Appendix A

Harmonia^{+PL} – procedure of negative impact risk assessment for invasive alien species and potentially invasive alien species in Poland

Questionnaire

A0 | Context

Questions from this module identify the assessor and the biological, geographical & social context of the assessment.

a01. Name(s) of the assessor(s):

first name and family name

Borys Kala
first name and family name

Bartłomiej Gorzkowski
first name and family name

.....

acomm01.	Comments:		
	degree	affiliation	assessment date
	msc	Polskie Towarzystwo Ochrony Przyrody "Salamandra"	20.12.2017
	degree	affiliation	assessment date
	.....	Fundacja Epicrates POLIWET Specjalistyczna Przychodnia dla Zwierząt – kierownik Egzotarium w Schronisku dla Bezdomnych Zwierząt w Lublinie	20.12.2017
	degree	affiliation	assessment date
	.....	.....	.....

a02. Name(s) of the ***Species*** under assessment:

Polish name

żółw ozdobny
Latin name

Trachemys scripta Schoepff, 1792
English name

Pond slider

acomm02.	Comments:	
	Polish name (synonym I) żółw wodnolądowy	Polish name (synonym II) subspecies: *T. s. elegans* – żółw czerwonolicy (or czerwonouchy), *T. s. scripta* – żółw żółtobrzuchy, *T. s. troostii* – żółw żółtlicy
	Latin name (synonym I) *Chrysemys scripta*	Latin name (synonym II) *Pseudemys scripta*
	English name (synonym I) Common slider	English name (synonym II) subspecies: *T. s. elegans* – red-eared slider, *T. s. scripta* – yellowbelly slider, *T. s. troostii* – cumberland slider

a03. **Area** under assessment:

Poland

acomm03.	Comments: The species is spread throughout the country, and therefore the assessment covers the whole area of Poland.

a04. **Status** of the *Species* in Poland. The *Species* is:

native to Poland	
alien, absent from Poland	
alien, present in Poland only in cultivation or captivity	
alien, present in Poland in the environment, not established	**X**
alien, present in Poland in the environment, established	

aconf01.	Answer provided with a	low	medium X	high	level of confidence

acomm04.	Comments: in „Comments" (questions acomm04-41) experts should provide **explanations for their answers and list sources of information**. In particular, Comments should explain the decision in cases when data is lacking, incomplete or uncertain, or if the available information is contradictory. Source of the information should also be provided here, with author and year of publication; data sources should be divided into P – published results of scientific research; B - databases; N – unpublished data; I - other; A – author's own data. Detailed information (including full bibliographic record) should be provided at the end of the questionnaire "Data sources". Guidance on data sources citation is available at the end of the *Harmonia*$^{+PL}$ – procedure of negative impact risk assessment for invasive alien species and potentially invasive alien species in Poland. Import of Red-eared sliders to Poland escalated at the end of the 80's and in the 90's. While even approximate numbers of animals imported at that time is unknown, it is undoubtedly huge. It is known that only between 1993-97 there were as many as 448.000 of Red-eared sliders officially imported into the country (Najbar 2001 - P). Currently, pond sliders are present in reservoirs and watercourses almost everywhere in Poland, except in the north-eastern part of the country. The database on distribution of turtles in Poland, managed by the PTOP "Salamandra", includes records from a total of at least 313 locations (PTOP "Salamandra" 2015 - B). So far, there is no confirmed information about successful breeding of pond sliders in Poland in the wild. There are, however, more than a dozen cases recorded of egg laying in semi-open breeding facilities. No hatching occurred from these clutches as yet - (Więckowski 2014, Gorzkowski 2015 - I). Lack of successful reproduction is undoubtedly the result of climatic conditions that are not favourable enough yet (Kala et al. 2015 - I). The establishment of pond sliders in Poland is therefore a real scenario if the expected climate change is taken into account. The increase in temperature will most likely contribute to the breeding success of these reptiles. On the other hand, however, it cannot be completely ruled out that pond sliders already do reproduce successfully in Poland. Very young specimens of this species were observed in a few localities during field studies in the research project "Invasive species of turtles as a source and vector of pathogenic microflora for animals and humans" (Gorzkowski, unpubl. 2017 - A). In the aforementioned project, ultrasound study of female turtles were carried out. It revealed various stages of ovarian activity, which suggests the possibility of reproduction of this species in our climatic zone (Chlebicka et al 2016 - I).

a05. The impact of the *Species* on major domains. The *Species* may have an impact on:

environmental domain	**X**
cultivated plants domain	
domesticated animals domain	**X**
human domain	**X**
other domains	

acomm05.	Comments: Red-eared slider, the most common subspecies of the pond slider in Poland, is on the list of the 100 of the World's Worst Invasive Alien Species (Lowe et al., 2000 - P). Pond sliders are opportunistic omnivores - they feed on both vegetable and animal food. The composition of their diet changes with age. Young turtles are characterized by strong predation. Over time, more and more plant material appears in the diet (Ernst and Lovich 2009 - P). In the case of breeding success, larger groups of juveniles may pose a threat to local populations of small aquatic organisms – e.g. dragonflies (larvae) or amphibians (spawn and tadpoles). Turtles introduced near Paris were found to have consumed aquatic plants and animals (mostly arthropods and molluscs (Teillac-Deschamps et al. 2008 - P). Pond sliders compete with the native European pond turtles *Emys orbicularis* for various resources. In an experimental design, *T. s. elegans* appeared more competitive than *E. o. galloitalica* in taking over preferred basking sites. Overall, *E. o. galloitalica* lost more mass than *T. s. elegans* in any experimental conditions (Cadi i Joly 2003 - P). Results of the laboratory tests carried out in Poland confirmed that alien species of turtles may be a sources of infection and vectors of pathogenic microflora. In the analysed samples (feces, swabs or animal tissues), the presence of human and animal pathogenic bacteria were detected, including *Salmonella* spp., *Klebsiella* spp., *Yersinia* spp., *Chlamydia* spp., *Aeromonas* spp. (pathogenic to fish), *Pseudomonas* spp., *Acinetobacter* sp., *Chryseobacterium indologenes* i *Serratia* sp. and potentially pathogenic viruses and yeasts for native fish and turtles. The occurrence of unidentified larvae of parasites in the tissues of the studied animals has also been reported (D. Wasyl, Państwowy Instytut Weterynaryjny – Państwowy Instytut Badawczy w Puławach, pers. comm 2015; after: Kala et al. 2015 - I). It should be taken into account that after introduction of alien turtles, vectors of *Salmonella*, into the natural environment, they may become a source of Salmonella serovars that have never before been found in natural environment, which creates a new epidemiological threat for humans and animals (Konieczna et al. 2016 - I). The problem of parasites introduced into the environment along with alien species of turtles is also noted by Meyer et al. (2015 - P) - invasion of T. s. elegans, together with its associated parasitic load, could be a key stressor to endemic turtle species. Presence of *Salmonella* bacteria was also confirmed in 10% of pond sliders (and other similar species of alien turtles) studied in Spain. Bacteria were isolated from both the turtle digestive tracts and eggs (Martinez et al., 2005 - P). As a part of the above-mentioned research project, the presence of genetic material of *Chlamydiaceae* was found in 9 (40.9%) out of the 22 studied *Trachemys scripta* individuals (Mitura et al. 2016 - I). Microflora isolated from external shells of alien turtle species (including *T. scripta*) can become a source of threat to the health condition of native fish in Poland. Alien species of turtles may be vectors of *Aeromonas* spp., *Pseudomonas* spp. and *S. putrefaciens*, and/or become a source of infections caused by bacteria so far unknown as fish pathogens (Pękala et al. 2016 - I).

A1 | Introduction

Questions from this module assess the risk for the *Species* to overcome geographical barriers and - if applicable - subsequent barriers of captivity or cultivation. This leads to Introduction, defined as the entry of The Organism within the limits of The Area and subsequently into the wild.

a06. The probability for the *Species* to expand into Poland's natural environments, **as a result of self-propelled expansion** after its earlier introduction outside of the Polish territory is:

low	
medium	
high	**X**

aconf02.	Answer provided with a	low	medium X	high	level of confidence

acomm06. Comments:
Currently, pond sliders are present in reservoirs and watercourses almost everywhere in Poland, except in the north-eastern part of the country. The database on distribution of turtles in Poland, managed by the PTOP "Salamandra", includes records from a total of at least 313 locations (PTOP "Salamandra" 2015 - B).

a07. The probability for the *Species* to be introduced into Poland's natural environments by **unintentional human actions** is:

low	**X**
medium	
high	

aconf03.	Answer provided with a	low	medium	high X	level of confidence

acomm07. Comments:
With no doubt, introductions of pond sliders in Poland, like in other countries, result from intentional human activities. Unsuspecting turtle owners are rarely prepared to maintain large adults (up to 30 cm carapace length) for a significant length of time (up to 50 years) in captivity. Larger adult turtles have therefore often been released by their owners to ponds in many places. Because of these introductions, Red-eared sliders now occur in freshwater ecosystems in many developed countries, with high densities in urban wetlands (Teillac-Deschamps et al. 2008 - P).

a08. The probability for the *Species* to be introduced into Poland's natural environments by **intentional human actions** is:

low	
medium	
high	**X**

aconf04.	Answer provided with a	low	medium	high X	level of confidence

acomm08. Comments:
Just like in the other European countries, occurrence of the pond sliders in the natural environment of Poland was the result of the releases of captive bred individuals (Najbar 2001 - P, Kala et al. 2015 - I). Unintended introductions also take place, although probably they happen on a much smaller scale (animals escaping from semi-open conditions).

A2 | Establishment

Questions from this module assess the likelihood for the *Species* to overcome survival and reproduction barriers. This leads to *Establishment*, defined as the growth of a population to sufficient levels such that natural extinction within The Area becomes highly unlikely.

a09. Poland provides **climate** that is**:**

non-optimal	
sub-optimal	**X**
optimal for establishment of the *Species*	

aconf05.	Answer provided with a	low	medium	high X	level of confidence

acomm09. Comments:

There are no confirmed records indicating successful reproduction of pond sliders in Poland. There are, however, more than a dozen cases recorded of egg laying in semi-open breeding facilities. No hatching occurred from these clutches as yet - (Więckowski 2014, Gorzkowski 2015 - N). Lack of successful reproduction is undoubtedly the result of climatic conditions that are not favorable enough yet (Kala et al. 2015 - I).

On the other hand, however, it cannot be completely ruled out that pond sliders already do reproduce successfully in Poland. Very young specimens of this species were observed in a few localities during field studies in the research project "Invasive species of turtles as a source and vector of pathogenic microflora for animals and humans" (Gorzkowski 2017 - A).

Ultrasonographic examination of female pond sliders caught in this project revealed that they were in different stages of egg development, which indicates that breeding of the species under climatic conditions in Poland is possible (Chlebicka i in. 2016 - P).

a10. Poland provides **habitat** that is:

non-optimal	
sub-optimal	
optimal for establishment of the *Species*	**X**

aconf06.	Answer provided with a	low	medium X	high	level of confidence

acomm10. Comments:

Pond sliders occupy a wide range of freshwaters. They prefer still waters or rivers with slow current, 1-2 m deep, with abundant aquatic vegetation and basking places. They often occur in lakes, marshes, ponds, channels and oxbows (Ernst and Lovich 2009 - P). Habitats available in Poland seem therefore optimal for establishment of the species.

A3 | Spread

Questions from this module assess the risk of the *Species* to overcome dispersal barriers and (new) environmental barriers within Poland. This leads to spread, in which vacant patches of suitable habitat become increasingly occupied from (an) already-established population(s) within Poland.

Note that spread is considered different from range expansions that stem from new introductions (covered by the *Introduction* module).

a11. The capacity of the *Species* to disperse within Poland by natural means, **with no human assistance**, is:

very low	
low	
medium	**X**

high	
very high	

aconf07.	Answer provided with a	low	medium X	high	level of confidence

acomm11. Comments:

Single source dispersal (Type A)

Pond sliders usually do not migrate over long distances. The aquatic and total (acquatic + terrestrial) home ranges of males (40 and 104 ha respectively) were significantly greater than those of females (15 and 37 ha respectively). The mean length of total home range, as determined by radio telemetry, was 731 m for males and 401 m for females (Ernst and Lovich 2009 - P).

The homing ability of *T. scripta elegans* was tested by Cagle (1944b), who marked and released 1,006 turtles in a drainage ditch in Illinois. Most remained within 0.8 km of the release point, but some moved greater distance. In 27 days, one moved approximately 3.2 km up the ditch, then 0.4 km overland to a pond (Ernst and Lovich 2009 - P).

During field studies under the research project "Invasive turtle species as a source and vector of pathogenic microflora for animals and humans", ability of expansion of the species was also analyzed. In a period of about one year (from 12/08/2015 to 30/09/2016), a female *T. s. scripta*, marked with a GPS transmitter, covered the distance of about four kilometers (in a straight line) down the Bystrzyca river. From August 2015 to May 2016, she stayed in about 150 m-long river section, then moved, covering within three days about 2,300 meters down the river to the location where she stayed for two weeks. The subsequent stages of migration were slower, which could be the result of the river channel shape, and access to food and safe basking places. Eventually, she stopped on the Bystrzyca section at Natura 2000 area (Bystrzyca Jakubowicka, PLH060096), from where the GPS transmitter sent signals from June 23, 2016 till September 30, 2016. Other individuals monitored in watercourses, were somewhat less active in search for appropriate places. Turtles monitored in water reservoirs also migrated, albeit covering significantly smaller distances (up to 1 km) (Gorzkowski pers. comm. 2017 - A).

a12. The frequency of the dispersal of the *Species* within Poland by **human actions** is:

low	
medium	
high	**X**

aconf08.	Answer provided with a	low	medium	high X	level of confidence

acomm12. Comments:

The wide distribution of pond sliders in Poland is the result of human activity, mainly deliberate introductions, resulting in systematic increase in the area occupied by this species. It is very easy to buy a turtle, and after a period of fascination, or when keeping becomes problematic, get rid of it. As a result, like elsewhere in European countries, there are more and more pond sliders both in natural and artificial waters throughout Poland. In most of these there are single sliders, however, in some places there are at least a few of them (Najbar 2001 - P).

A4a | Impact on environmental domain

Questions from this module qualify the consequences of the *Species* on wild animals and plants, habitats and

ecosystems.

Impacts are linked to the conservation concern of targets. Native species that are of conservation concern refer to keystone species, protected and/or threatened. See, for example, Red Lists, protected species lists, or Annex II of the 92/43/EWG Directive. Ecosystems that are of conservation concern refer to natural systems that are the habitat of many threatened species. These include natural forests, dry grasslands, natural rock outcrops, sand dunes, heathlands, peat bogs, marshes, rivers & ponds that have natural banks, and estuaries (Annex I of the 92/43/EWG Directive).

Native species population declines are considered on the local scale: limited decline is considered as a (mere) drop in numbers; severe decline is considered as a (near) extinction. Similarly, limited ecosystem change is considered as transient and easily reversible; severe change is considered as persistent and hardly reversible.

a13. The effect of the *Species* on native species, through **predation, parasitism or herbivory is:**

inapplicable	
low	
medium	
high	**X**

aconf09.	Answer provided with a	low	medium X	high	level of confidence

acomm13. Comments:

Examination of 25 Red-eared sliders stomach contents in France revealed that 22 of them were not empty; 21 stomachs contained plant material, 14 – insects (in 4 there were very numerous of ants), 7 – crustaceans, and 10 – fish remains (Prévot-Julliard et al. 2007 - P).

Pond slider is an opportunistic omnivore, subsisting on a wide-ranging diet of various plant and animal foods. Juveniles are highly carnivorous, but as they become older they eat progressively larger quantities of vegetable matter. The percentage of animal material dry weight in the digestive tracts of these turtles declines to between 0 and 10% at plastron length of about 4-6 cm (Ernst and Lovich 2009 - P).

Adults prefer animal food when it is available. Juveniles in Louisiana feed predominately on insects (mostly hemipterans and dragonfly nymphs) but gradually shift to plants with increasing plastron length (Ernst and Lovich 2009 - P).

Pond sliders, particularly young, may seriously threaten native amphibians (predating on spawn, tadpoles) fishes (mainly for eggs) and aquatic invertebrates (e.g. dragonfly larvae). In small reservoirs and with high densities of sliders, their impact upon local populations of native organisms may be significant (Gorzkowski, Kala - A).

a14. The effect of the *Species* on native species, through **competition** is:

low	
medium	
high	**X**

aconf10.	Answer provided with a	low	medium	high X	level of confidence

acomm14. Comments:

The pond sliders are able to effectively compete with the native European pond turtle *Emys orbicularis* for various resources, including eg. food, nesting sites or basking places (Luiselli et al. 1997, Arvy and Serv 1998, Cadi and Joly 2000, 2003, 2004 , Musioł 2008, Polo-Cavia and others 2008 - P). In experimental conditions, it was proved that Red-eared sliders successfully monopolize high-quality basking places, isolating the European pond turtle from them, sometimes displaying aggressive behaviors, including biting (Cadi and Joly 2003 - P). There is no literature data on the competition of pond sliders with other native species.

a15. The effect of the *Species* on native species, through **interbreeding** is:

no / very low	**X**
low	
medium	
high	
very high	

aconf11. Answer provided with a

low	medium	high
		X

level of confidence

acomm15. Comments:

The possibility of hybridization between native European pond turtle and alien pond slider is unlikely. However, in Slovakia, an attempt of courting of a male European pond turtle with a female red-eared slider was observed. Courting males of the native species can stay with selected females for around two weeks and copulate repeatedly (Mertens, 1950; Lác, 1968). With the increased occurrences of females of the alien species at particular localities, there is a possibility that males native turtles would spend a part of their energy in courtship with females of the "wrong" species and therefore less effectively pair with females of their own species. This could potentially lead to a reduction in gravid females of Euroepan pond turtle and decrease in successful reproduction of the species. (Jablonski et al. 2017 - P).

a16. The effect of the *Species* on native species by **hosting pathogens or parasites** that are harmful to them is:

very low	
low	
medium	
high	
very high	**X**

aconf12. Answer provided with a

low	medium	high
		X

level of confidence

acomm16. Comments:

Until recently, the level of knowledge of bacteria, parsites, viruses and fungi in invasive alien species was limited (Goławska et al. 2017 - P). The project carried out in Poland has contributed to bridging these gaps. Until now, it has been confirmed that pond sliders are vectors of numerous pathogens that pose a threat to native species of fish, amphibians, reptiles, birds and mammals, including: *Salmonella* spp. (Soccini and Ferri 2004 - P, Martínez et al. 2005 - P, Konieczna et al. 2016 - I), *Aeromonas* spp. (Soccini and Ferri 2004 - P, Pękala et al. 2016 - I), *Pseudomonas* spp. (Soccini and Ferri 2004 – P, Pękala et al. 2016 - I), *Shewanella putrefaciens* (Pękala et al. 2016 - I), *Chlamydia* spp. (Mitura et al. 2016 - I, Mitura et al. 2017 - P), *Acinetobacter* spp. (Pękala et al. 2016 - I), Yersinia spp. (Soccini and Ferri 2004 - P), *Klebsiella* spp. (Goławska 2017 - P), *Citrobacter* spp. (Pękala et al. 2016 - I), *Acinetobacter* sp., *Chryseobacterium indologenes* and *Serratia* sp. (Paździor et al. 2016 - P). High mortality in the European pond sliders used for reintroduction programme was detected in 2016 in a breeding facility in the Polesie National Park. Examination of the causes of this mortality revealed DNA of a *Chlamydiaceae* in a pond slider (*T. scripta*), kept in the same facility and fed by the same personnel (Mitura et al. 2017 - P).

The pond slider may also be a host and vector of north-American parasitic flukes *Neopolystoma orbiculare*, *Polystomoides oris* and *Spirorchis elegans*, and a nematode *Spiroxys contortus*. These alien parasites were detected in western and southern Europe in native turtles, including *E. orbicularis* (Kirin et al. 2001, Mihalca et al. 2007, Vernau et al. 2011, Iglesias et al. 2015, Domènech et al. 2016, Goławska et al. 2017 - P).

a17. The effect of the *Species* on ecosystem integrity, by **affecting its abiotic properties** is:

low	**X**
medium	
high	

aconf13. Answer provided with a

low	medium	high	level of confidence
		X	

acomm17. Comments:

No published information on the impact of the species on abiotic factors of ecosystems is available. It seems that the impact of pond sliders is neutral in this respect.

a18. The effect of the *Species* on ecosystem integrity, by **affecting its biotic properties** is:

low	
medium	**X**
high	

aconf14. Answer provided with a

low	medium	high	level of confidence
	X		

acomm18. Comments:

Assuming that the population of the pond sliders reaches the stage of establishment and starts to spread naturally in Poland, the number of specimens will systematically increase. In such a scenario, it can be expected that it will affect aquatic organisms in the invaded water bodies. It can, for example, reduce the number of some endangered amphibians, molluscs or insects. Turtles introduced near Paris were revealed to have consumed aquatic plants and animals (mostly arthropods and molluscs) (Teillac-Deschamps et al. 2008 - P).

A4b | Impact on cultivated plants domain

Questions from this module qualify the consequences of the *Species* on cultivated plants (e.g. crops, pastures, horticultural stock).

For the questions from this module, consequence is considered 'low' when presence of the *Species* in (or on) a population of target plants is sporadic and/or causes little damage. Harm is considered 'medium' when The Organism's development causes local yield (or plant) losses below 20%, and 'high' when losses range > 20%.

a19. The effect of the *Species* on cultivated plants targets through **herbivory or parasitism** is:

inapplicable	
very low	**X**
low	
medium	
high	
very high	

aconf15. Answer provided with a

low	medium	high
		X

level of confidence

acomm19. Comments:
The species does not affect the cultivation of plants either by herbivory or parasitism.

a20. The effect of the *Species* on cultivated plants targets through **competition** is:

inapplicable	**X**
very low	
low	
medium	
high	
very high	

aconf16. Answer provided with a

low	medium	high

level of confidence

acomm20. Comments:
The species does not affect plant cultivation through competition.

a21. The effect of the *Species* on cultivated plants targets through **interbreeding** with related species, including the plants themselves is:

inapplicable	**X**
no / very low	
low	
medium	
high	
very high	

aconf17.	Answer provided with a	low	medium	high	level of confidence

acomm21. Comments:

a22. The effect of the *Species* on cultivated plants targets by **affecting the cultivation system's integrity** is:

very low	**X**
low	
medium	
high	
very high	

aconf18.	Answer provided with a	low	medium	high X	level of confidence

acomm22. Comments:
The species does not affect the cultivation system's integrity.

a23. The effect of the *Species* on cultivated plants targets by hosting **pathogens or parasites** that are harmful to them is:

very low	
low	
medium	**X**
high	
very high	

aconf19.	Answer provided with a	low X	medium	high	level of confidence

acomm23. Comments:
The research conducted as part of the project "Invasive species of turtles as a source and vector of pathogenic microflora for animals and humans" has shown that alien species of turtles (including pond turtles) are vector of *Pseudomonas* spp. (Pękala et al. 2016 - I). A species of this genus, *Pseudomonas syringae*, is included in the EPPO A2 list.

A4c | Impact on domesticated animals domain

Questions from this module qualify the consequences of The Organism on domesticated animals (e.g. production animals, companion animals). It deals with both the well-being of individual animals and the productivity of animal populations.

a24. The effect of the *Species* on individual animal health or animal production, through **predation or parasitism** is:

inapplicable	
very low	**X**

low	
medium	
high	
very high	

aconf20.	Answer provided with a	low **X**	medium	high	level of confidence

acomm24. Comments:
Pond slider can potentially affect animals raised in aquaculture through predation, but there is no literature data available on this topic. The species does not affect livestock or pets through parasitism.

a25. The effect of the *Species* on individual animal health or animal production, by having properties that are hazardous upon **contact**, is:

very low	**X**
low	
medium	
high	
very high	

aconf21.	Answer provided with a	low	medium	high X	level of confidence

acomm25. Comments:
There are no publications describing the features of pond sliders that in case contact with livestock or pets could negatively affect them (with the exception of transmission of parasites and pathogens - see point a26). Adult specimens of this species can severely bite animals and humans, but such situations in the country will be without a doubt sporadic.

a26. The effect of the *Species* on individual animal health or animal production, by hosting **pathogens or parasites** that are harmful to them, is:

inapplicable	
very low	
low	
medium	
high	**X**
very high	

aconf22.	Answer provided with a	low	medium	high X	level of confidence

acomm26.	Comments: It has been confirmed that pond sliders are vectors of numerous pathogens that pose a threat to native species of fish (including commercially bred), amphibians, reptiles, birds and mammals, including: *Salmonella* spp. (Soccini and Ferri 2004 - P, Martínez et al. 2005 - P, Konieczna et al. 2016 - I), *Aeromonas* spp. (Soccini and Ferri 2004 - P; Pękala et al. 2016 - I), *Pseudomonas* spp. (Soccini and Ferri 2004 – P, Pękala et al. 2016 - I), *Shewanella putrefaciens* (Pękala et al. 2016 - I), *Chlamydia* spp. (Mitura et al. 2016 – I, Mitura et al. 2017 - P), *Acinetobacter* spp. (Pękala et al. 2016 - I), Yersinia spp. (Soccini and Ferri 2004 - P), *Klebsiella* spp. (Goławska 2017 - P), *Citrobacter* spp. (Pękala et al. 2016 - I), *Acinetobacter* sp., *Chryseobacterium indologenes* and *Serratia* sp. (Paździor et al. 2016 – P). If pond sliders invade fishponds or other reservoirs with commercial stocks of aquatic organisms, they may affect them both through predation and vector of pathogens and parasites.

A4d | Impact on human domain

Questions from this module qualify the consequences of The Organism on humans. It deals with human health, being defined as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (definition adopted from the World Health Organization).

a27. The effect of the *Species* on human health through **parasitism** is:

inapplicable	**X**
very low	
low	
medium	
high	
very high	

aconf23.	Answer provided with a	low	medium	high	level of confidence

acomm27.	Comments: Taking into account that pond sliders are most often released into water bodies in and around large cities, it is probable that these animals will come into direct contact with humans (e.g. in bathing areas). In direct contact, sliders may painfully bite, as these animals actively defend themselves. Due to the size of pond sliders, such bites do not pose a direct threat to human life, although they may indirectly contribute to the transmission of various types of parasites or pathogens.

a28. The effect of the *Species* on human health, by having properties that are hazardous upon **contact**, is:

very low	
low	**X**
medium	
high	
very high	

aconf24.	Answer provided with a	low	medium	high X	level of confidence

acomm28.	Comments: During direct contacts, pond sliders can bite painfully and scratch with claws, even leading to bleeding cuts.

a29. The effect of the *Species* on human health, by hosting **pathogens or parasites** that are harmful to humans, is:

inapplicable	
very low	
low	
medium	
high	
very high	**X**

aconf25.	Answer provided with a	low	medium	high X	level of confidence

acomm29.	Comments: It has been confirmed that pond sliders are vectors of numerous pathogens that pose a threat to native species of fish, amphibians, reptiles, birds and mammals, including: *Salmonella* spp. (Soccini and Ferri 2004 - P, Martínez et al. 2005 - P, Konieczna et al. 2016 - I), *Aeromonas* spp. (Soccini and Ferri 2004 - P, Pękala et al. 2016 - I), *Pseudomonas* spp. (Soccini and Ferri 2004 - P, Pękala et al. 2016 - I), *Shewanella putrefaciens* (Pękala et al. 2016 - I), *Chlamydia* spp. (Mitura et al. 2016 – I, Mitura et al. 2017 - P), *Acinetobacter* spp. (Pękala et al. 2016 - I), Yersinia spp. (Soccini and Ferri 2004 - P), *Klebsiella* spp. (Goławska 2017 - P), *Citrobacter* spp. (Pękala et al. 2016 - I). Most of these pathogens also pose a threat to people. The presence of bacteria has been demonstrated in 10% of the animals sampled. A variant of *Salmonella* has been isolated and is in process of taxonomic classification by the Catalan Government Livestock Health Laboratory. The study warns of the potential risk of the presence of Pond sliders in the waters of the Foix, not only from the ecological but also from the sanitary and environmental (to other species) and the zoonotic points of view (to people) (Martínez et al. 2005 - P). Food poisoning caused by zoonotic strains of *Salmonella* spp. most often have a mild effect. Sometimes, however, they may have a general character, including lethal outcome (Goławska et al. 2017 - P). Two species of flukes, *Neopolystoma orbicular*e and *Polystomoidesoris*, associated with pond sliders reached Europe as introduced species, similarly to *Spirorchis elegans* observed in Spain and *Spiroxys contortus* observed in Romania and Bulgaria, which until now has only been described on the American continent. These examples prove the introduction of the parasite to the new geographical region and its transmission from exotic turtles to native species (Goławska et al. 2017 - P).

A4e | Impact on other domains

Questions from this module qualify the consequences of the *Species* on targets not considered in modules A4a-d.

a30. The effect of the *Species* on causing damage to **infrastructure** is:

very low	
low	**X**
medium	
high	

very high	

aconf26.	Answer provided with a	low X	medium	high	level of confidence

acomm30. Comments:
It can be assumed that if the Pond slider establishes and expands in Poland, high number of individuals may negatively affect recreational areas, including urban water reservoirs, fountains and bathing areas in and around cities, where most releases occur. However, no information is available in this respect.

A5a | Impact on ecosystem services

Questions from this module qualify the consequences of The Organism on ecosystem services. Ecosystem services are classified according to the Common International Classification of Ecosystem Services, which also includes many examples (CICES Version 4.3). Note that the answers to these questions are not used in the calculation of the overall risk score (which deals with ecosystems in a different way), but can be considered when decisions are made about management of the *Species*.

a31. The effect of the *Species* on **provisioning services** is:

significantly negative	
moderately negative	**X**
neutral	
moderately positive	
significantly positive	

aconf27.	Answer provided with a	low **X**	medium	high	level of confidence

acomm31. Comments:
There are no published data available on this topic. It seems, however, that the species may have an impact on services related to providing food by transferring parasitic and pathogenic organisms to livestock. If established and widespread, the species may contribute to pollution of reservoirs used to provide drinking water.

a32. The effect of the *Species* on **regulation and maintenance services** is:

significantly negative	
moderately negative	**X**
neutral	
moderately positive	
significantly positive	

aconf28.	Answer provided with a	low	medium X	high	level of confidence

acomm32. Comments:
Pond sliders as a vectors of various pathogenic organisms (Chlebicka et al. 2016, Konieczna et al. 2016, Pękala et al. 2016; – P) may influence the regulation of zoonotic diseases.

a33. The effect of the *Species* on **cultural services** is:

significantly negative	
moderately negative	
neutral	
moderately positive	**X**
significantly positive	

aconf29.	Answer provided with a	low	medium X	high	level of confidence

acomm33. Comments:
The presence of turtles in city parks can potentially increase their attractiveness for visitors. An optimal number of turtles could attract to green spaces people who usually do not visit these areas (Teillac-Deschamps et al. 2009 - P).

A5b | Effect of climate change on the risk assessment of the negative impact of the *Species*

Below, each of the Harmonia+ modules is revisited under the premise of the future climate. The proposed time horizon is the mid-21st century. We suggest to take into account the reports of the Intergovernmental Panel on Climate Change. Specifically, the expected changes of atmospherical variables listed in its 2013 report on the physical science basis may be used for this purpose. The global temperature is expected to rise by 1 to 2 °C by 2046-2065.

Note that the answers to these questions are not used in the calculation of the overall risk score, but can be but can be considered when decisions are made about management of the *Species*.

a34. INTRODUCTION – Due to climate change, the probability for the *Species* to overcome geographical barriers and - if applicable - subsequent barriers of captivity or cultivation in Poland will:

decrease significantly	
decrease moderately	
not change	**X**
increase moderately	
increase significantly	

aconf30.	Answer provided with a	low	medium	high X	level of confidence

acomm34. Comments:
According to distribution data collected by PTOP “Salamandra” (2015 - B), the species occurs throughout Poland, except for the north-eastern part. Overcoming geographical barriers is irrelevant in its case.

a35. ESTABLISHMENT – Due to climate change, the probability for the *Species* to overcome barriers that prevented its survival and reproduction in Poland will:

decrease significantly	
decrease moderately	
not change	
increase moderately	
increase significantly	**X**

aconf31. Answer provided with a

low	medium	high
		X

level of confidence

acomm35. Comments:

The northern part of the natural range of Pond slider is tangent to the area climatically corresponding to the weather conditions in Poland. With the suitable habitat conditions (well exposed, not overgrown breeding ground), the expected climate warming of 1-2°C may be sufficient to break the incubation barrier for this species. In the survey conducted in the laboratory conditions, the dependence of incubation time on the temperature was tested - at egg temperature below 25°C - incubation lasted 112.5 days, at 25-25.5°C - 93.0-100.9 days, 25-30°C - 68.9 days, 29.5-30°C - 58.7-69 days (Ernst and Lovich 2009 - P).

According to Invasion Species Specialist Group (ISSG), hatching times are weather dependent: temperatures between 22°C to 30°C for 55 to 80 days are preferred (Pendlebury 2006, in Pupins 2007 - P).

Najbar (2008 - P) gives examples of temperatures from egg chambers of the European pond turtle with information on the incubation period: 15.5-3.5°C (average 23.6°C) - 86-104 days (average 96.5; data from Poland); 20.7-28°C (avg. 24.5°C) - 81-88 days (data from Germany); avg. 27°C - 70 days (data from Spain).

As shown above, the average incubation temperatures of the European pond turtles from Poland are similar to the lower level of incubation temperature range for pond sliders. Due to the temperature-induced sex determination in pond sliders, only males hatch at low incubation temperatures. Eggs incubated in 22.5, 25 or 27 °C produce 100% males, while those incubated at 30° C produce only females (Ernst and Lovich 2009 - P). Therefore, there is a chance that even if, due to climatic changes, the species breaks the barrier related to breeding success, at least in the initial stage only male specimens will hatch.

a36. SPREAD – Due to climate change, the probability for the *Species* to overcome barriers that prevented its spread in Poland will:

decrease significantly	
decrease moderately	
not change	
increase moderately	**X**
increase significantly	

aconf32. Answer provided with a

low	medium	high
	X	

level of confidence

acomm36. Comments:

The species spreads almost exclusively due to intentional introductions. Ability of self-propelled expansion at longer distances is limited. According to data collected by PTOP "Salamandra" (2015 - B), the species occurs already all over Poland except for north-eastern part of the country. This pattern seems to reflect the actual distribution and it seems likely that climate warming (particularly less-severe winters) may contribute to higher survival of the species in north-eastern Poland.

a37. IMPACT ON ENVIRONMENTAL DOMAIN – Due to climate change, the consequences of the *Species* on wild animals and plants, habitats and ecosystems in Poland will:

decrease significantly	
decrease moderately	
not change	
increase moderately	
increase significantly	**X**

aconf33. Answer provided with a

low	medium	high
		X

level of confidence

acomm37. Comments:
If the species overcomes the barrier related to successful breeding, then its impact on aquatic organisms may increase significantly, e.g. due to strong predation of juveniles, increased risk of transmission of parasites and pathogens, competition for breeding sites or basking places with native pond turtles.

a38. IMPACT ON CULTIVATED PLANTS DOMAIN – Due to climate change, the consequences of the *Species* on cultivated plants and plant domain in Poland will:

decrease significantly	
decrease moderately	
not change	**X**
increase moderately	
increase significantly	

aconf34. Answer provided with a

low	medium	high
		X

level of confidence

acomm38. Comments:
The species has practically no effect on plant cultivation and climate change should not influence it in any way.

a39. IMPACT ON DOMESTICATED ANIMALS DOMAIN – Due to climate change, the consequences of the *Species* on domesticated animals and animal production in Poland will:

decrease significantly	
decrease moderately	
not change	
increase moderately	**X**
increase significantly	

aconf35. Answer provided with a

low	medium	high
	X	

level of confidence

acomm39.	Comments: Resulting from climate warming, the increasing numbers of pond sliders in the environment will potentially increase the likelihood of interaction with farm animals - for example in wetland pastures.

a40. IMPACT ON HUMAN DOMAIN – Due to climate change, the consequences of the *Species* on human in Poland will:

decrease significantly	
decrease moderately	
not change	
increase moderately	**X**
increase significantly	

aconf36.	Answer provided with a	low	medium X	high	level of confidence

acomm40.	Comments: Resulting from climate warming, the increasing numbers of pond sliders in the environment will potentially increase the likelihood of interacting with people - for example, on the watering places, it will be more likely that the turtle will bite people.

a41. IMPACT ON OTHER DOMAINS – Due to climate change, the consequences of the *Species* on other domains in Poland will:

decrease significantly	
decrease moderately	
not change	
increase moderately	**X**
increase significantly	

aconf37.	Answer provided with a	low x	medium	high	level of confidence

acomm41.	Comments: Although data is lacking, it may be assumed that the increasing numbers of pond sliders in the environment due to the breaking of the reproductive barrier under the climate warming scenario, may result in greater pressure of these reptiles on various types of aquatic organisms – e.g. those used in aquaculture.

Summary

Module	Score	Confidence

Introduction (questions: a06-a08)	0.67	0.83
Establishment (questions: a09-a10)	0.75	0.75
Spread (questions: a11-a12)	0.75	0.75
Environmental impact (questions: a13-a18)	0.58	0.83
Cultivated plants impact (questions: a19-a23)	0.17	0.67
Domesticated animals impact (questions: a24-a26)	0.25	0.67
Human impact (questions: a27-a29)	0.63	1.00
Other impact (questions: a30)	0.25	0.50
Invasion (questions: a06-a12)	0.72	0.78
Impact (questions: a13-a30)	0.63	0.73
Overall risk score	0.45	
Category of invasiveness	moderately invasive alien species	

A6 | Comments

This assessment is based on information available at the time of its completing. It has to be taken into account. however. that biological invasions are. by definition. very dynamic and unpredictable. This includes introductions of new alien species and detection of their negative impact. As a result. the assessment of the species may change in time. For this reason it is recommended that it regularly repeated.

Below you can include your own comments on the assessment.

acomm42.

Comment:

The Pond slider was classified as moderately invasive alien species in this risk assessment. The maximum value of the negative impact (0.63) was scored in the 'Human impact' module (questions: a27-a29).

In the 'Environmental impact' module (questions a13-a18). in questions on predation (a13). competition (a14) and pathogen and parasite transmission (a16). the species scored the highest values (1.0) with high confidence levels (1.0). However. the overall score was reduced because of lower impact in other questions in this module.

It is worth noticing that the Pond slider scored relatively high in the modules assessing the invasion process – 'Introduction' (0.67). 'Establishment' (0.75) and 'Spread' (0.75). As successful breeding in this species directly depends on climatic conditions. climate change may lead to its establishment in near future.

It should also be considered that the categories of invasiveness in this assessment were defined *a priori*. without knowing the distribution of actual values of this parameter.

All the above aspects should be taken into account when decisions are made about the management approach for the assessed species. including their prioritisation.

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