

EU NON-NATIVE ORGANISM RISK ASSESSMENT SCHEME

Name of organism: *Trachemys scripta*

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Risk Assessment Area: South and Mediterranean Countries

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| EU CHAPPEAU | |
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| QUESTION | RESPONSE |
| 1. In how many EU member states has this species been recorded? List them. | <p>France; Germany; Greece; Italy; The Netherlands; Spain; Portugal; Slovenia; Austria (Van Dijk, et al, 2013). Romania (Dimancea, N., 2013), Hungary (Puky et. Al, 2004), Croatia (Lukac et al, 2015), Bulgaria (Mollov et al, 2013) , Slovakia (Ficetola et al, 2012), Czech (Brejcha et al, 2009).</p> <p>The Global Invasive Species Database (2009) lists it as a pest in France, Germany, Latvia, Poland and Spain.</p> <p>LIST: France; Germany; Greece; Italy; The Netherlands; Spain; Portugal; Slovenia; Austria; Latvia; Poland;</p> |
| 2. In how many EU member states has this species currently established populations? List them. | <p>Natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Global Invasive Species Database, 2009). Currently this species is introduced as breeding in many countries, especially in Mediterranean countries (France, Greece, Italy, Portugal, and Spain; GENIEZ & Cheylan, 1987; Araujo, 1996; LUISELLI et al., 1997; Filella et al., 1999), which it is kept in all types of water bodies due to its great adaptability, even at very waters contaminated (Gibbons, 1990). Reproduction in Slovenia has also been confirmed (Vamberger M, 2012). Also in Austria (Kleewein, 2014). In Europe it is becoming increasingly abundant, especially in Portugal, Spain and France. (Van Dijk, et al, 2013). However, a tendency for expansion of invasion range to the northern and eastern parts of Europe is also obvious: in recent publications one can find evidence of funding populations of T.s.elegans in Germany (Pieh and Laufer, 2006) in Poland (Najbar, 2001) and the Baltic Region (Pupins, 2007).</p> <p>The Global Invasive Species Database (2009) lists it as a pest in France, Germany, Latvia, Poland and Spain.</p> <p>LIST: France, Greece, Italy, Germany, Latvia, Poland, Portugal, Slovenia and Spain.</p> |
| 3. In how many EU member states has this species shown signs of invasiveness? List them. | <p>Currently he is introduced as breeding in many countries in Eastern Europe (Tiedemann, 1990; CHEN & LUE, 1998) especially in Mediterranean countries (France, Greece, Italy, Portugal, and Spain; GENIEZ & Cheylan, 1987; Araujo, 1996; LUISELLI et al., 1997; Filella et al., 1999), which it is kept in all types of water bodies due to its great adaptability, even at very waters contaminated</p> |

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| | <p>(Gibbons, 1990). In Europe it is becoming increasingly abundant, especially in Portugal, Spain and France. (Van Dijk, et al, 2013). The Global Invasive Species Database (2009) lists it as a pest in France, Germany, Latvia, Poland and Spain.</p> <p>In Spain, it is considered one of the most harmful invasive species (GEIB 2006) and is included in the Spanish Catalogue of Invasive Alien Species.</p> <p>Populations in Europe are in places considered to represent a threat to local turtle species (through competition). <i>Trachemys scripta elegans</i> is included in the IUCN/SSC Invasive Species Specialist Group's 100 Worst Invasives List. (Van Dijk, et al, 2013)</p> <p>LIST: France, Greece, Italy, Portugal, Spain, Germany, Latvia, Slovenia and Poland.</p> |
| <p>4. In which EU Biogeographic areas could this species establish?</p> | <p>Mediterranean biogeographical region. Natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Luiselli et al. 1997, Martinez-Silvestre et al. 1997, Cadi et al. 2003, in Cadi & Joly 2003).</p> <p>Following the countries in which has been recorded and their biogeographical regions, it could be the following: Mediterranean, Atlantic and Continental.</p> <p>LIST: Mediterranean, Atlantic and Continental .</p> |
| <p>5. In how many EU Member States could this species establish in the future [given current climate] (including those where it is already established)? List them.</p> | <p>Natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Luiselli et al. 1997, Martinez-Silvestre et al. 1997, Cadi et al. 2003, in Cadi & Joly 2003). For that reason, this species could establish in countries included in Mediterranean biogeographical region: France; Greece; Italy; Spain; Portugal; Slovenia; Malta, Cyprus It can also established in Germany; Austria; Netherlands; and United Kingdom (Gibraltar)). The Global Invasive Species Database (2009) lists in Latvia and Poland. Reproduction in Slovenia has also been confirmed (Vamberger M, 2012).</p> <p>LIST: France; Germany; Greece; Italy; The Netherlands; Spain; Portugal; Slovenia; Austria; Latvia; Poland; Belgium; Denmark; Ireland; United Kingdom; Finland; Czech Republic; Estonia; Lithuania; Romania; Slovakia; Bulgaria; Sweden;</p> |

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| <p>6. In how many EU member states could this species become invasive in the future [given current climate] (where it is not already established)?</p> | <p>Luxembourg; Malta; Cyprus</p> <p>Populations in Europe are in places considered to represent a threat to local turtle species (through competition). <i>Trachemys scripta elegans</i> is included in the IUCN/SSC Invasive Species Specialist Group's 100 Worst Invasives List. (Van Dijk, et al, 2013)</p> <p>Natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Luiselli et al. 1997, Martinez-Silvestre et al. 1997, Cadi et al. 2003, in Cadi & Joly 2003). For that reason, this species could establish in countries included in Mediterranean biogeographical regions: Malta and Cyprus.</p> <p>The Global Invasive Species Database (2009) lists it as a pest in France, Germany, Latvia, Poland and Spain. Following the same biogeographical regions, these countries: France; Germany; Greece; Italy; The Netherlands; Spain; Portugal; Slovenia; Austria; Latvia; Poland; Belgium; Denmark; Ireland; United Kingdom; Finland; Czech Republic; Estonia; Lithuania; Romania; Slovakia; Bulgaria; Sweden; Luxembourg; Malta; Cyprus.</p> <p>LIST: France, Germany, Latvia, Poland, Spain, Greece, Italy, The Netherlands, Portugal, Slovenia, Austria, Belgium, Denmark, Ireland, United Kingdom, Finland, Czech Republic, Estonia, Lithuania, Romania, Slovakia, Bulgaria, Sweden; Luxembourg, Malta and Cyprus.</p> |
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| SECTION A – Organism Information and Screening | | |
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| Stage 1. Organism Information | RESPONSE [chose one entry, delete all others] | COMMENT |
| 1. Identify the organism. Is it clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank? | <p><i>Trachemys scripta</i> (Schoepff, 1792)</p> <p>Common Name(s): Yellow-bellied Slider Turtle, Red-eared Slider Turtle, Cumberland Slider Turtle, Slider, Common Slider</p> <p>Synonym(s): <i>Chrysemys scripta</i> (Schoepff, 1792) <i>Emys cumberlandensis</i> Holbrook, 1840 <i>Emys elegans</i> Wied, 1839 <i>Emys troostii</i> Holbrook, 1836 <i>Pseudemys scripta</i> (Schoepff, 1792) <i>Testudo scripta</i> Schoepff, 1792 <i>Trachemys scripta</i> subsp. <i>elegans</i> (Wied, 1839) <i>Trachemys scripta</i> subsp. <i>troostii</i> (Holbrook, 1836) (Van Dijk, et al, 2013).</p> | Previously considering about 15 subspecies in North, Central and South America, most former subspecies have been elevated to species rank in recent years, leaving only <i>Trachemys scripta scripta</i> , <i>T.s. troostii</i> and <i>T.s. elegans</i> as current subspecies (see Seidel 2002, TTWG 2007, Fritz and Havas 2007, for details). |
| 2. If not a single taxonomic entity, can it be redefined? (if necessary use the response box to re-define the organism and carry on) | N/A | |
| 3. Does a relevant earlier risk assessment exist? (give details of any previous risk assessment) | No | Former risk assessment consider or just one country or do not include impacts on climate change, ecosystem services or other important issues. |
| 4. If there is an earlier risk assessment is it still entirely valid, or only partly valid? | No | |

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| <p>5. Where is the organism native?</p> | <p>Mexico (Coahuila); United States (Alabama, Arizona - Introduced, Arkansas, California - Introduced, Florida, Georgia, Hawaiian Is. - Introduced, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland - Introduced, Michigan - Introduced, Mississippi, Missouri, Nebraska, New Jersey - Introduced, North Carolina, Ohio, Oklahoma, Pennsylvania - Introduced, South Carolina, Tennessee, Texas, Virginia, West Virginia) (Van Dijk, et al, 2013).</p> | <p><i>Trachemys scripta</i> is native to the eastern and central United States of America (Iverson 1992). Its subspecies are distributed as follows: <i>T.s. scripta</i>: Atlantic drainages from southern Virginia to northern Florida. <i>T.s. elegans</i>: Alabama to extreme northeastern Mexico, up to Cuatro Ciénegas. <i>T.s. troostii</i>: Southwestern Virginia to northeastern Alabama (west of Appalachians).</p> |
| <p>6. What is the global distribution of the organism (excluding Europe)?</p> | <p>Cambodia; Canada; China; Guadeloupe; Indonesia; Israel; South Africa; Taiwan; Thailand; Japan; Turkey; Australia. (Van Dijk, et al, 2013). Brasil (Martins et al, 2014)</p> | <p>Introduced populations of <i>T.s. elegans</i> have been reported from Mexico: feral populations exist throughout the country; parts of the United States (Arizona, California, Hawaiian Islands, northeastern States); Guadeloupe (France): Occurs on Grande Terre and Basse Terre (Iverson 1992, Malhotra and Thorpe 1999); Portugal: widespread, especially in the south; Spain: widespread at low elevations; France: widespread, except in the north; Italy (scattered throughout the country); Slovenia (near Italian border region); Greece (Crete); Austria (Vienna region); Germany; southwestern Switzerland; Netherlands; Turkey; Israel; South Africa; Taiwan; Thailand; Cambodia; Indonesia; and Australia. (Van Dijk, et al, 2013).</p> |
| <p>7. What is the distribution of the organism in Europe?</p> | <p>France; Germany; Greece; Italy; Netherlands; Spain; Switzerland; Portugal; Slovenia; Austria; Germany; Switzerland. (Van Dijk, et al, 2013). Reproduction in Slovenia has also been confirmed (Vamberger M, 2012).</p> | <p>Introduced populations of <i>T.s. elegans</i> have been reported from Mexico: feral populations exist throughout the country; parts of the United States (Arizona, California, Hawaiian Islands, northeastern States); Guadeloupe (France): Occurs on Grande Terre and Basse Terre (Iverson 1992, Malhotra and Thorpe 1999); Portugal: widespread, especially in the south; Spain: widespread at low elevations; France: widespread, except in the</p> |

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| | | <p>north; Italy (scattered throughout the country); Slovenia (near Italian border region); Greece (Crete); Austria (Vienna region); Germany; southwestern Switzerland; Netherlands; Turkey; Israel; South Africa; Taiwan; Thailand; Cambodia; Indonesia; and Australia. (Van Dijk, et al, 2013).</p> <p>According to Urošević (2014) The spread of <i>T. s. scripta</i> has been documented in Spain (Martínez Silvestre et al. 2006; Alarcos et al. 2010; Valdeón et al. 2010), Sweden, Finland (Bringsøe 2006) and Austria (Kleewein 2014). There are also online reports of this subspecies from several islands in Greece: Corfu, Crete and Kos (Balej & Jablonski 2006-2014).</p> |
| <p>8. Is the organism known to be invasive (i.e. to threaten organisms, habitats or ecosystems) anywhere in the world?</p> | <p>Yes</p> | <p>The Global Invasive Species Database (2009) lists it as a pest in Australia, Bermuda, Brazil, British Virgin Islands, Canada, Cayman Islands, Dominican Republic, France, Germany, Israel, Ruyuku Islands (Japan), Latvia, Poland, Puerto Rico, Singapore, South Africa, Spain, Taiwan and Thailand. In Spain, it is considered one of the most harmful invasive species (GEIB 2006). Despite being native to parts of the United States, it has spread to most states, including Hawaii (Somma et al. 2009b). It was introduced into most countries via the pet trade (GISD 2009; WWF 2010)</p> <p>Populations in Europe are in places considered to represent a threat to local turtle species (through competition) and the ecosystem in general (competition, predation). <i>Trachemys scripta elegans</i> is included in the IUCN/SSC Invasive Species Specialist Group's 100 Worst Invasives List.</p> |
| <p>9. Describe any known socio-economic benefits of</p> | <p>Economic profits as a result of trade of this species</p> | <p>Market trade data are not available. More</p> |

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| <p>the organism in the risk assessment area.</p> | <p>in EU</p> | <p>information can be checked in “Understanding the biological invasion risk posed by the global wildlife trade: propagule pressure drives the introduction and establishment of Nearctic turtles” (http://www.researchgate.net/profile/Pablo_Garcia_7/publication/267634539_Understanding_the_biological_invasion_risk_posed_by_the_global_wildlife_trade_propagule_pressure_drives_the_introduction_and_establishment_of_Nearctic_turtles/links/546bf3380cf2f5eb180927d6.pdf)</p> <p>TARIC CODE difficults monitoring species at this level allows upper group (reptiles) monitoring.</p> <p>Only indirect data are available from exports in US (Mali et al, 2014): Between 2002 and 2012, a total of 126,600,529 individual freshwater turtles were exported from the US. Based on the marginally significant simple linear regression ($F=3.91$; $df=1,9$; $p=0.08$), the number of exported turtles decreased on average 500,000 turtles per year over the 11 year period. However, in 2007, residual standard deviation was 2.5 times higher than the average residual standard deviation. In 2007, there was a 79% increase (18,457,520 individual turtles) compared to 2006. Overall, 53% were commercially bred, 28% were classified as farmed or ranched, and 19% were classified as wild caught individuals. When we partitioned the total exports by source, the number of captive bred exports declined after 2007 while wild caught exports increased after 2009.</p> <p>Exported Taxa The following genera were exported: <i>Apalone</i>, <i>Chelydra</i>, <i>Chrysemys</i>, <i>Clemmys</i>, <i>Deirochelys</i>,</p> |
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| | | <p><i>Emydoidea</i>, <i>Graptemys</i>, <i>Kinosternon</i>, <i>Macroclemys</i>, <i>Malaclemys</i>, <i>Pseudemys</i>, <i>Sternotherus</i>, <i>Terrapene</i>, and <i>Trachemys</i>. Combined, <i>Pseudemys</i> and <i>Trachemys</i> represented between 61% (Florida; 1,321,202 individual turtles) and 96% (Louisiana; 81,404,579 individual turtles) of all species traded from the top four exporting states. <i>Chelydra</i> consisted of 12% (4,248,913 individuals) of the exports from California, 5% (99,846 individuals) of the exports from Texas, and 5% (125,276 individuals) of the exports from Florida. <i>Apalone</i> consisted of 25% (540,815 individuals) of all exports from Florida and 5% (99,024 individuals) from Texas. For the top four exported genera (<i>Apalone</i>, <i>Chelydra</i>, <i>Pseudemys</i>, and <i>Trachemys</i>), regression coefficients showed significant increase in traded <i>Trachemys</i> in Louisiana ($p=0.02$) and significant decrease in traded <i>Trachemys</i> in California ($p<0.01$). Traded <i>Apalone</i> significantly increased in Florida and California ($p<0.01$) while traded <i>Chelydra</i> increased in Louisiana and California ($p<0.01$).</p> |
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| SECTION B – Detailed assessment | | | |
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| PROBABILITY OF ENTRY | | | |
| <p>Important instructions:</p> <ul style="list-style-type: none"> • Entry is the introduction of an organism into Europe. Not to be confused with spread, the movement of an organism within Europe. • For organisms which are already present in Europe, only complete the entry section for current active pathways of entry or if relevant potential future pathways. The entry section need not be completed for organisms which have entered in the past and have no current pathways of entry. | | | |
| QUESTION | RESPONSE [chose one entry, delete all others] | CONFIDENCE [chose one entry, delete all others] | COMMENT |
| <p>1.1. How many active pathways are relevant to the potential entry of this organism?</p> <p>(If there are no active pathways or potential future pathways respond N/A and move to the Establishment section)</p> | few | medium | <p><i>Trachemys scripta elegans</i> is 'the' traditional pet turtle, farmed in large quantities in the southern USA for the global pet trade and in recent years also for raising for consumption in Asian countries; the latter is increasingly replaced by domestic, ex-situ farming in the consuming countries. Nearly all animals in commercial trade, which amounts to about 6 million individuals per year, are produced in near-closed-cycle farms. Wild harvest from native populations has involved mainly adult animals as breeder stock for farms, as well as adults for the domestic and international consumption trade; wild-caught females are sold to turtle farms, while surplus males enter the consumption trade. Eggs may be harvested from the wild.</p> <p>Following a ban on the import of <i>Trachemys scripta elegans</i> into the European Union as a potential invasive, the pet turtle farming industry partly shifted to <i>Trachemys scripta scripta</i>, intergrades <i>scripta</i> x <i>elegans</i>,</p> |

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| | | | <p>and other Emydid species. Attempts have been made in recent years to lift the US domestic pet trade ban. (Van Dijk, et al, 2013).</p> <p>With effect from 22 December 1997 the EU banned the import of the subspecies <i>T. scripta elegans</i> via the Protection of Species of Wild Fauna and Flora by Regulating Trade (Bringsøe 1998, 2001b, Bringsøe 2006). While it is no longer allowed to import the red-eared slider within the EU it is still legal to keep and distribute them within many EU countries. (Compiled by: IUCN SSC Invasive Species Specialist Group).</p> <p>In Spain and Portugal 23.000 exotic invasive specimens of tortoises have been caught in the wild during the LIFE+Trachemys (LIFE09 NAT/ES/000529) project implementation. Its wide spreading has been stopped in some wetlands, while the native tortoise populations have also been recovered. Natural spreading is also now one of the main spreading ways.</p> |
| <p>1.2. List relevant pathways through which the organism could enter. Where possible give detail about the specific origins and end points of the pathways.</p> <p>For each pathway answer questions 1.3 to 1.10 (copy and paste additional rows at the end of this section as necessary).</p> | <p>[Deliberate release into the wild by humans]</p> | | <p>However trade is banned in Spain since the inclusion of this species in the Spanish Catalogue of Invasive Alien Species (Act 630/2013, 2nd August, that regulates the Catalogue) many private owner still keep in captivity this species.</p> |
| <p>Pathway name:</p> | <p>[Deliberate release into the wild by humans]</p> | | |
| <p>1.3. Is entry along this pathway intentional (e.g. the organism is imported for trade) or accidental (the</p> | <p>intentional accidental</p> | <p>low medium</p> | <p>N/A</p> |

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| organism is a contaminant of imported goods)? (If intentional, only answer questions 1.4, 1.9, 1.10, 1.11) | | high very high | |
| 1.4. How likely is it that large numbers of the organism will travel along this pathway from the point(s) of origin over the course of one year? Subnote: In your comment discuss how likely the organism is to get onto the pathway in the first place. | very likely | high | Following a ban on the import of <i>Trachemys scripta elegans</i> into the European Union as a potential invasive, the pet turtle farming industry partly shifted to <i>Trachemys scripta scripta</i> , intergrades <i>scripta</i> x <i>elegans</i> , and other Emydid species (Van Dijk, et al, 2013). However not other measures were taken and internal trade is still possible in many European countries. In Spain its trade has been banned but there are many individuals, that were bought before banning, kept in private collections or as pets. |
| 1.5. How likely is the organism to survive during passage along the pathway (excluding management practices that would kill the organism)? Subnote: In your comment consider whether the organism could multiply along the pathway. | very unlikely unlikely moderately likely likely very likely | low medium high very high | N/A |
| 1.6. How likely is the organism to survive existing management practices during passage along the pathway? | very unlikely unlikely moderately likely likely very likely | low medium high very high | N/A |
| 1.7. How likely is the organism to enter Europe undetected? | very unlikely unlikely moderately likely likely very likely | low medium high very high | N/A |
| 1.8. How likely is the organism to arrive during the months of the year most appropriate for establishment? | very unlikely unlikely | low medium | N/A |

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| | moderately likely likely very likely | high very high | |
| 1.9. How likely is the organism to be able to transfer from the pathway to a suitable habitat or host? | likely | high | <p>Most of the red-eared terrapins that still survive in captivity are still probably a source for release in this kind of habitat.</p> <p>In Europe, <i>T. scripta elegans</i> are generally released in freshwater areas which are frequented by humans such as public ponds which are considered of low biological value (e.g. Kordges 1990, Thiesmeier & Kordges 1990 1991, in Bringsøe 2006). Natural habitats close to urban areas are also used for releases (Bringsøe 2006).</p> |
| 1.10. Estimate the overall likelihood of entry into Europe based on this pathway? | very likely | very high | The species is already present in many European countries. |
| <i>End of pathway assessment, repeat as necessary.</i> | | | |
| 1.11. Estimate the overall likelihood of entry into Europe based on all pathways (comment on the key issues that lead to this conclusion). | very likely | high | Together with natural spread from established populations new releases of individuals are the principal way to colonize new areas. |

| PROBABILITY OF ESTABLISHMENT | | | |
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| <p>Important instructions:</p> <ul style="list-style-type: none"> For organisms which are already well established in Europe, only complete questions 1.15 and 1.21 then move onto the spread section. If uncertain, check with the Non-native Species Secretariat. | | | |
| QUESTION | RESPONSE | CONFIDENCE | COMMENT |
| 1.12. How likely is it that the organism will be able to establish in Europe based on the similarity between climatic conditions in Europe and the organism’s current distribution? | very unlikely unlikely moderately likely likely very likely | low medium high very high | |
| 1.13. How likely is it that the organism will be able to establish in Europe based on the similarity between other abiotic conditions in Europe and the organism’s current distribution? | very unlikely unlikely moderately likely likely very likely | low medium high very high | |
| 1.14. How likely is it that the organism will become established in protected conditions (in which the environment is artificially maintained, such as wildlife parks, glasshouses, aquaculture facilities, terraria, zoological gardens) in Europe? Subnote: gardens are not considered protected conditions | very unlikely unlikely moderately likely likely very likely | low medium high very high | |
| 1.15. How widespread are habitats or species necessary for the survival, development and multiplication of the organism in Europe? | widespread | high | In its native range, <i>Trachemys scripta</i> is an inhabitant of a wide variety of waterbodies, and is most abundant in soft-bottomed shallow habitats with minimal flow, abundant access to sunlight and extensive vegetation. In Mexico, it is primarily a riverine species. In Europe, the species is an opportunistic inhabitant of freshwater habitats, generally in close proximity to human habitation |

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| | | <p>and/or recreation centres. (Van Dijk, et al, 2013).</p> <p><i>Trachemys scripta</i> is omnivorous and consumes a wide variety of plant and animal matter. Males may reach 24 cm carapace length (CL), females 29 cm. Maturity is reached at about 9-11 cm CL and two to five years in males, 15-20 cm CL and five to eight years. Longevity is about 30 years maximum. Generation time is probably around 12-15 years. Females produce 0-3 clutches of 5-20 eggs per year. Incubation takes 60-91 days. Hatchlings measure 23-35 mm (Thomas 2006, Ernst and Lovich 2009).</p> <p>In its introduced range in Europe egg deposition has been observed in Spain (de Roa and Roig, 1997; Martinez-Silvestre, 1997; Bertolero and Canicio, 2000; Capalleras and Carretero, 2000, in Cadi et al. 2004), and near Paris, France (Moran Pers. Comm., in Cadi et al. 2004). However, sex determination of the <i>Trachemys</i> embryos is temperature-dependent, with cooler incubation temperatures producing only males, and warmer incubation temperatures only females (Ewert et al. 199, in Cadi et al. 2004). Therefore, incubation temperature could be a limiting factor for the invasion of this species in parts of Europe, if hatchlings of only one sex are produced in the wild (Cadi et al. 2004). A strong bias towards female red-eared sliders has been detected in capture sampling in France. This may reflect a potential strong female bias of imported juveniles; the incubation at high temperature leads to rapid hatching, but produces females in this species with temperature dependent sex determination (Godfrey</p> |
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| | | | et al. 2003, in Prévot-Julliard et al. 2007). |
| 1.16. If the organism requires another species for critical stages in its life cycle then how likely is the organism to become associated with such species in Europe? | NA very unlikely unlikely moderately likely likely very likely | low medium high very high | |
| 1.17. How likely is it that establishment will occur despite competition from existing species in Europe? | very unlikely unlikely moderately likely likely very likely | low medium high very high | |
| 1.18. How likely is it that establishment will occur despite predators, parasites or pathogens already present in Europe? | very unlikely unlikely moderately likely likely very likely | low medium high very high | |
| 1.19. How likely is the organism to establish despite existing management practices in Europe? | very unlikely unlikely moderately likely likely very likely | low medium high very high | |
| 1.20. How likely are management practices in Europe to facilitate establishment? | very unlikely unlikely moderately likely likely very likely | low medium high very high | |
| 1.21. How likely is it that biological properties of the organism would allow it to survive eradication campaigns in Europe? | very likely | medium | Natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Luiselli et al. 1997, Martinez-Silvestre et al. 1997, Cadi et al. 2003, in Cadi & Joly 2003). The competitive advantages of the slider may also include lower age at maturity, higher fecundity, |

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| | | <p>and larger adult body size (Arvy & Servan 1998, in Cadi & Joly 2003). The minimum length of the male red-eared slider at maturity is less than that of the native European pond turtle (<i>Emys orbicularis orbicularis</i>) and the age to maturity is two to five years for <i>T. scripta elegans</i> versus six to 16 years for <i>E. orbicularis orbicularis</i> (Cagle 1950, Servan & Arvy 1997, in Ramsay et al. 2007).</p> <p>Turtles may compete for food, egg-laying sites, or basking places (Bury & Wolfheim 1973, Bury et al. 1979, Rovero et al. 1999, Lindeman 1999, in Cadi & Joly 2003). Because their metabolism is governed by body temperature, in regions where mean temperatures fall below minimum requirements basking is a vital activity (Rollinat 1934, Cagle 1946, Lebboroni & Chelazzi 1991, in Cadi & Joly 2004). In a study by Cadi and Joly (2003), <i>Emys</i> were shown to shift their basking activity toward places considered to be of lower quality, while the dominant <i>Trachemys</i> occupied the better basking sites. Basking increases body temperature and thus activates metabolism (Jackson 1971, Kepenis & McManus 1974, in Cadi & Joly 2003) and increases the ingestion rate (Parmenter 1980, in Cadi & Joly 2003).</p> <p>Other studies have also shown red-eared sliders to compete with indigenous species for food and basking sites (Frank & McCoy 1995, Williams 1999, Salzberg 2000, in Somma & Fuller 2009). The red-eared slider has also been considered occasionally aggressive towards other individuals (Cadi & Joly 2003).</p> |
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EU NON-NATIVE SPECIES RISK ANALYSIS – RISK ASSESSMENT TEMPLATE

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| | | | Pearson et al. (2015) indicates that Red-eared slider turtles (<i>Trachemys scripta elegans</i>) have been introduced to wetlands throughout the world and have negatively impacted native species, particularly other species of turtles. In our controlled feeding experiments in mesocosms juvenile red-eared slider turtles negatively impacted the growth of juvenile red-bellied turtles (<i>Pseudemys rubriventris</i>), an IUCN near threatened species and a Pennsylvania threatened species, through exploitative competition for limited food. |
| 1.22. How likely are the biological characteristics of the organism to facilitate its establishment? | very unlikely unlikely moderately likely likely very likely | low medium high very high | |
| 1.23. How likely is the capacity to spread of the organism to facilitate its establishment? | very unlikely unlikely moderately likely likely very likely | low medium high very high | |
| 1.24. How likely is the adaptability of the organism to facilitate its establishment? | very unlikely unlikely moderately likely likely very likely | low medium high very high | |
| 1.25. How likely is it that the organism could establish despite low genetic diversity in the founder population? | very unlikely unlikely moderately likely likely very likely | low medium high very high | |
| 1.26. Based on the history of invasion by this organism | very unlikely | low | |

EU NON-NATIVE SPECIES RISK ANALYSIS – RISK ASSESSMENT TEMPLATE

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| <p>elsewhere in the world, how likely is to establish in Europe? (If possible, specify the instances in the comments box.)</p> | <p>unlikely moderately likely likely very likely</p> | <p>medium high very high</p> | |
| <p>1.27. If the organism does not establish, then how likely is it that transient populations will continue to occur?</p> <p>Subnote: Red-eared Terrapin, a species which cannot reproduce in GB but is established because of continual release, is an example of a transient species.</p> | <p>very unlikely unlikely moderately likely likely very likely</p> | <p>low medium high very high</p> | |
| <p>1.28. Estimate the overall likelihood of establishment (mention any key issues in the comment box).</p> | <p>very unlikely unlikely moderately likely likely very likely</p> | <p>low medium high very high</p> | |

| PROBABILITY OF SPREAD | | | |
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| Important notes: <ul style="list-style-type: none"> Spread is defined as the expansion of the geographical distribution of a pest within an area. | | | |
| QUESTION | RESPONSE | CONFIDENCE | COMMENT |
| 2.1. How important is the expected spread of this organism in Europe by natural means? (Please list and comment on the mechanisms for natural spread.) | major | medium | <p>Natural dispersal (local): Red-eared sliders may disperse up to 2 km to lay eggs (Gibbons <i>et al.</i> 1983, in O'Keeffe 2009).</p> <p>Reproduction: Sexual maturity is reached in the third to fourth year (Obst 1983, Pupins Unpub. Data, in Pupins 2007). <i>T. scripta</i> exhibits complex courtship behaviour in the water. The female usually excavates a nest on the shore of a freshwater body or on beaches in places such as Costa Rica (Bringsøe 2006; Scalera 2006). Females may move as far as 1.6 kilometers to find a suitable nest site; the jug-shaped nest is generally up to 12 centimeters deep (Bringsøe 2006). Depending on body size and other factors up to six clutches a year containing up to 30 eggs may be laid; mean values of natural populations is around 6 to 11 eggs per clutch (Bringsøe 2006; Scalera 2006). Mean annual fecundity for <i>T. s. elegans</i> in Illinois and Louisiana is close to the 30 eggs per year (estimated by Cagle 1950 and Thomhill 1982, in Tucker 2001). Mean annual fecundity estimates for the <i>T. scripta scripta</i> from South Carolina seem exceedingly low in comparison (Tucker 2001). Incubation takes 59 to 112 days (Scalera 2006). Hatching times are weather dependent: temperatures between 22°C to 30°C for 55</p> |

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| | | <p>to 80 days are preferred (Pendlebury 2006, in Pupins 2007). Hatching of eggs requires 50 to 60 days at 26 °C. Longevity is approximately 20 years in the wild and 40 years in captivity.</p> <p>In its introduced range in Europe egg deposition has been observed in Spain (de Roa and Roig, 1997; Martinez-Silvestre, 1997; Bertolero and Canicio, 2000; Capalleras and Carretero, 2000, in Cadi et al. 2004), and near Paris, France (Moran Pers. Comm., in Cadi et al. 2004). However, sex determination of the <i>Trachemys</i> embryos is temperature-dependent, with cooler incubation temperatures producing only males, and warmer incubation temperatures only females (Ewert <i>et al.</i> 199, in Cadi <i>et al.</i> 2004). Therefore, incubation temperature could be a limiting factor for the invasion of this species in parts of Europe, if hatchlings of only one sex are produced in the wild (Cadi <i>et al.</i> 2004). A strong bias towards female red-eared sliders has been detected in capture sampling in France. This may reflect a potential strong female bias of imported juveniles; the incubation at high temperature leads to rapid hatching, but produces females in this species with temperature dependent sex determination (Godfrey <i>et al.</i> 2003, in Prévot-Julliard <i>et al.</i> 2007).</p> <p>Although chelonians might never be considered explosive breeders, the number of <i>T. s. elegans</i> individuals could surpass that of native aquatic chelonians in southern Spain, where <i>T. s. elegans</i> reach maturity earlier, are more fecund and their eggs are more fertile (Perez-Santiagosa et al, 2008).</p> <p>Habitat:</p> |
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| | | <p>Within its natural range <i>Trachemys scripta</i> lives in a wide variety of freshwater habitats including rivers, ditches, swamps, lakes and ponds (Bringsøe 2006). <i>T. scripta</i> prefers large quiet water bodies with soft bottoms, an abundance of aquatic plants and suitable basking sites (Carr 1952, Ernst <i>et al.</i> 1994, Bringsøe 2001b, in Bringsøe 2006). Although they prefer quiet waters, red-eared sliders are highly adaptable and can tolerate anything from brackish waters, to manmade canals, and city park ponds (Ernst <i>et al.</i> 1994, Cox <i>et al.</i> 1998, Salzberg 2000, in Somma & Fuller 2009). Small turtles usually limit their activity to areas of heavy floating vegetation. It is thought that the terrapins do not feed or grow beyond temperature range of 10°C to 37°C (Ramsay <i>et al.</i> 2007).</p> <p><i>Trachemys scripta</i> is omnivorous and consumes a wide variety of plant and animal matter.(Thomas 2006, Ernst and Lovich 2009)</p> <p>In Europe, <i>T. scripta elegans</i> are generally released in freshwater areas which are frequented by humans such as public ponds which are considered of low biological value (e.g. Kordges 1990, Thiesmeier & Kordges 1990 1991, in Bringsøe 2006). Natural habitats close to urban areas are also used for releases (Bringsøe 2006). Natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Luiselli <i>et al.</i> 1997, Martinez-Silvestre <i>et al.</i> 1997, Cadi <i>et al.</i> 2003, in Cadi & Joly 2003). The occurrence of the red-eared slider in a tropical urban polluted river in Brazil supports evidence of its capacity to use anthropogenic environments. Polluted rivers can offer a high amount of organic residues and food items, which can represent an advantage for such a generalist</p> |
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EU NON-NATIVE SPECIES RISK ANALYSIS – RISK ASSESSMENT TEMPLATE

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| | | | freshwater turtle species (Moll 1980, Lindeman 1996, Souza & Abe 2000, in Ferronato <i>et al.</i> 2009). |
| 2.2. How important is the expected spread of this organism in Europe by human assistance? (Please list and comment on the mechanisms for human-assisted spread.) | major | medium | <p>Intentional release: As red-eared sliders reach adulthood, many are released by their owners into natural ecosystems (Cadi <i>et al.</i> 2004).</p> <p>In Europe, <i>T. scripta elegans</i> are generally released in freshwater areas which are frequented by humans such as public ponds which are considered of low biological value (e.g. Kordges 1990, Thiesmeier & Kordges 1990 1991, in Bringsøe 2006). Natural habitats close to urban areas are also used for releases (Bringsøe 2006).</p> |
| 2.3. Within Europe, how difficult would it be to contain the organism? | with some difficult | medium | <p>Preventative measures: With effect from 22 December 1997 the EU banned the import of the subspecies <i>T. scripta elegans</i> via the Protection of Species of Wild Fauna and Flora by Regulating Trade (Bringsøe 1998, 2001b, Bringsøe 2006). While it is no longer allowed to import the red-eared slider within the EU it is still legal to keep and distribute them within many EU countries. After this legislation was passed the red-eared slider was semi-replaced in the market by other North American turtles which fetch higher prices and are imported in lower quantities (Adrados <i>et al.</i> 2002, in Bringsøe 2006). This may change if American turtle farmers manage to improve breeding success of these species in turtle farms. Unfortunately some of the species replacing the red-eared slider in the market are substantially better adapted to cold climates (such as Nova Scotia and Siberia, respectively) and probably represent a</p> |

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| | | <p>higher ecological risk; they are cryptic species and are significantly more carnivorous than the red-eared slider (P.P. van Dijk Pers. Comm. 2006).</p> <p>Physical: Sliders can be captured by hand or through various trapping devices. Floating boards used by sliders as basking sites seem very effective when equipped with baited cages on top (Scalera 2006). Sniffer dogs can be used to detect and remove both turtles and their eggs; eggs can also be found and removed by following females at nesting areas (Scalera 2006).</p> <p>Many eradication campaigns are being held in several places and various methods of elimination and trap models have been tried. Valdeon et al (2010) present the Aranzadi Turtle Trap (ATT), which has been tested with great effectiveness in a fluvial backwater stretch of the Arga River in Pamplona (Spain).</p> <p>In Spain and Portugal 23.000 exotic invasive specimens of tortoises have been caught in the wild during the LIFE+Trachemys (LIFE09 NAT/ES/000529) project implementation. Its wide spreading has been stopped in some wetlands, while the native tortoise populations have also been recovered. Natural spreading is also now one of the main spreading ways.</p> <p>An exotic invasive turtle eradication handbook has been produced as a final result of the LIFE TRACHEMYS (LIFE09 NAT/ES/000529) project. The control strategy and methods of capture and eradication of exotic species are shown in it. The most effective control method was fishing pots. Different</p> |
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EU NON-NATIVE SPECIES RISK ANALYSIS – RISK ASSESSMENT TEMPLATE

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| | | | <p>nest location techniques have been tested: dog training, ground penetration radar, and gravid female radio tracking; as well as they can be applied depending on circumstances. The diverse tested trapping methods (floating traps, baited traps, etc.) allow improving the effectiveness of catches.</p> <p>Control of <i>Trachemys scripta</i> will allow carrying out reintroduction programs of <i>Emys orbicularis</i>.</p> |
| <p>2.4. Based on the answers to questions on the potential for establishment and spread in Europe, define the area endangered by the organism.</p> | <p>France, Germany, Latvia, Poland, Spain, Greece, Italy, The Netherlands, Portugal, Slovenia, Austria, Belgium, Denmark, Ireland, United Kingdom, Finland, Czech Republic, Estonia, Lithuania, Romania, Slovakia, Bulgaria, Sweden; Luxembourg, Malta and Cyprus.</p> | <p>medium</p> | <p>Natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Luiselli et al. 1997, Martinez-Silvestre <i>et al.</i> 1997, Cadi et al. 2003, in Cadi & Joly 2003). However, a tendency for expansion of invasion range to the northern and eastern parts of Europe is also obvious: in recent publications one can find evidence of founding populations of <i>T.s.elegans</i> in Germany (Pieh and Laufer, 2006) in Poland (Najbar, 2001) and the Baltic Region (Pupins, 2007).</p> |
| <p>2.5. What proportion (%) of the area/habitat suitable for establishment (i.e. those parts of Europe were the species could establish), if any, has already been colonised by the organism?</p> | <p>10-33</p> | <p>medium</p> | <p>Mediterranean biogeographical region. Natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Luiselli et al. 1997, Martinez-Silvestre et al. 1997, Cadi et al. 2003, in Cadi & Joly 2003).</p> <p>Following the countries in which has been recorded and their biogeographical regions, it could be the following: Alpine, Mediterranean, Atlantic, Boreal, Continental and Macaronesian.</p> |

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| | | | LIST: Mediterranean, Alpine, Mediterranean, Atlantic, Boreal, Continental and Macaronesian (some parts of these regions) |
| 2.6. What proportion (%) of the area/habitat suitable for establishment, if any, do you expect to have been invaded by the organism five years from now (including any current presence)? | 10-33 | medium | <p>Mediterranean biogeographical region, since Natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Luiselli et al. 1997, Martinez-Silvestre et al. 1997, Cadi et al. 2003, in Cadi & Joly 2003).</p> <p>In Europe it is becoming increasingly abundant, especially in Portugal, Spain and France. (Van Dijk, P.P., Harding, J. & Hammerson, G.A. 2013. <i>Trachemys scripta</i>. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>).</p> <p>The Global Invasive Species Database (2009) lists it as a pest in France, Germany, Latvia, Poland and Spain.</p> <p>In Spain, it is considered one of the most harmful invasive species (GEIB 2006).</p> |
| 2.7. What other timeframe (in years) would be appropriate to estimate any significant further spread of the organism in Europe? (Please comment on why this timeframe is chosen.) | 40 | medium | It would be necessary to estimate evolution of this species long-term, taking into account biological characteristics, habitat and climate change evolution. |
| 2.8. In this timeframe what proportion (%) of the endangered area/habitat (including any currently occupied areas/habitats) is likely to have been invaded by this organism? | 10-33 | medium | Mediterranean biogeographical region since natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Luiselli et al. 1997, Martinez-Silvestre et al. 1997, Cadi et al. 2003, in Cadi & Joly 2003). |

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| | | | <p>Besides, take into account countries in which has been recorded and their biogeographical regions, it could be the following: Alpine, Mediterranean, Atlantic, Boreal, Continental and Macaronesian.</p> <p>It is basic the importance of climate change evolution in this timeframe.</p> |
| <p>2.9. Estimate the overall potential for future spread for this organism in Europe (using the comment box to indicate any key issues).</p> | <p>moderately</p> | <p>medium</p> | <p>Taking to account the following factors:</p> <p>Preventative measures: With effect from 22 December 1997 the EU banned the import of the subspecies <i>T. scripta elegans</i> via the Protection of Species of Wild Fauna and Flora by Regulating Trade (Bringsøe 1998, 2001b, Bringsøe 2006). While it is no longer allowed to import the red-eared slider within the EU it is still legal to keep and distribute them within many EU countries. After this legislation was passed the red-eared slider was semi-replaced in the market by other North American turtles which fetch higher prices and are imported in lower quantities (Adrados <i>et al.</i> 2002, in Bringsøe 2006). This may change if American turtle farmers manage to improve breeding success of these species in turtle farms. Unfortunately some of the species replacing the red-eared slider in the market are substantially better adapted to cold climates (such as Nova Scotia and Siberia, respectively) and probably represent a higher ecological risk; they are cryptic species and are significantly more carnivorous than the red-eared slider (P.P. van Dijk Pers. Comm. 2006).</p> <p>Physical measures: Sliders can be captured by hand or through various trapping devices. Floating boards used by sliders as basking sites seem very effective</p> |

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| | | <p>when equipped with baited cages on top (Scalera 2006). Sniffer dogs can be used to detect and remove both turtles and their eggs; eggs can also be found and removed by following females at nesting areas (Scalera 2006).</p> <p>Natural reproduction conditions: Mediterranean biogeographical region since natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Luiselli et al. 1997, Martinez-Silvestre et al. 1997, Cadi et al. 2003, in Cadi & Joly 2003).</p> <p>Countries in which has been recorded and their biogeographical regions, it could be the following: Alpine, Mediterranean, Atlantic, Boreal, Continental and Macaronesian.</p> <p>Climate change: It is basic the importance of climate change evolution in this timeframe.</p> <p>Natural dispersal conditions:</p> <p>Reproduction: Sexual maturity is reached in the third to fourth year (Obst 1983, Pupins Unpub. Data, in Pupins 2007). <i>T. scripta</i> exhibits complex courtship behaviour in the water. The female usually excavates a nest on the shore of a freshwater body or on beaches in places such as Costa Rica (Bringsøe 2006; Scalera 2006). Females may move as far as 1.6 kilometers to find a suitable nest site; the jug-shaped nest is generally up to 12 centimeters deep (Bringsøe 2006). Depending on body size and other factors up to six clutches a year containing up to 30 eggs may be laid; mean</p> |
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| | | <p>values of natural populations is around 6 to 11 eggs per clutch (Bringsøe 2006; Scalera 2006). Mean annual fecundity for <i>T. s. elegans</i> in Illinois and Louisiana is close to the 30 eggs per year (estimated by Cagle 1950 and Thomhill 1982, in Tucker 2001). Mean annual fecundity estimates for the <i>T. scripta scripta</i> from South Carolina seem exceedingly low in comparison (Tucker 2001). Incubation takes 59 to 112 days (Scalera 2006). Hatching times are weather dependent: temperatures between 22°C to 30°C for 55 to 80 days are preferred (Pendlebury 2006, in Pupins 2007). Hatching of eggs requires 50 to 60 days at 26 °C. Longevity is approximately 20 years in the wild and 40 years in captivity.</p> <p>In its introduced range in Europe egg deposition has been observed in Spain (de Roa and Roig, 1997; Martinez-Silvestre, 1997; Bertolero and Canicio, 2000; Capalleras and Carretero, 2000, in Cadi et al. 2004), and near Paris, France (Moran Pers. Comm., in Cadi et al. 2004). However, sex determination of the <i>Trachemys</i> embryos is temperature-dependent, with cooler incubation temperatures producing only males, and warmer incubation temperatures only females (Ewert <i>et al.</i> 199, in Cadi <i>et al.</i> 2004). Therefore, incubation temperature could be a limiting factor for the invasion of this species in parts of Europe, if hatchlings of only one sex are produced in the wild (Cadi <i>et al.</i> 2004). A strong bias towards female reared sliders has been detected in capture sampling in France. This may reflect a potential strong female bias of imported juveniles; the incubation at high temperature leads to rapid hatching, but produces females in this species with temperature dependent sex determination (Godfrey <i>et al.</i> 2003, in Prévot-</p> |
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| | | <p>Julliard <i>et al.</i> 2007).</p> <p>Habitat: Within its natural range <i>Trachemys scripta</i> lives in a wide variety of freshwater habitats including rivers, ditches, swamps, lakes and ponds (Bringsøe 2006). <i>T. scripta</i> prefers large quiet water bodies with soft bottoms, an abundance of aquatic plants and suitable basking sites (Carr 1952, Ernst <i>et al.</i> 1994, Bringsøe 2001b, in Bringsøe 2006). Although they prefer quiet waters, red-eared sliders are highly adaptable and can tolerate anything from brackish waters, to manmade canals, and city park ponds (Ernst <i>et al.</i> 1994, Cox <i>et al.</i> 1998, Salzberg 2000, in Somma & Fuller 2009). Small turtles usually limit their activity to areas of heavy floating vegetation. It is thought that the terrapins do not feed or grow beyond temperature range of 10°C to 37°C (Ramsay <i>et al.</i> 2007). <i>Trachemys scripta</i> is omnivorous and consumes a wide variety of plant and animal matter.(Thomas 2006, Ernst and Lovich 2009)</p> <p>Human conditions to dispersal: In Europe, <i>T. scripta elegans</i> are generally released in freshwater areas which are frequented by humans such as public ponds which are considered of low biological value (e.g. Kordges 1990, Thiesmeier & Kordges 1990 1991, in Bringsøe 2006). Natural habitats close to urban areas are also used for releases (Bringsøe 2006). Natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Luiselli <i>et al.</i> 1997, Martinez-Silvestre <i>et al.</i> 1997, Cadi <i>et al.</i> 2003, in Cadi & Joly 2003). The occurrence of the red-eared slider in a tropical urban polluted river in Brazil supports evidence of its</p> |
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| | | <p>capacity to use anthropogenic environments. Polluted rivers can offer a high amount of organic residues and food items, which can represent an advantage for such a generalist freshwater turtle species (Moll 1980, Lindeman 1996, Souza & Abe 2000, in Ferronato <i>et al.</i> 2009).</p> <p>Invasive potential: <i>Trachemys scripta elegans</i> is included in the IUCN/SSC Invasive Species Specialist Group's 100 Worst Invasives List. (Van Dijk et al, 2013).</p> |
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| PROBABILITY OF IMPACT | | | |
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| Important instructions: <ul style="list-style-type: none"> • When assessing potential future impacts, climate change should not be taken into account. This is done in later questions at the end of the assessment. • Where one type of impact may affect another (e.g. disease may also cause economic impact) the assessor should try to separate the effects (e.g. in this case note the economic impact of disease in the response and comments of the disease question, but do not include them in the economic section). • Note questions 2.10-2.14 relate to economic impact and 2.15-2.21 to environmental impact. Each set of questions starts with the impact elsewhere in the world, then considers impacts in Europe separating known impacts to date (i.e. past and current impacts) from potential future impacts. Key words are in bold for emphasis. | | | |
| QUESTION | RESPONSE | CONFIDENCE | COMMENTS |
| 2.10. How great is the economic loss caused by the organism within its existing geographic range, including the cost of any current management? | minimal | medium | While this species can certainly cause ecological damage wherever competition with threatened native terrapins is an issue, the economic loss caused by <i>Trachemys scripta elegans</i> appears to be minor throughout its existing geographic range. |
| 2.11. How great is the economic cost of the organism currently in Europe excluding management costs (include any past costs in your response)? | minimal | medium | Excluding management cost there are not concrete data. The red-eared slider's economic impact is apparent in the methods of management and control employed due to its invasion. Methods of removing the red-eared sliders require time, effort, and funding |
| 2.12. How great is the economic cost of the organism likely to be in the future in Europe excluding management costs? | minimal | medium | <p>The red-eared slider's economic impact is apparent in the methods of management and control employed due to its invasion. Methods of removing the red-eared sliders require time, effort, and funding.</p> <p>There are virtually no means by which <i>Trachemys scripta elegans</i> could cause direct negative economic effects. The three main risks would be due to: 1. predation on commercially valuable fish stocks (in fishing lakes or freshwater fish farms), although adults of this species are largely herbivorous and have almost</p> |

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| | | | no impact on fish populations; 2. the possible disruption of economically important activities (e.g. the leisure use of freshwater bodies) due to the perceived or actual dangers caused by pathogens, such as Salmonella, known to be carried by this species; 3. Damage to commercial watercress beds due to the feeding activities of adult terrapins. These risks, however, are so minimal as to be unmeasurable. |
| 2.13. How great are the economic costs associated with managing this organism currently in Europe (include any past costs in your response)? | major | high | In Spain and Portugal 23.000 exotic invasive specimens of tortoises have been caught in the wild during the LIFE+Trachemys (LIFE09 NAT/ES/000529) project implementation. Its wide spreading has been stopped in some wetlands, while the native tortoise populations have also been recovered. Natural spreading is also now one of the main spreading ways. This project had a budget of: 1,200,754.00 € |
| 2.14. How great are the economic costs associated with managing this organism likely to be in the future in Europe? | major | medium | If no measures are taken cost of control will increase rapidly. |
| 2.15. How important is environmental harm caused by the organism within its existing geographic range excluding Europe? | major | high | Parasite host-switching is of big concern with reference to native <i>M. leprosa</i> turtles in natural environments of Southern France and Northern Spain (Meyer et al, 2015). As a result, invasion of <i>T. s. elegans</i> , together with its associated parasitic load, could be a key stressor to endemic turtle species (Meyer et al, 2015). It is invasive in Japan: https://www.nies.go.jp/biodiversity/invasive/DB/detail/30050e.html According to the Global Invasive Species Database is managed by the Invasive Species Specialist Group (ISSG) of the IUCN the Location Specific Impacts: Asia |

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| | | <p>Competition: The CITES (2003, in Ramsay et al. 2007) report on the trade in chelonians noted that if there is competition with other terrapins, it is more likely to be in temperate regions where basking becomes more important.</p> <p><u>Australia</u></p> <p>Ecosystem change: Overseas, red-eared sliders have had major impacts (eg. Levell 2000) and could present a similar hazard in Australia (Burgin 2006).</p> <p><u>New South Wales (Australia)</u></p> <p>Competition: Competition from this exotic species could have a detrimental impact on local species such as the common snake-neck turtle (<i>Chelodina longicollis</i>) and the Sydney Basin Turtle (<i>Emydura macquararii dharuk</i>) (Burgin 2006).</p> <p><u>Queensland (Australia)</u></p> <p>Competition: Red-eared sliders have the potential to multiply rapidly and spread through Queensland's waterways, becoming the most common turtle in creeks and rivers and replacing native turtles (NRM&W). Disease transmission: Red-eared sliders have the potential to carry new diseases and pathogens to native turtles and other aquatic wildlife (NRM&W).</p> <p><u>Sydney (Australia)</u></p> <p>Competition: Competition from this exotic species could have a detrimental impact on the local species, the common snake-neck turtle (<i>Chelodino longicollis</i>) and the Sydney basin turtle <i>Emydura macquararii dhoruk</i> (Shelley 2007).</p> <p><u>Bermuda</u></p> <p>Ecosystem change: The full extent of its impact on freshwater ecosystems in Bermuda has not been extensively studied (Bacon Gray & Kitson 2006). Reduction in native biodiversity: <i>T. scripta elegans</i> may be a threat to endemic fish species in brackish ponds</p> |
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| | | <p>(De Silva 2003, in Varnham 2006), for example the endemic and endangered killifish (<i>Fundulus bermudae</i>) on which the red-eared slider may prey on in sympatric ponds.</p> <p><i>T. scripta elegans</i> also inhabits some of the only habitat for the diamondback terrapin (<i>M. terrapin</i>); a highly localised native species. The ecological impact of the red-eared slider on native chelonians in other regions has been documented, however, the impact on the Bermudian diamondback is currently unknown (Outerbridge 2008). Local conservationists fear that the feral sliders are competing with the diamondbacks for nesting sites; all known nesting sites for the diamondback in Bermuda are limited to six small sand bunkers on a golf course, of which three are also being used by sliders; further studies are needed to determine the extent to which diamondbacks are being negatively affected by sliders (Outbridge 2008).</p> <p><u>Brazil</u></p> <p>Competition: <i>P. Geoffroanus</i> feeds mainly on Chironomidae larvae (Souza & Abe 2000, in Ferronato et al. 2009), which could possibly also be a prey for red-eared sliders.</p> <p><i>T. scripta elegans</i> has a large dispersal and dispersion capacity (Gibbons 1990, Bodie & Semlitsch 2000, in Ferronato et al. 2009). It also seems to be more aggressive than other freshwater turtles (Bels et al. 2008, in Ferronato et al. 2009).</p> <p><i>P. geoffroanus</i> nests in the anthropogenic forest of the Piracicamirim stream. This area could be suitable as nesting habitat for <i>T. scripta elegans</i> as well. Predation of <i>P. geoffroanus</i> nests occurs, however, <i>T. scripta elegans</i> nests can be located at great distances from the water (Mount 1975, in Ferronato et al. 2009) and their eggs can be laid 140 cm deep (Packard et al. 1997, in</p> |
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| | | <p>Ferronato et al. 2009). These characteristics could act defensively against local predators (Ferronato et al. 2009).</p> <p>While Cadi & Joly (2003 2004) noted competition for basking sites between native turtles (<i>Emys orbicularis</i>) and introduced red-eared sliders Ferronato and colleagues (2009) have no evidence of competition with native species (<i>Hydromedusa tectifera</i> and <i>P. geoffroanus</i>) as water temperature is considerably milder than in Europe, reducing the need for basking.</p> <p>Human health: Red-eared sliders may pose a potential risk to human health as they carry salmonella (de Sa and Solari 2001).</p> <p><u>British Virgin Islands</u></p> <p>Other: Ecological impacts remain unstudied, but are likely to be small because of the localised nature of the invasion and the artificial nature of the habitat (Perry et al. 2007).</p> <p><u>Canada</u></p> <p>Competition: In Ontario, Red-eared Sliders that have been released into Grenadier Pond have established a local population that apparently competes directly with the natural turtle population (Dog Legislation Council of Canada 1998, in Bunnell 2005).</p> <p>Disease transmission: The western painted turtle has been observed at the pond in the Richmond Nature Centre in the past (Griffith 2000, in Bunnell 2005). Sanders and colleagues (2004, in Bunnell 2005) noted attempted nest-building by sliders at the pond, indicating that the species is present and potentially capable of sharing pathogens with native turtles.</p> <p><u>Cayman Islands</u></p> <p>Hybridisation: The red eared slider <i>Trachemys scripta</i> has the potential to hybridise with native Taco River slider (<i>Trachemys decussata angusta</i>) (Cottam,</p> |
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| | | <p>2004 in Varnham, 2006).</p> <p><u>Dominican Republic</u></p> <p>Hybridisation: <i>T. scripta</i> competes and hybridises with native turtles (Powell et al. 2000), possibly diluting unique gene pools (Powell & Inchaustegui 2009).</p> <p><u>France</u></p> <p>Competition: Red-eared slider reproduction has been recorded in three places where the European pond turtle (<i>Emys orbicularis</i>) is living. There is a wide overlap in their ecological niches.</p> <p>Threat to endangered species: The IUCN Red List Near Threatened European pond turtle <i>Emys orbicularis</i>, in particular the subspecies <i>Emys orbicularis galloitalica</i>, face competitive pressure from introduced red-eared sliders.</p> <p><u>Germany</u></p> <p>Ecosystem change: The concern for the natural environment became obvious from the 1980s (especially in Germany), because increasing numbers of red-eared sliders were released (Bringsøe 2006).</p> <p><u>Israel</u></p> <p>Competition: In Israel, <i>T. scripta</i> is believed to compete with <i>Mauremys caspica</i> (Bouskila 1986, in Ramsay et al. 2007).</p> <p><u>Ryukyu Islands (Japan)</u></p> <p>Other: Various types of impacts on the indigenous biodiversity have been shown for feral populations of <i>T. scripta elegans</i> outside Japan (Lever 2003, Cadi & Joly 2004, in Ota et al. 2004). However, no pertinent data are available yet for the Ryukyu population.</p> <p><u>Latvia</u></p> <p>Threat to endangered species: Spread of invasion of <i>T. scripta elegans</i> in Latvia, besides the influence of this species on the habitat, can result in a direct competition of the species with the extremely rare Latvian species of</p> |
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| | | <p>turtle <i>Emys orbicularis</i> (Pupins 2005, Pupins & Pupina 2005, in Pupins 2007).</p> <p><u>Poland</u> Competition: On the market, the substitute for the red-eared terrapin has presently become Troost's terrapin <i>Trachemys scripta troostii</i>, since other turtles are too expensive. Troost's terrapin may also pose a threat for the native European pond turtle <i>Emys orbicularis</i>.</p> <p><u>Boqueron State Wildlife Refuge (Puerto Rico)</u> Disease transmission: The red-eared slider (<i>Trachemys scripta elegans</i>) is a known potential vector of diseases that can be transmitted to humans (e.g. <i>Salmonella</i>) (Felix Grana., pers.comm., November 2007). Reduction in native biodiversity: The red-eared slider (<i>Trachemys scripta elegans</i>) is reported to compete with the endemic Puerto Rican slider, <i>Trachemys stejnegeri stejnegeri</i> (see <i>Trachemys stejnegeri</i> in IUCN Red List of Threatened Species) (Felix Grana., pers.comm., November 2007).</p> <p><u>Singapore</u> Competition: Sulaiman (2002, in Ramsay et al. 2007) noted that a major concern for conservationists in Singapore was that sliders may outcompete local species, such as the spiny terrapin and the Malayan box terrapin (<i>Cuora amboinensis</i>). Sulaiman (2002) noted that a female slider can produce up to a dozen eggs twice a year and may out-breed the Malayan box terrapin that lays two eggs each time. Other: The large numbers of <i>T. scripta elegans</i> imported into Singapore for sale as pets every year, some of which may be released, is a cause for concern (Sulaiman 2002, in Goh & O'Riordan 2007) because they are present in many freshwater bodies. Some localities, such as the Botanic Gardens, Bedok</p> |
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| | | <p>Reservoir and Bukit Batok Town Park, have high population densities (Goh 2004, in Goh & O’Riordan 2007). It is unknown what adverse effects, if any, <i>T. scripta elegans</i> as an alien species may have.</p> <p><u>South Africa</u></p> <p>Competition: In South Africa it is suspected that <i>T. scripta</i> has displaced the native <i>Pelomedusa subrufa</i> through competition (Ramsay et al. 2007).</p> <p><u>Spain</u></p> <p>Competition: Although chelonians might never be considered explosive breeders, the number of <i>T. scripta elegans</i> individuals could surpass that of native aquatic chelonians in southern Spain, where <i>T. scripta elegans</i> reach maturity earlier, are more fecund and their eggs are more fertile (Perez-Santigosa Diaz-Paniagua & Hidalgo-Vila 2008). Also, the absence of Spanish terrapins in areas with high predation risk occupied by <i>T. scripta</i> (Pleguezuelos 2002, in Polo-Cavia, Lopez & Martin 2007) suggests that native species are more sensitive to predation pressure. Although these freshwater turtles are predominately aquatic, they have to come to land for basking, where they are potential prey of birds and mammals (Greene 1988, Martin & Lopez 1990, in Polo-Cavia, Lopez & Martin 2007). Behavioral asymmetries could contribute to the greater competitive ability of introduced <i>T. scripta</i> within anthropogenically disturbed environments (Polo-Cavia, Lopez & Martin 2007). Polo-Cavia Lopez & Martin (2009a) hypothesised that interspecific differences in morphology, and thus, in heating and cooling rates, might confer competitive advantages to introduced <i>T. scripta</i>. <i>T. scripta</i> showed a more rounded shape than <i>M. leprosa</i>, a lower surface-to-volume ratio and a greater thermal inertia, which facilitates body heat retention and favors the</p> |
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| | | <p>performance of activities and physiological functions such as foraging or digestion, thus aggravating the competition process with native turtles in Mediterranean habitats.</p> <p>Ecosystem change: In studies by Polo-Cavia Lopez & Martin (2009b) <i>M. leprosa</i> preferred water with chemical stimuli of conspecifics and avoided water with chemical cues of <i>T. scripta</i> (while <i>T. scripta</i> showed no preference) which suggests that chemical cues could be used by native <i>M. leprosa</i> to avoid water pools occupied by introduced <i>T. scripta</i>. The authors suggest that this avoidance behavior of native <i>M. leprosa</i> may be one of the causes that contributes to the observed displacement of their populations by the invasive <i>T. scripta</i>.</p> <p>Threat to endangered species: In the Iberian Peninsula, the introduced red-eared slider is an invasive species that is competing and displacing the endangered native Spanish terrapin (<i>Mauremys leprosa</i>) (Polo-Cavia, Lopez & Martin 2007). The introduction of exotic turtles is considered to threaten the status of the two native species of aquatic turtles (European pond turtle (<i>Emys orbicularis</i>) and <i>M. leprosa</i>), which are at present listed as vulnerable, with declining populations (Pleguezuelos et al. 2004, in Perez-Santigosa Diaz-Paniagua & Hidalgo-Vila 2008).</p> <p><u>Taiwan</u></p> <p>Herbivory: In the Taipei Botanical Garden, released individuals of the sliders have almost eradicated the vegetation (water lilies) in a pond (Ramsay et al. 2007). Reduction in native biodiversity: Lue and Chen (1996, in Ramsay et al. 2007) suggested that the wide ecological tolerance and dietary habits of sliders may cause impacts on indigenous chelonians in Taiwan.</p> <p><u>Thailand</u></p> |
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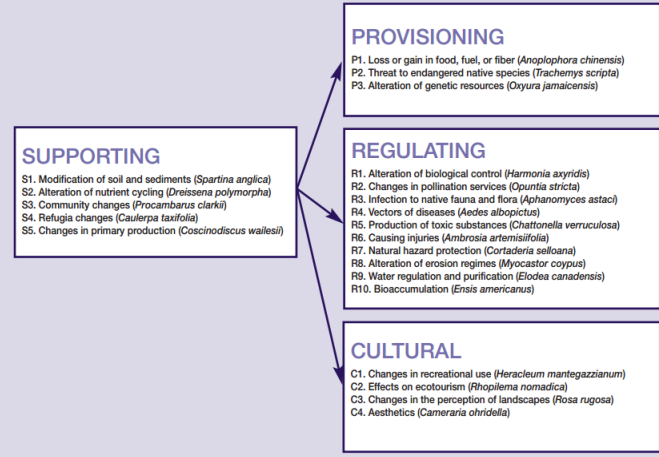
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| | | | <p>Competition: The red-eared slider has the potential to disrupt native turtle populations (Thirakhupt & van Dijk 1994). <u>United States (USA)</u> Human health: The red-eared slider may carry diseases harmful to humans and many other species. For example, it is considered a potential vector of Salmonella (Scalera 2006). <u>Arizona (United States (USA))</u> Other: Potential negative consequences of the widespread introduction of sliders are little-studied, and in some cases may be benign, including in Arizona (Stitt 2005). Stitt (2005) writes "In completely urban settings, where wetlands have been created where once there were none, sliders may provide a glimpse of nature to people otherwise removed from wilderness. There, they join park ducks, swans, and squirrels and provide enjoyment to a sedentary society that appreciates nature, any nature, regardless of origin. In these urban aquatic islands, perhaps red-eared sliders have their place, feeding on koi and grass carp, and being chased into the water by little kids and dogs." <u>California (United States (USA))</u> Competition: Red-eared sliders (<i>Trachemys scripta elegans</i>) out-compete native turtles, such as the western pond turtle (see <i>Clemmys marmorata</i> in IUCN Red List of Threatened Species), for food and basking spots. Disease transmission: Red-eared sliders (<i>Trachemys scripta elegans</i>) may introduce new diseases to native turtle populations.</p> |
| 2.16. How important is the impact of the organism on biodiversity (e.g. decline in native species, changes in native species communities, hybridisation) currently in | major | medium | Populations in Europe are in places considered to represent a threat to local turtle species (through competition). <i>Trachemys scripta elegans</i> is included in |

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| <p>Europe (include any past impact in your response)?</p> | | | <p>the IUCN/SSC Invasive Species Specialist Group's 100 Worst Invasives List. (Van Dijk et al, 2013). The introduction of exotic species has contributed to the global loss of biodiversity and to the increase in the number of threatened or endangered species (Wilson 1988, in Cadi et al. 2004).</p> <p>Competitive interactions between <i>T. scripta elegans</i> and the European pond turtle (<i>Emys orbicularis</i>) are of particular interest, as the latter is registered as an endangered species (Appendix II of the Bern Convention, Corbett 1989, Luiselli et al. 1997, Martinez-Silvestre et al. 1997, in Cadi & Joly 2003, see Competition).</p> <p>Turtles introduced near Paris were revealed to have consumed aquatic plants and animals (mostly arthropods and molluscs)(Prévot-Julliard et al. 2007, in Teillac-Deschamps et al. 2008)</p> |
| <p>2.17. How important is the impact of the organism on biodiversity likely to be in the future in Europe?</p> | <p>major</p> | <p>high</p> | <p>The competitive advantages of the slider may include lower age at maturity, higher fecundity, and larger adult body size (Arvy & Servan 1998, in Cadi & Joly 2003). Turtles may compete for food, egg-laying sites, or basking places (Bury & Wolfheim 1973, Bury et al. 1979, Rovero et al. 1999, Lindeman 1999, in Cadi & Joly 2003). In a study by Cadi and Joly (2003), <i>Emys</i> were shown to shift their basking activity toward places considered to be of lower quality, while the dominant <i>Trachemys</i> occupied the better basking sites. Other studies have also shown red-eared sliders to compete with indigenous species for food and basking sites (Frank & McCoy 1995, Williams 1999, Salzberg 2000, in Somma & Fuller 2009). The red-eared slider has also been considered occasionally aggressive towards other</p> |

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| | | | <p>individuals (Cadi & Joly 2003).</p> <p>Competitive interactions between <i>T. scripta elegans</i> and the European pond turtle (<i>Emys orbicularis</i>) are of particular interest, as the latter is registered as an endangered species (Appendix II of the Bern Convention, Corbett 1989, Luiselli et al. 1997, Martinez-Silvestre et al. 1997, in Cadi & Joly 2003, see Competition).</p> <p>Continuous releasing of exotic pet turtles in natural ecosystems increases the risk of parasite transmission to native species, and highlights the impending need for regulation of pet turtle trade in Europe (Hidalgo-Vila et al. 2008); the red-eared slider is known to carry nematodes (Hidalgo-Vila et al. 2008).</p> <p>Turtles introduced near Paris were revealed to have consumed aquatic plants and animals (mostly arthropods and molluscs, Prévot-Julliard et al. 2007, in Teillac-Deschamps et al. 2008).</p> <p>Parasite host-switching is of big concern with reference to native <i>M. leprosa</i> turtles in natural environments of Southern France and Northern Spain (Meyer et al, 2015). As a result, invasion of <i>T. s. elegans</i>, together with its associated parasitic load, could be a key stressor to endemic turtle species. (Meyer et al, 2015)</p> |
| <p>2.18. How important is alteration of ecosystem function (e.g. habitat change, nutrient cycling, trophic interactions), including losses to ecosystem services, caused by the organism currently in Europe (include any past impact in your response)?</p> | <p>moderate</p> | <p>low</p> | <p>The impacts of <i>T. scripta</i> on natural habitats and ecosystems are unknown; should the red-eared slider be released in natural habitats with high ecological value, it would be relevant to monitor any consequences on native fauna and flora, typically invertebrates, amphibians, native turtles and nesting birds (Bringsøe</p> |

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| | | | <p>2006). <i>Trachemys script elegans</i> which competes with the European pond turtle for food and basking spaces.</p> <p>Invasive species in Europe causing a variety of impacts on ecosystem services include (a) American crayfish (<i>Procambarus clarkii</i>), (b) common slider (<i>Trachemys scripta elegans</i>), (c) prickly pear cactus (<i>Opuntia maxima</i>), and (d) muskrat (<i>Ondatra zibethicus</i>) (Villa e al. 2010).</p> <p>Examples of impact types of invasive species in Europe, classified into four categories of ecosystem services, based on Binimelis et al. (2007). PROVISIONING: P2. Threat to endangered native species (<i>Trachemys scripta</i>)</p>  <p>SUPPORTING S1. Modification of soil and sediments (<i>Spartina anglica</i>) S2. Alteration of nutrient cycling (<i>Dreissena polymorpha</i>) S3. Community changes (<i>Procambarus clarkii</i>) S4. Refugia changes (<i>Caulerpa taxifolia</i>) S5. Changes in primary production (<i>Coccolodiscus walleisii</i>)</p> <p>PROVISIONING P1. Loss or gain in food, fuel, or fiber (<i>Azopoghora chinensis</i>) P2. Threat to endangered native species (<i>Trachemys scripta</i>) P3. Alteration of genetic resources (<i>Oxyura jamaicensis</i>)</p> <p>REGULATING R1. Alteration of biological control (<i>Harmonia axyridis</i>) R2. Changes in pollination services (<i>Oxania stricta</i>) R3. Infection to native fauna and flora (<i>Aphanomyces astaci</i>) R4. Vectors of diseases (<i>Aedes albopictus</i>) R5. Production of toxic substances (<i>Chattoneella verruculosa</i>) R6. Causing injuries (<i>Ambrosia artemisiifolia</i>) R7. Natural hazard protection (<i>Cortaderia selloana</i>) R8. Alteration of erosion regimes (<i>Myocastor coypus</i>) R9. Water regulation and purification (<i>Elodea canadensis</i>) R10. Bioaccumulation (<i>Ensis americanus</i>)</p> <p>CULTURAL C1. Changes in recreational use (<i>Heracleum mantegazzianum</i>) C2. Effects on ecotourism (<i>Rhopilema nomadica</i>) C3. Changes in the perception of landscapes (<i>Rosa rugosa</i>) C4. Aesthetics (<i>Cameraria ohridella</i>)</p> |
| <p>2.19. How important is alteration of ecosystem function (e.g. habitat change, nutrient cycling, trophic interactions), including losses to ecosystem services,</p> | <p>major</p> | <p>low</p> | <p>The impacts of <i>T. scripta</i> on natural habitats and ecosystems are unknown; should the red-eared slider be released in natural habitats with high ecological value, it</p> |

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| <p>caused by the organism likely to be in Europe in the future?</p> | | | <p>would be relevant to monitor any consequences on native fauna and flora, typically invertebrates, amphibians, native turtles and nesting birds (Bringsøe 2006). <i>Trachemys scripta elegans</i> which competes with the European pond turtle for food and basking spaces.</p> <p>Many aquatic organisms have significant effects on ecosystem functioning and benthic communities.</p> <p>Considering the large density and the high biomass of fresh-water turtles in aquatic ecosystems (Congdon et al., 1986), it is important to recognize the impact that <i>T. s. elegans</i> may have on pond ecosystems and community dynamics. While omnivorous feeding can directly affect ecosystems by influencing aquatic food webs on different trophic levels (McCann and Hastings, 1997; Duffy, 2002), <i>T. s. elegans</i> may also potentially alter ecosystem functioning through influencing resource availability, increasing habitat disturbance, or modulating environmental conditions such as sediment accumulation, pH or conductivity (Hooper et al., 2005).</p> |
| <p>2.20. How important is decline in conservation status (e.g. sites of nature conservation value, WFD classification) caused by the organism currently in Europe?</p> | <p>major</p> | <p>high</p> | <p>The Florida common slider (<i>Trachemys scripta</i>) can wipe out amphibian species in good conservation status habitats.</p> |
| <p>2.21. How important is decline in conservation status (e.g. sites of nature conservation value, WFD classification) caused by the organism likely to be in the future in Europe?</p> | <p>major</p> | <p>medium</p> | <p>The impacts of <i>T. scripta</i> on natural habitats and ecosystems are unknown; should the red-eared slider be released in natural habitats with high ecological value, it would be relevant to monitor any consequences on native fauna and flora, typically invertebrates, amphibians, native turtles and nesting birds (Bringsøe</p> |

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| | | | 2006). |
| 2.22. How important is it that genetic traits of the organism could be carried to other species, modifying their genetic nature and making their economic, environmental or social effects more serious? | No data available | | |
| 2.23. How important is social, human health or other harm (not directly included in economic and environmental categories) caused by the organism within its existing geographic range? | Major | High | <p>Reptiles, including turtles, are well-recognised reservoirs for Salmonella, and are a source of human salmonellosis (Nagano <i>et al.</i> 2006).</p> <p><i>Clostridium butyricum</i> BoNT/E was isolated from water from tanks housing pet ‘yellow-bellied’ terrapins (<i>Trachemys scripta scripta</i>): in case A the terrapins were in the infant’s home; in case B a relative fed the terrapin prior to holding and feeding the infant when both visited another relative. <i>C. butyricum</i> isolates from the infants and the respective terrapin tank waters were indistinguishable by molecular typing. Review of a case of <i>C. butyricum</i> BoNT/E botulism in the UK found that there was a pet terrapin where the infant was living. It is concluded that the <i>C. butyricum</i>-producing BoNT type E in these cases of infant botulism most likely originated from pet terrapins. These findings reinforce public health advice that reptiles, including terrapins, are not suitable pets for children aged (Shelley <i>et al.</i>, 2014).</p> |
| 2.24. How important is the impact of the organism as food, a host, a symbiont or a vector for other damaging organisms (e.g. diseases)? | Major | High | <p>Continuous releasing of exotic pet turtles in natural ecosystems increases the risk of parasite transmission to native species, and highlights the impending need for regulation of pet turtle trade in Europe (Hidalgo-Vila <i>et al.</i> 2008); the red-eared slider is known to carry nematodes (Hidalgo-Vila <i>et al.</i> 2008).</p> <p>The importance of disease-mediated invasions and the role of parasite spillover as a substantial threat to the</p> |

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| | | | <p>conservation of global biodiversity are now well known. Although competition between invasive sliders <i>Trachemys scripta elegans</i> and indigenous European turtles has been extensively studied, the impact of this invasive species on diseases affecting native populations is poorly known. During winter 2012-2013 an unusual event was detected in a population of <i>Emys orbicularis</i> (Linnaeus, 1758) inhabiting a pond system in Galicia (NW Spain). Most turtles were lethargic and some had lost mobility of limbs and tail. Necropsies were performed on 11 turtles that were found dead or dying at this site. Blood flukes belonging to the species <i>Spirorchis elegans</i> were found inhabiting the vascular system of 3 turtles, while numerous fluke eggs were trapped in the vascular system, brain, lung, heart, liver, kidney, spleen, and/or gastrointestinal tissues of all necropsied animals. Characteristic lesions included miliary egg granulomas, which were mostly found on serosal surfaces, particularly of the small intestine, as well as endocarditis, arteritis, and thrombosis. The most probable cause of death in the 3 turtle specimens which were also examined histologically was a necrotic enteritis with secondary bacterial infection associated with a massive egg embolism. The North American origin of <i>S. elegans</i>, the absence of prior recorded epizootics in the outbreak area, and the habitual presence of its type host, the highly invasive red-eared slider, in this area suggest a new case of parasite spillover resulting in a severe emerging disease (Iglesias et al, 2015)</p> |
| <p>2.25. How important might other impacts not already covered by previous questions be resulting from introduction of the organism? (specify in the comment</p> | <p>NA</p> | | |

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| box) | | | |
| 2.26. How important are the expected impacts of the organism despite any natural control by other organisms, such as predators, parasites or pathogens that may already be present in Europe? | Major | Very high | Populations in Europe are in places considered to represent a threat to local turtle species (through competition) and the ecosystem in general (competition, predation). <i>Trachemys scripta elegans</i> is included in the IUCN/SSC Invasive Species Specialist Group's 100 Worst Invasives List. (Van Dijk et al, 2013). |
| 2.27. Indicate any parts of Europe where economic, environmental and social impacts are particularly likely to occur (provide as much detail as possible). | All countries include in the Mediterranean, Atlantic and Continental biogeographical regions. | high | France; Germany; Greece; Italy; The Netherlands; Spain; Portugal; Slovenia; Austria; Latvia; Poland; Belgium; Denmark; Ireland; United Kingdom; south of Finland; Czech Republic; Estonia; Lithuania; Romania; Slovakia; Bulgaria; south of Sweden; Luxembourg; Malta; Cyprus |

| RISK SUMMARIES | | | |
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| | RESPONSE | CONFIDENCE | COMMENT |
| Summarise Entry | likely | high | Natural spread from established populations and new releases are the principal way to colonize new areas. |
| Summarise Establishment | lvery likely | high | This species has a great capacity to settle in a great variety of wetlands due to the biological characteristics of the organism. |
| Summarise Spread | rapidly | medium | <p>Natural spread: <i>Trachemys scripta elegans</i> is included in the IUCN/SSC Invasive Species Specialist Group's 100 Worst Invasives List. (Van Dijk et al, 2013).</p> <p>Human conditions to dispersal: In Europe, <i>T. scripta elegans</i> are generally released in freshwater areas which are frequented by humans such as public ponds which are considered of low biological value (e.g. Kordges 1990, Thiesmeier & Kordges 1990 1991, in Bringsøe 2006). Natural habitats close to urban areas are also used for releases (Bringsøe 2006). Natural reproduction of the red-eared slider in Europe under Mediterranean climate conditions has been reported (Luiselli <i>et al.</i> 1997, Martinez-Silvestre <i>et al.</i> 1997, Cadi et al. 2003, in Cadi & Joly 2003). The occurrence of the red-eared slider in a tropical urban polluted river in Brazil supports evidence of its capacity to use anthropogenic environments. Polluted rivers can offer a high amount of organic residues and food items, which can represent an advantage for such a generalist freshwater turtle species (Moll 1980, Lindeman 1996, Souza & Abe 2000, in Ferronato <i>et al.</i> 2009).</p> |
| Summarise Impact | major | high | <p>Ecosystem and biodiversity impact:</p> <p>The introduction of exotic species has contributed to the</p> |

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| | | <p>global loss of biodiversity and to the increase in the number of threatened or endangered species (Wilson 1988, in Cadi et al. 2004). Competitive interactions between <i>T. scripta elegans</i> and the European pond turtle (<i>Emys orbicularis</i>) are of particular interest, as the latter is registered as an endangered species (Appendix II of the Bern Convention, Corbett 1989, Luiselli et al. 1997, Martinez-Silvestre et al. 1997, in Cadi & Joly 2003, see Competition).</p> <p>Populations in Europe are in places considered to represent a threat to local turtle species (through competition) and the ecosystem in general (competition, predation). <i>Trachemys scripta elegans</i> is included in the IUCN/SSC Invasive Species Specialist Group's 100 Worst Invasives List. (Van Dijk et al, 2013).</p> <p>Competitive interactions: between <i>T. scripta elegans</i> and the European pond turtle (<i>Emys orbicularis</i>) are of particular interest, as the latter is registered as an endangered species (Appendix II of the Bern Convention, Corbett 1989, Luiselli et al. 1997, Martinez-Silvestre et al. 1997, in Cadi & Joly 2003, see Competition).</p> <p>Public Health impact: Reptiles, including turtles, are well-recognised reservoirs for Salmonella, and are a source of human salmonellosis (Nagano <i>et al.</i> 2006).</p> <p>Animal Health: Continuous releasing of exotic pet turtles in natural ecosystems increases the risk of parasite transmission to native species, and highlights the impending need for regulation of pet turtle trade in Europe (Hidalgo-Vila et al. 2008); the red-eared slider is known to carry nematodes (Hidalgo-Vila et al. 2008).</p> |
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EU NON-NATIVE SPECIES RISK ANALYSIS – RISK ASSESSMENT TEMPLATE

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| | | | <p>American common sliders, <i>Trachemys scripta</i>, are opportunistic predators that changes from carnivorous in juvenile stage to omnivorous as an adult, feeding on plants and animals, insects and other invertebrates to vertebrates such as amphibians, reptiles, small mammals and birds. Then again, the antipredatory behaviour that some native amphibian tadpoles have in the presence of native terrapins, doesn't show in the presence of common sliders. Common sliders have negative impact on biodiversity as they eat several aquatic plants, which could deeply alter local vegetation, and also because it competes for other food items, basking and nesting sites, with native turtles. It can be a vector of dangerous diseases to humans, like Salmonella, and some can impose painful bites, and can spread other diseases and parasites to native turtles and wildlife, for example nematodes and bacteria (EEA 16, 2012).</p> |
| <p>Conclusion of the risk assessment</p> | <p>major</p> | <p>high</p> | <p>Impacts: Ecosystem and biodiversity, Public Health, Animal Health, Competitive interactions with native species.</p> <p>Populations in Europe are in places considered to represent a threat to local turtle species (through competition) and the ecosystem in general (competition, predation). <i>Trachemys scripta elegans</i> is included in the IUCN/SSC Invasive Species Specialist Group's 100 Worst Invasives List. (Van Dijk et al, 2013).</p> <p>Parasite host-switching is of big concern with reference to native <i>M. leprosa</i> turtles in natural environments of Southern France and Northern Spain (Meyer et al, 2015). As a result, invasion of <i>T. s. elegans</i>, together with its associated parasitic load, could be a key stressor to endemic turtle species. (Meyer et al, 2015).</p> |

EU NON-NATIVE SPECIES RISK ANALYSIS – RISK ASSESSMENT TEMPLATE

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| | | | <p>Spirorchidiasis can decimate small population (Iglesias et al, 2015), all turtle species that act as vector for these parasites should be banned.</p> <p>The import of four species (Red-eared slider (<i>Trachemys scripta elegans</i>); American bullfrog (<i>Rana catesbeiana</i>); Painted turtle (<i>Chrysemys picta</i>); American ruddy duck (<i>Oxyura jamaicensis</i>)) which constitute an ecological threat is prohibited under the Wildlife Trade Regulation (Council Regulation 338/97) primarily designed to control trade in endangered species. Member States have established inspection and control procedures under the Regulation, but there are no assessment procedures.</p> |
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| ADDITIONAL QUESTIONS - CLIMATE CHANGE | | | |
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| <p>3.1. What aspects of climate change, if any, are most likely to affect the risk assessment for this organism?</p> | <p>Temperature increase New wetlands</p> | <p>high</p> | <p>The rise in global temperature will increase the appropriate altitude and ecologic range for the species Increase of marine water levels could generate new wetland areas appropriate for the species.</p> <p>According to the document “Exotic turtles in the Netherlands: a risk assessment” (file:///C:/Users/at_tragsatec_21/Downloads/20111111_AlterraRapport2186_turtles%20(5).pdf) there are two different possible pathways for introduction of exotic species to the Netherlands: through introduction by humans (escaped/discarded pets or accidental or willing introduction) and through species extending their range to the Netherlands from populations in neighbouring countries. In both cases, their suitability for the present and expected Dutch conditions determines the probability of adult survival, reproduction success and successive population establishment. Since present conditions are generally too cold for turtle reproduction, the principle factor determining the boundary conditions for successful invasion is Climate Change. All species are assessed against this background. The risk of a turtle species becoming invasive increases: 1) if it is already present in or established at close distance to Dutch nature, 2) if it naturally occurs in or has successfully colonised areas with climatological conditions comparable to present or future Dutch ones, and 3) if it is available in the pet-trade or has 'pet potential'.</p> <p>As the climate warms redeared slider range should expand northward</p> |
| <p>3.2. What is the likely timeframe for such changes?</p> | <p>50 years</p> | <p>medium</p> | <p>It is basic the importance of climate change evolution in</p> |

EU NON-NATIVE SPECIES RISK ANALYSIS – RISK ASSESSMENT TEMPLATE

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| | | | this timeframe. |
| 3.3. What aspects of the risk assessment are most likely to change as a result of climate change? | The suitable area for establishment of the species will be increased | medium | The rise in global temperature favours species proceeding from tropical climates The increases of the suitability of some habitats for the colonization of the species will increase the speed dispersal ability of the species. |
| ADDITIONAL QUESTIONS – RESEARCH | | | |
| 4.1. If there is any research that would significantly strengthen confidence in the risk assessment please summarise this here. | | medium | Additional studies are necessary to know how the presence of the species impacts on the ecosystem services of the habitat where it occurs |

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countries are Denmark, Estonia, Finland, Faroe Islands, Germany, Greenland, Iceland, Latvia, Lithuania, Norway, Poland, European part of Russia, Sweden. The NOBANIS project will provide fact sheets on 60 of the most invasive alien species of the region, covering both animals and plant as well as microorganisms. We intend to upload 60 fact sheets - so please visit this page regularly.

NOBANIS is available from: www.nobanis.org, this page is available from: http://www.nobanis.org/files/factsheets/Trachemys_scripta.pdf

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invasive species currently provides information related to Scientific names, family, group and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page.

It is important to notice that these lists are constantly being updated, please refer to the main page

(<http://www.conabio.gob.mx/invasoras/index.php/Portada>), under the section Novedades for information on updates.

Invasive species - reptiles is available from: http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Reptiles [Accessed 30 July 2008]

Spanish: La lista de especies del Sistema de información sobre especies invasoras de México cuenta actualmente con información acerca de nombre científico, familia, grupo y nombre común, así como hábitat, estado de la invasión en México, rutas de introducción y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la página de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualización, por favor consulte la portada (<http://www.conabio.gob.mx/invasoras/index.php/Portada>), en la sección novedades, para conocer los cambios. Especies invasoras - Reptiles is available from:

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[Accessed March 2005]
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for the pest risk they pose if introduced to Australia, by calculating Vertebrate Pests Committee (VPC) Threat Categories. These categories incorporate risk of establishing populations in the wild, risk of causing public harm, and risk of becoming a pest (eg causing agricultural damage, competing with native fauna, etc). The 7-factor Australian Bird and Mammal Model was used for these assessments.

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- Lukač, M.; Horvatek , D.; Cizelj, I.; Mašala, N.; Belić, M.; Habuš, J.; Martinković, F.; Štimac, I.; Turk, N.; Prukner-Radovčić, E. Screening of selected pathogens and general health status of freshwater turtles (*Trachemys* sp.) introduced to Croatia. *Proceedings of International Conference on Diseases of Zoo and Wild Animals / Szentiks, C, A ; Schumann, A (ed). - Berlin : Leibniz Institute for Zoo and Wildlife Research , 2015. 165.*
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- Mollov I.A.; Naumov B. Y.; Dobrev D. D.; Popgeorgiev G.S. Conservation activities for European pond turtles (*Emys orbicularis*) in Bulgaria. *Herpetology Notes*, volume 6: 135-138 (2013) (published online on 22 March 2013)
- Mosimann, Denis; Cadi, Antoine., 2004. On the occurrence and viability of the European pond turtle (*Emys orbicularis*) in Moulin-de-Vert (Geneva, Switzerland): 50 years after first introduction. *Biologia (Bratislava)*. 59(Suppl. 14). 2004. 109-112. **Summary:** This paper reports on an investigation designed to survey a mixed population of *Emys orbicularis* and *Trachemys scripta elegans* in the Moulin-de-Vert reserve (Canton of Geneva, SW Switzerland) 50 years after introduction of the first *E. orbicularis*, and to study the habitat use by *E. orbicularis* there. The authors estimate the population size to be 306 +/- 10.5 turtles. This corresponds to a density of 64 individuals per hectare.

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- Neil F. Ramsay; Pek Kaye; Abigayle Ng; Ruth M. O'Riordan and Loke Ming Chou., 2007. Chapter 8: The red-eared slider (*Trachemys scripta elegans*) in Asia: a review In Biological invaders in inland waters: Profiles, distribution, and threats Vol2 Invading Nature - Springer Series In Invasion Ecology. Francesca Gherardi **Summary:** This chapter reviews what is currently known about the status of red-eared sliders in Asia, as well as the potential impact of this non-indigenous species on the native Asian biota. It includes published literature, information from websites, as well as mentioning ongoing research where known.
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- Servan, J. and Arvy, C., 1997. The introduction of *Trachemys scripta* in France: A new competitor for the European pond turtles. *Bulletin Francais de la Peche et de la Pisciculture*. 0(344-345).173-177. **Summary:** Report from France.
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