MODULE 7: TERRESTRIAL INVERTEBRATES

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1. What is in this module?

This module provides additional guidance to Parties on the key considerations when undertaking non-detriment findings (NDFs) for terrestrial invertebrates. It is complementary to **module 1** and **2** and should not be used in isolation.

This document presents a 3-step process for completing NDFs for terrestrial invertebrates, following the simplified format established outlined in **module 2**. Step 3 offers conclusions based on information collected in Steps 2 and 3 as to whether or not an NDF is needed, and whether it will be positive or negative. A summary of terrestrial invertebrates listed on CITES (as of November 2023) is provided in **Annex 1**. Case studies for the medicinal leech *Hirudo medicinalis* and the tarantula *Brachypelma smithi* are available in **module 14**.

2. How to use this module?

This module follows a three-step process: (1) information gathering, (2) simplified evaluation, and (3) conclusions, with each step divided into substeps. Step 3 offers guidance for completing NDFs based on the information compiled in Steps 1 and 2. Note that Step 2 provides a qualitative approach for assessing risks posed by different life history characteristics of species. While scenarios are suggested, a Scientific Authority must exercise judgment to determine whether the proposed trade is sustainable.

The text of this module is formatted for easy navigation:

- General informative text is in normal black text.
- The topics in Steps 1–3, specific questions, and conclusions to be considered by the user are numbered (e.g., "1.1 Identification" or "1.3.1 Did the specimens originate in a range State for the species?").
- Text advising the user where to proceed next is in ***bold and italicized red*** text.

Users should start with Step 1, which provides advice on the preliminary information a Scientific Authority should consider when preparing an NDF. After reviewing this text, users should follow the instructions in ***red*** 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. Case studies in **module 14** may serve as examples to assist users in completing the process.

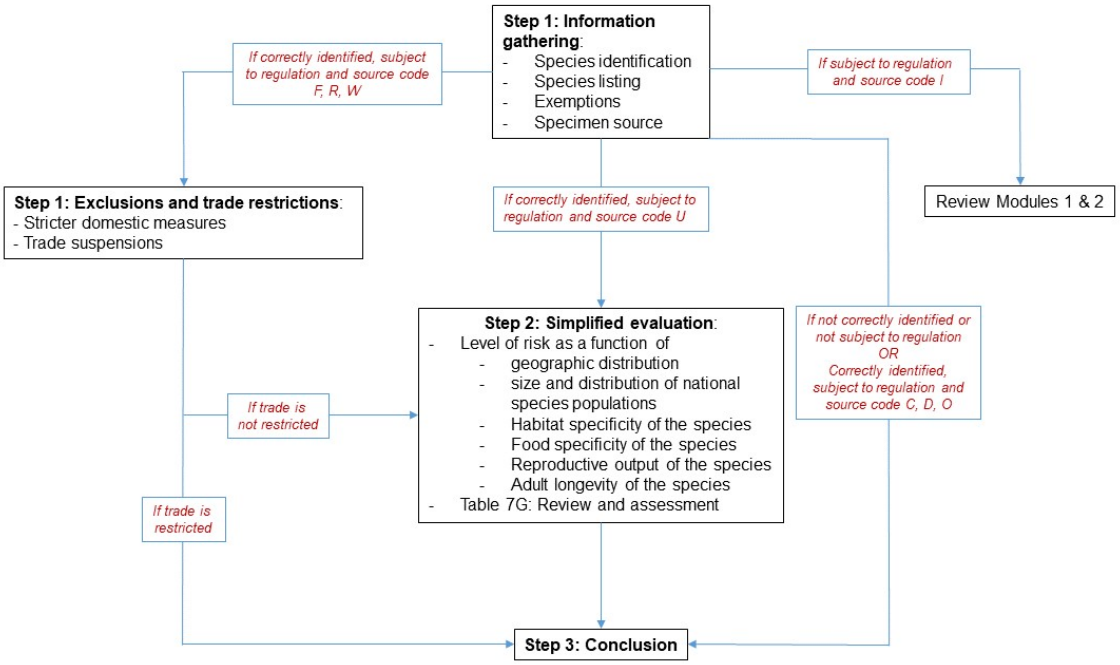

Figure 7A: Graphical flowchart of the decision tree proposed in **module 7**.

3. Step 1: Information gathering

3.1. Identification

The first stage of the NDF process is to determine whether an NDF is required for international trade of the specimens in question. In line with the NDF process identified in **module 2**, there are different components to this step, including:

- Is the specimen correctly identified and named?
- Is the species listed in the CITES Appendices, and if so, in which Appendix?
- If the species is listed in the Appendices, is the specimen excluded by the wording of the listing, or via annotation? [Note that at the time of writing, this consideration did not apply to any species of terrestrial invertebrates listed on the CITES Appendices].

These questions are generic in nature and not exclusive to terrestrial invertebrates. The identification of terrestrial invertebrates can, however, be 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. Live specimens may be much more challenging and identification may be difficult without injuring the specimens or causing them to escape. Furthermore, shipments of terrestrial invertebrates may involve large numbers of specimens of mixed species, including species not listed on the CITES 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 adults. In many cases it may be difficult to even determine the genus to which a juvenile belongs (1). 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.

3.1.1. Suggested resources to assist with identification of terrestrial invertebrates

Presumptive identification of animals, plants, and fungi may be facilitated using the iNaturalist and Seek applications. These applications, when downloaded to a smartphone allows the viewer to use their camera to scan and identify specimens using image recognition technology (2). Taxa specific references are summarized in the following bullets.

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]. Available here.
- 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. 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, 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, A. (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/.

When the user is confident that the specimens are correctly identified, proceed to section 3.2 in Step 1. If there is doubt as to the identification of the specimens, go to section 5.1.1 in Step 3 (conclusion).

3.2. Specimen Source

3.2.1. Did the specimens originate in a range State of 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 traded terrestrial invertebrates 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* tarantulas traded 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 from non-range-States.

Trade in specimens bred in captivity outside of their natural range would normally present negligible risk to conservation of the species in the wild, assuming laundering of wild specimens is not a concern. The legality and sustainability of the initial collection of wild founder stock may be a separate issue. Refer to Res. Conf. 17.7 (Rev. CoP19) for additional information.

When confident the species being traded is native to the exporting country, proceed to Substep 3.2.2. If the species is not native, go to Conclusion 5.3.2 in Step 3.

3.2.2. What is the source of the specimens being traded?

As noted, a large percentage of the CITES-listed terrestrial invertebrates are traded as living specimens that were bred in captivity. 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. Many butterflies are also produced via ranching. Conversely, most of the *Pandinus* scorpions in trade are taken from the wild, but other methods for production are emerging (in the past, significant numbers of *Pandinus* were traded as ranched specimens).

Generic guidance for confirming that specimens are truly captive-bred is provided in Res. Conf. 10.16 (Rev. CoP19) and Res. Conf. 17.7 (Rev. CoP19). Guidance for applying CITES source codes can be found here and guidance for inspecting captive breeding and ranching facilities is provided here.

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.

Tarantulas and scorpions are predators and most 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 live 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 of sufficient size. Plus, birdwing butterfly larvae grow and develop quickly (compared to fossorial arachnids). However, temperate species may have more extended larval stage. 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 has been determined, and a CITES source code has been assigned, proceed to the appropriate next step of this module as directed in the following list:

- ***If the specimens meet the requirements for pre-convention (source code "O"), proceed to Conclusion 5.2.1 in Step 3.***
- ***If the specimens meet the requirements for confiscated or seized (source code "I"), refer to module 1 and module 2 for guidance.***

- ***If the specimens meet the requirements for captive-bred (source code "C") or bred in captivity in a registered facility per Res. Conf. 12.10 (Rev. CoP15) (source code "D"), proceed to Conclusion 5.3.2 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 3.3.***
- ***If the source of the specimens is unknown (source code "U"), treat the specimens as taken from the wild and proceed to Step 2 in Section 4.***

3.3. Relevant Exclusions and Trade Restrictions

3.3.1. 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 legislation or regulations in place that restrict the export of some CITES-listed terrestrial invertebrates over and above those imposed by CITES. 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.

For example, 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. Potentially, these prohibitions may be relevant for species listed on the Appendices of CITES in the future.

Presumably, the Management 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.

When confident that the proposed trade in specimens is permitted under the national or sub-national policies of the exporting country, proceed to Substep 3.3.2 of this module. If trade is not permitted, go to Conclusion 5.2.2 in Step 3.

3.3.2. Has an export quota been established for the species being traded?

Guidance for the management of national export quotas is provided in Res. Conf. 14.7 (Rev. CoP15). 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 have been communicated to the Secretariat are listed on the CITES website and are noted in the individual species listings in the Species+ website.

At the time of writing, the Secretariat had received notice of published quotas for 2023 for export of two species of leech, one species of scorpion and one species of tarantula from five Parties. This information may change and should be routinely reviewed for any application to export or import specimens of terrestrial invertebrates.

If confident that trade in the specimens is not subject to any export quotas, or that the volume of proposed trade will not exceed a set export quota, proceed to Substep 3.3.3 of this module. If an established export quota would be exceeded if the trade was permitted, go to Conclusion 5.2.2 in Step 3.

3.3.3. Have recommendations to suspend trade relevant to the species being exported been published by the Secretariat?

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

Management Authorities for affected Parties would presumably be aware of these recommendations and the Scientific Authorities 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 confident that trade in the specimens is not subject to any recommendations to suspend trade, proceed to Step 2 of this Module. If a recommendation to suspend trade is in place, proceed to Conclusion 5.2.2 in Step 3.

4. Step 2: Simplified evaluation

4.1. Biological and Life History Characteristics

The life history characteristics referenced in this section are generic and 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. Irrelevant issues have been excluded.

The degree of risk assignable for different life history characteristics ranges from low to very high. If data needed to determine degree of risk is lacking or unreliable, then an unknown level of risk should be assigned. This should not be interpreted as a neutral term (see Substep 4.1.7).

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. 7B**). 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 Substeps 4.1.1 to 4.1.6 should be considered when completing a non-detriment finding before proceeding to Substep 4.1.7 for a final evaluation. A blank table is provided (**Table 7G**) 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.

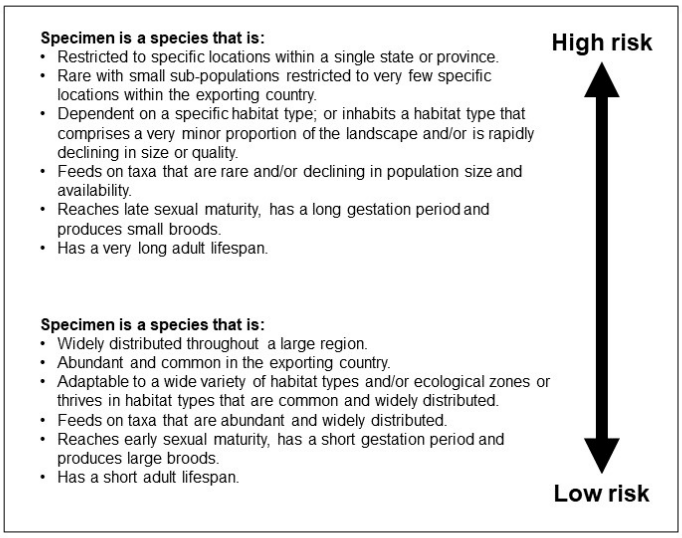

Figure 7B. Risk to wild populations based on life history characteristics

4.1.1. 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 7A**). 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. An example of a species with a very high degree of risk is the tarantula *Brachypelma smithi* which is found only on the central Pacific coast of the State of Guerrero, Mexico (3).

Table 7A. 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 suggests that if the risk posed by the geographic distribution is unknown, then care should be taken before assigning a positive non-detriment finding unless supported by other life history characteristics.

4.1.2. 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 7B**). 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 is widely distributed throughout the country (4). 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 (5).

Population survey methodologies will vary between the taxa, environments or ecological niches being surveyed. Two recommended references for surveying terrestrial invertebrates are:

- Wheater, C. P., & Cook, P. A. (2003). *Studying invertebrates*. Richmond Publishing Company.
- Krebs, C. J. (1999). *Ecological methodology*. Benjamin/Cummings.

Table 7B. 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	Species is distributed in small sub-populations and/or with low density and/or 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 suggests 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 supported by other life history characteristics.

4.1.3. 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. An adaptable species that can thrive in a wide variety of habitats would be expected to be less susceptible to overexploitation (**Table 7C**). 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 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 (3). 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 (6).

Table 7C. 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, potentially including anthropogenic or human disturbed habitats, 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 is rapidly declining in size and/or quality.
Unknown	Data are lacking or unreliable.

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

4.1.4. 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 7D**). 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.; 7). 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* (8).

Table 7D. Risk posed by food specificity

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

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

4.1.5. 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, generation time and brood size. Wild populations of a species that exhibit late maturity, long generation time and small broods would be more susceptible to over-exploitation (**Table 7E**). 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 (9). Female *Troides aeacus* in Southern Gansu province, China, produce 36–44 eggs, which are laid individually on the host plant (10). 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 (11, Cooper, pers. obs.).

Table 7E. Risk posed by reproductive output

Degree of Risk	Indicators
Low	Females reach sexual maturity early, have a short generation time and produce large broods.
Medium	Females exhibit one of the following three traits: late sexual maturity; a long generation time; small broods.
High	Females exhibit two of the following three traits: late sexual maturity; a long generation time; small broods.
Very high	Females reach sexual maturity late, have a long generation time 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 suggests that if the risk posed by the reproductive output is unknown, then care should be taken before assigning a positive non-detriment finding unless supported by other life history characteristics.

4.1.6. What level of risk is indicated for harvest of wild specimens based on adult 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 7F**). 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 (**9**). 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 produces 400 to 800 eggs in each egg sac and may breed annually (**12**). Extraction of a single mature female could therefore be the equivalent of removing thousands of offspring from the wild.

Table 7F. 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 suggests that if the risk posed by the adult longevity is unknown, then care should be taken before assigning a positive non-detriment finding unless supported by other life history characteristics.

4.1.7. Review and assessment

Table 7G may be used to compile the results of the biological and life history evaluation following the guidance provided in Substep 4.1 of this document. Each life history characteristic should be scored from one to four points based on the assessed degree of risk. Each of rows one through six can include only a single score. The scores are compiled in the right-hand column and the sum of these scores is added to the bottom right-hand cell. The sum of the scores for each column is added to the bottom row and their total must equal the number in the bottom right-hand cell. The number in the bottom right-hand cell is the total score. The lowest possible total score is six points and the highest is 24.

If a species receives a total score of eight or lower, then it is unlikely to be threatened by trade and a Comprehensive NDF Assessment is not required. A score of nine or higher suggests that a Comprehensive NDF Assessment should be completed (see module 2). Any assessment that scores a three or four for any characteristic automatically qualifies for a full Comprehensive NDF Assessment.

Table 7G. Blank worksheet for compiling life history risk

Row	Life history characteristics	Degree of risk				Total
		Low Score 1	Medium Score 2	High or unknown Score 3	Very high Score 4	
1	Geographic distribution					
2	National/sub-national population size/distribution					
3	Habitat specificity					
4	Food specificity					
5	Reproductive output					
6	Adult longevity					
Total						

Ultimately, it is the responsibility of 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 exhibiting a high or very high degree of risk would likely warrant a negative NDF or a positive NDF with conditions imposed to reduce the impact of trade. However, the assignment of risk may be mitigated by other factors. One important consideration is the annual offtake of wild specimens. 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 risk posed to a species due to offtake levels will vary dramatically between taxa, populations, subpopulations, the age class of the harvested specimens, volumes of specimens, etc. The issue is generic to all traded species and not specific to terrestrial invertebrates. Hence Scientific Authorities should refer to **module 2** for guidance on addressing annual offtake.

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 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 5.3.1 in Step 3. 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 5.3.1. 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 5.4.1.

5. Step 3: Conclusions

The following sections outline scenarios and the conclusions that can be made about whether a non-detriment finding is needed, and whether it will be positive or negative.

5.1. A non-detriment finding cannot be made

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

5.2. A non-detriment finding is not required

5.2.1. No NDF is required for trade in pre-convention specimens (source code "O").

5.2.2. Export of specimens of the species in question is not permitted and an NDF is not required. The permit application should be refused. Refer to **module 1** and **module 2** for guidance on preparing an NDF to lift a recommendation to suspend trade or justify an increase to a quota established under the review of significant trade assessment.

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

5.3.1. Based on the information compiled via this module, the proposed trade would not be considered detrimental to survival of the species in the wild and a simplified NDF should suffice. However, other factors relevant to the proposed trade may preclude this finding. Guidance for assessing generic issues not specific to the collection and trade of terrestrial invertebrates (**module 2**) must be consulted before a final non-detriment finding can be determined.

5.3.2. Based on the information compiled via this module, the proposed trade consists of specimens that were not taken from the wild and their trade would not be detrimental to survival of the species in the wild. Completion of a simplified NDF should be sufficient. However, the source of the parents should be considered when completing the NDF. 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 the text of Step 2 for the species. There may also be other factors relevant to the proposed trade that preclude this finding. Consult **module 2** for guidance on generic issues not specific to terrestrial invertebrates before determining a final non-detriment finding.

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

5.4.1. Based on the information compiled via this module, the proposed trade would be detrimental to survival of the species in the wild. In this case, a negative NDF should be issued, and exports should not be permitted. Alternatively, an NDF with conditions may be issued (see information on NDFs with conditions in **module 1**).

6. Module 7 references

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Annex 1: Additional Information: CITES-listed Terrestrial Invertebrates as of November 2023

Phylum	Class	Order	Family	Species	Appendices		
					I	II	III
Annelida (2 spp.)	Hirudinoidea (2 spp.)	Arhynchobdellida (2 spp.)	Hirudinidae (2 spp.)	*Hirudo medicinalis*[1]		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 (EU)
				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)

[1] *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.

Phylum	Class	Order	Family	*Species*	Appendices		
					I	II	III
Arthropoda (119 spp.)	Insecta (77 spp.)	Lepidoptera (55 spp.)	Papilionidae (52 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.)[2]		II	
				Papilio homerus	I		
				Papilio hospiton		II	
				Papilio phorbanta			III (EU)
				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 25 November 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).

[2] All species in the genus *Ornithoptera* are listed in CITES Appendix II except those listed in I. Currently, 13 species are listed in Appendix II and one (*O. alexandrae*) is in Appendix I.