2009 in Roy et al., 2017). Additionally, climate change may increase the rate of spread and extend suitable areas for IAS, which might offer new opportunities for repeat introductions via corridors and unaided introductions. Extreme events such as floods, tsunamis, and strong winds may directly help IAS spread and indirectly open new areas for colonization. One approach to investigating the potential consequences of climate change for IAS is to revisit components of the risk assessment in light of predicted climate changes.

10. Data limitations:

The best available evidence should be used throughout the risk assessment process. There may be a paucity of information on some species, but it is essential that risk assessment can still proceed, with precautionary approaches applied where appropriate, to enable decision-makers to undertake risk management. Therefore, it is critical that the range of sources, including expert opinion, is accompanied by a statement indicating the assessor's confidence level in the quality and reliability of the data/information. Additionally, risk assessments should be reviewed regularly and revised when new data and/or information becomes available.

11. Information sources:

The information sources should be well documented and supported with references to the scientific literature (peer- reviewed publications). If this is lacking, then it may also include other sources ("grey literature" and expert opinion). In all cases, confidence levels should be assigned to the information sources.

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary:

Many risk assessments are divided into related component sections corresponding to invasion stages such as introduction, establishment, spread and impact alongside an overall summary. Both the individual questions (protocols) and the system summarizing risks should be consistent and unambiguous. **The summary information could be as a nominal scale (e.g. low, medium, high risk) or numerical scale (1 = low risk to 5 = high risk).** It is important that clear interpretation guidance or definitions of the summaries are provided for each component of the risk assessment so that decision- makers can rapidly refer to the most pertinent aspects for their needs.

13. Uncertainty (confidence):

For many biological invasions, there may be a lack of information and a high degree of uncertainty surrounding the risk assessment because the species may not have been the subject of the previous study, and this may be both for the species' native and introduced ranges. Alternatively, there may be information available, but the assessor may still have a level of uncertainty with respect to the interpretation of the information in response to a risk assessment questionnaire. Therefore, it is essential that the answers provided within risk assessments are accompanied by an uncertainty ranking (e.g. certainty or confidence level) from the assessor (Baker et al., 2008 in Roy et al., 2017).

14. Quality assurance:

It is important that the quality of the risk assessment is assured. Eliciting multiple expert opinions by organizing a panel and their associated confidence levels provides the possibility of deriving the degree of agreement between experts (Vanderhoeven et al., 2017). Specifically, the minimum standards that include assessment or description of entry (2. Likelihood of invasion; 3. Distribution, spread and impacts; 4. Assessment of introduction pathways) would not be comprehensively considered within an impact assessment.

3. RISK ASSESSMENT FOR IAS TARGETED IN BLACK SEA DELTAIC PROTECTED AREAS MONITORED IN IASON PROJECT

3.1 - Danube Delta - Romania

3.1.1 – *Amorpha fruticosa* L. (desert false indigo, dullleaf indigo, false indigobush, leadplant, desert indigobush, indigobush, false indigo)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Plantae – Vegetal, plants Phylum: Spermatophyta Ordo: Fabales Family: Fabaceae – peas, legumes Species: *Amorpha fruticosa* L.
Invasion history	*A. fruticosa* was introduced to Europe in 1724 as an ornamental plant (Karmyzova, 2014). It was first recorded in Lithuania in 2013, where it is now naturalized and invasive (Gudžinskas and Žalneravičius, 2015).
Distribution range	Introduced
Geographic scope	*A. fruticosa* grows in a wide range of habitats, including riparian and alluvial habitats, sandy banks of ravines, coastal areas, dunes and disturbed land, such as plantations, orchards, meadows and urban areas (Szigetvári, 2002; Flora of China Editorial Committee, 2010; Karmyzova, 2014).
Socio-economic benefits	*A. fruticosa* has been a popular ornamental plant since the 1700s (Kozuharova et al., 2017). In 2016, Cuivăț et al. reviewed its value in terms of its potential medicinal, food and industrial uses. Recent research has demonstrated the potential health benefits of *A. fruticosa*, particularly in treating diabetes and metabolic disease (Kozuharova et al., 2017) *A. fruticosa* is a honey plant and an important food source for bees across its native and introduced range (Kozuharova et al., 2017). Its well-developed root system means that it has also been planted to stabilize soil and prevent erosion, e.g. on railway embankments (Kozuharova et al., 2017).

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	as an ornamental plant, **by human**
Vectors of introduction	plantation, by human
Spread	unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species
Ecosystem services	Negative impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	Response
Amorpha fruticosa L.	High negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	Response
Status of species under threat	Threatened and Protected
Status habitat under threat	Threatened and Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Amorpha fruticosa L.	Expanding

10. Data limitations

Species	Data limitations
Amorpha fruticosa L.	No data limitation

11. Information sources

Species	Information sources
Amorpha fruticosa L.	Gudžinskas, Z., Žalneravicius, E., 2015. Karmyzova L, 2014. Kozuharova, et al., 2017. Szigetvári C, 2002. CABI, 2022 Flora of China Editorial Committee, 2010.

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Danube Delta National Institute (DDNI) and from panels of other Institutes and University scientists.

3.1.2 - *Xanthium strumarium ssp. Italicum* Moretti (Common cocklebur)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Plantae Phylum: Spermatophyta Ordo: Asterales Family: Asteraceae Species: *Xanthium strumarium ssp. Italicum* (Moretti)
Invasion history	Species with uncertain, but probably from Central and South America, it has been extensively naturalized elsewhere, including the Eastern and Central Europe.
Distribution range	Introduced
Geographic scope	invades roadsides, wasteland, disturbed land, fallow land, crops, plantations, drainage ditches, savannahs, water courses, lowlands, floodplains and sandy dry riverbeds.
Socio-economic benefits	Species has been used for various medicinal purposes, including the treatment of malaria in India. The genus name is derived from the Greek root 'Xanthos' which means 'yellow', and the plant may once have been used to produce a dye (Weaver and Lechowicz, 1983).

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly

Magnitude of impact	Magnitude

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	Response
Pathways of introduction	The harbors could be the main gate for the introduction of this taxa in the coastal area.
Vectors of introduction	Bee forage and accidentally as a contaminant.
Spread	Unintentional

5. Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species
Ecosystem services	Negative impact
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact. Is an alternative host for a number of crop pests. *X. strumarium* burrs lodge in animal hair and in sheep's wool, reducing the quality and increasing treatment costs. The plants are toxic to livestock and can lead to death if eaten.
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	Response
Xanthium strumarium ssp. Italicum (Moretti)	High negative impact. Rapidly forms large stands, displacing other plant species. X. strumarium is a major weed of row crops such as soybeans, cotton, maize and groundnuts in many parts of the world, including North America, southern Europe, the Middle East, South Africa, India and Japan. It also has a damaging impact on rice production in Southeast Asia.

8. **Status (threatened or protected) of species or habitat under threat**

The threatened environmental component	Response
Status of species under threat	Threatened and Protected
Status habitat under threat	Protected

9. **Possible effects of climate change in the foreseeable future**

Species	Possible effects of climate change in the foreseeable future
Xanthium strumarium ssp. Italicum (Moretti)	Expanding

10. **Data limitations**

Species	Data limitations
Xanthium strumarium ssp. Italicum (Moretti)	No data limitation

11. **Information sources**

Species	Information sources
Xanthium strumarium ssp. Italicum (Moretti)	CABI, 2022; Weaver SE, Lechowicz MJ, 1983

12. **Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary**

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3)	High (4)

	X High (= 5)	

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	**Team of experts**
Panel of experts invited to review the risk assessment	The research team of Danube Delta National Institute (DDNI) and from panels of other Institutes and University scientists.

3.1.3 – *Elodea nuttallii* (Planch.) H. St. John (Western waterweed)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	**Response**
Taxonomy	Kingdom: Plantae Phylum: Tracheophyta Ordo: Alismatales Family: Hydrocharitaceae Species: *Elodea nuttallii* (Planch.) H. St. John
Invasion history	E. nuttallii was reported in Belgium in 1939 (with a definite identification in 1955); and in Britain in 1966, and spreading rapidly from 1970 onwards from the southeast and scattering throughout Wales, Scotland and Ireland (1984). It was also reported in the Netherlands in 1941 and in Germany in 1961, where it has since spread across the country. There are also reports of finds in Denmark (1974) (DAISIE, 2009), in Switzerland, where it was reported in the 1980s, and is spreading along the Rodan (Rhone) river. It was first found in Sweden in 1991, in Lake Mälaren and, together with *E. canadensis* and *Nymphoides peltata*, it is one of the three most troublesome species in Sweden. Thereafter, its spread was noted in 1998 in the Danube delta in Romania, covering the majority of the delta; and from there to Slovakia in 2001 and Hungary and then spreading into Western. It is not unlikely that additional finds have been made, but that they have been mistaken for Canadian

	waterweed. In Asia, it was reported for the first time in 1960 in Japan (Lake Biwa). Since then, it has expanded very rapidly, and is regarded as one of the most troublesome aquatic weeds together with *Egeria densa*. It was also introduced into China around the 1980s.
Distribution range	Introduced Unintentionally introduced outside its natural range via the trade in live aquarium plants, and has spread by escaping from garden ponds and during the disposal of garden waste near waterways.
Geographic scope	Has been found growing in a wide range of water bodies, in general in quiet water such as shorelines of lakes, reservoirs and ponds, along rivers and streams, and also in wetlands, canals and ditches (Hickman, 1993).
Socio-economic benefits	Economic value - is used in cool water aquariums and it has a little economic importance in its native range. Environmental services - Elodea species are often a preferred food for waterfowl or crayfish (Lodge, 1991; van Donk and Otte, 1996), and can also be used as shelter for small fishes and aquatic invertebrates.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	Response
Pathways of introduction	Pet/aquarium trade, by human
Vectors of introduction	It is likely to be spread by birds and animals.
Spread	Unintentional

5. Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species
Ecosystem services	Negative impact
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	Plants can become dominant in altered or created aquatic systems, especially when bicarbonate, reduced iron, and phosphorus are plentiful (Thiébaut and De Nino, 2009).

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	Response
Elodea nuttallii (Planch.) H. St. John	High negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	Response
Status of species under threat	Threatened and Protected
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Elodea nuttallii	Expanding

(Planch.) H. St. John	

10. Data limitations

Species	Data limitations
Elodea nuttallii (Planch.) H. St. John	No data limitation

11. Information sources

Species	Information sources
Elodea nuttallii (Planch.) H. St. John	Lodge, 1991 Hickman, 1993 van Donk and Otte, 1996 Thiébaut and De Nino, 2009 DAISIE, 2009 CABI, 2022

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Danube Delta National Institute (DDNI) and from panels of other Institutes and University scientists.

3.1.4 - *Leptinotarsa decemlineata* Say, 1824 (Colorado potato beetle)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response

Taxonomy	Kingdom: Animalia Phylum: Arthropoda Ordo: Coleoptera Family: Chrysomelidae Species: *Leptinotarsa decemlineata* Say, 1824
Invasion history	The species became established in Europe following its introduction from the USA to Bordeaux, France in 1922 (after several unsuccessful attempts from 1876). The beetle spread rapidly in Europe despite intensive control operations to contain it. It was first reported in Belgium and Spain in 1935, Luxembourg in 1936, the Netherlands and Switzerland in 1937, Austria in 1941, Hungary and the former Czechoslovakia in 1945, Poland and Romania in 1947, Turkey in 1949 and was detected in Xinjiang, China in 1993 (CABI, 2022).
Distribution range	Introduced
Geographic scope	Because of its capacity for adaptation to different climatic conditions and different host plants (Hsiao, 1982), is constantly moving into fresh areas and crossing international borders. The species attacks potatoes and various other cultivated crops including tomatoes and aubergines. It also attacks wild solanaceous plants, which occur widely and can act as a reservoir for infestation. The adults feed on the tubers of host plants in addition to the leaves, stems and growing points (CABI, 2022).
Socio-economic benefits	There are no social benefits

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	Colorado beetle contaminates means of transport (e.g. lorries) by walking, or flying, on board. As a result, it will most likely be found on the outside of packages (CABI, 2022).
Vectors of introduction	Clothing, footwear and possessions Land vehicles Plants or parts of plants Soil, sand and gravel
Spread	Unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Neutral impact
Impact on natural and semi-natural ecosystem biodiversity	Moderate pressure on native species
Ecosystem services	Neutral impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	Response
Leptinotarsa decemlineata Say, 1824	High negative impact

8. **Status (threatened or protected) of species or habitat under threat**

The threatened	Response

environmental component	
Status of species under threat	Unprotected
Status habitat under threat	Unprotected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Leptinotarsa decemlineata Say, 1824	In temperate regions, photoperiod is the most important factor inducing 'hibernal diapause' in teneral adults, but ambient temperatures and food quality may have modifying effects. This species is a typical 'long-day' insect entering diapause after exposure to a critically short photoperiod, which varies with latitude. In general, populations from the south require a shorter photoperiod for diapause induction than those from the north. Critical photoperiods approach 16 hours for northern populations (latitude 45°N) (Tauber et al., 1988) and decline to about 12 hours for southern populations (latitude 32°N) (CABI, 2022).

10. Data limitations

Species	Data limitations
Leptinotarsa decemlineata Say, 1824	No data limitation

11. Information sources

Species	Information sources
Leptinotarsa decemlineata Say, 1824	CABI, 2022

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (3)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Danube Delta National Institute (DDNI) and from panels of other Institutes and University scientists.

3.1.4 – *Perccottus glenii* Dybowski, 1877 (Amur sleeper)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Animalia Phylum: Cordata Ordo: Gobiiformes Family: Odontobutidae Species: *Perccottus glenii* Dybowski, 1877
Invasion history	The species first documented introduction outside its natural range distribution comes from 1912 when it was brought by the Russian naturalist I.L. Zalivskii near St. Petersburg (Lisiy Nos settlement) and four years later some individuals were released to a garden pond, from which they spread to other waterbodies (see Reshetnikov, 2001). In 1948, another introduction took place, the species was brought to Moscow by the participants of the Amur expedition). Soon it appeared in the aquaria of amateurs and next in several ponds in Moscow and the Moscow Province. The other introductions were more unintentional as the Amur sleeper was translocated as contamination of stocking material of Asian herbivorous cyprinids e.g. *Cyprinus carpio* to fish farms from where it penetrated to open waters. One of the earliest examples of such introduction was the expansion of Amur sleeper from the Khabarovsk fish farm (Far East of Russia) to Gusinoe Lake (the Lake Baikal basin) in 1969. Similarly, it penetrated from the Ilevsk fish farm to waterbodies of the Nizhniy Novgorod Province in 1970-1971. Reshetnikov and Ficetola (2011) distinguished 13 centres of the Amur

	sleeper distribution outside of its native range - their location determined the shape of the current invaded range. According to these authors the invasion centre of Amur sleeper for Central Europe, i.e. Ukraine, Poland, Slovakia, Hungary, Serbia, Romania and Bulgaria, might be the fish farm near Lviv (Ukraine), where Amur sleeper had been introduced before 1980. However, the series of independent accidental introductions of Amur sleeper (as contamination of stocking material) from different locations, including areas of the species native range distributions, is also possible considering the intensity of trade of stocking material of Asian cyprinids and number of purposeful introductions of these commercially important species both to ponds and open waters.
Distribution range	Natural expansion of the species' habitat
Geographic scope	Terrestrial - Natural / Semi-natural: Floodplains Freshwater: Irrigation channels, Lakes, Reservoirs, Rivers / streams, Ponds Brackish: Estuaries
Socio-economic benefits	The Amur sleeper does not have any human uses, economic value and social benefits, apart from use as bait (see Reshetnikov, 2001).

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	Response
Pathways of introduction	Pet trade: In 1950s it appeared on the bird market in Moscow Stocking: Accidently introduced many times to many

	places as contamination of stocking material of Asian carp
Vectors of introduction	Aquaculture stock: Accidently introduced many times to many places as contamination of stocking material of Asian carp
Spread	Natural Dispersal (Non-Biotic) Accidental Introduction Intentional Introduction

5. Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	High pressure on native species
Ecosystem services	Negative impact
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	**Response**
Perccottus glenii Dybowski, 1877	High negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	**Response**
Status of species under threat	Threatened and Protected
Status habitat under	Threatened and Protected

threat	

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Perccottus glenii Dybowski, 1877	Unknown

10. Data limitations

Species	Data limitations
Perccottus glenii Dybowski, 1877	No data limitation

11. Information sources

Species	Information sources
Perccottus glenii Dybowski, 1877	Reshetnikov and Ficetola, 2011 Reshetnikov, 2001 CABI, 2022

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Danube Delta National Institute (DDNI) and from panels of other Institutes and University scientists.

3.2 - Danube Delta - Ukraine

3.2.1 - *Elodea canadensis* Michx. (American or Canadian Waterweed, Pondweed)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Plantae; Phylum: Tracheophyta; Ordo: Alismatáles; Family: Hydrocharitaceae; Species: Elodea canadensis Michx., 1803
Invasion history	Elodea canadensis was first observed in Europe in 1836, in an Irish pond, where it had already been established for some time. It has been introduced to a large number of European countries and was first reported in Scotland in 1854, in Germany near Berlin in 1859 and also in Poland at about this time. The first report of E. canadensis in Scandinavia is from Denmark in 1870, Sweden in 1871 and Finland in 1884. In Finland E. canadensis was intentionally planted in the Botanical Garden of the University of Helsinki (Hintikka 1917), from which it spread with water and birds to the entire country. Although *E. canadensis* was first observed in Norway near Oslo in 1925, it did not begin to spread to other areas until the 1960s. *E. canadensis* was observed for the first time in the European part of Russia in 1880, in Latvia in 1872, in Lithuania in1884 and in Estonia in 1905. In 1984, *E. canadensis* was recorded for the first time in Ukraine. *Elodea canadensis* is now widespread globally and is considered a noxious weed in Asia, Africa, Australia and New Zealand (Bowmer et al. 1995). *E. canadensis* is included in the list of most dangerous invasive alien species (EEA/SEBI 2010, Larsson & al. 2007).
Distribution range	Introduced
Geographic scope	Has been found growing in a wide range of water bodies, in general in the oligo-mesosaprobic and mesoeutrophic water
Socio-economic benefits	*Elodea canadensis* is sold as an ornamental plant in garden centers and as an aquarium plant

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	Pet/aquarium trade, by human
Vectors of introduction	Likely to be spread by birds and animals.
Spread	Unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

(The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species
Ecosystem services	Negative impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	Plants can become dominant in altered or created aquatic systems.

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	Response
Elodea canadensis Michx.,1803	High negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	Response
Status of species under threat	Threatened and Protected
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Elodea canadensis Michx.,1803	Expanding

10. Data limitations

Species	Data limitations
Elodea canadensis Michx.,1803	No data limitation

11. Information sources

Species	Information sources
Elodea canadensis Michx.,1803	Larsson & al. 2007; DAISIE, 2009 Thiébaut and De Nino, 2009; Dubyna D.V. et al., 2017; Prokopuk, 2018; CABI, 2022

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	**Team of experts**
Panel of experts invited to review the risk assessment	The research team of the Institute of Marine Biology of the NAS of Ukraine (IMB).

3.2.2 – *Amorpha fruticosa* L. (Desert false indigo, False indigo-bush, Bastard indigo-bush)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	**Response**
Taxonomy	Kingdom Plantae – plantes, Planta, Vegetal, plants Subkingdom Viridiplantae – green plants Infrakingdom Streptophyta – land plants Superdivision Embryophyta Division Tracheophyta – vascular plants, tracheophyte Subdivision Spermatophytina – spermatophytes, seed plants, phanérogames Class Magnoliopsida, Order Fabales Family Fabaceae – peas, legumes Genus *Amorpha* L. – false indigo, indigobush Species *Amorpha fruticosa* L. – desert false indigo, dullleaf indigo, false indigobush, leadplant, desert indigobush, indigobush, false indigo
Invasion history	The plant is a shrub native to North America – contiguous United States, northern Mexico, and south-eastern Canada (Wilbur, 1975), but has been introduced to New England and the Pacific Northwest. The first report of its wild occurrence in the Chesapeake area was in Potomac Park, Washington DC, in 1898, reported as a garden escape. Amorpha

	fruticosa became popular in Europe as ornamental plant in the early 1700s (Huxley, 1992; Austin, 2004). Afterward, it used to be widely planted in Europe at the beginning of the 20th century and was introduced in North Asia before the middle of the same century (Jung, 2014; Takagi & Hioki, 2013). Presently A. fruticosa is reported to be invasive in a number of European countries (Roy et al., 2020).
Distribution range	Introduced
Geographic scope	*A. fruticosa* tolerate dry soils, but it is most abundant along river banks and roads and the edges of flooded forests. The plant grows well in medium to wet, well-drained, soils in full sun to light shade and is tolerant of occasional flooding. It has well-developed roots and is relatively wind-tolerant. It may spread by self-seeding and/or suckers to form thickets (Freeman and Schofield, 1991).
Socio-economic benefits	The rich nectar production of these flowers makes false indigo a highly appreciated honey plant and important food source for bees, both in its native range and in the invaded territories. Additionally, it was planted to stabilize the soil (especially on railway embankments) due to its protective role against erosion provided by an extensive root system *A. fruticosa* has Antioxidant and Acetylcholinesterase Inhibition Properties, Hepatoprotective Effects, Insect Repellent and Insecticidal Activity. One of the quite promising medical applications of *A. fruticosa* is against diabetic complications. Plants have been a continuous source of therapeutic agents historically, and still today represent a valuable pool for the discovery and development of new therapeutics in general, as well as in the context of cardiovascular and metabolic disease in particular). Ethnobotanical use of *Amorpha fruticosa:* as bedding material, horse feed, arrow shafts, the stems were arranged on the ground to create a clean surface on which to put butchered meat, and name “false indigo” is related to the application of the plant as a blue dye (Kozuharova, Matkowski et al, 2017).

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Current distribution	Likelihood
Potential distribution	Likelihood
Spread	Rapidly
Magnitude	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	as an ornamental plant, by human
Vectors of introduction	first by people, then by natural ways
Spread	unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species
Ecosystem services	Negative impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	Response
Amorpha fruticosa L.	High negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	Response
Status of species under threat	Threatened and Protected
Status of species under threat	Threatened and Protected
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Amorpha fruticosa L.	Expanding

10. Data limitations

Species	Data limitations
Amorpha fruticosa L.	No data limitation

11. Information sources

Species	Information sources
Amorpha fruticosa L.	Wilbur, 1975; Huxley, 1992; Austin, 2004 Jung, 2014; Takagi & Hioki, 2013; Roy et al., 2020; Freeman and Schofield, 1991; Kozuharova, Matkowski et al, 2017.

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Danube Biosphere Reserve and from panels of the Institute of Marine Biology of the NAS of Ukraine (IMB).

3.2.3- *Oithona davisae* Ferrari F.D. and Orsi, 1984

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Arthropoda; Ordo: Cyclopoida Family: Oithonidae; Species: *Oithona davisae* Ferrari & Orsi, 1984
Invasion history	*Oithona davisae* was first recorded in the Sevastopol Bay in 2000 (Zagorodnyaya, 2002), next it was found only in 2005 and after that it is expanding along the Black Sea coast since 2009 (Tamura et al., 2004; Mihneva & Stefanova, 2013). The genetic analyses supported identification of *O. davisae* (Shiganova et al., 2015). *Oithona davisae* reproduce and established self-sustaining populations in their new Black Sea.
Distribution range	Introduced
Geographic scope	coastal, shelf, open sea, transitional waters
Socio-economic benefits	It is a component of the forage zooplankton useful for planktophagous commercial fish species.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly

Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	a component of the forage zooplankton useful for planktophagous commercial fish species
Vectors of introduction	shipping
Spread	Intentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Positive impact
Impact on natural and semi-natural ecosystem biodiversity	It is a component of the forage zooplankton useful for planktophagous commercial fish species
Ecosystem services	Positive impact
Food-web	Positive impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Positive impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	Response

Oithona davisae Ferrari & Orsi, 1984	Positive impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	Response
Status of species under threat	Least concern
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Oithona davisae Ferrari & Orsi, 1984	Expanding

10. Data limitations

Species	Data limitations
Oithona davisae Ferrari & Orsi, 1984	No data limitation

11. Information sources

Species	Information sources
Oithona davisae Ferrari and Orsi, 1984	Zagorodnyaya, 2002 Tamura K et al.,2004 Mihneva & Stefanova, 2013; Shiganova et al., 2015

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (3)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of the Institute of Marine Biology of the NAS of Ukraine (IMB).

3.2.4- *Corbicula leana* (O.F. Muller, 1774) (Asian clam, Japanese clam)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Mollusca; Ordo: Venerida; Family: Cyrenidae; Species: *Corbicula leana* (Prime, 1864) [in many publications, misidentified as *C. fluminea*]
Invasion history	Along with other species of this genus, it is a global resident in freshwater ecosystems, taking over a variety of habitats and strongly influencing ecosystem functions and economics (Den Hartog et al. 1992; Son, 2007; Bódis et al. 2011; Sousa et al. 2014; Ferreira-Rodríguez et al. 2021; Haubrock et al. 2022; Morhun et al. 2022)
Distribution range	Native: East Asia; introduced: Europe, South and North America, South-East Asia
Geographic scope	Inhabits a wide variety of still water bodies, lowland rivers, estuaries and brackish coastal lagoons C (C1, C2, C3): Inland surface waters; X01: Estuaries; X03: Brackish coastal lagoons
Socio-economic benefits	A traditional component of Asian cuisine, live bait

1. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood - high
Establishment	Likelihood - high
Spread	Rapidity - high
Magnitude of impact	Magnitude - high

2. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

3. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	Transport – Contaminant: Transportation of habitat material; Transport- Stowaway: Ship/boat ballast water; Escape from confinement: Aquaculture, Live food and live bait
Vectors of introduction	unintentional
Spread	Corridors: Interconnected waterways / basins / seas; Unaided

4. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Negative impact
Ecosystem services	Negative impact
Food-web	Negative impact

5. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	Negative impact

6. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	Response
Corbicula leana (Prime, 1864)	Negative impact

7. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	Response
Status of species under threat	No data
Status habitat under threat	Protected

8. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Corbicula leana (Prime, 1864)	Possible peaks in summer mortality, leading to a temporary reduction of certain subpopulations

9. Data limitations

Species	Data limitations
Corbicula leana (Prime, 1864)	No data limitation

10. Information sources

Species	Information sources
Corbicula leana (Prime, 1864)	Bódis et al. 2011 Den Hartog et al. 1992 Ferreira-Rodríguez et al. 2021 Haubrock et al. 2022 Morhun et al. 2022 Son, 2007 Sousa et al. 2014

11. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

12. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

13. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of the Institute of Marine Biology of the NAS of Ukraine (IMB).

3.2.5- *Perccottus glenii (Dybowski*, 1877) (Chinese sleeper, Amur sleeper)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Animalia Phylum: Cordata Ordo: Gobiiformes Family: Odontobutidae Species: *Perccottus glenii* (Dybowski, 1877)
Invasion history	The Chinese sleeper has spread in Central and Eastern Europe, primarily through transportation of aquacultural fish stocks since 1970-1971 (Reshetnikov 2004; Kutsokon 2017). The species' range in the Danube is presently restricted to the Middle and Lower reaches, including the river basins of some tributaries, e.g. the Tisza river basin (Koščo et al. 2003; Jurajda et al. 2006; Hegediš et al. 2007; Ćaleta et al. 2011; Covaciu-Marcov et al. 2011, 2017; Kutsokon 2017). There is also an isolated population in the Upper Danube basin in Germany, where it inhabits several lakes and streams in the Naab river basin (north tributary of the Danube), though it remains absent in the German sector of the Danube (Nehring and Steinhof 2015). The existing Danube basin Chinese sleeper populations are related to the Carpathian population, first introduced from China to the Upper Dniester basin in Ukraine (Grabowska et al. 2020). The Chinese sleeper was first registered in the Romanian section of the Danube delta, with individuals found in the Ukrainian stretch soon after (Năstase 2007; Kvach 2012). Outside of the delta, the species has also been registered in Lake Kartal, at sites along the main stretch of the Ukrainian Danube and in the Moldavian part of Lake Kahul (Moshu and Chiriac 2011; Kvach et al. 2020). In recent years, the species has also spread within the Ukrainian delta zone and is now

	also recorded in the Dnieper Estuary (Kutsokon 2017; Kvach et al. 2016) and in the brackish Gulf of Yahorlyk in the Black Sea (Kvach et al. 2021).
Distribution range	Natural expansion of the species' habitat
Geographic scope	Terrestrial - Natural / Semi-natural: Floodplains Freshwater: Channels, lakes, reservoirs, rivers / streams, ponds, marshes Brackish: Estuaries, bays
Socio-economic benefits	Commonly used as bait (Pupina et al., 2015).

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	Response
Pathways of introduction	Pet trade: ornamental fish for aquarium and ponds (Pupina et al., 2015) Stocking: Accidently introduced many times to many places as contamination of stocking material of Asian carp
Vectors of introduction	Aquaculture stock: Accidently introduced many times to many places as contamination of stocking material of Asian carp
Spread	Natural Dispersal (Non-Biotic) Accidental Introduction Intentional Introduction

5. Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes

The threatened	Response

environmental or socio-economic component	
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	High pressure on native species
Ecosystem services	Negative impact
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	Response
Perccottus glenii Dybowski, 1877	High negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	Response
Status of species under threat	Threatened and Protected
Status habitat under threat	Threatened and Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Perccottus glenii (Dybowski, 1877)	Unknown

10. Data limitations

Species	Data limitations
Perccottus glenii (Dybowski, 1877)	No data limitation

11. Information sources

Species	Information sources
Perccottus glenii (Dybowski, 1877)	Verreycken, 2015 Kutsokon, 2017 Bogutskaya, 2022

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of the Institute of Marine Biology of the NAS of Ukraine (IMB).

3.2.6 – *Canis aureus* (Linnaeus, 1758) (Golden jackal)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Cordata; Class: Mammalia Order: Carnivora; Family: Canidae; Species: *Canis aureus* (Linnaeus, 1758)
Invasion history	*Canis aureus* appeared in the Dniester and Danube deltas in 1997-1998 (Volokh et all., 1998; Rozhenko, Volokh, 1999; Zagorodniuk, 2006). After expansion, this species

	created numerous local populations (Chronicle of nature…, 2019). *Canis aureus* competes with native species for food and habitat, destroys bird nests, and is involved in the circulation of dangerous pathogens (rabies) (Chronicle of nature…, 2019).
Distribution range	Native: south-west Asia; introduced: south-eastern Europe
Geographic scope	A2.5, B1.1, B1.6, B1.7, G1.11,
Socio-economic benefits	no data

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidity
Magnitude of impact	Magnitude

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	Response
Pathways of introduction	natural invasion
Vectors of introduction	expansion of the range of the species
Spread	unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and	Negative impact

semi-natural ecosystem biodiversity	
Ecosystem services	Negative impact
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	Response
Canis aureus (Linnaeus, 1758)	Negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	Response
Status of species under threat	Protected
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Canis aureus (Linnaeus, 1758)	Expanding

10. Data limitations

Species	Data limitations
Canis aureus (Linnaeus, 1758)	No data limitation

11. Information sources

Species	Information sources
Canis aureus (Linnaeus, 1758)	Volokh A.M. et al., 1998; Rozhenko, Volokh, 1999, 2000; Volokh, 2004; Potish, 2006;

	Rozhenko, 2006, 2017; Zagorodniuk, 2006; Domnich et al., 2009; Redinov, 2015; Chronicle of nature…, 2018, 2019

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Danube Biosphere Reserve and from panels of the Institute of Marine Biology of the NAS of Ukraine (IMB).

3.3 - Nestos Delta - Greece

3.3.1 – *Amorpha fruticosa* L. (desert false indigo, dullleaf indigo, false indigobush, leadplant, desert indigobush, indigobush, false indigo)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Plantae – Vegetal, plants Phylum: Spermatophyta Order: Fabales Family: Fabaceae – peas, legumes Species: *Amorpha fruticosa* L.
Invasion history	*A. fruticosa* was introduced to Europe in 1724 as an ornamental plant (Karmyzova, 2014). It was first recorded in Lithuania in 2013, where it is now naturalized and invasive (Gudžinskas and Žalneravičius, 2015).
Distribution range	Introduced
Geographic scope	*A. fruticosa* grows in a wide range of habitats, including riparian and alluvial habitats, sandy banks of ravines, coastal areas, dunes and disturbed land, such as plantations, orchards, meadows and urban areas (Szigetvári, 2002; Flora of China Editorial Committee, 2010; Karmyzova, 2014).
Socio-economic benefits	*A. fruticosa* has been a popular ornamental plant since the 1700s (Kozuharova et al., 2017). In 2016, Cuivăț et al. reviewed its value in terms of its potential medicinal, food and industrial uses. Recent research has demonstrated the potential health benefits of *A. fruticosa*, particularly in treating diabetes and metabolic disease (Kozuharova et al., 2017) *A. fruticosa* is a honey plant and an important food source for bees across its native and introduced range (Kozuharova et al., 2017). Its well-developed root system means that it has also been planted to stabilize soil and prevent erosion, e.g. on railway embankments (Kozuharova et al., 2017).

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly

Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	**Response**
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	**Response**
Pathways of introduction	as an ornamental plant, by human
Vectors of introduction	plantation, by human
Spread	unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species
Ecosystem services	Negative impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	Due to nitrogen-fixating ability, changes in nutrient cycling may occur.

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	Response
Amorpha fruticosa L.	High negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	Response
Status of species under threat	Threatened and Protected
Status habitat under threat	Threatened and Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Amorpha fruticosa L.	Expanding

10. Data limitations

Species	Data limitations
Amorpha fruticosa L.	No data limitation

11. Information sources

Species	Information sources
Amorpha fruticosa L.	Gudžinskas, Z., Žalneravicius, E., 2015. Karmyzova L, 2014. Kozuharova, et al., 2017. Szigetvári C, 2002. CABI, 2022 Flora of China Editorial Committee, 2010.

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High	

	X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	Members of the research team of the IHU conducted the risk assessment, whereas review was made by external experts.

3.3.2 – *Acer negundo* L. (box elder, boxelder maple, Manitoba maple, ash-leaved maple)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Plantae Phylum: Spermatophyta Order: Sapindales Family: Sapindaceae Species: *Acer negundo* L.
Invasion history	*A. negundo* was introduced in Europe by the ends of the 17th century. It was then planted throughout much of Europe but the history of introduction and spread through the continent is fragmentary. It is considered a species with uncertain, but probably from Central and South America, it has been extensively naturalized elsewhere, including the Eastern and Central Europe.
Distribution range	Introduced
Geographic scope	invades roadsides, wasteland, poplar plantations, *Alnus glutinosa* riparian forests and sandy dry riverbeds.
Socio-economic benefits	It has been used as an ornamental and widely used in cities and parks all around Greece because it is resilient in conditions of increased atmospheric pollution, whereas it can also tolerate heat and water stress.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	Horticulture, ornamental purpose other than horticulture, forestry (including reforestation), natural dispersal across borders of invasive alien species that have been introduced through pathways 1 to 5.
Vectors of introduction	plantation, by human
Spread	Intentional, unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species
Ecosystem services	Negative impact
Food-web	Neutral

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact. *Acer negundo* is expected to severely affect specific habitat types in the area of Nestos after several years through vegetation succession. It is believed that it will replace *Alnus glutinosa* in its natural stands and in this way, it will affect the total ecosystem.
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	Response
Acer negundo L.	Negative impact. It is gradually changing the floristic composition of the riparian forests in the area of Nestos. Its seeds are able for long distance dispersal and now it can be found in areas far away from places where it was planted. As a result, it has become one of the most invasive plant species occurring in riparian forests all around Europe (Sikorska et al. 2019).

8. **Status (threatened or protected) of species or habitat under threat**

The threatened environmental component	Response
Status of species under threat	Protected
Status habitat under threat	Protected

9. **Possible effects of climate change in the foreseeable future**

Species	Possible effects of climate change in the foreseeable future
Acer negundo L.	Expanding

10. **Data limitations**

Species	Data limitations
Acer negundo L.	No data limitation

11. **Information sources**

Species	Information sources
Acer negundo L.	CABI, 2022; Sikorska et al. 2019

12. **Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary**

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (3)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	Members of the research team of the IHU conducted the risk assessment, whereas review was made by external experts.

3.3.3 - *Robinia pseudoacacia* L. (black locust)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Plantae Phylum: Tracheophyta Order: Fabales Family: Fabaceae Species: *Robinia pseudoacacia* L.
Invasion history	*R. pseudoacacia* has been widely introduced to other parts of North America, possibly in pre-history, thus blurring the actual limits to its native range. It is known to have been introduced to tidewater Virginia by native Americans for bow production, and then introduced widely by colonists in New England and Canada as a ship building timber and later as an ornamental species. It was introduced in Europe in the early 1600s and has since become widely naturalized in many countries. A very old tree in a park in central Paris, France, is considered to be the original tree introduced by Jean Robin, planted in 1604, and is still bearing fruit 400 years later. Although many forest managers today consider this tree a weed species and a strong competitor against more desirable species, it has been widely planted in some central European countries where it is an important timber species. It is one of the most important stand-forming

	tree species in Hungary, covering approximately 20% of the forested land and providing 25% of the country's annual timber cut.
Distribution range	Introduced The popularity of *R. pseudoacacia* as an ornamental, forestry, shelter and land reclamation species have ensured that it has been widely introduced. At the same time, it has become naturalized or invasive across many regions, so there is a risk that it will become naturalized or invasive where conditions are suitable. Some countries where it is naturalized view it as a potential problem and are monitoring for signs of invasiveness.
Geographic scope	The native range of *R. pseudoacacia* includes cool temperate moist forest, warm temperate montane moist forest, warm temperate montane wet forest, and warm temperate moist forest life zones (Sawyer and Lindsey, 1964). *R. pseudoacacia* invades disturbed woodlands and urban and rural landscapes throughout North America (Westbrooks, 1998), riparian areas and canyons in California, also disturbed or cleared sites, and frequently becomes established on burned-over land. It also aggressively invades dry prairies, sand prairies and savannas. In South Africa, *R. pseudoacacia* invades riverbanks and roadsides (Henderson, 2001). In Europe, it is commonly seen as a roadside tree, and forming thorny, stands from root suckers along roads, rivers and field margins.
Socio-economic benefits	Economic value - is it used to control erosion, as an ornamental plant, for timber production, whereas moreover, it is considered a significant beekeeper plant.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	Response
Current distribution	Invasive, not invasive
Potential distribution	Invasive
Spread	Invasive

Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	Horticulture, ornamental purpose other than horticulture, forestry (including reforestation), natural dispersal across borders of invasive alien species that have been introduced through pathways 1 to 5.
Vectors of introduction	plantation, by human
Spread	Intentional, unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species
Ecosystem services	Negative and positive impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	Due to nitrogen-fixating ability, changes in nutrient cycling may occur.

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	Response
Robinia pseudoacacia L.	Negative impact

8. **Status (threatened or protected) of species or habitat under threat**

The threatened environmental component	Response

Status of species under threat	Protected
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Robinia pseudoacacia L.	Expanding

10. Data limitations

Species	Data limitations
Robinia pseudoacacia L.	No data limitation

11. Information sources

Species	Information sources
Robinia pseudoacacia L.	Sawyer and Lindsey, 1964 Westbrooks, 1998 Henderson, 2001 DAISIE, 2009 CABI, 2022

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (3)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	Members of the research team of the IHU conducted the risk assessment, whereas review was made by external experts.

3.3.4 - *Phytolacca americana* L. (American pokeweed, pokeweed, poke sallet, dragonberries, and inkberry)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Plantae Phylum: Tracheophyta Order: Caryophyllales Family: Phytolaccaceae Species: *Phytolacca americana* L.
Invasion history	It usually infests disturbed anthropogenic habitats, but in particular forest edges, open woodlands (Balogh and Juhász 2008), and mixed forests, where it forms dominant and dense stands (Schirmel 2020). Consequently, attention has been paid to its invasion in forests (e.g. Rupp et al. 2017). In Europe, the increasing spread of the species in near-natural habitats has been the motivation for assessments of the invasiveness and associated risks (e.g. Tanner and Fried 2020). However, the species had also locally emerged as a weed in crop fields in some European countries, such as in France and Hungary. In its native range, though, *P. americana* has already become more prevalent in certain agricultural areas and it is considered difficult to manage (Patches et al. 2017).
Distribution range	Introduced
Geographic scope	Pokeweed is native to eastern North America, the Midwest, and the South, with more scattered populations in the far West. It is also naturalized in parts of Europe and Asia. It is considered a pest species by farmers. In the wild, it is easily found growing in pastures, recently cleared areas, and woodland openings, edge habitats such as along fencerows, and in wastelands.
Socio-economic benefits	It is used as an ornamental in horticulture, and it provokes interest for the variety of its natural products (toxins and other classes), for its ecological role, its historical role in traditional medicine, and for some utility in biomedical research (e.g., in studies of pokeweed mitogen).

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood

Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	Horticulture, ornamental purpose other than horticulture, natural dispersal across borders of invasive alien species that have been introduced through pathways 1 to 5.
Vectors of introduction	by human
Spread	Intentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Moderate pressure on native species
Ecosystem services	Neutral impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	Response
Phytolacca americana L.	Negative impact

8. **Status (threatened or protected) of species or habitat under threat**

The threatened environmental component	Response
Status of species under threat	Unprotected, protected
Status habitat under threat	Unprotected, protected

9. **Possible effects of climate change in the foreseeable future**

Species	Possible effects of climate change in the foreseeable future
Phytolacca americana L.	Expanding

10. **Data limitations**

Species	Data limitations
Phytolacca americana L.	No data limitation

11. **Information sources**

Species	Information sources
Phytolacca americana L.	Follak et al. 2022

12. **Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary**

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (3)

13. **Uncertainty (confidence)**

	Reference	
Confidence level	X High X Medium	Low

	X Low	

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	Members of the research team of the IHU conducted the risk assessment, whereas review was made by external experts.

3.3.4 - *Ailanthus altissima* (Mill.) Swingle (Tree-of-heaven)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Plantae Phylum: Tracheophyta Order: Sapindales Family: Simaroubaceae Species: *Ailanthus altissima* (Mill.) Swingle
Invasion history	In Europe, *A. altissima* was introduced in the 1740s (Hu, 1979) and currently is widely established (Kowarik and Säumel, 2007). It was introduced into the USA in 1784 and has become extensively naturalized in North America (Luken and Thieret, 1997). A. altissima has been introduced from China and Japan to India, where it is cultivated in the plains and hills of the north (Singh et al., 1992). It grows abundantly along roadsides in Himachal Pradesh and is able to grow on barren and stony substrates. It is used for afforestation in Jammu and Kashmir and as an avenue tree elsewhere. In Iran, it is planted in green belts around cities in semi-arid areas (Luna, 1996).
Distribution range	Introduced
Geographic scope	In Europe, *A. altissima* has colonized disturbed sites along roads and ditches, particularly in the Mediterranean region, where has successfully invaded several habitats including old fields, scrubland and pine, oak and riparian forests (Kowarik, 1983; Lepart & Debussche 1991; Kowarik and Säumel, 2007; Constán-Nava, 2012).
Socio-economic benefits	Ailanthus altissima does not have any human uses, economic value and social benefits, apart from use as an

	ornamental.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	Response
Pathways of introduction	Horticulture, ornamental purpose other than horticulture, natural dispersal across borders of invasive alien species that have been introduced through pathways 1 to 5.
Vectors of introduction	by human
Spread	Natural Dispersal (Non-Biotic) Intentional Introduction

5. Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Medium impact
Impact on natural and semi-natural ecosystem biodiversity	Medium pressure on native species
Ecosystem services	Medium impact
Food-web	Neutral

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse	Response

impacts with respect to ecosystem services:	
Biotic impact	Negative impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	Response
Ailanthus altissima (Mill.) Swingle	Negative impact

8. **Status (threatened or protected) of species or habitat under threat**

The threatened environmental component	Response
Status of species under threat	Unprotected
Status habitat under threat	Unprotected

9. **Possible effects of climate change in the foreseeable future**

Species	Possible effects of climate change in the foreseeable future
Ailanthus altissima (Mill.) Swingle	Expanding

10. **Data limitations**

Species	Data limitations
Ailanthus altissima (Mill.) Swingle	No data limitation

11. **Information sources**

Species	Information sources
Ailanthus altissima (Mill.) Swingle	Hu, 1979 Kowarik and Säumel, 2007 Luken and Thieret, 1997 Singh et al., 1992 Luna, 1996 Zheng, 1978 Liu, 1988 CABI, 2022

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (3)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	Members of the research team of the IHU conducted the risk assessment, whereas review was made by external experts.

3.3.6 – *Solanum elaeagnifolium* Cav. (silverleaf nightshade)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Plantae Phylum: Tracheophyta Order: Solanales Family: Solanaceae Species: *Solanum elaeagnifolium* Cav.
Invasion history	It is considered to be native to the Americas, although it may have been introduced to the northern and eastern parts of North America (EPPO, 2007). The species has spread primarily as a seed contaminant in soil and crops. Spanish or Portuguese colonists may have been instrumental in spreading the species across the Americas, and it is thought to have been introduced to California by contaminated railway cars (Boyd et al., 1984). The species was first recorded for Israel during the 1956 war, and to Morocco in 1958 through contaminated crop seeds (EPPO, 2007).

Distribution range	Introduced
Geographic scope	It is native to north-east Mexico and the south-west USA (Goeden, 1971; Boyd et al., 1984; Wapshere, 1988). Although it is also thought to be indigenous to Argentina, the nature of the insect herbivore faunas in this country suggests that this distribution is secondary (EPPO, 2007). USDA-NRCS (2014) reports the species as native to all the North American states listed by the source, although a note in the USDA-ARS (2014) database says 'probably not native to North America', and EPPO (2007) quotes Goeden (1971) as saying that in California it was introduced in 1890. It is adapted to a wide range of habitats, but appears mostly in areas of relatively low annual rainfall (300-500 mm) (Parsons, 1981; Heap et al., 1997). The weed thrives on disturbed land and, in addition to crop lands, areas particularly prone to invasion include roads, water furrows and rivers, and livestock corrals (Wassermann et al., 1988).
Socio-economic benefits	*S. elaeagnifolium* does not have any human uses, economic value and social benefits.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	Response
Pathways of introduction	Agriculture (including Biofuel feedstocks), contaminant nursery material, transportation of habitat material (soil, vegetation,…), machinery/equipment, vehicles (car, train, …), natural dispersal across borders of invasive alien species that have been introduced

	through pathways 1 to 5.
Vectors of introduction	by human
Spread	Natural Dispersal (Non-Biotic) Intentional Introduction

5. Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	High impact
Impact on natural and semi-natural ecosystem biodiversity	High pressure on native species
Ecosystem services	Medium impact
Food-web	Medium

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	Response
Solanum elaeagnifolium Cav.	Negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	Response
Status of species under threat	Unprotected
Status habitat under threat	Unprotected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future

Solanum elaeagnifolium Cav.	Expanding

10. Data limitations

Species	Data limitations
Solanum elaeagnifolium Cav.	No data limitation

11. Information sources

Species	Information sources
Solanum elaeagnifolium Cav.	EPPO, 2007 Boyd et al., 1984 Goeden, 1971 Wapshere, 1988 USDA-NRCS 2014 CABI, 2022

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (3)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	Members of the research team of the IHU conducted the risk assessment, whereas review was made by external experts.

3.4. Kızılırmak Delta - Turkey

3.4.1. Carassius gibelio (Bloch, 1782)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Cordata; Order: Cypriniformes; Family: Cyprinidae; Species: Carassius gibelio (Bloch, 1782)
Invasion history	Prussian carp have been responsible for degradation and alteration of habitat quality by disturbing sediment during foraging, furthering declines in native fish species (Richardson et al., 1995; Crivelli, 1995; Veer and Nentwing, 2015). Differences in the abundance of native species before and after Prussian carp invasion demonstrated significant declines in the abundance of native species (Ruppert et al. (2017)
Distribution range	Introduced
Geographic scope	Inhabits a wide variety of still water bodies and lowland rivers (FAO 2021). C (C1, C2, C3): Inland surface waters
Socio-economic benefits	It is not the consumers first choice, although, the Prussian carp is edible.

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidity
Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	**Response**
Pathways of introduction	For fishing purpose, by human
Vectors of	Fisheries, by human
Spread	Intentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species
Ecosystem services	Negative impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	**Response**
Carassius gibelio (Bloch, 1782)	High negative impact

8. Status (threatened or protected) of species or habitat under thre

The threatened environmental component	Response
Status of species under threat	Threatened and Protected
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Carassius gibelio (Bloch, 1782)	Expanding

10. Data limitations

Species	Data limitations
Carassius gibelio (Bloch, 1782)	No data limitation

11. Information sources

Species	Information sources
	CABI, 2022 Holcik, 1991; İnnal and Erk'akan,2006; Gaygusuz et al., 2007; Tarkan et al., 2012; Ekmekçi et al., 2013 MAF, 2018

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium	High

	X Low	

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists, and from panels of other university scientists.

3.4.2. Mosquito Fish (*Gambusia holbrooki*)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Cordata; Order: Cyprinodontiformes Family: Poeciliidae Species: *Gambusia holbrooki* (Girard, 1859)
Invasion history	The species invasion in the area; likelihood of spread post invasion(C), and potential impact on biodiversity (D).
Distribution range	Introduced Its introduced into the Turskish water by antropogenic (by human) ways for combating mosquitoes in the ponds and rivers and they spreaded . It can form crowded populations in a short time due to its wide food preference, successful adaptation to different habitats, and high reproductive potential. It is known that they cause a decrease in the numbers of many invertebrates, fish and amphibians in aquatic ecosystems with their hunting, competition and aggressive behavior, and even threaten the existence or extinction of some species. In addition, it is known that the predation effect on zooplankton leads to an increase in phytoplankton and primary production and even eutrophication. It is very dangerous especially for the toothed carp (Aphanius) species, which is endemic to our country, and negatively affects the reproduction of other fish by damaging their eggs.
Geographic scope	Inhabits standing and slow-flowing waters, mostly in vegetated areas (Page et al. 1991). They are also encountered in brackish waters C (C1, C2, C3): Inland surface waters

Socio-economic benefits	It is not the consumers first choice, although, the Prussian carp is edible.

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	**Response**
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidity
Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	**Response**
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	**Response**
Pathways of introduction	Combating purposes for mosquitoes, by human
Vectors of	Anthropogenic (by human)
Spread	Intentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	No information
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native and endemic (*Aphanius transgrediens* (Dişli Sazancık)) species.
Ecosystem services	Negative impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	**Response**
Gambusia holbrooki (Girard, 1859)	High negative impact

8. **Status (threatened or protected) of species or habitat under thre**

The threatened environmental component	**Response**
Status of species under threat	Endemic species
Status habitat under threat	Protected

9. **Possible effects of climate change in the foreseeable future**

Species	**Possible effects of climate change in the foreseeable future**
Gambusia holbrooki (Girard, 1859)	Expanding

10. **Data limitations**

Species	**Data limitations**
Gambusia holbrooki (Girard, 1859)	No data limitation

11. **Information sources**

Species	**Information sources**
	Yoğurtçuoğlu and Ekmekçi,, 2017 CABI, 2022 IUCN http://www.iucngisd.org/gisd/100_worst.php

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists, and from panels of other university scientists.

3.4.3. Gambusia affinis (S. F. Baird and Girard, 1853)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Cordata; Order: Cyprinodontiformes Family: Poecilidae Species: Gambusia affinis (S. F. Baird and Girard, 1853)
Invasion history	The species invasion in the area; likelihood of spread post invasion(C), and potential impact on biodiversity (D).
Distribution range	Introduced
Geographic scope	Inhabits standing and slow-flowing waters, mostly in vegetated areas (Yamamoto and Tagawa, 2000). They are also encountered in brackish waters C-Inland surface waters
Socio-economic benefits	No socio-economic benefits

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	**Response**
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidity
Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	**Response**
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	**Response**
Pathways of introduction	Artificially, by man
Vectors of	By man
Spread	Intentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	It is listed under 100 worst invasive species. Through predation and competition, mosquito fish negatively affect small fish populations. They are known to prey on eggs, larvae and juveniles of various fishes including carp species.
Ecosystem services	Negative impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	Response
Gambusia affinis (S. F. Baird and Girard, 1853)	High negative impact

8. **Status (threatened or protected) of species or habitat under thre**

The threatened environmental component	Response
Status of species under threat	Food competition and carrying disease to the natural species.
Status habitat under threat	Protected

9. **Possible effects of climate change in the foreseeable future**

Species	Possible effects of climate change in the foreseeable future
Gambusia affinis (S. F. Baird and Girard, 1853)	Expanding

10. **Data limitations**

Species	Data limitations
Gambusia affinis (S. F. Baird and Girard, 1853)	No data limitation

11. **Information sources**

Species	Information sources
Gambusia affinis (S. F. Baird and Girard, 1853)	CABI, 2022 IUCN http://www.iucngisd.org/gisd/100_worst.php MAF, 2018 Ugurlu ve Polat, 2007 Kurtul and Sarı, 2019 İnnal and Erk'akan, 2006; Kurtul ve Sarı, 2019 Courtenay and Meffe, 1989

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists.

3.4.4. Pseudorasbora parva (Temminck & Schlegel, 1846)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Cordata; Order: Cypriniformes Family: Cyprinidae Species: Pseudorasbora parva (Temminck & Schlegel, 1846)
Invasion history	The species invasion in the area; likelihood of spread post invasion(C), and potential impact on biodiversity (D).
Distribution range	Introduced
Geographic scope	Inhabits standing and slow-flowing waters, mostly in vegetated areas. They are also encountered in brackish wa-

	ters C (C1, C2, C3): Inland surface waters
Socio-economic benefits	No socio-economic benefits

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	**Response**
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	**Response**
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	**Response**
Pathways of introduction	Vector for the Black Sea: Tuna River
Vectors of	Vector for the Black Sea: Tuna River
Spread	Unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	No information
Impact on natural and semi-natural ecosystem biodiversity	Competition with carp in the aquaculture ponds and eat larger zooplankton. Pressure on natural species
Ecosystem services	Negative impact
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	Response
Pseudorasbora parva (Temminck & Schlegel, 1846)	High negative impact

8. Status (threatened or protected) of species or habitat under thre

The threatened environmental component	Response
Status of species under threat	Food competition and carrying disease to the natural species.
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Pseudorasbora parva (Temminck & Schlegel, 1846)	Expanding

10. Data limitations

Species	Data limitations
Pseudorasbora parva (Temminck & Schlegel, 1846)	No data limitation

11. Information sources

Species	Information sources
Pseudorasbora parva (Temminck & Schlegel,	Yoğurtçuoğlu and Ekmekçi,, 2017 CABI, 2022

1846)	IUCN http://www.iucngisd.org/gisd/100_worst.php MAF, 2018

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists, and from panels of other university scientists (Hacettepe University, 19 Mayıs University).

3.4.5. Oncorhynchus mykiss (Walbaum , 1792)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Cordata; Order: Salmoniformes Family: Salmonidae Species: Oncorhynchus mykiss (Walbaum , 1792)
Invasion history	The species invasion in the area; likelihood of spread post invasion(C), and potential impact on biodiversity (D).
Distribution range (Native/Introduced)	Introduced

Geographic scope	Lakes, rivers, costal zones of seas A7, C (C1, C2, C3): Marine (pelagic water column), and Inland surface waters
Socio-economic benefits	Fisheries, aquaculture. The species a commercially valuable and they are under fishing pressure from the local fishermen.

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	**Response**
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidity
Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	**Response**
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	**Response**
Pathways of introduction	Transferred by man (antropogenically)
Vectors of	Transferred by man (antropogenically)
Spread	Intentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	Genetic mixture with natural species
Impact on natural and semi-natural ecosystem biodiversity	Food and area competitions with natural species. This species is also aquacultured in the ponds.The species is resist for the illness and have and advantages

Ecosystem services	Negative impact
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	**Response**
	High negative impact. And High positive impact (This species is also economically valuable and produced in ponds).

8. Status (threatened or protected) of species or habitat under thre

The threatened environmental component	**Response**
Status of species under threat	Pressure on the natural species.
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	**Possible effects of climate change in the foreseeable future**
Oncorhynchus mykiss (Walbaum , 1792)	Expanding

10. Data limitations

Species	**Data limitations**
Oncorhynchus mykiss (Walbaum , 1792)	No data limitation

11. Information sources

Species	**Information sources**
Oncorhynchus mykiss (Walbaum , 1792)	Yoğurtçuoğlu and Ekmekçi,, 2017 CABI, 2022

	IUCN http://www.iucngisd.org/gisd/100_worst.php MAF, 2018

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	High

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists, and from panels of other university scientists (Hacettepe University, 19 Mayıs University).

3.4.6. Lithognathus mormyrus (Linnaeus, 1758)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Cordata; Order: Perciformes Family: Sparidae Species: Lithognathus mormyrus (Linnaeus, 1758)
Invasion history	The species invasion in the area; likelihood of spread post invasion(C), and potential impact on biodiversity (D).
Distribution range	Introduced; Likelihood of arrival L. mormyrus reached to the Black Sea through straits and formed adaptive populations. The first recorded in 2014

	in the Black Sea. The species is rarely considered as invasive species ever since due to being economically valuable. L. mormyrus is a carnivorous fish species and feeds on mostly aquatic invertebrates in shallow waters. Invasion of the species is not considered previously in Kızılırmak Delta or any other region but possible negative effects and pressure on benthic organisms is obvious.
Geographic scope	The species is widely distributed in shallow seas at depths down to about 150m. Its range includes the Mediterranean Sea, the Black Sea, the Sea of Azov and more. Marine habitats and littoral zone; A1, A2, B1
Socio-economic benefits	It is a small fish choice, although, the Prussian carp is edible.

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	**Response**
Introduction	Likelihood
Establishment	Likelihood
Spread	Likelihood
Magnitude of impact	Likelihood

3. **Description of the current and potential distribution, spread and magnitude of impact ("invasive" or "not")**

Species information	**Response**
Current distribution	not
Potential distribution	Invasive
Spread	not
Magnitude	not

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	**Response**
Pathways of introduction	From Mediterranean-Aegean Sea to Black Sea
Vectors of	From waterway; via Çanakkale and İstanbul Straits
Spread	Unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	No information
Impact on natural and semi-natural ecosystem biodiversity	No information; No noticed adverse impact
Ecosystem services	No information
Food-web	No information

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	No changes
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	**Response**
Lithognathus mormyrus (Linnaeus, 1758)	No changes; maybe commercialy positive impact. Because it is commercialşy valuable species in the Mediterranean Sea.

8. **Status (threatened or protected) of species or habitat under thre**

The threatened environmental component	**Response**
Status of species under threat	Food competition and carrying disease to the natural species.
Status habitat under threat	Protected

9. **Possible effects of climate change in the foreseeable future**

Species	**Possible effects of climate change in the foreseeable future**
Lithognathus mormyrus	No data

(Linnaeus, 1758)	

10. Data limitations

Species	Data limitations
Lithognathus mormyrus (Linnaeus, 1758)	Data limitation

11. Information sources

Species	Information sources
Lithognathus mormyrus (Linnaeus, 1758)	Less information. Aydın M., 2017.

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists

3.4.7. *Liza haematocheila* (Temminck & Schlegel, 1845) (correct Latin name for the mullet Mugil soiuy (Basilewsky, 1855))

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Cordata; Order: Mugiliaformes Family: Mugilidae Species: Liza haematocheila (Temminck & Schlegel, 1845)
Invasion history	likelihood of arrival (A)
Distribution range	Introduced; likelihood of arrival
Geographic scope	Adults inhabit shallow coastal waters as well as freshwaters occasionally A7, C1, C2
Socio-economic benefits	This species is under fishing pressure from the local fishermen.

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rate
Magnitude of impact	Likelihood

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	Invasive
Potential distribution	Likelihood
Spread	Likelihood
Magnitude	Not

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	Water ways, channels, straits

Vectors of	Artificially, by man
Spread	Intentional

5. Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	No information
Impact on natural and semi-natural ecosystem biodiversity	Overgrowing, Competition with local species for food and habitat
Ecosystem services	Negative impact
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	**Response**
Liza haematocheila (Temminck & Schlegel, 1845)	negative impact in the habitat but positive economical impact.

8. Status (threatened or protected) of species or habitat under thre

The threatened environmental component	**Response**
Status of species under threat	Food competition and carrying disease to the natural species.
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Liza haematocheila (Temminck & Schlegel, 1845)	Expanding

10. Data limitations

Species	Data limitations
Liza haematocheila (Temminck & Schlegel, 1845)	No data limitation

11. Information sources

Species	Information sources
Liza haematocheila (Temminck & Schlegel, 1845)	Kostadinova, 2008; Can and Taş, 2012;Ugurlu and Polat, 2007

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Low (1)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists, and from panels of other university scientists (Hacettepe University, 19 Mayıs University).

3.4.8. Parablennius incognitus (Bath, 1968)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Cordata; Order: Perciformes Family: Beleniidae Species: Parablennius incognitus (Bath, 1968)
Invasion history	The species invasion in the area; likelihood of arrival (A) and likelihood of establishment (B)
Distribution range	Introduced
Geographic scope	Marine and Coastal water (A1, A2, B) Parablennius incognitus is a blenny species and mainly distributed in the coastal waters of the Black Sea at a depth from 0.5-2.5 meters. P. Incognitus mainly feed on invertebrates which forms an extra pressure on especially gammarids.
Socio-economic benefits	The species is very small for commercial purposes and there is no direct socio-economic benefits.

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidity
Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	not
Potential distribution	not
Spread	not
Magnitude	not

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of	Water ways and starits

introduction	
Vectors of	Turkish Starits
Spread	Unintentional

5. Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	No information
Impact on natural and semi-natural ecosystem biodiversity	Competition with local species
Ecosystem services	No information
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	No information
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	**Response**
Parablennius incognitus (Bath, 1968)	No information

8. Status (threatened or protected) of species or habitat under thre

The threatened environmental component	**Response**
Status of species under threat	Food competition and carrying disease to the natural species.
Status habitat under	Protected

threat	

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Parablennius incognitus (Bath, 1968)	Likelihood of Arrival and establishment

10. Data limitations

Species	Data limitations
Parablennius incognitus (Bath, 1968)	Les data

11. Information sources

Species	Information sources
Parablennius incognitus (Bath, 1968)	Khutornoy and Kvach, 2019

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists.

3.4.9. Syngnathus acus (Linnaeus, 1758)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Cordata; Order: Syngnathiformes Family: Syngnathidae Species: Syngnathus acus (Linnaeus, 1758)
Invasion history	The species invasion in the area; likelihood of establishment
Distribution range	Introduced
Geographic scope	Inshore waters, often among seaweeds and seagrass. Marine Littoral rock and sediment (A1, A2)
Socio-economic benefits	No socio-economic benefits

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Likelihood
Magnitude of impact	Likelihood

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	not
Potential distribution	not
Spread	not
Magnitude	not

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	Waterways, straits
Vectors of	Turkish Straits
Spread	Unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	No information
Impact on natural and semi-natural ecosystem biodiversity	Competition with local species
Ecosystem services	Negative impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	**Response**
Syngnathus acus (Linnaeus, 1758)	No measurable impact

8. **Status (threatened or protected) of species or habitat under thre**

The threatened environmental component	**Response**
Status of species under threat	Food competition with local species.
Status habitat under threat	Protected

9. **Possible effects of climate change in the foreseeable future**

Species	**Possible effects of climate change in the foreseeable**

	future
Syngnathus acus (Linnaeus, 1758)	establishing

10. Data limitations

Species	Data limitations
Syngnathus acus (Linnaeus, 1758)	Less data

11. Information sources

Species	Information sources
Syngnathus acus (Linnaeus, 1758)	Yıldız et al., 2015.

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists, and from panels of other university scientists (Hacettepe University, 19 Mayıs University).

3.4.10. Gobius cruentatus (Gmelin, 1789)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Cordata; Order: perciformes Family: Gobiidae Species: Gobius cruentatus (Gmelin, 1789)
Invasion history	The species invasion in the area; likelihood of arrival
Distribution range	Introduced
Geographic scope	Inshore waters at depths up to 40 meters , areas with rocky and/or sandy substrates Marine littoral rock and sediment (A1, A2)
Socio-economic benefits	No socio-economic benefits

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Likelihood
Magnitude of impact	Likelihood

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	Not
Potential distribution	Not
Spread	Not
Magnitude	Not

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	Waterways, straits
Vectors of	Turkish Straits
Spread	Unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	No information
Impact on natural and semi-natural ecosystem biodiversity	Competition with local species
Ecosystem services	No impact impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	No impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	**Response**
Gobius cruentatus (Gmelin, 1789)	No impact

8. **Status (threatened or protected) of species or habitat under thre**

The threatened environmental component	**Response**
Status of species under threat	Food competition with local sepecies
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Gobius cruentatus (Gmelin, 1789)	Introduction

10. Data limitations

Species	Data limitations
Gobius cruentatus (Gmelin, 1789)	Less data

11. Information sources

Species	Information sources
Gobius cruentatus (Gmelin, 1789)	Aydın and Bodur, 2018

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists.

3.4.11. Mnemiopsis leidyi (Agassiz, 1865)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Animalia Phylum: Ctenophora Order: Lobata Family: Bolinopsidae Species: *Mnemiopsis leidyi* (Agassiz, 1865)
Invasion history	The species invasion in the area; likelihood of spread post invasion(C), and potential impact on biodiversity (D).
Distribution range	Introduced
Geographic scope	The native habitat of the ctenophore, Mnemiopsis, is in temperate to subtropical estuaries along the Atlantic coast of North and South America. M. leidyi is tolerant of a wide range of salinity, temperature and water quality conditions over a broad range of inshore habitats. Since its unintentional introduction to the Black Sea, Mnemiopsis has spread to adjacent bodies of water, inhabiting waters of salinities ranging from 3% in the Sea of Azov to 39‰ in the eastern Mediterranean, and temperatures ranging from 4oC in winter to 31oC in summer (Vinogradov et al. 1989). Marine habitats (A7)
Socio-economic benefits	There is no socio-economic benefits. The species has been catastrophic disaster on the fisheries of the Black Sea.

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidity
Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive

Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	**Response**
Pathways of introduction	Shipping activities, ballast water
Vectors of	Ballast water from ships
Spread	Unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	No information
Impact on natural and semi-natural ecosystem biodiversity	Mnemiopsis ledyi is a major zooplankton predator and is associated with fishery collapse (Costello, 2001). A carnivorous predator on edible zooplankton (including meroplankton), pelagic fish eggs and larvae, M. leidyi causes negative impacts right through the food chain of the areas it has invaded. In the Black Sea and the Sea of Azov, the zooplankton, ichthyoplankton and zooplanktivorous fish stocks all underwent profound changes.
Ecosystem services	Negative impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	**Response**
Mnemiopsis leidyi (Agassiz, 1865)	High negative impact

8. **Status (threatened or protected) of species or habitat under thre**

The threatened environmental component	**Response**
Status of species under threat	Food competition and carrying disease to the natural species.
Status habitat under threat	Protected

9. **Possible effects of climate change in the foreseeable future**

Species	**Possible effects of climate change in the foreseeable future**
Mnemiopsis leidyi (Agassiz, 1865)	Expanding

10. **Data limitations**

Species	**Data limitations**
Mnemiopsis leidyi (Agassiz, 1865)	No data limitation

11. **Information sources**

Species	**Information sources**
Mnemiopsis leidyi (Agassiz, 1865)	Yoğurtçuoğlu and Ekmekçi,, 2017 CABI, 2022 IUCN http://www.iucngisd.org/gisd/100_worst.php MAF, 2018

12. **Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary**

Summarizing risks	**Risk scale (reference)**	**Risk Scale**
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	High

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists, and from panels of other university scientists (Hacettepe University, 19 Mayıs University).

3.4.12. Rapana venosa (Valenciennes, 1846)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Mollusca Order: Neogastropoda Family: Muricidae Species: Rapana venosa (Valenciennes, 1846)
Invasion history	The species invasion in the area; likelihood of spread post invasion(C), and potential impact on biodiversity (D).
Distribution range	
Geographic scope	Inhabits standing and slow-flowing waters, mostly in vegetated areas (Page et al. 1991). They are also encountered in brackish waters A1, A2 (Littoral rock and sediments),
Socio-economic benefits	Rapana whelk is a commercially valuable IAS in the Black Sea coasts. Rapa whelk stocks are heavily fished with dredge and by diving. No domestic consumption in Turkey, all the production is exported as frozen meat to Asian countries.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood
Establishment	Likelihood

Spread	Rapidity
Magnitude of impact	Magnitude

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	**Response**
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	**Response**
Pathways of introduction	Shipping activities; Ballast water of the ships
Vectors of	Ballast water
Spread	Unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	No information
Impact on natural and semi-natural ecosystem biodiversity	Negative impact on biodiversity. Rapana whelk, which feed on mussels, oysters and other mollusks, caused a decrease in the stocks of mussels and oysters.
Ecosystem services	Negative impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	Response
Rapana venosa (Valenciennes, 1846)	In the beginning, the species was a negative impact but after its population increased, the fishing of this species has very good income for the fishermen.

8. **Status (threatened or protected) of species or habitat under thre**

The threatened environmental component	Response
Status of species under threat	Rapa whelk has high predation press on native bivalve species. Rapana responsible for decline of local mussel species. There is no predator in the Black Sea.
Status habitat under threat	Protected

9. **Possible effects of climate change in the foreseeable future**

Species	Possible effects of climate change in the foreseeable future
Rapana venosa (Valenciennes, 1846)	Expanding

10. **Data limitations**

Species	Data limitations
Rapana venosa (Valenciennes, 1846)	No data limitation

11. **Information sources**

Species	Information sources
Rapana venosa (Valenciennes, 1846)	Yoğurtçuoğlu and Ekmekçi,, 2017 CABI, 2022 IUCN http://www.iucngisd.org/gisd/100_worst.php MAF, 2018

12. **Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary**

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3)	Medium (=3)

	X High (= 5)	

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists, and from panels of other university scientists (Hacettepe University, 19 Mayıs University).

3.4.13. Callinectes sapidus (Rathbun, 1896)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Arthropoda Order: Decapoda Family: Portunidae Species: *Callinectes sapidus* (Rathbun, 1896)
Invasion history	The species invasion in the area; likelihood of arrival (a)
Distribution range	Arrival
Geographic scope	Inhabits standing and slow-flowing waters, mostly in vegetated areas (Yamamoto and Tagawa, 2000). They are also encountered in brackish waters A-Marine habitats, B-Coastal habitats
Socio-economic benefits	New arrival and in the Black Sea coast and the presence of the species is not validated in the deltaic area.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood

Establishment	Likelihood
Spread	Likelihood
Magnitude of impact	Likelihood

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	**Response**
Current distribution	Not
Potential distribution	Not
Spread	Not
Magnitude	Not

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	**Response**
Pathways of introduction	Waterways, straits
Vectors of	Turkish Straits
Spread	Unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	No information
Impact on natural and semi-natural ecosystem biodiversity	No information
Ecosystem services	No information
Food-web	No information

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	No information
Abiotic impact	No information

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	**Response**
Callinectes sapidus (Rathbun, 1896)	No information

8. **Status (threatened or protected) of species or habitat under thre**

The threatened environmental component	**Response**
Status of species under threat	Food competition with many species living the area.
Status habitat under threat	Protected

9. **Possible effects of climate change in the foreseeable future**

Species	**Possible effects of climate change in the foreseeable future**
Callinectes sapidus (Rathbun, 1896)	New Arrivals

10. **Data limitations**

Species	**Data limitations**
Callinectes sapidus (Rathbun, 1896)	No enough data

11. **Information sources**

Species	**Information sources**
Callinectes sapidus (Rathbun, 1896)	Ceylan, 2020; Öztürk et al., 2020.

12. **Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary**

Summarizing risks	**Risk scale (reference)**	**Risk Scale**
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Low

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists.

3.4.14. Astacus leptodactylus (Rathbun, 1896)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Kingdom: Animalia; Phylum: Arthropoda Order: Decapoda Family: Astacidae Species: Astacus leptodactylus (Rathbun, 1896)
Invasion history	The species invasion in the area; likelihood of spread post invasion(C), and potential impact on biodiversity (D).
Distribution range	Invaded
Geographic scope	Inhabits standing and slow-flowing waters but favors relatively brackish waters such as deltas and lakes. C (C1, C2, C3)-Inland surface waters
Socio-economic benefits	Turkish crayfish is an economically important species with a high demand from Europe countries which supports the pressure on their invasion

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidity

Magnitude of impact	Likelihood

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	**Response**
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	**Response**
Pathways of introduction	Artificial, by man
Vectors of	By men; fisheries purposes
Spread	Intentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	No impact
Impact on natural and semi-natural ecosystem biodiversity	Competition with native crayfish and competition with food with native species
Ecosystem services	Negative impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	Response
Astacus leptodactylus (Eschscholtz, 1823)	High economic impact. Turkish crayfish is an economically important species with a high demand from Europe countries which supports the pressure on their invasion.

8. **Status (threatened or protected) of species or habitat under thre**

The threatened environmental component	Response
Status of species under threat	The crayfish have been intentionally introduced to different water sources including Kızılırmak Delta to enhance fishing activity and to provide employment opportunity. Food and place competition with native cray fish.
Status habitat under threat	Protected

9. **Possible effects of climate change in the foreseeable future**

Species	Possible effects of climate change in the foreseeable future
Astacus leptodactylus (Eschscholtz, 1823)	Expanding

10. **Data limitations**

Species	Data limitations
Astacus leptodactylus (Eschscholtz, 1823)	No data limitation

11. **Information sources**

Species	Information sources
Astacus leptodactylus (Eschscholtz, 1823)	Aydın et al., 2015;

12. **Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary**

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (=3)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	High

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	The research team of Karadeniz Technical University, Ordu University Scientists, and from panels of other university scientists (Hacettepe University, 19 Mayıs University).

3.5 - Chorokhi and Kolkheti Deltas- Georgia

There are two region were selected in Georgia. One is Chorokhi Delta the other is Kolkheti Delta.

A. CHOROKHI DELTA

3.5.1. Ambrosia artimisiifolia L. *(Linnaeus, 1758).* (Common ragweed, Ambrosia)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Domain: Eukaryota Kingdom: Plantae Phylum: Spermatophyta Subphylum: Angiospermae Class: Dicotyledonae Order: Asterales Family: Asteraceae Genus: Ambrosia Species: *Ambrosia artemisiifolia* L., *(Linnaeus, 1758)*
Invasion history	*Ambrosia artemisiifolia* is native to North and Central America. It is now widely distributed across the world; Africa (CJB, 2016), Asia (Flora of China Editorial Committee, 2011), Australia (Council of Heads of Australasian Herbaria, 2016) and Europe (Euro+Med, 2016). *Ambrosia artemisiifolia* is a neophyte which was introduced in Africa, Europe and Asia after the year 1492 (the discovery of America). Some studies on the history of introduction were published for Europe, in various regions such as France (Chauvel et al., 2006), Austria (Essl et al., 2009) and central and eastern Europe. *A. artemisiifolia* was reported in Germany in 1863 (Bassett and Crompton, 1975; Kovalev, 1989). *A. artemisiifolia* is found almost throughout Hungary although it has not been recorded in northern regions because climatic conditions prevent the seeds from ripening (Beres, 1994). In Russia, *A. artemisiifolia* was

	collected for the first time near Stavropol in 1918. A. artemisiifolia was collected in 1995 from north-east Anatolia, Turkey, where well-established populations of the weed now exist (Byfield and Baytop, 1998). *A. artemisiifolia* has become a dominant alien plant in countries such as Italy (Siniscalo and Barni, 1994), Lithuania (Gudzinskas, 1993) and Hungary. *A. artemisiifolia* is not as prominent in subtropical and tropical regions (Allard, 1943; King, 1966). The hot, dry summers in southern Europe and Mediterranean areas are not favorable for its growth (Allard, 1943; King, 1966; CABI, 2021). Its first samples in Georgia was described at the beginning of last century. The first description of Ambrosia artemisifolia in natural and semi natural cenosis in Ajara (Gorgia) floristic areas was in 1938 (Davitadze, 2001)
Distribution range	Introduced
Geographic scope	Favors sunny, medium and slightly dry conditions. Doesn't make a sense to the types of habitats surviving in the soil containing reasonable amount of clay, small stones and sand. It is a drought-resistant being strong enough to environmental conditions and distinguished by its aggressiveness having viable seeds for several years. It has both of rudelar and segetal nature having main habitats for preferring: abandoned fields, alongside roads, gardens, trenches, forest edges and storage of wastes. Prefers degraded ecosystems where especially the top soil is stripped off the land.
Socio-economic benefits	*Ambrosia artemisifolia* has allele pathogenic characteristics enable to stop the growth of neighboring plants. It is very competitive specie. Pollen of *A. artemisiifolia* is one of the most common seasonal sources of aeroallergens which cause allergic rhinitis, fever, or dermatitis. It has negatively impacts human health. Its oil-worth seeds are nutrition for numerous insects and birds especially in winter whereas the plant conserves the ripped seeds even above the snow cover.

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	Response
Introduction	Likelihood high
Establishment	Likelihood high
Spread	Rapidly high
Magnitude of impact	Magnitude high

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	Response
Pathways of introduction	Unintentional by human
Vectors of introduction	The seeds probably came with other plants and after naturalization spread by animals, waters, wind, Soil transportation, transport etc.
Spread	Unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

(The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species, Changes the species composition of the ecosystem
Ecosystem services	Negative impact
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact
Abiotic impact	Negative impact, it leads to soil depletion-reduction of fertility

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	Response
Ambrosia artimisiifolia L. *(Linnaeus, 1758)*	High negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	Response
Status of species under threat	Least concern
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Ambrosia artimisiifolia L. *(Linnaeus, 1758)*	Expanding

10. Data limitations

Species	Data limitations
Ambrosia artimisiifolia L. *(Linnaeus, 1758)*	No data limitation

11. Information sources

Species	Information sources
Ambrosia artimisiifolia L. *(Linnaeus, 1758)*	Davitadze, 2001. Mikeladze, 2015. GBD, 2022

	EPPO, 2022 CABI, 2022

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (3)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	PP 6- International Business and Economic Development Center (IBEDC); Irakli Mikeladze, Exteranl Expert for IAS Monitoring in Chorokhi Delta.

3.5.2. Verbena brasiliensis Vell., (Vellozo, 1829) (Brasilian verbena, Brazilian vervain, Verbena)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Domain: Eukaryota Kingdom: Plantae Phylum: Spermatophyta Subphylum: Angiospermae Class: Dicotyledonae Order: Lamiales Family: Verbenaceae Genus: Verbena Species: *Verbena brasiliensis* Vell.,
Invasion history	*Verbena brasiliensis* naturally exists in parts of South

	America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, and Uruguay, and then it has become a widespread invasive alien plant in many other parts of the world: North America, Oceania, Africa, Asia and Europe (Tunçkol, 2002). The first dates about *Verbena brasiliensis* on the territory of Georgia was referred by Filip Verloove (Verlove, 2006). He studied the sample of Verbena in Belgium Botanical Garden, which was taken by Vladimir Vashak 1979 near Sokhumi as a Verbena hastata. After studying the above-mentioned sample, it was estimated that this sample was *Verbena brasiliensis*. Earlier in 1945-1946 the plant was noticed by Kolakovski (1986). For the last ten years *Verbena* has been detected near most highways and railway stations, on the banks of channels, rivers and lakes in the lowlands of Western Georgia (Mikeladze, at.al. 2017). The first samples of *Verbena* were described in the Adjara seaside in 2010. In 2011 on the territory of Kobuleti Municipality along the highway there were some samples which were easy to count. In 2013 the first samples of plants were detected in Makhinjauri, at the outfall of the river Korolistskali, Bartskhana settlement, on the territory of Batumi, near airport, Gonio landfills. At this time appear in Chorokhi delta. In 2014 -2015 Verbena is widely spread not only in humid but also in dry places as well.
Distribution range	Introduced
Geographic scope	According to the researches in Georgia *Verbena Brasiliensis* is mainly spread in the seaside, along the roads, along the railroad, on the ruderal places, near channels and rivers, deserted building sites, landfills, homestead, non-agricultural lands. Them meets on every soils – red soil, black, shingle soil, sandy soil etc. It especially prefers humid and secondary damaged habitats. It is also detected the spread of some samples in agro-cultural lands. On the Chorokhi delta, it is mainly distributed in groups on channel mouths and ruderal places where it forms serious populations. It is rarely found in meadows in the form of single groups. There are few amounts in the A*lnus* forest.
Socio-economic benefits	*Verbena brasiliensis* is characterized with rapid growing and aggressive distribution interrupting

	development of other native plants. At the second and third years of development, it matures up to 90 000 seeds facilitating its spreading. Verbena in the flowering period is intensely used in bouquet making. At this time the plant flowering and seed ripening happens at the same time which helps to spread and widely settle with many abiotic and biotic factors. It has both - negative and positive benefits.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Current distribution	Likelihood
Potential distribution	Likelihood
Spread	Rapidly
Magnitude	Magnitude

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	Response
Pathways of introduction	as an ornamental plant, by human
Vectors of introduction	first by people, then by natural ways. The seeds spread by animals, waters, windს, Soil transportation, waste transportation and bouquet making (At this time the plant flowering and seed ripening happens at the same time which helps to spread).
Spread	Unintentional

5. Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes

The threatened environmental or socio-economic	Response

component	
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species
Ecosystem services	Negative impact
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	**Response**
Verbena brasiliensis Vell.	Adverse impacts

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	**Response**
Status of species under threat	Least concern
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	**Possible effects of climate change in the foreseeable future**
Verbena brasiliensis Vell.	Expanding

10. Data limitations

Species	**Data limitations**
Verbena brasiliensis Vell.	No data limitation

11. Information sources

Species	Information sources
Verbena brasiliensis Vell.	Mkeladze, 2022; Mikeladze at all, 2021 Mikeladze et al. 2017; Kolakovskii, 1986; Verlove, 2006. Tunçkol, 2002;

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	PP - International Business and Economic Development Center (IBEDC); Irakli Mikeladze Exteranl Expert for IAS Monitoring in Chorokhi Delta.

3.5.3. Sicyos angulatus L. (Linnaeus, 1753). (Bur cucumber/ Star-cucumber Sicyos)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Domain: Eukaryota Kingdom: Plantae Phylum: Spermatophyta Subphylum: Angiospermae Class: Dicotyledonae Order: Violales Family: Cucurbitaceae Genus: Sicyos

	Species: *Sicyos angulatus* (Linnaeus, 1753).
Invasion history	The naturally distribution of *Sicyos angulatus* is eastern part of North America. Sicyos angulatus as decorative plant was introduced to Europe in the XIX th century (Bailey, 1947; Hanson, 1985; Steševi and Jovovi, 2005;). The first spontaneous record of *Sicyos angulatus* in the Balkan Peninsula was presented by Hayek in 1927 (Hayek, 1927). *Sicyos angulatus* is naturalized in moist places in central, southern and south eastern Europe (in Austria, Czech Republic, Hungary, Italy, Romania and the central and western part of Russia) (Tutin et al., 1968). Since the second half of the twentieth century, it has spread widely in Sweden, Croatia, Norway, France, the United Kingdom, Spain, Germany, Korea, Siberia, Japan, Slovenia, the Czech Republic, China, Australia, and the Caribbean islands (Trijnajsti and Dubravec, 1975; Webb, 1981; Van Uffelen 1983; Hanson 1985; Ouren, 1987; Clement, 1994; Hulina, 1996; Shimizu, 1999; Smeda, 2001; Pys˘ek, 2002; Larché, 2004; Tzonev, 2005; Kee Dae Kim, 2017; Zhao et al. 2019;). Described in Turkey (Duman, 1996; Terzioğlu, 1999; Yazlık, 2018, Uysal and Boz, 2018), Ukraine (EPPO-2010) and India (Thakur, 2016). The first samples of bur cucumber (*Sicyos angulatus* L.) in Georgia were described in 2012 on agricultural areas in the valley of the Chorokhi River (Mikeladze at al. 2015). The intensity and frequency of their distribution indicate their spread in the given areas earlier than we have described. What was confirmed during the interview with the peoples. According to them, the plant appeared 10-12 years ago, which was initially in small quantities on the edges of the river, and gradually began to spread in agricultural areas. In 2014, a few amounts of *sicyos* were seen on the Chorokhi Delta. According to the latest data Sicyos is widespread in the western part of Georgia, especially on moisture soils, on the edges of rivers etc. (Mikeladze, 2022).
Distribution range	Introduced
Geographic scope	Sicyos angulatus is spread on the river banks and nearby territories, mainly in the swampy and moist soils. It is widely spread on the agricultural grounds, semi natural habitats. On the Chorokhi delta, it is mainly distributed on the edges of river, on the edges of the canals and in the *Alnus* forest.

Socio-economic benefits	*Sicyos angulatus* has quite rich populations on soil moisture. It is climbing over the plant, which will meet in its distribution area prevents its development. In agricultural crops, in maize field and citrus plantations, it significantly reduces the qualitative and quantitative indicators of the harvest. The second problematic characteristic of *Sicyos angulatus* is its spiny fruits for humans. Getting thorns into human skin causes negative reactions. Spiny fruits help to wide spread of Sicyos angulatus. It expands its distribution area in each growing season. The climatic conditions of Western Georgia is advantageous for its spread, which increases the potential of invasiveness, therefore the level of harmfulness in agricultural and disturbed coenoses becomes noticeable every year. *Sicyos angulatus* is represents as a serious weed for farmers.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	**Response**
Introduction	Likelihood-high
Establishment	Likelihood -high
Spread	Rapidly -high
Magnitude of impact	Magnitude-high

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	**Response**
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	**Response**
Pathways of introduction	Shipment importation is the most likely pathway of accidental introduction of S. Angulatus in Georgia. Also, transportation of building materials and traffic.
Vectors of introduction	The seeds spread by animals, rivers, waters, winds, Soil transportation, waste transportation.
Spread	unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Negative impact on the semi-natural ecosystem biodiversity and agricultural lands.
Ecosystem services	Negative impact
Food-web	Negative impact

6. **Assessment of adverse impacts with respect to ecosystem services**

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	**Response**
Sicyos angulatus (Linnaeus, 1753).	High negative impact

8. **Status (threatened or protected) of species or habitat under threat**

The threatened environmental component	**Response**
Status of species under threat	Least concern
Status habitat under threat	Protected

9. **Possible effects of climate change in the foreseeable future**

Species	**Possible effects of climate change in the foreseeable future**
Sicyos angulatus (Linnaeus, 1753).	Expanding

10. Data limitations

Species	Data limitations
Sicyos angulatus (Linnaeus, 1753).	No data limitation

11. Information sources

Species	Information sources
Sicyos angulatus (Linnaeus, 1753).	Mikeladze, 2022; Mikeladze, 2021; Mikeladze, 2015; CABI, 2022

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	High

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	PP - International Business and Economic Development Center (IBEDC); Irakli Mikeladze, Exteranl Expert for IAS Monitoring in Chorokhi Delta.

3.5.4. Solidago canadensis L., (Linnaeus, 1753). (Canadian goldenrod, Solidago)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Domain: Eukaryota Kingdom: Plantae

	Phylum: Spermatophyta Subphylum: Angiospermae Class: Dicotyledonae Order: Asterales Family: Asteraceae Genus: Solidago Species: *Solidago canadensis* L.
Invasion history	Solidago canadensis spread in most parts of the world including Georgia. It is considered as "black list" invasive species in most of temperate Europe (Priede, 2008; Mikeladze, 2021). The species is present and abundant in many North, Central and West European countries. Solidago canadensis is listed in the EPPO List of invasive alien plants which lists the plants that have been identified to pose an important threat to plant health, environment and biodiversity in the EPPO region. S. canadensis is listed in so called black lists of several European countries as highly invasive plant, e.g., in Switzerland (CPS/SKEW), Belgium (Alter IAS), Estonia (List of invasive alien species), Denmark (List of invasive alien species) and numerous other countries. S. canadensis is widespread in Poland, Sweden, Estonia, Latvia, Lietuva, Belarus, in the European part of Russia and many others (Kabuce at al., 2010). We meet a lot of information about new locations of its spread (Mikeladze, 2021). According to references the few amount of it Solidago canadensis was described last century in different parts of Georgia. The first samples were collected in Ochamchire surroundings in 1920s. After that, it spread in the other floristic districts of western Georgia, especially widely spread from the beginning of XXI century. first samples of *Solidago canadensis* in Adjara floristic district described in 2011. In the 2019 few amounts were described on the territory of Batumi landfill and Chorokhi delta.
Distribution range	*S. canadensis* is native to Mexico, eastern and southern USA and Canada, between the latitudes 26°N and 65°N (Weber, 2003)
Geographic scope	The plant is wide spread within the Southern Colchis areas alongside the roads, railways, rudelar areas, at the edges of channels and river banks, abandoned construction polygons, wetlands, abandoned agricultural lands, within the degraded forests. *Solidago Canadensis* is not yet characterized by a massive spread within the Chorokhi Delta, although the indicators

	of the spread of individual groups are observed. Last year on the delta described few amounts of *Solidago*. during the last monitoring we identified an additional population. The plant is characterized with vegetative and generative propagation, which provides its fast distribution.
Socio-economic benefits	*Solidago canadensis* has both negative (on local plants) and positive (It is a honey plant (for bee) and is also used to decorate bouquets) impact.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	**Response**
Introduction	Likelihood – high
Establishment	Likelihood – high
Spread	Rapidity – high
Magnitude of impact	Magnitude - high

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	**Response**
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	**Response**
Pathways of introduction	as an ornamental plant, by human
Vectors of introduction	first by people, then uunintentional by natural ways. The plant propagates by vegetative and generative ways. The plant produces great amount of seeds, which are spread by wind. Vegetative or clonal propagation takes place by means of underground shoots-rhizomes growth and buds grown of them. The seeds also spread by animals, rivers, waters, soil transportation, waste transportation.
Spread	Unintentional

5. Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes

The threatened environmental or	**Response**

socio-economic component	
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Negative impact
Ecosystem services	Negative impact
Food-web	Positive impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	Negative impact -Solidago canadensis chemicals releases that inhibit the growth, germination and survival of native plants, and change the soil composition by diverting nutrients and minerals

7. **Assessment of adverse socio-economic impacts:**

Adverse socio-economic impact	**Response**
Solidago canadensis L., (Linnaeus, 1753).	Adverse

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	**Response**
Status of species under threat	Least concern
Status habitat under threat	Threatened and protected

9. Possible effects of climate change in the foreseeable future

Species	**Possible effects of climate change in the foreseeable future**
Solidago canadensis L., (Linnaeus, 1753).	Expanding

10. Data limitations

Species	Data limitations
Solidago canadensis L., (Linnaeus, 1753).	No data limitation

11. Information sources

Species	Information sources
Solidago canadensis L., (Linnaeus, 1753).	Mikeladze, 2022; Mikeladze, 2021; Kabuce at al., 2010 Kolakovski, 1982

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (3)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	PP - International Business and Economic Development Center (IBEDC); Irakli Mikeladze, Exteranl Expert for IAS Monitoring in Chorokhi Delta.

B. KOLKHETI DELTA

3.5.5. Ambrosia artimisiifolia L. (Linnaeus, 1758). (Common ragweed, Ambrosia)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Domain: Eukaryota Kingdom: Plantae Phylum: Spermatophyta Subphylum: Angiospermae Class: Dicotyledonae Order: Asterales Family: Asteraceae Genus: Ambrosia Species: *Ambrosia artemisiifolia* L., *(Linnaeus, 1758)*
Invasion history	*Ambrosia artemisiifolia* is native to North and Central America. It is now widely distributed across the world; Africa (CJB, 2016), Asia (Flora of China Editorial Committee, 2011), Australia (Council of Heads of Australasian Herbaria, 2016) and Europe (Euro+Med, 2016). *Ambrosia artemisiifolia* is a neophyte which was introduced in Africa, Europe and Asia after the year 1492 (the discovery of America). Some studies on the history of introduction were published for Europe, in various regions such as France (Chauvel et al., 2006), Austria (Essl et al., 2009) and central and eastern Europe. *A. artemisiifolia* was reported in Germany in 1863 (Bassett and Crompton, 1975; Kovalev, 1989). *A. artemisiifolia* is found almost throughout Hungary although it has not been recorded in northern regions because climatic conditions prevent the seeds from ripening (Beres, 1994). In Russia, *A. artemisiifolia* was collected for the first time near Stavropol in 1918. *A. artemisiifolia* was collected in 1995 from north-east Anatolia, Turkey, where well-established populations of the weed now exist (Byfield and Baytop, 1998). *A. artemisiifolia* has become a dominant alien plant in countries such as Italy (Siniscalo and Barni, 1994), Lithuania (Gudzinskas, 1993) and Hungary. *A. artemisiifolia* is not as prominent in subtropical and

	tropical regions (Allard, 1943; King, 1966; CABI, 2021). Its first samples in Georgia was described at the beginning of last century. During the past centuries the plant was wide spread all over the Kolkheti National Park and Katsoburi Reserve and beyond the boundaries.
Distribution range	Introduced
Geographic scope	Studies showed that the characteristics of the distribution-development process of this species were very diverse and large-scaled. It was mainly found in ruderal areas, canal edges, fields, pastures, agricultural land shores and roads.
Socio-economic benefits	Due to their high survivability, rapid growth and ability to adapt to environmental conditions, they create groves and gradually expand the territories and drive out and replace local rare and endemic vegetation/plants. *Ambrosia artemisiifolia* is quite spread in Kolkheti lowland where it is one of the major causes of pollen-induced allergy. It has negative impact on human health.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	**Response**
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidly
Magnitude of impact	Magnitude

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	**Response**
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	**Response**
Pathways of	Unintentional by human

introduction	
Vectors of introduction	The seeds probably came with other plants and after naturalization spread by animals, waters, wind, Soil transportation, transport etc.
Spread	Unintentional

5. Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	Negative impact, high risk for an environment, risk of dispersal, high risk for ecological impact.
Impact on natural and semi-natural ecosystem biodiversity	pressure on native species
Ecosystem services	Negative impact
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	Negative impact, it leads to soil depletion-reduction of fertility

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	**Response**
Ambrosia artimisiifolia L. (Linnaeus, 1758).	Negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	**Response**
Status of species under threat	Threatened and protected
Status habitat under	Threatened and protected

threat	

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Ambrosia artimisiifolia L. (Linnaeus, 1758).	Expanding

10. Data limitations

Species	Data limitations
Ambrosia artimisiifolia L. (Linnaeus, 1758).	No data limitation

11. Information sources

Species	Information sources
Ambrosia artimisiifolia L. (Linnaeus, 1758).	Davitadze, 2001. Mikeladze, 2015. EPPO, 2022 CABI, 2022

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	PP 5- International Business and Economic Development Center (IBEDC); Gela Ingorokhva, Exteranl Expert for IAS Monitoring in Kolheti.

3.5.6 *Solidago canadensis L., (Linnaeus, 1753)* (Canadian goldenrod,Solidago)

1. **Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)**

Species information	Response
Taxonomy	Domain: Eukaryota Kingdom: Plantae Phylum: Spermatophyta Subphylum: Angiospermae Class: Dicotyledonae Order: Asterales Family: Asteraceae Genus: Solidago Species: *Solidago canadensis* L.
Invasion history	*Solidago canadensis* natural distribution habitat is Northern America but today spread in most parts of the world, including Georgia. The first samples in Georgia were collected in Ochamchire surroundings in 1920s (Kolakovskii, 1986). After that, it spread in the other floristic districts of western Georgia. In the Kolkheti lowlands it is observed in the second half of the 19th century. The dramatic increase in their distribution area was due to the ongoing secondary wetland processes in the Kolkheti lowlands (hundreds of hectares of land are uncultivated) which were completely occupied by Canadian goldenrod. It should be noted that within the administrative boundaries of Kolkheti National Park and surrounding areas, Solidago canadensis is widely distributed.
Distribution range	Introduced. *S. canadensis* is native to Mexico, eastern and southern USA and Canada (Weber, 2003)
Geographic scope	The plant is wide spread within the Kolkheti lowland on roadsides, pastures, forest plains, also found in reclaimed swamps, ruderal lands, low-density forests, forested fields and managed habitats. Also it is commonly spread within the low-density forests and shrubs with damp.
Socio-economic benefits	Negative impact -High risk for an environment, risk of dispersal, high risk for ecological and socio-economic impact. Positive impact - *Canadian goldenrod* is a honey-yielding plant with abundant nectar especially pro-

	duced after minor rains. Due to its long flowering period, it is a desirable ornamental plant for gardening, for landscaping of the moderately dry and humid places.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Introduction	Likelihood
Establishment	Likelihood
Spread	Rapidity
Magnitude of impact	Magnitude

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	Response
Pathways of introduction	As an ornamental plant, by human
Vectors of introduction	It's introduced first by people, then uunintentional by natural ways. The plant propagates by vegetative and generative ways. The plant produce great amount of seeds, which spread by wind. The seeds also spread by animals, rivers, waters, soil transportation.
Spread	Unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Negative impact
Ecosystem services	Negative impact
Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	Response
Biotic impact	Negative impact - rapid growth, rapid occupation of fields, pastures and forest areas, and local vegetation limitation of their distribution area.
Abiotic impact	Negative impact - the root system of Canadian goldenrod releases poison, changing the soil properties of the structure

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	Response
Solidago canadensis L., (Linnaeus, 1753)	Negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	Response
Status of species under threat	Threatened and protected
Status habitat under threat	Threatened and protected

9. Possible effects of climate change in the foreseeable future

Species	Possible effects of climate change in the foreseeable future
Solidago canadensis L., (Linnaeus, 1753)	Expanding

10. Data limitations

Species	Data limitations
Solidago canadensis L., (Linnaeus, 1753)	No data limitation

11. Information sources

Species	Information sources
Solidago canadensis L., (Linnaeus, 1753)	Kabuce at al., 2010 Kolakovski, 1982 CABI, 2022

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	PP - International Business and Economic Development Center (IBEDC) Gela Ingorokhva, Exteranl Expert for IAS Monitoring in Kolheti National Park.

3.5.7. *Amorpha fruticosa* L. (Linnaeus,1753) (Desert false indigo, False indigo-bush, Bastard indigo-bush)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Domain: Eukaryota Kingdom: Plantae Phylum: Spermatophyta Subphylum: Angiospermae Class: Dicotyledonae Order: Fabales Family: Fabaceae Subfamily: Faboideae Genus: Amorpha Species: *Amorpha fruticosa* L.
Invasion history	*Amorpha fruticosa* is a fast-growing, deciduous shrub that grows in wetlands and disturbed habitats. It is native to North America but has spread across Asia and Europe, likely through its use as an ornamental plant. It

	is became popular in Europe as an ornamental plant in the early 1700s (Huxley, 1992; Austin, 2004). Afterward, it used to be widely planted in Europe at the beginning of the 20th century and was introduced in North Asia before the middle of the same century (Jung, 2014; Takagi & Hioki, 2013). Presently *A. fruticosa* is reported to be invasive in a number of European countries (Roy et al., 2020,_Wilbur, 1975; CABI, 2022). Additionally, it was planted to stabilize the soil (especially on railway embankments) due to its protective role against erosion provided by an extensive root system (Van Dersal et al., 1938; Bowie, 1982). As a result of all these human activities *A. fruticosa* is registered among the worst Alien Invasive Species Inventories for Europe (DAISIE, 2009) and the detrimental effects of the plant on local biospheres have been investigated in several case studies (Kozuharova et al, 2017). *Amorpha* was introduced and cultivated in Georgia at the beginning of the last century. Its naturalization and invasion on the Kolkheti lowland occurred in the first half of the last century. In the Kokheti National Park and in the buffer zone of the administrative border of the Katsoburi Reserve, it has been observed since the 80s of the 19th century. At the beginning it was found in small groups alongside the coastal area of highways, railways. Due to its high ability of seed distribution, it's been massively spread within the wetland and humid habitats of the Kolkheti lowlands.
Distribution range	Introduced
Geographic scope	*Amorpha fruticosa* adapts to almost all types of soil but it is most abundant along river banks, roadsides, water canal edges, moist soils, abandoned homesteads, urban areas flooded forests, dunes and disturbed land. *Amorpha* is spread by seeds, it is also characterized by numerous lateral eruptions, on the basis of which it manages to cover the full development of the habitat, rivers, canals and lakes along the coast in a short period of time.
Socio-economic benefits	*Amorpha fruticose* has negative and positive benefits. Negative - rapid growth, rapid occupation of fields, pastures and forest areas, and local vegetation, limitation of their distribution area. It changes the

	species composition of the ecosystem Positive - used as an ornamental plant in decorative horticulture to decorate the exterior; The rich nectar production of these flowers a highly appreciated honey plant and important food source for bees.

2. **Likelihood of introduction, establishment, spread and magnitude of impact**

Species information	**Response**
Current distribution	Likelihood - high
Potential distribution	Likelihood - high
Spread	Rapidity - high
Magnitude	Magnitude - high

3. **Description of the current and potential distribution, spread and magnitude of impact**

Species information	**Response**
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. **Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional**

Species information	**Response**
Pathways of introduction	as an ornamental plant, by human
Vectors of introduction	First by people, then by natural ways
Spread	Unintentional

5. **Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes**

The threatened environmental or socio-economic component	**Response**
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species
Ecosystem services	Negative impact

Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	**Response**
Amorpha fruticosa L. (Linnaeus,1753)	High negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	**Response**
Status of species under threat	Threatened and protected
Status habitat under threat	Protected

9. Possible effects of climate change in the foreseeable future

Species	**Possible effects of climate change in the foreseeable future**
Amorpha fruticosa L. (Linnaeus,1753)	Expanding

10. Data limitations

Species	**Data limitations**
Amorpha fruticosa L.	No data limitation

11. Information sources

Species	**Information sources**
Amorpha fruticosa L.	CABI 2022; Grabić, 2022; EPPO, 2021; DAISIE, 2009; Kozuharova at al. 2017; Wilbur, 1975.

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	PP - International Business and Economic Development Center (IBEDC); Gela Ingorokhva, Exteranl Expert for IAS Monitoring in Kolheti.

3.5.8. *Gleditsia triacanthos* L. (Linnaeus,1753) (honey locust, thorny locust, thorny honey locust, gledichia, sweet bean locust, sweet locust, thorn tree, three-thorned acacia)

1. Description taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio- economic benefits)

Species information	Response
Taxonomy	Domain: Eukaryota Kingdom: Plantae Phylum: Spermatophyta Subphylum: Angiospermae Class: Dicotyledonae Order: Fabales Family: Fabaceae Subfamily: Caesalpinioideae Genus: Gleditsia Species: *Gleditsia triacanthos* L.
Invasion history	The native range of *Gleditsia triacanthos* is W. Central & E. U.S.A. to Mexico. It is a shrub or tree and grows primarily in the temperate biome(s) (POWO). Isolated populations also occur in northwestern Florida. It is

	naturalized east of the Appalachian Mountains as far north as Nova Scotia, Canada (Briones, 1988). From the 1600s, *G. triacanthos* was introduced to other states in the USA, and later to South America, Europe, Africa, west and South Asia (CABI, 2022) Europe it was introduced in 1700 (Ferus at al.2013). *Gleditsia triacanthos* planted for ornamental and in hedges in central and south Europe; occasionally naturalized (Tutin at al. 1968). It is exotic species in Australia, Canada, France, India, Lesotho, New Zealand, Russian Federation, South Africa, Tunisia, United Kingdom (Orwa et al.2009). It was introduced in the Black Sea coastline of Georgia in the 50s of the last century (Davitadze, 2001). Since the 70s of the last century plants have been observed in the forests within the administrative boundaries and buffer zones of the Kolkheti National Park and Katsoburi Reserve.
Distribution range	Introduced
Geographic scope	*G. triacanthos* is native to the hardwood forests of eastern, central and southern USA, and is one of the hardiest, most adaptable and most useful tree species known there. It thrives in climates ranging from cold-temperate to subtropical within its native habitat and has been grown successfully in tropical conditions where it has been introduced. It is drought- and frost-tolerant and grows in all types of soil. The area of distribution in Kolkheti lowland includes: Managed habitats, degraded low-density forests, river banks and water channels, plains, ruderal lands. Due to high ability of distribution, being gradually increased at every vegetation period, the plant is able to penetrate not only into the Kokheti National Park and Katsoburi Reserve, but beyond their boundaries facilitating expulsion of local, endemic and relict trees. *G. triacanthos* propagates by seeds and root suckers.
Socio-economic benefits	Negative benefit- due to *G. triacanthos* high viability, rapid growth and ability to adapt to the environment, they form groves and gradually occupy the areas and replacing the local rare and endemic vegetation. it causes significant changes in ecosystem functions. Positive benefit- flowers are very attractive to bees, which make honey from the nectar. The plant is excellent source of fuelwood (used as a firewood

	material). The wood is strong, hard and durable, resistant to shock, it is used locally for fence posts, crating and general construction. It is a fast-growing plant, already fruiting at the age of 8-10 years, the fruit has a sweet taste and is used by cattle for food.

2. Likelihood of introduction, establishment, spread and magnitude of impact

Species information	Response
Current distribution	Likelihood – high
Potential distribution	Likelihood – high
Spread	Rapidity – high
Magnitude	Magnitude – high

3. Description of the current and potential distribution, spread and magnitude of impact

Species information	Response
Current distribution	Invasive
Potential distribution	Invasive
Spread	Invasive
Magnitude	Invasive

4. Inclusion of multiple pathways and vectors of introduction and spread both intentional and unintentional

Species information	Response
Pathways of introduction	As an ornamental plant, by human
Vectors of introduction	First by people, then by natural ways
Spread	Unintentional

5. Assessment of environmental impacts with respect to biodiversity (and ecosystem) patterns and processes

The threatened environmental or socio-economic component	Response
Biodiversity (genetic and species)	Negative impact
Impact on natural and semi-natural ecosystem biodiversity	Pressure on native species
Ecosystem services	Negative impact

Food-web	Negative impact

6. Assessment of adverse impacts with respect to ecosystem services

Assessment of adverse impacts with respect to ecosystem services:	**Response**
Biotic impact	Negative impact
Abiotic impact	No changes

7. Assessment of adverse socio-economic impacts:

Adverse socio-economic impact	**Response**
Gleditsia triacanthos L. (Linnaeus,1753)	Negative impact

8. Status (threatened or protected) of species or habitat under threat

The threatened environmental component	**Response**
Status of species under threat	Threatened and protected
Status habitat under threat	Threatened and protected

9. Possible effects of climate change in the foreseeable future

Species	**Possible effects of climate change in the foreseeable future**
Gleditsia triacanthos L. (Linnaeus,1753)	Expanding

10. Data limitations

Species	**Data limitations**
Gleditsia triacanthos L. (Linnaeus,1753)	No data limitation

11. Information sources

Species	Information sources
Gleditsia triacanthos L. (Linnaeus,1753)	Davitadze, 2001; Briones, 1988; CABI 2022; POWO, 2022; Tutin at al.,

12. Summary of the different components of the risk assessment in a consistent and interpretable form and an overall summary

Summarizing risks	Risk scale (reference)	Risk Scale
Risk assessment	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

13. Uncertainty (confidence)

	Reference	
Confidence level	X High X Medium X Low	Medium

14. Quality assurance

Quality of the risk assessment	Team of experts
Panel of experts invited to review the risk assessment	PP5 - International Business and Economic Development Center (IBEDC); Gela Ingorokhva, Exteranl Expert for IAS Monitoring in Kolheti National Park.

4. DATA INTERPRETATION FOR THE LIST OF TARGETED INVASIVE ALIEN SPECIES STUDIED IN THE PROJECT

Risk assessment	Estimated risk indicator	Estimated Risk IASON Project
(Danube Delta-Romania)		
Amorpha fruticosa L. (desert false indigo, dullleaf indigo, false indigobush, leadplant, desert indigobush, indigobush, false indigo)	X Low (= 1) X Medium (= 3) X High (= 5)	High (= 5)
Xanthium strumarium ssp. Italicum Moretti (common cocklebur)	X Low (= 1) X Medium (= 3) X High (= 5)	High (= 5)
Elodea nuttallii (Planch.) H. St. John (western waterweed)	X Low (= 1) X Medium (= 3) X High (= 5)	High (= 5)
Leptinotarsa decemlineata Say, 1824 (Colorado potato beetle)	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (= 3)
Perccottus glenii Dybowski, 1877 (Amur sleeper)	X Low (= 1) X Medium (= 3) X High (= 5)	High (= 5)
(Danube Delta-Ukraine)		
Elodea canadensis	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)
Amorpha fruticosa	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)
Oithona davisae	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (3)
Corbicula leana	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)
Perccottus glenii	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)
Canis aureus	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)
(Nestos Delta-Greece)		

Amorpha fruticosa L. (desert false indigo, dullleaf indigo, false indigobush, leadplant, desert indigobush, indigobush, false indigo)	X Low (= 1) X Medium (= 3) X High (= 5)	High (= 5)
Acer negundo L. (box elder, boxelder maple, Manitoba maple, ash-leaved maple)	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (= 3)
Robinia pseudoacacia L. (black locust)	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (= 3)
Phytolacca americana L. (American pokeweed, pokeweed, poke sallet, dragonberries, and inkberry)	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (= 3)
Ailanthus altissima (Mill.) Swingle (Tree-of-heaven)	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (= 3)
Solanum elaeagnifolium Cav. (silverleaf nightshade)	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (= 3)
(Kızılırmak Delta-Türkiye)		
Carassius gibelio (Bloch, 1782)	X Low (= 1) X Medium (= 3) X High (= 5)	High (=5)
Gambusia holbrooki (Mosquito Fish)	X Low (= 1) X Medium (= 3) X High (= 5)	High (=5)
Gambusia affinis (S. F. Baird and Girard, 1853)	X Low (= 1) X Medium (= 3) X High (= 5)	High (=5)
Pseudorasbora parva (Temminck & Schlegel, 1846)	X Low (= 1) X Medium (= 3) X High (= 5)	High (=5)
Oncorhynchus mykiss (Walbaum , 1792)	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)
Lithognathus mormyrus (Linnaeus, 1758)	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)
Liza haematocheila (Temminck & Schlegel, 1845) (correct Latin name for the mullet Mugil soiuy	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)

(Basilewsky, 1855))		
Parablennius incognitus (Bath, 1968)	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)
Syngnathus acus (Linnaeus, 1758)	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)
Gobius cruentatus (Gmelin, 1789)	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)
Mnemiopsis leidyi (Agassiz, 1865)	X Low (= 1) X Medium (= 3) X High (= 5)	High (=5)
Rapana venosa (Valenciennes, 1846)	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (=3)
Callinectes sapidus (Rathbun, 1896)	X Low (= 1) X Medium (= 3) X High (= 5)	Low (=1)
Astacus leptodactylus (Rathbun, 1896)	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (=3)
(Chorokki and Kolkheti Delta-Georgia)		
Ambrosia artimisiifolia L. Chorokhi Delta	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (3)
Verbena brasiliensis Vell. Chorokhi Delta	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)
Sicyos angulatus L. Chorokhi Delta	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)
Solidago canadensis L., Chorokhi Delta	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)
Ambrosia artimisiifolia L. Kolkheti Delta	X Low (= 1) X Medium (= 3) X High (= 5)	Medium (3)
Solidago canadensis L. Kolkheti Delta	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)
Amorpha fruticosa L. Kolkheti Delta	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

Gleditsia triacanthos L. Kolkheti Delta	X Low (= 1) X Medium (= 3) X High (= 5)	High (5)

5. CONCLUSIONS

Four Deltaic area from 5 countries in the IASON project were analysed by means of IAS risk assessment. The IAS was selected from different ecosystem such as aquatic (fresh water and marine) and terrestrial areas. The selected invasive species were animal, plant and planktonic organisms.

Although there are many IAS in the selected area, the experts decided estimation of the risk in the target area and the target species mentioned above. These species have both ecological and economic effects in their area. Experts from 5 countries evaluated the risk level of A. fruticose in the deltas of Danube Delta, Nestos Delta, Choroki, and Kalketi as 5. Considering the deltas where this species is distributed, the IAS effect of A. fruticose in the Black Sea deltas can be considered alarming. In addition to these species, P.glenii is also another important IAS species for the Danube coasts of Ukraine and Romania (Figure-1). Some of these species, which are considered important by experts those species are ecological and economic effects that are not noticeable but could be considered effective species for the Black Sea. For instance, M. leidy had a catastrophic impact on the Black Sea environment and economy in previous years, and another species, R. venosa, has now been made considered an economically important species although it was invaded as an invasive species in the past.

(Danube Delta-Romania)

The 5 Invasive Alien Species (IAS) considered for the Danube Delta - Romania, especially for the representativeness of the phenomenon of invasiveness, represent at the same time:

- the terrestrial environment (3 species) and the aquatic environment (2 species)
- the animal kingdom (*Leptinotarsa decemlineata* Say, 1824 and *Perccottus glenii* Dybowski, 1877) as well as the vegetable kingdom (*Amorpha fruticosa* L., *Xanthium strumarium ssp. Italicum* Moretti and *Elodea nuttallii* (Planch.) H. St. John).

From the point of view of the "Estimated risk indicator" in the Danube Delta - Romania, of the 5 Invasive Alien Species (IAS):

- 4 present a "High" risk (3 species = 5 (*Amorpha fruticosa* L., *Elodea nuttallii* (Planch.) H. St. John and *Perccottus glenii* Dybowski, 1877) and 1 species = 4 (Xanthium strumarium ssp. Italicum Moretti))
- 1 species presents a "Medium" risk = 3 – *Leptinotarsa decemlineata* Say, 1824

The invasive species with the strongest and most evident impact on the other species and habitats (in the Danube Delta - Romania) are - Amorpha fruticosa L. and Perccottus glenii, which also present the highest probability of dispersion and widening of the distribution area.

(Danube Delta-Ukraine)

In total of 6 IAS considered for the Ukrainian part of the Danube Delta to evaluate the risk assessment, from different ecological groups. From the point of view of the "Estimated risk indicator" in the Danube Delta - Ukraine, of the 6 IAS:

- 5 present a "High" risk (*Elodea canadensis, Amorpha fruticose, Corbicula leana, Perccottus glenii, Canis aureus*).
- 1 species presents a "Medium" risk (*Oithona davisae*).

The high socio-economic impact is detected only for three of the species – *Elodea canadensis, Amorpha fruticosa* and *Perccottus glenii*, but of one species – *Oithona davisae* – we recorded positive impact.

(Nestos Delta-Greece)

The 6 Invasive Alien Species (IAS) considered for the Nestos Delta - Greece, especially for the representativeness of the phenomenon of invasiveness, represent at the same time species of terrestrial environments and all of them are classified to the Plantae Kingdom.

From the point of view of the "Estimated risk indicator" in the Nestos Delta - Greece, of the 5 Invasive Alien Species (IAS):

- 1 presents a "High" risk = 5 (*Amorpha fruticosa* L.)
- 4 species present a "Medium" risk = 3 (*Acer negundo* L., *Robinia pseudoacacia* L., *Phytolacca americana* L., *Ailanthus altissima* (Mill.) Swingle, and *Solanum elaeagnifolium* Cav.

Amorpha fruticosa is considered the most important and dangerous invasive species in the area of Nestos delta – Greece. This is based on its invasiveness and its impact to the other species of the habitat.

(Kızılırmak Delta-Türkiye)

The 14 Invasive Alien Species (IAS) selected for the Kızılırmak Delta - Türkiye, especially for the representativeness of the phenomenon of invasiveness, represent at the same time:

- the fish species (10 species) distributed in three different Kızılırmak lakes. These lakes have gate to the sea temporarily.
- One species is from ctenophora phylum distributed in the coastal area of the Kızılırmak discharge area and whole Black Sea.
- Two invertebrates distributed in the coastal area of the Kızılırmak River discharge
- The estimated risk level of these species are;
    - *Carassius gibelio, Mosquito Fish, Gambusia affinis, Pseudorasbora parva and Mnemiopsis leidyi* are evaluated as high risk (=5)
    - *Rapana venosa and Astacus leptodactylus* are evaluated as medium risk (=3),
    - *Oncorhynchus mykiss, Lithognathus mormyrus, Liza haematocheila, Parablennius incognitus, Syngnathus acus, Gobius cruentatus, and Callinectes sapidus* are evaluated as low risk (=1)

The invasive species with the strongest and most evident impact on the other species and habitats (in the Kızılırmak Delta - Türkiye) is *Carassius gibelio* which also impacts ecologically and economically and the highest probability of dispersion and widening of the distribution area.

(Chorokki and Kolkheti Delta-Georgia)

In total of 6 IAS are considered for the Georgia of Chorokhi Delta and Kolkheti to evaluate the risk assessment, from different ecological groups. From the point of view of the "Estimated risk indicator" in the Chorokhi Delta and Kolkheti - Georgia, of the 6 IAS:

Chorokhi Delta:

1. Three species have a "High" risk -*Verbena brasiliensis, Solidago canadensis, Sicyos angulatus;*
2. One species has a "Medium" risk - Ambrosia artimisiifolia

Kolkheti Delta:

1. Three species have a "High" risk - *Gleditsia triacanthos, Amorpha fruticosa, Solidago canadensis;*
2. One species has a "Medium" risk - Ambrosia artimisiifolia.

The risk of Ambrosia artimisiifolia at both Chorokh and the Kolkheti study site is medium (3).

Socio-economic Impact

The high socio-economic impact is detected for three species - *Ambrosia artimisiifolia, Amorpha fruticosa, Sicyos angulatus*. The remaining three species are

characterized by both positive and negative impact - *Verbena brasiliensis, Solidago canadensis, Gleditsia triacanthos.*

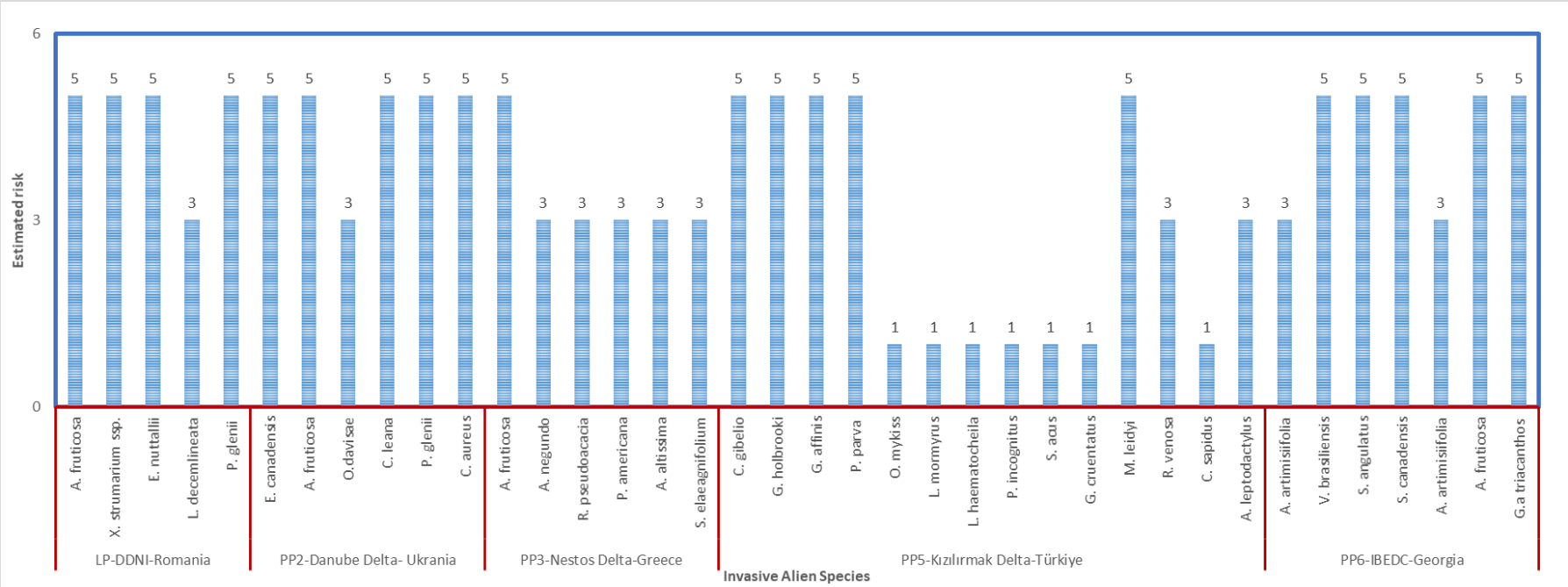

Figure-1: IAS in IASON project Deltaic Areas in Romania, Ukrania, Greece, Türkiye and Georgia

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