**SECTION: Research Letters**

**Assessing the risk of invasion of species in the pet trade in Brazil**

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**Appendix A: Electronic Supplementary Material**

The questions used in the Risk Assessment For Non-Native Terrestrial Vertebrates from Pereira and Ziller (2008) are in Table 1. There are 39 questions divided into four sections: (1) biological and ecological features, (2) biogeographic features, (3) social and economic features, and (4) characteristics that potentialize risk (Table 1). The final risk rating is calculated from scores attributed to each answer, which vary according to the relevance and consistency of each question/feature in contributing to invasion success. The final rating indicates the risk of a species becoming invasive if released in nature or specific habitat types, according to each species. Questions are given different weights based on three levels of impact: high (5 points), medium (3 points) or low (1 point). These levels were set according to the potential competitive advantage of species traits if introduced to an ecosystem (e.g. species able to live in habitats with a wide spectrum of changes in temperature and/or humidity - question 4.03 - may have strong competitive advantage, so potential impact is considered high). The questions on "biogeographic aspects" are attributed high impact values because propagule pressure along with history of invasion, are the most consistent predictors of invasion to date (Lockwood et al. 2005). If one species is subjected to repeat introductions (question 5.01) the greater its propagule pressure (5 points) and the greater is the chance of establishment and invasion. If a species is already established in some other location (question 5.02) higher values are assigned (7 points). If the species has a history of invasion elsewhere (question 5.05), 10 points are added. Because mammals are generally successful invaders globally, they receive the highest risk score among terrestrial vertebrates (5.5 points). The protocol is valid if 70% of the questions in each category are answered and overall risk can be rated as very low (total score below 11 points), low (total score between 11 and 32 points), moderate (total score 32 and 45 points), high (between 45 and 65 points) or very high (total score above 65 points to a maximum of 150 points) (Pereira and Ziller, 2008).

The hedgehog *Erinaceus europaeus* (Table 2)*,* chipmunk *Tamias sibiricus* (Table 3), gerbil *Meriones unguiculatus* (Table 4)*,* sugar glide *Petaurus breviceps* (Table 5)*,* skunk *Mephitis mephitis* (Table 6) and stoat *Mustela erminea* (Table 7) risk assessments are provided.

Table 1: Risk Assessment For Non-Native Terrestrial Vertebrates from Pereira and Ziller (2008). With exception of question 9.01 all other questions requires yes/no answers.

|  |  |  |  |
| --- | --- | --- | --- |
| **THE HORUS INSTITUTE FOR ENVIRONMENTAL CONSERVATION AND DEVELOPMENT** | | | |
| **RISK ASSESSMENT FOR NON-NATIVE TERRESTRIAL VERTEBRATES** | | | |
| **S**e**ction** | **Group** |  | **Question** |
| **Biological and ecological features** | | | |
| A | Reproduction | 1.01 | Does the taxon practice parental care? |
| 1.02 | Does the taxon have a short juvenile period? |
| 1.03 | Does the taxon reproduce all year round (or more than once a year)? |
| 1.04 | Does the taxon produce large offspring at every reproductive cycle? |
| Feeding group | 2.01 | Is the taxon a carnivore? |
| 2.02 | Can the taxon spend long periods without feeding? |
| 2.03 | Does the taxon feed on or degrade vegetation? |
| 2.04 | Is the taxon an omnivore or generalist (feeds on more than one food type)? |
| Ecological interactions | 3.01 | Is the taxon aggressive or a predator of other animals? |
| 3.02 | Does the taxon defend its resources (nest or food) in its territory? |
| 3.03 | Is there any natural predator of the taxon in the area? |
| 3.04 | Does the taxon use any resource (food, space, shelter) that results in competition with indigenous species? |
| 3.05 | Does the taxon use any resistance strategy in adverse situations (hibernation, early reproduction, change in fur or feathers in winter)? |
| Habitat | 4.01 | Can the taxon cover long distances? |
| 4.02 | Is the taxon capable of living in anthropic habitats (such as gardens or plantations)? |
| 4.03 | Is the taxon capable of living in habitats with a wide variation in temperature or humidity, or withstand stress? |
| **Biogeographic features** | | | |
| B | Occurrences | 5.01 | Does the taxon have a history of repeated introductions outside its native range - intentional **introductions**? |
| 5.02 | Are there records that the taxon is established outside its historically known native range? |
| 5.03 | Is the taxon endemic in its native range? |
| 5.04 | Are there records of occurrence of the taxon in breeding facilities outside its native range? |
| 5.05 | Are there records that the species is invasive in habitats outside its native range? |
| **Social and economic features** | | | |
| C | Economic relevance | 6.01 | Can the taxon be (or is it) used in animal production, breeding sites or cultivation? |
| 6.02 | Does the taxon have ornamentally attractive traits for humans that favor its breeding? |
| 6.03 | Are there records of occurrence of this taxon in habitats close to its breeding grounds (or are there records of escape from breeding grounds - **accidental introductions**)? |
| Riks posed to humans | 7.01 | Is the taxon aggressive to humans or are there any records of accidents involving humans? |
| 7.02 | Is the taxon capable of inoculating toxins or does it have any type of poison that may be harmful to humans? |
| 7.03 | Can the breeding of this taxon cause any harm to public health or put people at risk (even if through escapes or production of feces)? |
| **Characteristics that potentialize risk** | | | |
| D | Contamination by pathogens or parasites | 8.01 | Is the taxon susceptible to, or could it transmit, any disease or parasite to other indigenous species of animals? |
| 8.02 | Are there records of epidemics in this taxon (or in the genus) caused by viruses, protozoans, fungi or other parasites in other regions? |
| Class  Attributes of persistence | 9.01 | Is the taxon a mammal, bird, amphibian or reptile? |
| 10.01 | Does any wild population of the species feed on or harm agricultural production (including damage caused by pollution with feces or urine, or nesting activities) |
| 10.02 | Would the taxon be able to spread invasive plants or weeds? |
| 10.03 | Is the taxon consumed as food by people? |
| 10.04 | Would the taxon be able to deform or cause physical damage to buildings or structures (fences, houses, water or light systems, other equipment)? |
| 10.05 | Is it viable and easy to apply control practices to the taxon at a reasonable cost? |
| Use and trade | 11.01 | Are there breeding sites or shops that legally commercialize the taxon? |
| 11.02 | Is there a large number of people who trade on, use or breed the taxon in the country (including animal trafficking)? |
| 11.03 | Is it easy for breeders to obtain permits for transporting the taxon? |
| 11.04 | Are there governmental incentives for breeding the taxon or for trade? |

Table 2: Risk Assessment (Pereira and Ziller, 2008) for invasion of the hedghog *Erinaceus europaeus* in Brazilian territory.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **THE HORUS INSTITUTE FOR ENVIRONMENTAL CONSERVATION AND DEVELOPMENT** | | | | |
| **RESULT** | | | | |
| **Pontuation: 81.5** | | | **Valid Avaliation (>70% of answers)** | **High Risk** |
| **RISK ASSESSMENT FOR NON-NATIVE TERRESTRIAL VERTEBRATES** | | | | |
| **Section** | **Group** |  | **Answers *Erinaceus europaeus*** | **References** |
| **Biological and ecological features** | | | | |
| A | Reproductive Mechanisms | 1.01 | Yes | (Long, 2003) |
| 1.02 | Yes | (Bunnell, 2009; Long, 2003) |
| 1.03 | No | (Long, 2003) |
| 1.04 | Yes | (Long, 2003) |
| Food Group | 2.01 | No | (Long, 2003) |
| 2.02 | Yes | (Fowler and Racey, 1987; Fowler and Racey, 1990; Long, 2003) |
| 2.03 | No | (Jones and Norbury, 2011) |
| 2.04 | Yes | (Jones et al., 2005) |
| Ecological Interactions | 3.01 | Yes | (Hagman et al., 2015; Jackson and Green, 2000; Jackson et al., 2004; Kross et al., 2013; Long, 2003; Pimentel, 2014) |
| 3.02 | No | (Hof and Bright, 2010; Moss and Sanders, 2001; Rondinini, 2007) |
| 3.03 |  |  |
| 3.04 | Yes | (Campbell, 1973) |
| 3.05 | Yes | (Fowler and Racey, 1987; Fowler and Racey, 1990; Long, 2003) |
| Hábitat | 4.01 | No | (Long, 2003; Morris et al., 1992; Moss, 1999; Moss and Sanders, 2001; Riber, 2006) |
| 4.02 | Yes | (Baker and Harris, 2007; Dowding et al., 2010; Haigh et al., 2009; Long, 2003) |
| 4.03 | Yes | (Fowler and Racey, 1987; Fowler and Racey, 1990; Long, 2003) |
| **Biogeographic features** | | | |  |
| B | Occurrence | 5.01 | Yes | (Long, 2003) |
| 5.02 | Yes | (Long, 2003) |
| 5.03 | No | (Amori et al., 2008; Long, 2003) |
| 5.04 | Yes | (Long, 2003) |
| 5.05 | Yes | (Amori et al., 2008; DAISIE, 2015; Long, 2003) |
| **Social and economic features** | | | |  |
| C | Economic importance of the taxon | 6.01 | No | We did not found reasons encouraging the creation of this taxon for the. Meat consumption) |
| 6.02 | Yes | (Long, 2003) |
| 6.03 | Yes | (Long, 2003) |
| Risk to People | 7.01 | No | There is no record |
| 7.02 | No | There are no records of toxins inoculated by this species |
| 7.03 | Yes | (Cirak et al., 2010; English and Morris, 1969; Krawczyket al., 2015; Long, 2003; Pimentel, 2014) |
| **Characteristics that potentialize risk** | | | |  |
| D | Contamination by Pathogens and Parasites | 8.01 | Yes | (Cirak et al., 2010; English and Morris, 1969; Krawczyket al., 2015; Long, 2003; Pimentel, 2014) |
| 8.02 |  |  |
| Persistence Attributes | 9.01 | Mammal | (Long, 2003) |
| 9.02 | No | (Moss and Sanders, 2001) |
| 9.03 |  |  |
| 9.04 | No | We did not find usage records for human consumption |
| 9.05 |  |  |
| 9.06 | No | (Griffiths et al., 2015) |
| Social Actors Involved | 10.01 | No | Import and sale not allowed by Ordinance IBAMA 93/1998 |
| 10.02 |  |  |
| 10.03 | Yes | Only need waybill issued by any vet without restriction (Normative Instruction IBAMA 07/2015) |
| 10.04 | No | Import and sale not allowed by Ordinance IBAMA 93/1998 |

Table 3: Risk Assessment (Pereira and Ziller, 2008) for invasion of the chipmunk *Tamias sibiricus* in Brazilian territory.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **THE HORUS INSTITUTE FOR ENVIRONMENTAL CONSERVATION AND DEVELOPMENT** | | | | |
| **RESULT** | | | | |
| **Pontuation: 82.5** | | | **Valid Avaliation (>70% of answers)** | **High Risk** |
| **RISK ASSESSMENT FOR NON-NATIVE TERRESTRIAL VERTEBRATES** | | | | |
| **Section** | **Group** |  | **Answers *Tamias sibiricus*** | **References** |
| **Biological and ecological features** | | | |  |
| A | Reproductive Mechanisms | 1.01 | Yes | (Long, 2003) |
| 1.02 | Yes | (DAISIE, 2015; Long, 2003) |
| 1.03 | No | (NNSS, 2015) |
| 1.04 | Yes | (DAISIE, 2015; Long, 2003) |
| Food Group | 2.01 | No | (Long, 2003) |
| 2.02 | Yes | (DAISIE, 2015; Long, 2003) |
| 2.03 |  |  |
| 2.04 | Yes | (Long, 2003) |
| Ecological Interactions | 3.01 | Yes | (Forstmeier and Weiss, 2004; NNSS, 2015) |
| 3.02 |  |  |
| 3.03 | Yes | (NNSS, 2015) |
| 3.04 | Yes | (DAISIE, 2015; NNSS, 2015; Pimentel, 2014) |
| 3.05 | Yes | (Anufriev and Arkhipov, 2004; DAISIE, 2015; Long, 2003) |
| Hábitat | 4.01 | No | (DAISIE, 2015; Marmet et al., 2009; Marmet et al., 2011; NNSS, 2015) |
| 4.02 | Yes | (DAISIE, 2015; Long, 2003) |
| 4.03 | Yes | (Fløjgaard et al., 2009; NNSS, 2015) |
| **Biogeographic features** | | | |  |
| B | Occurrence | 5.01 | Yes | (Long, 2003; NNSS, 2015) |
| 5.02 | Yes | (Benassi and Bertolino, 2011; Long, 2003) |
| 5.03 | No | (Long, 2003; Tsytsulina et al., 2008) |
| 5.04 | Yes | (Long, 2003) |
| 5.05 | Yes | (Long, 2003; Tsytsulina et al., 2008) |
| **Social and economic features** | | | |  |
| C | Economic importance of the taxon | 6.01 | No | We did not found reasons encouraging the creation of this taxon the meat consumption |
| 6.02 | Yes | Sold in pet stores throughout Brazil |
| 6.03 | Yes | (DAISIE, 2015; Long, 2003; NNSS, 2015) |
| Risk to People | 7.01 | No | There are no records of accidents and aggression |
| 7.02 | No | There are no records of toxins inoculated by this species |
| 7.03 | Yes | (Bonnet et al., 2015; NNSS, 2015) |
| **Characteristics that potentialize risk** | | | |  |
| D | Contamination by Pathogens and Parasites | 8.01 | Yes | (Kim et al., 2011; Klein et al., 2015; Marsot et al., 2011; NNSS, 2015) |
| 8.02 | No | There is no epidemic events |
| Persistence Attributes | 9.01 | Mammal | (Long, 2003) |
| 9.02 | Yes | (DAISIE, 2015; Long, 2003; NNSS, 2015) |
| 9.03 | Yes | (Yi et al., 2015) |
| 9.04 | No | We did not find usage records for human consumption |
| 9.05 |  |  |
| 9.06 |  |  |
| Social Actors Involved | 10.01 | No | Import and sale not allowed by Ordinance IBAMA 93/1998 |
| 10.02 |  |  |
| 10.03 | Yes | Only need waybill issued by any vet without restriction (Normative Instruction IBAMA 07/2015) |
| 10.04 | No | Import and sale not allowed by Ordinance IBAMA 93/1998 |

Table 4: Risk Assessment (Pereira and Ziller, 2008) for invasion of the gerbil *Meriones unguicuatus* in Brazilian territory.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **THE HORUS INSTITUTE FOR ENVIRONMENTAL CONSERVATION AND DEVELOPMENT** | | | | | |
| **RESULT** | | | | | |
| **Pontuation: 88.5** | | | **Valid Avaliation (>70% of answers)** | | **High Risk** |
| **RISK ASSESSMENT FOR NON-NATIVE TERRESTRIAL VERTEBRATES** | | | | | |
| **Section** | **Group** |  | **Answers *Merioness unguiculatus*** | **References** | |
| **Biological and ecological features** | | | |  | |
| A | Reproductive Mechanisms | 1.01 | Yes | (Prates and Guerra, 2005) | |
| 1.02 | Yes | (Gulotta, 1971; Long, 2003) | |
| 1.03 | Yes | (Gulotta, 1971; Long, 2003) | |
| 1.04 | Yes | (Gulotta, 1971; Long, 2003) | |
| Food Group | 2.01 | No | (Gulotta, 1971; Long, 2003) | |
| 2.02 |  |  | |
| 2.03 | Yes | (Agren et al., 1989; Gulotta, 1971) | |
| 2.04 | Yes | (Gulotta, 1971; Long, 2003) | |
| Ecological Interactions | 3.01 | No | (Long, 2003) | |
| 3.02 |  |  | |
| 3.03 | Yes | (Long, 2003) | |
| 3.04 | Yes | (Scheiber et al., 2005; Scheibler and Wollnik, 2009) | |
| 3.05 | Yes | (Li et al., 2001; Li and Wang, 2005) | |
| Hábitat | 4.01 | No | (Long, 2003) | |
| 4.02 | Yes | (Scheiber et al., 2005; Zhong et al., 1985) | |
| 4.03 | Yes | (Gulotta, 1971; Scheiber et al., 2005) | |
| **Biogeographic features** | | | |  | |
| B | Occurrence | 5.01 | Yes | (Long, 2003) | |
| 5.02 | Yes | (Long, 2003) | |
| 5.03 | No | (Batsaikhan and Tsytsulina, 2008; Long, 2003) | |
| 5.04 | Yes | (Long, 2003) | |
| 5.05 | Yes | (DAISIE, 2015; Long, 2003) | |
| **Social and economic features** | | | |  | |
| C | Economic importance of the taxon | 6.01 | Yes | (Gulotta, 1971) | |
| 6.02 | Yes | Sold in pet stores throughout Brazil | |
| 6.03 | Yes | (Long, 2003) | |
| Risk to People | 7.01 | No | (Gulotta, 1971) | |
| 7.02 | No | There are no records of toxins inoculated by this species | |
| 7.03 | Yes | (Gaastra et al., 2009) | |
| **Characteristics that potentialize risk** | | | |  | |
| D | Contamination by Pathogens and Parasites | 8.01 | Yes | (Dubey and Lindsey, 2000; Langey and Gray, 1987) | |
| 8.02 | No | (Gulotta, 1971) | |
| Persistence Attributes | 9.01 | Mammal | (Long, 2003) | |
| 9.02 | No | (Agren et al., 1989) | |
| 9.03 |  |  | |
| 9.04 | No | We did not find usage records for human consumption | |
| 9.05 |  |  | |
| 9.06 |  |  | |
| Social Actors Involved | 10.01 | No | Import and sale not allowed by Ordinance IBAMA 93/1998 | |
| 10.02 | Yes | Common in pet stores and with large numbers of pets supporters in Brazil | |
| 10.03 | Yes | Only need waybill issued by any vet without restriction (Normative Instruction IBAMA 07/2015) | |
| 10.04 | No | Import and sale not allowed by Ordinance IBAMA 93/1998 | |

Table 5: Risk Assessment (Pereira and Ziller, 2008) for invasion of the sugar glider *Petaurus breviceps* in Brazilian territory.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **THE HORUS INSTITUTE FOR ENVIRONMENTAL CONSERVATION AND DEVELOPMENT** | | | | | |
| **RESULT** | | | | | |
| **Pontuation: 71** | | | **Valid Avaliation (>70% of answers)** | | **High Risk** |
| **RISK ASSESSMENT FOR NON-NATIVE TERRESTRIAL VERTEBRATES** | | | | | |
| **Section** | **Group** |  | **Answers *Petaurus breviceps*** | **References** | |
| **Biological and ecological features** | | | |  | |
| A | Reproductive Mechanisms | 1.01 | Yes | (Long, 2003; Smith, 1973) | |
| 1.02 | Yes | (Long, 2003) | |
| 1.03 | Yes | (Jackson, 2000; Smith, 1973) | |
| 1.04 | No | (Long, 2003; Smith, 1973) | |
| Food Group | 2.01 | No | (Long, 2003; Smith, 1973; Smith, 1982) | |
| 2.02 |  |  | |
| 2.03 | No | (Smith, 1973; Smith, 1982) | |
| 2.04 | Yes | (Long, 2003; Smith, 1973; Smith, 1982) | |
| Ecological Interactions | 3.01 | Yes | (Heinsohn et al., 2015; Stojanovic et al., 2014) | |
| 3.02 | No | (Schultze-Westrum, 1969; Smith, 1973) | |
| 3.03 |  |  | |
| 3.04 | Yes | (Booth, 2003; Lindenmayer and Cunningham, 1997; Smith, 1973) | |
| 3.05 | Yes | (Geiser, 2004; Geiser et al., 2007; Quin et al., 2010) | |
| Hábitat | 4.01 | No | (Caryl et al., 2013; Jackson, 2000; Taylor and Rohweder, 2013) | |
| 4.02 | Yes | (Caryl et al., 2013; Smith, 1973) | |
| 4.03 | Yes | (Geiser, 2004; Geiser et al., 2007; Quin et al., 2010) | |
| **Biogeographic features** | | | |  | |
| B | Occurrence | 5.01 | Yes | (Long, 2003) | |
| 5.02 | Yes | (Heinsohn et al., 2015; Long, 2003; Stojanovic et al., 2014) | |
| 5.03 | No | (Smith, 1973) | |
| 5.04 | Yes | (Booth, 2003) | |
| 5.05 | Yes | (Long, 2003) | |
| **Social and economic features** | | | |  | |
| C | Economic importance of the taxon | 6.01 | No | We did not found reasons encouraging the creation of this taxon for the meat consumption | |
| 6.02 | Yes | Sold in pet stores throughout Brazil | |
| 6.03 | No | (Long, 2003) | |
| Risk to People | 7.01 | No | (Booth, 2003) | |
| 7.02 | No | There are no records of toxins inoculated by this species | |
| 7.03 | Yes | (Nichols et al., 2015; Smith, 1973) | |
| **Characteristics that potentialize risk** | | | |  | |
| D | Contamination by Pathogens and Parasites | 8.01 | Yes | (Holz and Graham, 2008; Nichols et al., 2015; Smith, 1973) | |
| 8.02 | No | There is no epidemic events | |
| Persistence Attributes | 9.01 | Mammal | (Long, 2003) | |
| 9.02 | No | (Smith, 1973; Smith, 1982) | |
| 9.03 |  |  | |
| 9.04 | No | (Smith, 1973) | |
| 9.05 |  |  | |
| 9.06 |  |  | |
| Social Actors Involved | 10.01 | No | Common in pet stores and with large numbers of pets supporters in Brazil | |
| 10.02 |  | Common in pet stores and with large numbers of pets supporters in Brazil | |
| 10.03 | Yes | Common in pet stores and with large numbers of pets supporters in Brazil | |
| 10.04 | No | Common in pet stores and with large numbers of pets supporters in Brazil | |

Table 6: Risk Assessment (Pereira and Ziller, 2008) for invasion of the skunk *Mephitis mephitis* in Brazilian territory.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **THE HORUS INSTITUTE FOR ENVIRONMENTAL CONSERVATION AND DEVELOPMENT** | | | | |
| **RESULT** | | | | |
| **Pontuation: 79** | | | **Valid Avaliation (>70% of answers)** | **High Risk** |
| **RISK ASSESSMENT FOR NON-NATIVE TERRESTRIAL VERTEBRATES** | | | | |
| **Section** | **Group** |  | **Answers *Mephitis mephitis*** | **References** |
| **Biological and ecological features** | | | |  |
| A | Reproductive Mechanisms | 1.01 | Yes | (Long, 2003) |
| 1.02 | No | (Long, 2003) |
| 1.03 | No | (Johnson-Delaney, 2014; Long, 2003) |
| 1.04 | No | (Long, 2003) |
| Food Group | 2.01 | Yes | (Long, 2003) |
| 2.02 | Yes | (Aleksiuk and Stewart, 1977; Mustonen et al., 2013) |
| 2.03 | No | Taxon is carnivorous and there are no records of consumption or vegetation compression for any species of *Mephitis* sp. |
| 2.04 | Yes | (Long, 2003) |
| Ecological Interactions | 3.01 | Yes | (Alvarez et al., 2014; Azevedo et al., 2006; Harrison et al., 2011; Long, 2003) |
| 3.02 |  |  |
| 3.03 |  |  |
| 3.04 |  |  |
| 3.05 | Yes | (Aleksiuk and Stewart, 1977; Mustonen et al., 2013) |
| Hábitat | 4.01 | Yes | (Brashear et al., 2015; Long, 2003; Neiswenter et al., 2010; Rosatte et al., 1992) |
| 4.02 | Yes | (Harrison et al., 2011; Kowalski, 2003; Lesmeister et al., 2015) |
| 4.03 | Yes | (Mustonen et al., 2013) |
| **Biogeographic features** | | | |  |
| B | Occurrence | 5.01 | Yes | (Long, 2003) |
| 5.02 | Yes | (Long, 2003) |
| 5.03 | No | (Long, 2003; Reid and Helgen, 2008b) |
| 5.04 | Yes | (Long, 2003) |
| 5.05 | Yes | (DAISIE, 2015; Long, 2003) |
| **Social and economic features** | | | |  |
| C | Economic importance of the taxon | 6.01 | No | We did not found reasons encouraging the creation of this taxon for the meat consumption |
| 6.02 | Yes | (Long, 2003) |
| 6.03 | Yes | (Long, 2003) |
| Risk to People | 7.01 | Yes | (Johnson-Delaney, 2014) |
| 7.02 |  |  |
| 7.03 | Yes | (Barton et al., 2010; Brown et al., 2014; Dubey and Jones, 2008; Gajadhar and Forbes, 2010) |
| **Characteristics that potentialize risk** | | | |  |
| D | Contamination by Pathogens and Parasites | 8.01 | Yes | (Barton et al., 2010; Brown et al., 2014; Dubey and Jones, 2008; Gajadhar and Forbes, 2010) |
| 8.02 | Yes | (Brashear, 2013; Brown et al., 2014) |
| Persistence Attributes | 9.01 | Mammal | (Long, 2003) |
| 9.02 | No | There are no records of direct (consumption) or indirect (feces, urine, etc.) damage to agriculture |
| 9.03 |  |  |
| 9.04 | No | We did not find usage records for human consumption |
| 9.05 |  |  |
| 9.06 |  |  |
| Social Actors Involved | 10.01 | No | Import and sale not allowed by Ordinance IBAMA 93/1998 |
| 10.02 |  |  |
| 10.03 | Yes | Only need waybill issued by any vet without restriction (Normative Instruction IBAMA 07/2015) |
| 10.04 | No | Import and sale not allowed by Ordinance IBAMA 93/1998 |

Table 7: Risk Assessment (Pereira and Ziller, 2008) for invasion of the stoat *Mustela erminea* in Brazilian territory.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **THE HORUS INSTITUTE FOR ENVIRONMENTAL CONSERVATION AND DEVELOPMENT** | | | | | |
| **RESULT** | | | | | |
| **Pontuation: 68.5** | | | | **Valid Avaliation (>70% of answers)** | **High Risk** |
| **RISK ASSESSMENT FOR NON-NATIVE TERRESTRIAL VERTEBRATES** | | | | | |
| **Section** | **Group** | |  | **Answers *Mustela erminea*** | **References** |
| **Biological and ecological features** | | | | |  |
| A | Reproductive Mechanisms | | 1.01 | Yes | (Long, 2003) |
| 1.02 | No | (Csurhes and Markula, 2010; King, 2002) |
| 1.03 | No | (Csurhes and Markula, 2010; King, 2002; King and Moody, 1982) |
| 1.04 | Yes | (Csurhes and Markula, 2010; King, 2002) |
| Food Group | | 2.01 | Yes | (Long, 2003) |
| 2.02 | No | (Harris and Yalden, 2008) |
| 2.03 | No | (Hoset et al., 2014) |
| 2.04 | Yes | (King et al., 2003; Long, 2003; Martinoli et al., 2001; Remonti et al., 2007) |
| Ecological Interactions | | 3.01 | Yes | (Edwards and Forbes, 2003; Elmeros, 2006; Long, 2003; Moorhouse et al., 2003) |
| 3.02 |  |  |
| 3.03 |  |  |
| 3.04 | Yes | (Erlinge, 1983) |
| 3.05 |  |  |
| Hábitat | | 4.01 | Yes | (Gillies et al., 2007; King, 1983; Long, 2003; Reid and Helgen, 2008; Samson and Raymond, 1995; Veale et al., 2012) |
| 4.02 | Yes | (Cervinka et al., 2013; Csurhes and Markula, 2010; Klemola et al., 1999; Ratz, 2000; Smith et al., 2007) |
| 4.03 |  |  |
| **Biogeographic features** | | | | |  |
| B | Occurrence | 5.01 | | Yes | (Long, 2003) |
| 5.02 | | Yes | (Long, 2003) |
| 5.03 | | No | (Long, 2003; Reid and Helgen, 2008) |
| 5.04 | | Yes | (Long, 2003) |
| 5.05 | | Yes | (Long, 2003; Reid and Helgen, 2008) |
| **Social and economic features** | | | | |  |
| C | Economic importance of the taxon | 6.01 | | No | We did not found reasons encouraging the creation of this taxon for the meat consumption |
| 6.02 | | Yes | Sold in pet stores throughout Brazil |
| 6.03 | | No | (Long, 2003) |
| Risk to People | 7.01 | |  |  |
| 7.02 | | No | There are no records of toxins inoculated by this species |
| 7.03 | | Yes | (Burrells et al., 2013; Csurhes and Markula, 2010) |
| **Characteristics that potentialize risk** | | | | |  |
| D | Contamination by Pathogens and Parasites | 8.01 | | Yes | (Burrells et al., 2013; Csurhes and Markula, 2010; Dubay et al., 2014; Oltean et al., 2014; Pavlacik et al., 2007; Stuart et al., 2012) |
| 8.02 | |  |  |
| Persistence Attributes | 9.01 | | Mammal | (Long, 2003) |
| 9.02 | | No | There are no records of direct (consumption) or indirect (feces, urine, etc.) damage to agriculture |
| 9.03 | |  |  |
| 9.04 | | No | (Csurhes and Markula, 2010; Reid and Helgen, 2008) |
| 9.05 | | No | (Csurhes and Markula, 2010) |
| 9.06 | | No | (Csurhes and Markula, 2010; King et al., 2009) |
| Social Actors Involved | 10.01 | | No | Import and sale not allowed by Ordinance IBAMA 93/1998 |
| 10.02 | |  |  |
| 10.03 | | Yes | Only need waybill issued by any vet without restriction (Normative Instruction IBAMA 07/2015) |
| 10.04 | | No | Import and sale not allowed by Ordinance IBAMA 93/1998 |

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