# **MODULE 7: TERRESTRIAL INVERTEBRATES**

1. **What is in this module?**

This Module provides additional guidance to parties on some of the key considerations for undertaking NDFs for terrestrial invertebrates. The text of this appendix should be used to complement the generic guidance provided in (Modules 1 and 2) and not used in isolation.

This Appendix is separated into four parts. This introduction concludes Part 1. Parts 2–4 outline a 3-step process for completing NDFs for terrestrial invertebrates following the basic format developed for generic guidance on making NDFs (Module 2). A summary of the terrestrial invertebrates listed on the Appendices of CITES (as of June 2023) is provided in Annex A of this document. Module 13 offers draft case studies for selected species of the medicinal leech *Hirudo medicinalis* and the tarantula *Brachypelma smithi*.

1. **How to use this module?**

As noted, this Module follows a three-step process: (1) identification, (2) evaluation and (3) conclusion. Steps 2 and 3 are divided into subtopics. Step 2 poses a series of questions for a Scientific Authority to consider and Step 3 offers conclusions for completing NDFs, based on the information compiled via the questions in Step 2. Note that Step 2 offers the least prescriptive guidance and provides a qualitative approach for determining the risks posed by different life history characteristics of species. A ScientificAuthority should consider the scenarios offered but will ultimately be required to judge whether proposed trade is sustainable.

The different questions and conclusions are all numbered and the text of Steps 1–3 is formatted to simplify navigation of this document as follows:

* General informative text is in **black**.
* Questions and conclusions to be considered by the user are in **black**.

Text advising the user where to move to next in the guidance process is in **black.**

Users should start with Step 1, which provides advice on identifying specimens of terrestrial invertebrates. After reviewing this text, users should follow the directions in grey text and move to Step 2 or Step 3, as directed. This process should be continued until the user reaches an appropriate conclusion in Step 3. The case studies in Module 13 may be used as examples to assist the user in completing the process.

1. **Step 1: Identification**

The first step in the NDF process is to determine whether an NDF is required for international trade of the specimens in question. There are different components to this step, including the following:[[1]](#footnote-1)

* Is the specimen correctly identified?
* Is the species listed in the CITES Appendices?

If the species listed in the Appendices, is the specimen excluded by the wording of the listing, or via annotation?

These steps are generic in nature and not exclusive to trade in terrestrial invertebrates. The identification of terrestrial invertebrates can, however, be especially problematic. The ease of identifying terrestrial invertebrates in trade varies considerably by the source of specimens and purpose of trade. Adult animals that are being traded as dead specimens (e.g., butterflies) may be straightforward to examine and identify. Living specimens may be much more challenging and identification may be difficult without damaging the specimen or allowing it to escape. Furthermore, shipments of terrestrial invertebrates may involve large numbers of specimens of mixed species, including species not listed on the Appendices. Species identification is a particular challenge for live specimens of captive-bred or captive-born tarantulas. These animals are normally traded as tiny newly hatched juveniles which do not display the colours and morphological characters of an adult. In many cases it may be difficult even to determine the genus to which a juvenile belongs (Cooper et al., 2019). Furthermore, taxonomy is a dynamic science, and the classification of terrestrial invertebrates is subject to revision, sometimes resulting in multiple synonyms for the same species. There may not be scientific consensus as to the classification of some species.

**When the user is confident that the specimens are correctly identified, proceed to Step 2 of this guidance. If there is doubt as to the identification of the specimens, go to Conclusion 5.1 in Step 3.**

* 1. **Suggested resources to assist with identification of terrestrial invertebrates**

***Butterflies:***

* Canada. (2000). *CITES identification guide–butterflies: guide to the identification of butterfly species controlled under the Convention on International Trade in Endangered Species of Wild Fauna and Flora.* Government of Canada, Ottawa. ISBN 0-660-61562-2. [English, French, Spanish]. <https://tinyurl.com/mtsvdnbd>.
* d’Abrera, B. (1975). *Birdwing Butterflies of the World.* Lansdowne, Melbourne. ISBN 10: 0701803681ISBN 13: 9780701803681. [English].
* Peggie, D. (2011). *Precious and Protected Indonesian Butterflies: Kupu-kupu Indonesia yang Bernilai dan Dilindungi*. Bidang Zoologi (Museum Zoologi Bogor), Pusat Penelitian Biologi & Nagao Natural Environment Foundation Japan, Cibinong, 72 pp. ISBN: 978-602-99753-0-7.

Yen, S. and Yang, P. (2001). *Illustrated identification guide to insects protected by the CITES and Wildlife Conservation Law of Taiwan, R.O.C. Taiwan*. Council of Agriculture, Executive Yuan. ISBN: 957-01-0607-7. [English].

#### **Butterflies, beetles, scorpions, and tarantulas:**

Yen, S., Yang, P. and Wei, C. (2001). *Illustrated Identification Guide to the Insects and Spiders Listed in the CITES Appendices.* Council of Agriculture, Executive Yuan. ISBN: 957-01-0607-7. [Chinese].

#### **Leeches:**

* Davies, R.W. (1991). *Annelida, Leeches, Polychaetes and Acanthobdellids*. Ecology and Classification of North American Freshwater Invertebrate. pp. 437-479. Alberta, Canada.
* Govedich, F. R., Bain, B. A., Moser, W. E., Gelder, S. R., Davies, R. W., & Brinkhurst, R. O. (2010). *Annelida (Clitellata) Oligochaeta, Branchiobdellida, Hirudinida, and Acanthobdellida*. In J. H. Thorp & A. P. Covich (Eds.), *Ecology and Classification of North American Freshwater Invertebrates* (Third Edition ed., pp. 385-436). San Diego, CA: Academic Press / Elsevier.
* Govedich, F. R., Moser, W. E., Nakano, T., Bielecki, A., Bain, B. A., & Utevsky, A. (2019). *Subclass Hirudinida*. In D. C. Rogers & J. H. Thorp (Eds.), *Keys to Palaearctic Fauna Thorp and Covich’s Freshwater Invertebrates* (Third Edition ed., Vol. Volume IV, pp. 491-507). San Diego, CA: Academic Press/Elsevier.
* Klemm, D. J. (1985). *Identification guide to the freshwater leeches (Annelida: Hirudinea) of Florida and other southern states*. Tallahassee, Florida: Florida Department of Environmental Protection.
* Moser WE, Govedich FR, Klemm DJ. (2009). *Annelida, Euhirudinea (leeches)*. Likens GE, editor. In: *Encyclopedia of Inland Waters*. UK: Elsevier Ltd, Oxford; p.116-23.
* Moser, W. E., Govedich, F. R., & Klemm, D. J. (2009). *Annelida, Euhirudinea (leeches)*. In G. E. Likens (Ed.), *Encyclopedia of Inland Waters* (pp. 116-123). UK: Elsevier Ltd, Oxford.
* Nesemann, H., & Neubert, E. (1999). *Annelida: Clitellata: Branchiobdellida, Acanthobdellea, Hirudinea*. Heidelberg, Berlin: Spektrum Akademischer Verlag,

Saglam, N. (2004). *Key of Freshwater and Marine leeches*. Fırat University Basım Evi. 38p. [Turkish].

#### **Scorpions:**

* Rossi, Andrea. (2015). Clarification of the type locality of *Pandinus ulderigoi* with notes on the scorpions protected by CITES (Scorpiones: Scorpionidae). Arachnologische Mitteilungen. 49. 47-54. 10.5431/aramit4905. [English].

#### **Tarantulas:**

Cooper, E.W.T., West, R., and Mendoza, J. (2019). *Identification of CITES-listed Tarantulas: Aphonopelma, Brachypelma and Sericopelma species.* Commission for Environmental Cooperation, Montreal, Canada. 93 pp. ISBN: 978-2-89700-255-8; 978-2-89700-256-5. [English, French, Spanish]. <http://www.cec.org/publications/identification-of-cites-listed-tarantulas/>.

1. **Step 2: Evaluation**
   1. **Specimen Source**
      1. **Are the specimens originating in a range State for the species?**

The keeping of live invertebrates is a popular hobby in many countries. Captive breeding of these animals is a common goal for hobbyists, and a significant percentage of terrestrial invertebrates in trade are specimens that were captive-bred in countries that are outside of species’ natural distribution. For example, a review of trade found that 100% of the *Poecilotheria* tarantulastraded internationally in the years 2017–2021 were exported from countries that were not range States for the species.

Commercial enterprises may also contribute large numbers of captive-bred specimens of non-range-State species. Of the 31,190–66,594 *Ornithoptera* butterflies traded in 2017–2021,upwards of 90% were exported from non-range States.

Trade in specimens bred in captivity outside of their natural range would present negligible risk to conservation of the species in the wild. The legality and sustainability of the initial collection of wild founders may be a separate issue.

**When the user is confident the species being traded is native to the exporting country, proceed to Section 4.1.2 of this guidance. If the species is determined to not be native, go to Conclusion 5.1 in Step 3.**

* + 1. **What is the source of the specimens being traded?**

As previously noted, a large percentage of the CITES-listed terrestrial invertebrates are traded as living specimens that were bred in captivity (see *Introduction*). This is the case for most of the listed tarantulas and leeches in trade. A significant proportion of the butterflies in trade are also captive bred, although most genera are typically traded as dead adult specimens. Conversely, most of the *Pandinus* scorpions in trade are taken from the wild.

Generic guidance for confirming that specimens are truly captive-bred is provided in Resolution Conf. 10.16 (Rev CoP19) and Resolution Conf. 17.7 (Rev CoP19) (CITES, 1997, 2016). Guidance for applying CITES source codes is offered in Lyons, et al. (2017) and guidance for inspecting captive breeding and ranching facilities is discussed in Lyons, et al. (2017).

Tarantulas typically produce hundreds of eggs in a single clutch. The resulting offspring are tiny compared to the adult and will quickly disperse after completing their first exoskeleton moult within days of hatching. Scorpions produce fewer offspring, but like tarantulas, the offspring are tiny and will disperse after their first moult.

These animals are predators and will commonly cannibalize their siblings given the opportunity. In captivity they must be housed independently, and most are slow growing. Feeding large numbers of tiny predatory arachnids that must be housed separately is labour intensive. Breeders of tarantulas and scorpions therefore have a strong incentive to sell the animals they produce as soon as possible. As a result, true captive-bred arachnids are internationally traded almost exclusively as very young (and tiny) juveniles. Exports of multiple specimens of the same species will normally consist of juveniles from the same egg case, and hence will be the same size. Exports of adult or subadult captive-bred arachnids will therefore be uncommon and involve very few animals.

Rearing an arachnid from newly hatched juvenile to an adult is a significant investment of time and effort, and adults are therefore valuable. This provides an incentive to collect and trade wild-caught animals. Restrictions on exporting wild specimens provide a further incentive for exporters to launder wild-caught specimens as captive-bred. Authorities should be suspicious of any shipments of large numbers of sub-adult or adult arachnids that are declared as having been captive bred, captive-born, or ranched.

In contrast, the larvae of butterflies are herbivorous and in captivity many may be maintained together on a single host plant. Plus, butterfly larvae grow and develop quickly (compared to fossorial arachnids). Producing captive-bred adult butterflies is economically viable and the market for butterflies consists primarily of dead adult specimens to be displayed by collectors. Adult captive-bred specimens are therefore common in trade. Live specimens in trade consist of larvae or (more commonly) pupae, rather than adult butterflies. Captive-bred or ranched adult butterflies will have perfect wings, antennae, and legs, whereas wild-caught specimens may exhibit damaged wings or missing appendages.

**When the source of the specimens being traded has been determined, and a CITES source code has been assigned, proceed to the appropriate next step of this guidance as directed in the following list:**

* **If the specimens meet the criteria for** **pre-convention (source code “O”) or law enforcement (source code “I”), proceed to Conclusion 5.2 in Step 3.**
* **If the specimens meet the criteria for captive-bred (source code “C”) or bred in captivity in a registered facility per Resolution Conf. 12.10 (Rev. CoP15) (source code “D”), proceed to Conclusion 5.3 in Step 3.**
* **If the specimens were born in captivity (source code “F”); were ranched (source code “R”), or were taken from the wild (source code “W”), proceed to Section 4.2.1.**
* **If the source of the specimens is unknown (source code “U”), treat the specimens as taken from the wild and proceed to Section 4.2.1.**
  1. **Relevant Exclusions and Trade Restrictions**

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### **Is the harvest and/or export of wild-harvested specimens of the species permitted by national or sub-national legislation or regulations?**

Parties may have national or sub-national legislation or regulations in place that restrict the export of some CITES-listed terrestrial invertebrates over and above those imposed by the Convention. Export of specific species of terrestrial invertebrates could be subject to national regulations. But more typically a country may impose general restrictions on the export of wildlife, including invertebrates. These restrictions may be limited by specific criteria. For example, they may apply only to specimens taken from the wild and the export of captive-bred specimens may be permitted. Confirming the source of the specimens in trade would be critically important in those cases.

India, Panama, and the Philippines have each notified the Conference of Parties via the Secretariat about domestic trade restrictions that are stricter than required by CITES (as per Article XIV of the Convention). India has prohibited the commercial export of CITES-listed fauna taken from the wild, while Panama and the Philippines have prohibited the commercial export of all wild-taken terrestrial fauna. These prohibitions impact the export of certain species of CITES-listed terrestrial invertebrates native to those countries (Table 1). Potentially, these prohibitions may be relevant for species listed on the Appendices of CITES in the future.

Presumably, the Scientific Authority for an exporting Party would be familiar with domestic policies and would factor them into the NDF process. Nonetheless, Scientific Authorities should review relevant national policy for all proposed exports of terrestrial invertebrates. Domestic prohibitions that have been communicated to the Secretariat are noted in the individual species listings in the Species+ website available via the CITES website (CITES & UNEP-WCMC, 2023).

**When the user is confident that the proposed trade in the specimens is permitted under the national or sub-national policies of the exporting country, proceed to Section 4.2.2 of this guidance. If the trade is not permitted, go to Conclusion 5.2 in Step 3.**

### **Has an export quota been established for the species being traded?**

Guidance for the management of national export quotas is provided in Resolution Conf. 14.7 (Rev. CoP15) (CITES, 2007). The text of the Resolution notes that national export quotas should be established in response to non-detriment findings by Scientific Authorities. The Resolution further notes that export quotas apply to specimens taken from the wild unless otherwise indicated. However, quotas may be established for specimens acquired from different sources including ranched and captive bred. Export quotas that are currently in place are noted in the individual species listings in the Species+ website available via the CITES website (CITES & UNEP-WCMC, 2023).

At the time of writing, quotas had been established for export of two species of leech, one species of scorpion and one species of tarantula from five Parties (Table 2). This information may change and should be routinely reviewed for any application to export or import any specimens of terrestrial invertebrate taxa.

**If the user is confident that trade in the specimens to be traded are not subject to any export quotas, or that the volume of proposed trade will not exceed a set export quota, proceed to Section 4.2.3 of this guidance. If a relevant export quota has been established, and that quota would be exceeded if the proposed trade was permitted, go to Conclusion 5.2 in Step 3.**

### **Have recommendations to suspend trade relevant to the species being exported been issued by the Secretariat?**

At the time of writing there were five active recommendations to suspend trade in the scorpion *Pandinus imperator* and one recommendation to suspend trade in two species of butterfly (*Ornithoptera priamus* and *O. victoriae*) (Table 3).

The Scientific Authorities for the affected Parties would presumably be aware of these recommendations and should factor them into the NDF process. The list of recommendations to suspend trade is maintained by the CITES Secretariat on the CITES website (CITES, 2023a).

**If the user is confident that trade in the specimens to be traded are not subject to any recommendations to suspend trade, proceed to Section 4.3 of this guidance. If a relevant recommendation to suspend trade is in force, then it is the responsibility of the exporting country to abide by the recommendations of the Secretariat and proceed to Conclusion 5.2 in Step 3.**

## **Biological and Life History Characteristics**

The life history characteristics referenced in this section may be considered generic in nature in that they could apply to a wide range of animal and plant taxa and are not unique to terrestrial invertebrates. However, these topics have been chosen because of their specific relevance in determining the conservation risk posed by trade in terrestrial invertebrates. Issues that are irrelevant to terrestrial invertebrates have been excluded.

The degree of risk assignable for different life history characteristics ranges from low to very high. If the data needed to determine the degree of risk is lacking or unreliable, then an unknown level of risk should be assigned. But this should not be interpreted as a neutral term (see Section 4.3.6).

Overall, the degree of risk that should be assigned to trade in specimens of a species forms a continuum, with low-risk life history characteristics at one end and high-risk characteristics at the other (Fig. 4). Species of terrestrial invertebrates may be positioned somewhere on that continuum depending on their specific characteristics. And that position may vary between different subpopulations.

Each of the questions posed in **Sections 4.3.1 to 4.3.6** should be considered when completing a non-detriment finding before proceeding to step 2.3.7 for a final evaluation. A blank worksheet is provided (Table 10) which may be copied and used to compile the answers to these questions and provide an overview of the risk that trade of the specimen in question will be detrimental to the survival of the species in the wild.

|  |
| --- |
| A close-up of a document  Description automatically generated with low confidence |
| Figure 4. Risk to Wild Populations Based on Life History Characteristics |

### **What level of risk is indicated for harvest of wild specimens based on the geographic distribution of the species?**

This question focuses on the overall geographic distribution of the species, and not the distribution of subpopulations or the rarity of the species throughout its range. Generally, trade in a species with a large distribution will be less detrimental to the survival of that species in the wild (Table 4). An example of a species with a low degree of risk based solely on geographic distribution is the leech *Hirudo verbana*, which is known to occur in at least 17 European countries (UNEP-WCMC, 2023c). An example of a species with a very high degree of risk is the tarantula *Brachypelma smithi* which is found only on central Pacific coast of the State of Guerrero, Mexico (C. Fukushima et al., 2019).

Table 4. Risk Posed by Geographic Distribution

|  |  |
| --- | --- |
| **Degree of Risk** | **Description** |
| Low | Species is widely distributed throughout a large region including multiple countries. |
| Medium | Species is distributed across more than one country. |
| High | Species is distributed across more than one state or province within a single country. |
| Very high | Species distribution is restricted to specific locations within a single state or province of a country. |
| Unknown | Data are lacking or unreliable. |

Note: A precautionary approach would suggest that if the risk posed by the geographic distribution is unknown, then care should be taken before assigning a positive non-detriment finding unless that finding is supported by other life history characteristics.

### **What level of risk is indicated for harvest of wild specimens based on the size and distribution of national or sub-national populations of the species?**

This question focuses on the distribution of the species within the country of export/import, with species having more restricted distributions being more susceptible to overexploitation (Table 5). An example of a species with a low degree of risk based solely on sub-national distribution is the butterfly *Troides rhadamantus* in the Philippines, where the species widely distributed throughout the country (Böhm, 2018). An example of a species with a very high degree of risk is the tarantula *Poecilotheria smithi* which, as of 2013, was known only from two locations in Sri Lanka that were 31.42 kilometers apart (Nanayakkara et al., 2013).

Table 5. Risk Posed by National or Sub-national Population Size and Distribution

|  |  |
| --- | --- |
| **Degree of Risk** | **Indicators** |
| Low | Species is abundant and common with sub-populations widely distributed throughout the country. |
| Medium | Species is abundant and not uncommon with sub-populations unevenly distributed throughout the country. |
| High | Species is uncommon with few small sub-populations patchily distributed across the country. |
| Very high | Rare with small sub-populations restricted to very few specific locations within a single sub-national region, state or province. |
| Unknown | Data are lacking or unreliable. |

Note: A precautionary approach would suggest that if the risk posed by the national or sub-national population size and distribution is unknown, then care should be taken before assigning a positive non-detriment finding unless that finding is supported by other life history characteristics.

### **What level of risk is indicated for harvest of wild specimens based on the habitat specificity of the species?**

This question focuses on the general habitat requirements of the species but excluding food requirements. Generally, an adaptable species that can thrive in a wide variety of habitats would be expected to be less susceptible to overexploitation (Table 6). There are no good examples of CITES-listed terrestrial invertebrates that would be assessed as having a low degree of risk based solely on habitat requirements. A species with a medium degree of risk based would be *Brachypelma vagans*. This species of tarantula inhabits tropical and subtropical moist broadleaf forests including areas of moderate human disturbance, and separate life stages occur in different microhabitats (C. Fukushima et al., 2019). An example of a species with a very high degree of risk is the leech *Hirudo medicinalis* which inhabits freshwater ponds, pools and small lakes that have silty bottoms, dense submerged and emergent vegetation and gently sloping banks to allow mature females to deposit cocoons (Utevsky et al., 2014).

Table 6. Risk Posed by Habitat Specificity

|  |  |
| --- | --- |
| **Degree of Risk** | **Indicators** |
| Low | Species is adaptable and thrives in a wide variety of habitat types and/or ecological zones across its range; and/or thrives in few habitat types that are common, widely distributed across the country and not significantly declining in size or quality. |
| Medium | Species thrives in a limited variety of habitat types and/or ecological zones across its range that are not widely distributed across the country and/or are declining in size or quality. |
| High | Species thrives in few different habitat types and/or ecological zones across its range; or inhabits habitat types that are poorly distributed across the country and/or are declining in size or quality. |
| Very high | Species is dependent on one specific habitat type; or inhabits a habitat type that comprises a very minor proportion of the landscape and/or the is rapidly declining in size and/or quality. |
| Unknown | Data are lacking or unreliable. |

Note: A precautionary approach would suggest that if the risk posed by the habitat requirements is unknown, then care should be taken before assigning a positive non-detriment finding unless that finding is supported by other life history characteristics.

### **What level of risk is indicated for harvest of wild specimens based on the food specificity of the species?**

This question focuses specifically on the food requirements of the species to the exclusion of other environmental considerations. Restrictive food requirements and/or availability will increase a species’ susceptibility to overexploitation (Table 7). Any of the *Brachypelma* tarantulas would qualify as examples of species with a low degree of risk based solely on food specificity. These species are opportunistic predators that will prey on a very wide variety of arthropods and small vertebrates (Cooper, pers. obs.; West, 2005). An example of a species with a very high degree of risk is the Jamaican butterfly *Papilio homerus*. The larvae of this species have been confirmed to feed on two species of endemic plants: *Hernandia catalpaefolia* and *H. jamaicensis*. As of 2017, there were two existing populations of *P. homerus*, neither of which had access to both food plant species*.* The eastern population of the butterfly could only access *H. catalpaefolia*, while the western population could only access *H. jamaicensis* (Lehnert et al., 2017).

Table 7. Risk Posed by Food Specificity

|  |  |
| --- | --- |
| **Degree of Risk** | **Indicators** |
| Low | Species is adaptable and will readily feed on a wide variety of taxa that are abundant, widely distributed across the country, and have stable or growing populations. |
| Medium | Species feeds on few different taxa that are abundant, widely distributed across the country, and are not declining in population size and availability. |
| High | Species feeds on few different taxa that are uncommon, poorly distributed and/or declining in population size or availability. |
| Very high | Species is dependent on one or two taxa that are rare and/or declining in population size and availability. |
| Unknown | Data are lacking or unreliable. |

Note: A precautionary approach would suggest that if the risk posed by the food specificity is unknown, then care should be taken before assigning a positive non-detriment finding unless that finding is supported by other life history characteristics.

### **What level of risk is indicated for harvest of wild specimens based on reproductive output of the species?**

This question focuses on the reproductive characteristics of the species and considers the rate at which a female reaches sexual maturity, gestation period and brood size. Wild populations of a species that exhibits late maturity, long gestation periods and small broods would be more susceptible to over-exploitation (Table 8). Most birdwing butterflies would likely qualify as having a low degree of risk based solely on reproductive output. For example, at the Cibinong Science Center in Indonesia *Troides helena* developed from eggs to adults in an average of 45.9 days, and females were observed mating as soon as the second or third day after emerging from pupae (Djunijanti et al., 2021). Female *Troides aeacus* in Southern Gansu province, China, produce 36–44 eggs, which are laid individually on the host plant (Li et al., 2010). In contrast, *Pandinus* scorpions have a very high degree of risk based on their taking more than 36 months to reach sexual maturity, having a gestation period of 10 months or more, and broods of 20 (or fewer) offspring (Polis, 1990; Cooper, pers. obs.).

Table 8. Risk Posed by Reproductive Output

|  |  |
| --- | --- |
| **Degree of Risk** | **Indicators** |
| Low | Mature females reach sexual maturity early, have a short gestation period and produce large broods. |
| Medium | Mature females exhibit one of the following three traits: late sexual maturity; a long gestation period; small broods. |
| High | Mature females exhibit two of the following three traits: late sexual maturity; a long gestation period; small broods. |
| Very high | Mature females reach sexual maturity late, have a long gestation period and produce small broods. |
| Unknown | Data are lacking or unreliable. |

Note: This factor is primarily relevant to exports of adult and sub-adult specimens. A precautionary approach would suggest that if the risk posed by the reproductive output is unknown, then care should be taken before assigning a positive non-detriment finding unless that finding is supported by other life history characteristics.

### **What level of risk is indicated for harvest of wild specimens based on longevity of the species?**

This question focuses on the longevity of a species once sexual maturity has been reached. Extracting an adult or sub-adult specimen of a long-lived species from the wild will be equivalent to extracting multiple years of offspring and poses a greater risk of overexploitation (Table 9). An example of a species with a low degree of risk based solely on adult longevity is the butterfly *Troides Helena*, which may live one to three weeks after emerging from pupae as mature adults (Djunijanti et al., 2021). An example of a species with a very high degree of risk is the tarantula *Brachypelma klaasi* which mature at 7 to 9 years of age and live up to 30 years. This species 400 to 800 eggs in each egg sac and may breed annually (Yánez et al., 1999). Extraction of a single mature female could therefore be the equivalent of removing thousands of offspring from the wild.

Most birdwing butterflies would likely qualify as species having a low degree of risk based solely on reproductive output. For example, *Troides helena* at the Cibinong Science Center in Indonesia were develop from eggs to adults in an average of 45.9 days, and females have been observed mating as soon as the second or third day after emerging from pupae (Djunijanti et al., 2021). Female *Troides aeacus* in Southern Gansu province, China, produce 36–44 eggs, which are laid individually on the host plant (Li et al., 2010). In contrast, *Pandinus* scorpions have a high degree of risk based on their taking more than 36 months to reach sexual maturity, having a gestation period of 10 months or more, and broods of approximately 20 (or fewer) offspring (Polis, 1990; Cooper, pers. obs.).

Table 9. Risk Posed by Adult Longevity

|  |  |
| --- | --- |
| **Degree of Risk** | **Indicators** |
| Low | Species has a seasonal life history and short adult lifespan, with mature adults living one year or less. |
| Medium | Adults are short-lived with mature adults living one year or more, but less than five years. |
| High | Adults are long-lived, with mature adults potentially living more than five years, but less than 10 years. |
| Very high | Species has a very long lifespan, with mature adults potentially living more than 10 years. |
| Unknown | Data are lacking or unreliable. |

Notes: This factor is primarily relevant to exports of adult and sub-adult specimens. A precautionary approach would suggest that if the risk posed by the adult longevity is unknown, then care should be taken before assigning a positive non-detriment finding unless that finding is supported by other life history characteristics.

* + 1. **Review and assessment**

Ultimately, it is up to the Scientific Authority to judge whether the life history characteristics of a species indicate that the proposed trade would negatively impact the survival of the species in the wild. Species with life histories that suggest a high or very high degree of risk would likely warrant a negative NDF. However, the assignment of risk may be mitigated by other factors. For example, trade in a single wild-caught specimen of a species that exhibits high-risk life history characteristics may be deemed to not be detrimental to conservation of the species, whereas a large volume of trade in wild-caught specimens of a species with low-risk characteristics may not be considered sustainable.

The assignment of an unknown degree of risk should also be considered carefully. If the life history of a species is so poorly documented that a level of risk cannot be assigned, then that conclusion itself suggests a degree of risk. A precautionary approach would suggest that when data are lacking or unreliable the degree of risk of risk should be considered high. A Scientific Authority should therefore be cautious about assigning a positive non-detriment finding when the risk associated with specific life history characteristics are unknown—unless the finding is supported by other life history characteristics, or relevant aspects of the harvest or trade in the species.

**If the Scientific Authority concludes, based on the life history characteristics of the species, that there is low risk the proposed trade would negatively impact the survival of the species in the wild, proceed to Conclusion 5.3 in Step 3 of this guidance. Similarly, if the life history characteristics of the species suggest the degree of risk is medium or high, but the circumstances of the proposed trade indicate that the trade would not negatively impact the survival of the species in the wild, proceed to Conclusion 5.3 in Step 3. If, however, the life history characteristics of the species indicate there is a high risk that the proposed trade would negatively impact the survival of the species in the wild, proceed to Conclusion 5.4 in Step 3 of this guidance.**

Table 10. Blank Worksheet for Compiling Life History Risk

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Life history characteristic** | **Degree of risk** | | | | |
| **Low** | **Medium** | **High** | **Very high** | **Unknown** |
| Geographic distribution |  |  |  |  |  |
| National or sub-national population size and distribution |  |  |  |  |  |
| Habitat specificity |  |  |  |  |  |
| Food specificity |  |  |  |  |  |
| Reproductive output |  |  |  |  |  |
| Adult longevity |  |  |  |  |  |

1. **Step 3: Conclusions**

The following sections provide broad scenarios and the conclusions that can be made about whether a non-detriment is needed, and whether or not it will be positive or negative.

* 1. **A non-detriment finding cannot be made**

It is not possible to complete an NDF unless the taxa being traded are correctly identified.

* 1. **No non-detriment finding is required**

### A NDF is not required for trade in pre-convention specimens (source code “O”) or those being traded for law enforcement purposes (source code “I”).

### Export of specimens of the species in question is not permitted and the NDF is not required. The permit application should be refused.

* 1. **Trade is likely not detrimental to the survival of the species in the wild**

### Based on the information compiled via this guidance, the proposed trade would not be considered detrimental to survival of the species in the wild. However, there may be other factors relevant to the proposed trade that preclude this finding. Guidance for assessing generic issues not specific to the collection and trade of terrestrial invertebrates must be consulted before a final non-detriment finding can be determined.

### Based on the information compiled via this guidance, the proposed trade would consist of specimens that were not taken from the wild and their trade would not be detrimental to survival of the species in the wild. However, the source of the parents should be considered when completing an NDF for the trade. If the parents were also captive bred, then the impact of the trade on wild populations would be minimal. If one or both parents were removed from the wild, then the Scientific Authority should also consider the impact of this removal on wild populations and may find it informative to review Section 4.3 of this guidance for the species. There may also be other factors relevant to the proposed trade that preclude this finding. Guidance for assessing generic issues not specific to the collection and trade of terrestrial invertebrates must be consulted before a final non-detriment finding can be determined.

* 1. **Trade is likely detrimental to the survival of the species in the wild**

### Based on the information compiled via this guidance, the proposed trade would be detrimental to survival of the species in the wild. In this case, a conditional NDF may be issued (see information on conditional NDFs in Module 1). Alternatively, a negative NDF can be issued and exports not permitted.

**6.0. References**

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# Additional Information: CITES-listed Terrestrial Invertebrates as of June 2023

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Phylum** | **Class** | **Order** | **Family** | ***Species*** | **Appendices** | | |
| **I** | **II** | **III** |
| Annelida  (2 spp.) | Hirudinoidea (2 spp.) | Arhynchobdellida  (2 spp.) | Hirudinidae  (2 spp.) | *Hirudo medicinalis*[[2]](#footnote-2) |  | II |  |
| *Hirudo verbena*1 |  | II |  |
| Arthropoda  (118 spp.) | Arachnida  (42 spp.) | Araneae  (37 spp.) | Theraphosidae  (37 spp.) | *Aphonopelma pallidum* |  | II |  |
| *Brachypelma* spp. (11 spp.) |  | II |  |
| *Caribena versicolor* |  |  | III  (European Union) |
| *Poecilotheria* spp. (15 spp.) |  | II |  |
| *Sericopelma angustum* |  | II |  |
| *Sericopelma embrithes* |  | II |  |
| *Tliltocatl* spp. (7 spp.) |  | II |  |
| Scorpiones  (5 spp.) | Scorpionidae  (5 spp.) | *Pandinus camerounensis* |  | II |  |
| *Pandinus dictator* |  | II |  |
| *Pandinus gambiensis* |  | II |  |
| *Pandinus imperator* |  | II |  |
| *Pandinus roeseli* |  | II |  |
| Insecta  (76 spp.) | Coleoptera  (22 spp.) | Lucanidae  (21 spp.) | *Colophon* spp. (21 spp.) |  |  | III  (South Africa) |
| Scarabaeidae  (1 spp.) | *Dynastes satanas* |  | II |  |
| Lepidoptera  (54 spp.) | Nymphalidae  (3 spp.) | *Agrias amydon boliviensis* |  |  | III (Bolivia) |
| *Morpho godartii lachaumei* |  |  | III (Bolivia) |
| *Prepona praeneste buckleyana* |  |  | III (Bolivia) |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Phylum** | **Class** | **Order** | **Family** | ***Species*** | **Appendices** | | |
| **I** | **II** | **III** |
|  |  |  | Papilionidae  (51 spp.) | *Achillides chikae chikae* | I |  |  | |
| *Achillides chikae hermeli* | I |  |  | |
| *Atrophaneura jophon* |  | II |  | |
| *Atrophaneura pandiyana* |  | II |  | |
| *Bhutanitis* spp.(4 spp.) |  | II |  | |
| *Ornithoptera alexandrae* | I |  |  | |
| *Ornithoptera* spp*.* (13 spp.)[[3]](#footnote-3) |  | II |  | |
| *Papilio homerus* | I |  |  | |
| *Papilio hospiton* |  | II |  | |
| *Parides burchellanus* | I |  |  | |
| *Parnassius apollo* |  | II |  | |
| *Teinopalpus* spp*.* (2 spp.) |  | II |  | |
| *Trogonoptera* spp. (2 spp.) |  | II |  | |
| *Troides* spp. (21 spp.) |  | II |  | |
| Mollusca  (46 spp.) | Gastropoda  (46 spp.) | Stylommatophora  (46 spp.) | Achatinellidae  (39 spp.) | *Achatinella* spp. (39 spp.) | I |  |  | |
| Camaenidae  (1 sp.) | *Papustyla pulcherrima* |  | II |  | |
| Cepolidae (6 spp.) | *Polymita* spp. (6 spp.) | I |  |  | |

Source: CITES Appendices I, II and III valid from 21 May 2023 (<https://cites.org/eng/app/appendices.php>). For genera in which all species are listed in the Appendices of CITES the number of species listed is provided in brackets. The number of listed species in each higher taxon is also noted. Note that the taxonomic nomenclature used in the Appendices may not be current with accepted scientific opinion. For example, the genus *Pandinus* is currently undergoing revision and it is anticipated that not all the species currently included in the Appendices will be considered valid (Lorenzo Prendini, in litt. to E. Cooper, May 2020).

1. Per WG-1 Generic. [↑](#footnote-ref-1)
2. *Hirudo medicinalis* and *H. verbena* may be described as aquatic invertebrates rather than terrestrial. However, adult females exit the water in which they live to lay their eggs on land. [↑](#footnote-ref-2)
3. All species in the genus *Ornithoptera* are listed in CITES Appendix II except those listed in I. Currently, 13 species are listed in Appendix I and one (*O. alexandrae*) is in Appendix I. [↑](#footnote-ref-3)