Genetic Diversity Indicator Testing Kobo v4.0 Manual

This guide will help you work through the Kobo Form for the Genetic Indicator Testing project. Kobo Toolbox was chosen as the platform for the manual data collecting as it allows complex forms, allows forms to be shared, and allows the user to collect data both *online* and *offline*.

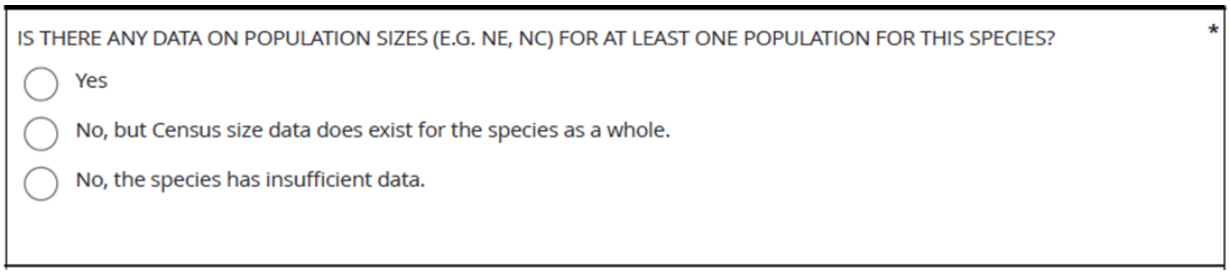
This manual provides detailed advice on how to answer each question, with examples if necessary. Along with the overall Project Guidance document, you should have all the information necessary to complete a species assessment. However, if you have a question, please post it on the Genetic Indicators Google Group, and a member will try to answer you.

Layout of the Kobo Form

There are 8 sections to the Kobo form.

Section 1: Assessor & Country Information
Section 2: Species Taxonomy
Section 3: Indicator 2
Section 4: Preface to Indicator 1
Section 5: Indicator 1 (per population)
Section 6: Modified Indicator 1 for the Entire Species Within the Country of Assessment
Section 7: Indicator 3
Section 8: Other Species Information

The assessor will only be presented with 7 of the 8 sections. Depending on how users answer the first question in Section 4 (see below), Section 5 or 6 will be presented.



If ‘Yes’ is selected, Section 5 will be presented, whereas if the option ‘No, but census size data exists for the species as a whole’ is selected, the assessor will be taken to Section 6 instead.

Many questions are Mandatory, but there is often the option to choose ‘Unknown’ if this information is not available or is too difficult to find at this time.

Questions in the form are presented sequentially with some explanatory text and without numbering, but in this document, we numbered the questions and provide, to the left of each question, a code regarding the format of the expected answer, whether it is mandatory, and if it is linked to another question (Table 1). Should you wish to carry out an assessment using a pdf or word document, these codes help identify the questions and answers that are being asked. **NOTE**: in general **when entering multiple values** to answer a given question, **use semicolons (;) for separation**, not commas!

Table 1. Codes used to qualify questions in the Kobo Form. For each question, sequentially numbered codes provide information on the format of the expected answers, whether a response is mandatory and whether the question is linked to another question.

Text (T)	Year (Y)
Number (N)	File upload (F)
Decimal number (D)	Mandatory (M)
Select One (S1)	Optional (O)
Select Many (S+)	Linked to another question (-[#])

For example:

3 S1M — refers to Question 3; only one answer can be chosen from the list provided, and it is mandatory

4 TM — refers to Question 4; the answer to the question requires text, and it is mandatory.

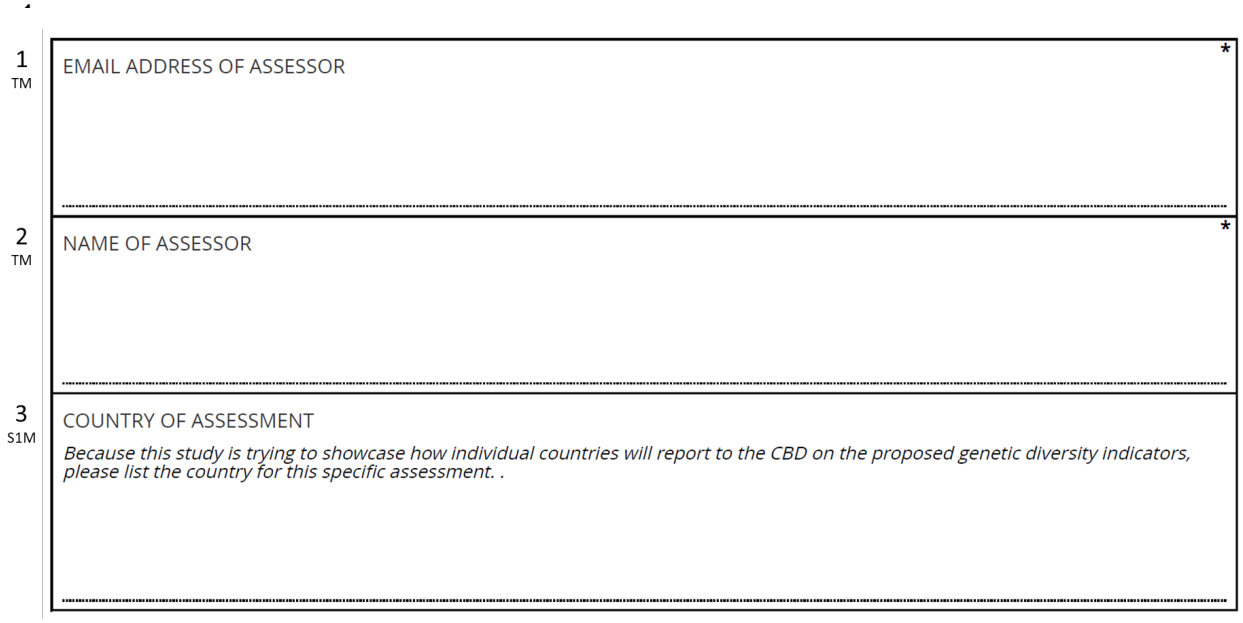
14 S1M-13 — refers to Question 14; one answer will be selected from the list provided, it is mandatory, and is linked to Question 13 (i.e., only appears if a certain response to question 13 is provided)

IMPORTANT: Section 5 of this document asks for information on effective population size (Ne) and census size (Nc). If *multiple estimates of Ne or Nc exist* for a single population, and the assessor, to the best of their knowledge, *cannot determine which would be the most appropriate* or accurate to report on, then the **assessor will need to complete the entire Kobo form for the same species TWICE** noting these alternative population size estimates. A specific note **MUST** be made on both forms (see Q51) explaining the situation (e.g. why there was a conflict e.g. report A states X while report B states Y) so that evaluators can be made aware and review the records together. Similarly, Section 3 asks for the number of populations. **If the assessor feels that there are multiple valid possibilities for the number of populations (extant or extinct), you should complete the entire Kobo form twice** (or more- as many times as needed).

Section 1: Assessor & Country Information (Questions 1-3)

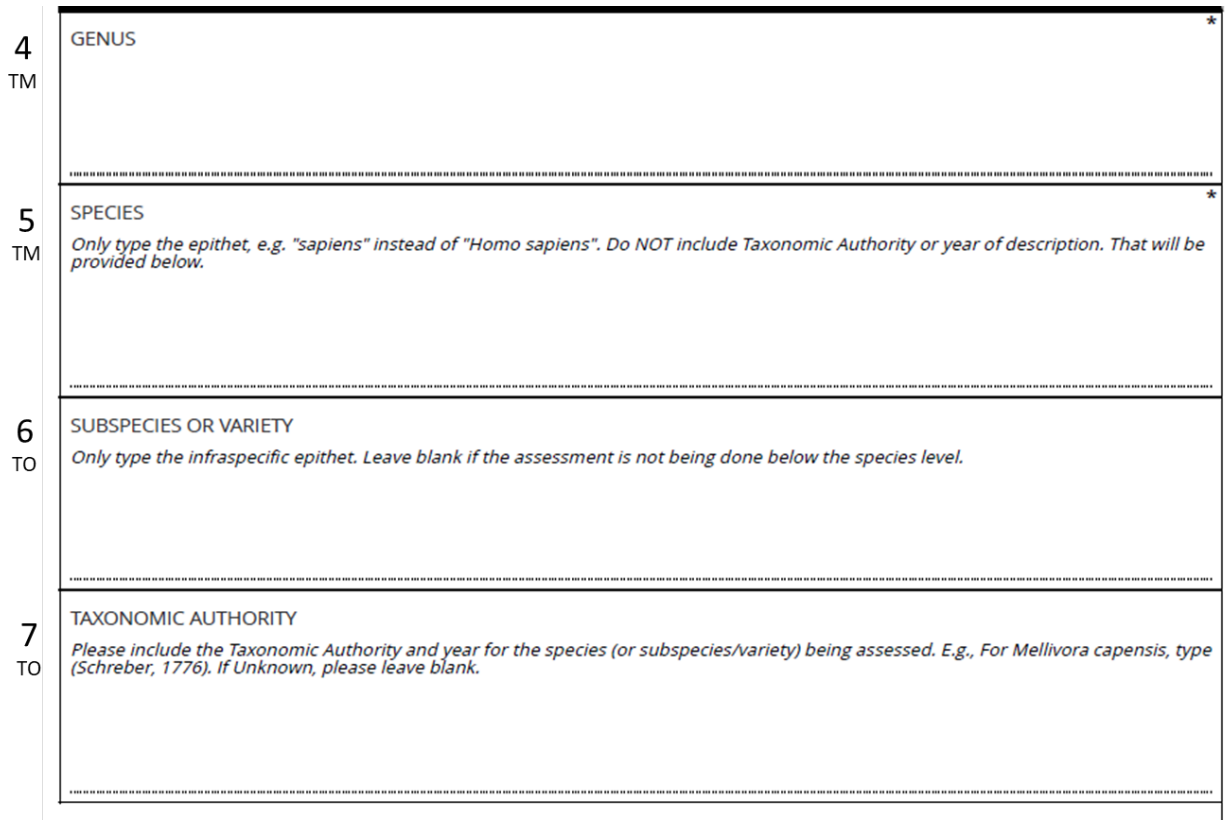
This section records the assessor's name and contact details, and the country of assessment (should clarification be needed on the species in question, and to help track the number of assessments completed by an assessor so that proper credit can be provided).

Although some species may be distributed across more than one country, this study aims to test the feasibility of individual countries in reporting to the CBD on the proposed genetic diversity indicators. *As such, species assessments must be completed at the country level, focusing only on the populations/geographic range within the country in question*.



Section 2: Species Taxonomy (Questions 4-9)

Except for question 6 (Q6), all questions within this section are Mandatory. Q6 allows the user to specify subspecies or variety. While assessments are intended to be conducted at the species level, it is recognized that there are revisions of taxonomy (lumping and splitting of species), and what may be considered a subspecies or variety by some experts, may be considered a species by others. Also, distinctions at infraspecies levels may be of special importance for some taxa, like some crop wild relatives. Assessors may thus include subspecies or variety if the entity is an important unit for that country (e.g., it has separate management reports, protection level or Red List status or a wild relative of a crop). To prevent ambiguity, the Taxonomic Authority should be reported; however if it is not known, please leave it blank.



For Q8, please provide the most widely used common name(s) for the species, followed by the language in brackets. *For example*, the common names for *Taxus baccata* are Common yew in English and If commun in French. These can be GIFas Common yew (EN); If commun (FR). When entering multiple common names, please ensure they are separated by a semicolon (;).

8
TM

COMMON NAME *

9
S1M

TAXONOMIC GROUP *

- Angiosperm
- Gymnosperm
- Pteridophytes (e.g., ferns)
- Bryophyte
- Fungus
- Invertebrate
- Fish
- Amphibian
- Reptile
- Bird
- Mammal
- Other

Q10-13 are optional questions that would allow the assessor to record the taxon IDs for the species within the assessment country from different databases, such as GBIF or NCBI.

GBIF often provides several Taxon IDs known for the species at the bottom of the species page.

Providing at least one of these IDs can help form linkages between the different data sources, which may prove useful in downstream analyses or future projects. If available, please provide these taxon IDs in Q10-12. If Q12 is answered, please provide the name of the database where the taxon ID recorded in Q12 is based on. If no IDs are available, please leave these questions blank.

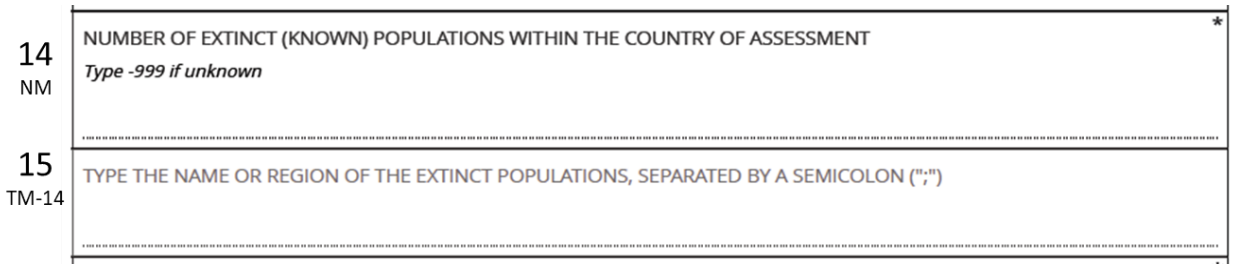
10 TO	IF AVAILABLE, ADD THE GBIF TAXONID FOR THIS SPECIES *e.g. 2684495 for Juniperus blancoi as shown here https://www.gbif.org/species/2684495 (scroll down to the end "Taxon identifiers" section)*
11 TO	IF AVAILABLE, ADD THE NCBI TAXONID FOR THIS SPECIES *e.g. 698470 for Juniperus blancoi as shown here https://www.ncbi.nlm.nih.gov/search/all/?term=juniperus%20blancoi*
12 TO	IF AVAILABLE, ADD THE TAXONID FOR THIS SPECIES FROM ANY INFORMATION SYSTEM OR LOCAL DATABASE IN THE COUNTRY OF ASSESSMENT.
13 TO-12	WHAT'S THE NAME OF THE INFORMATION SYSTEM/LOCAL DATA BASE FOR THE NATIONAL TAXONID YOU ADDED BEFORE?

Section 3: Indicator 2 (Questions 14-24)

Questions in this section are for quantifying Indicator 2, and will inform the section on Indicator 1 by stipulating the number of populations you will be asked to complete with respect to population name and size (extant populations).

As with the rest of this form, Q14 is asking about the number of known extinct populations *within the country*! In other words, the total number of known losses of historic populations in the country! Any population whose original gene pool in that location has disappeared entirely should be considered extinct. The assessor will find details of extinct populations in the reports, databases, or experts s/he is consulting. This may come in the form of a list or map(s). An integer count (e.g., 1, 2) must be reported. **If the number of extinct populations is Unknown, please type -999.**

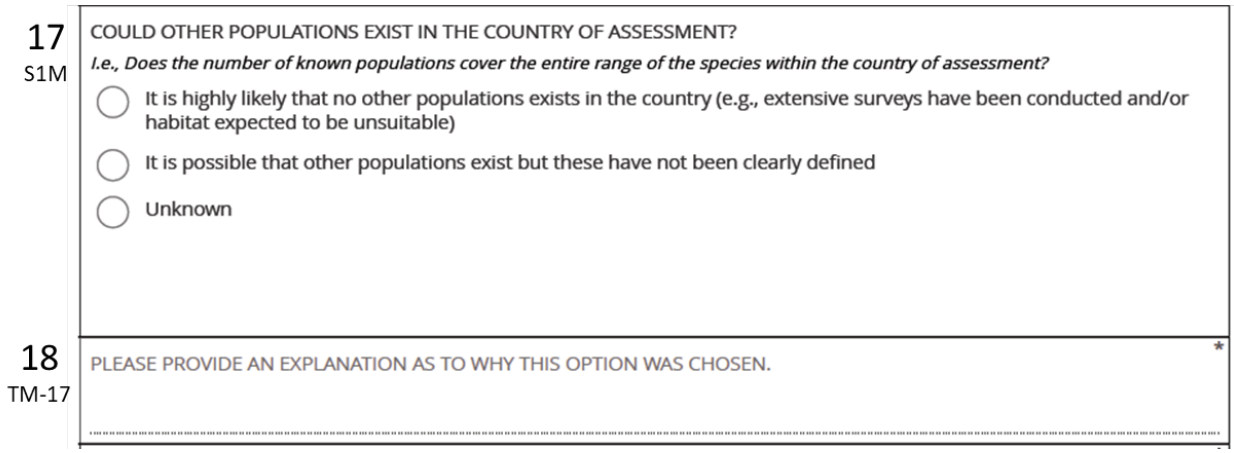
Given that we are assessing human-induced changes in species' genetic diversity and structure, 50-200 years ago can be used as the historic/prior baseline for which to compare population numbers. This reflects the industrial era and rapid habitat change in many countries. However, baselines might vary by country depending on human impact/ growth and even depending on species type (e.g. earlier hunting of large mammals). As such, it is the choice of the in-country assessor as to what is appropriate, and is somewhat dependent on the data available in records. Please record the date of the baseline/historic structure that you are referring to when counting populations (Q15). This could allow for interesting temporal comparisons during downstream analyses (e.g., 'pre industrial' [1700s], initiation of the CBD [1993], the start of this decade [2020]).



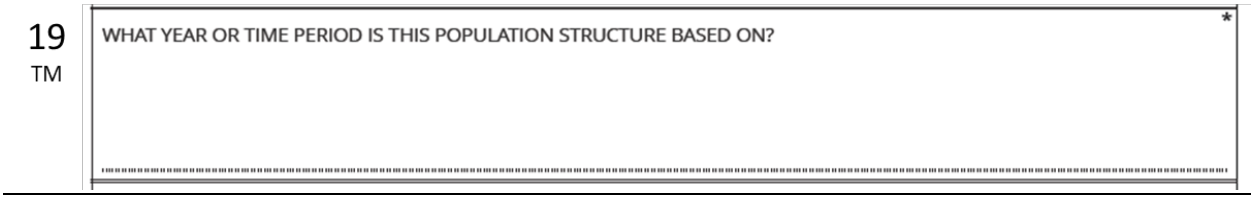
Q16 asks for the number of known extant (current) populations. Please consult the Guidance document on how populations can be defined. Examples for particular taxonomic groups are provided. In there, you will also find information on metapopulations and how to quantify recently fragmented populations. If you are still uncertain, please pose your question on the Google Group.

IMPORTANT: the number of populations entered in Q16 will influence how many specific population sections appear in Section 5 (e.g. for entering Ne or Nc information), with the limit on the Kobo Form set to 100 populations. However, if more than 100 populations exist, an option will be provided to upload their information using a tab delimited file **(Q34-35)**.

For some species, not all populations may be ‘known’, possibly due to the lack of surveys on the species within certain areas. However, there may still be a possibility of additional populations of the species existing, for example, due to available but unexplored habitat. If there is a reasonable idea that there may be other populations in existence, click the second option in (Q17) and provide some clarifying text explaining why this option was chosen (Q18).



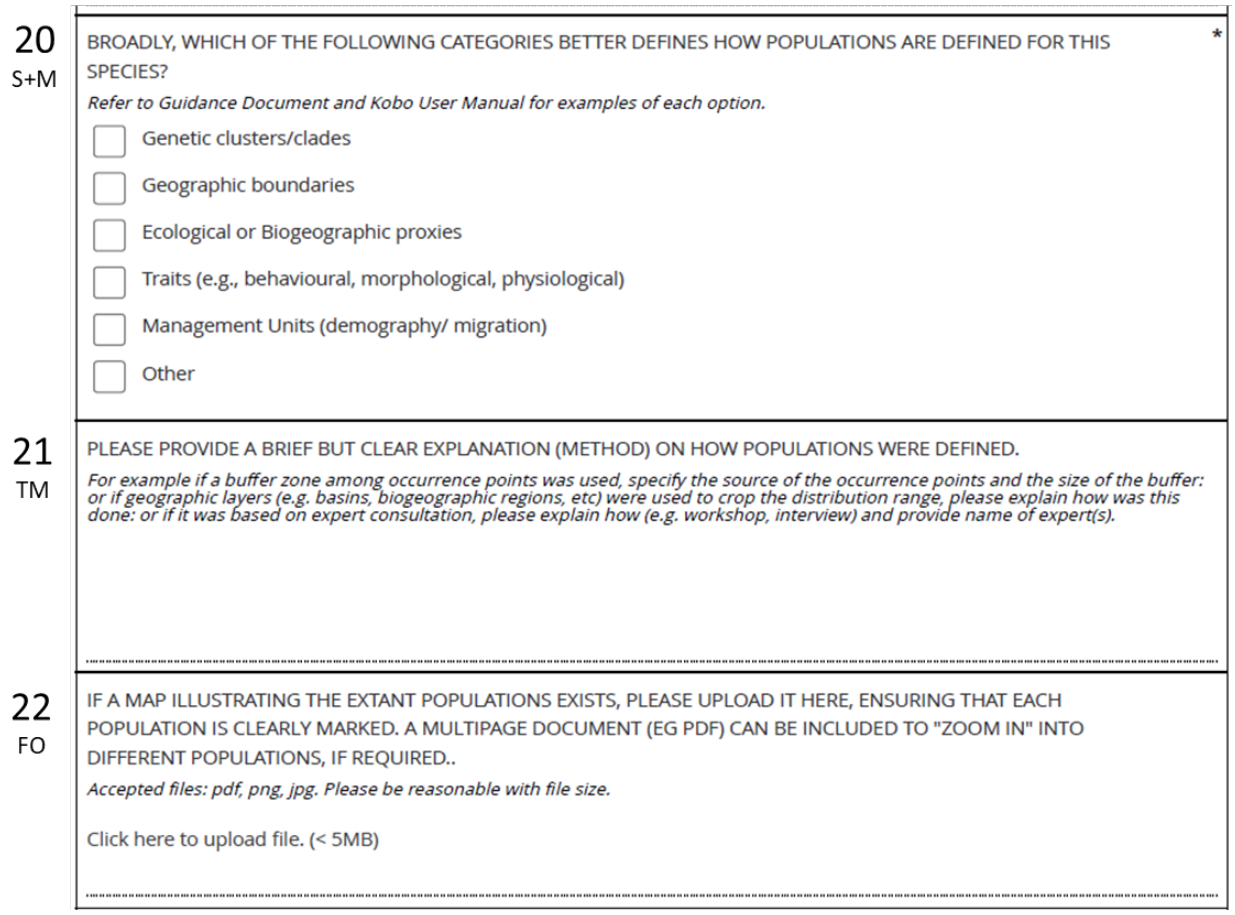
Also, please record the single year (e.g., 2012) or general time period (e.g.,1990-20001990s, 2016-2019) that the information provided in Q14-16 is based on (Q19). For example, the year of the report or database, or year of knowledge from local experts. Please only enter a single year or range of YYYY-YYYY for your submission, for ease of automated analysis!



Please report on all methods used in defining populations for this species (Q20) and provide a brief explanation (Q21), as well as an optional map (or series of maps) depicting the population structure (current and historical), if available (Q22). *If only partial information on populations is available, it is **highly recommended** that assessors denote this information on the map(s) by indicating which populations are being assessed*.

Because only ONE file can be uploaded in Q22, if you have multiple maps we recommend pasting them into a single document (e.g., Word Doc [.docx], PDF). The maps may be rough sketches, drawn digitally, or screenshots from publications.

Note: to be able to upload the map file you will need to have **pop-ups enabled** in your browser. Having them disabled will prevent the prompt from appearing to upload the file.



20
S+M

BROADLY, WHICH OF THE FOLLOWING CATEGORIES BETTER DEFINES HOW POPULATIONS ARE DEFINED FOR THIS SPECIES? *

Refer to Guidance Document and Kobo User Manual for examples of each option.

- [ ] Genetic clusters/clades
- [ ] Geographic boundaries
- [ ] Ecological or Biogeographic proxies
- [ ] Traits (e.g., behavioural, morphological, physiological)
- [ ] Management Units (demography/ migration)
- [ ] Other

21
TM

PLEASE PROVIDE A BRIEF BUT CLEAR EXPLANATION (METHOD) ON HOW POPULATIONS WERE DEFINED.

For example if a buffer zone among occurrence points was used, specify the source of the occurrence points and the size of the buffer: or if geographic layers (e.g. basins, biogeographic regions, etc) were used to crop the distribution range, please explain how was this done: or if it was based on expert consultation, please explain how (e.g. workshop, interview) and provide name of expert(s).

22
FO

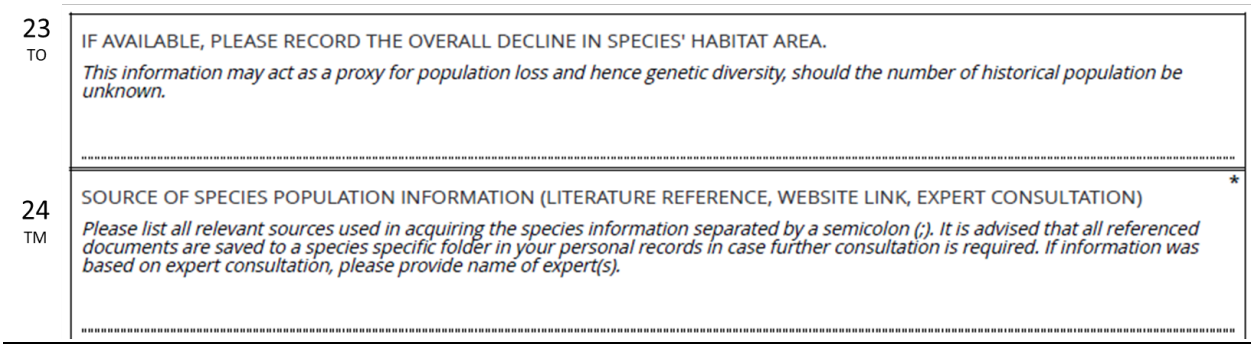
IF A MAP ILLUSTRATING THE EXTANT POPULATIONS EXISTS, PLEASE UPLOAD IT HERE, ENSURING THAT EACH POPULATION IS CLEARLY MARKED. A MULTIPAGE DOCUMENT (EG PDF) CAN BE INCLUDED TO "ZOOM IN" INTO DIFFERENT POPULATIONS, IF REQUIRED..

Accepted files: pdf, png, jpg. Please be reasonable with file size.

Click here to upload file. (< 5MB)

It may be more frequent to find a report on ‘overall decline’ in species habitat area in the country than actual numbers on populations lost, so we do want to record such information. If this is discovered, please report it in Q23.

Note: Overall Decline should be a whole number between 0 and 100 percent. A decline (or loss) of 99% of habitat would mean 1% of habitat remains. Many assessments may simply report “the species has declined by X%”. This is where you can record this information. Only enter the number itself, no % or other symbols or text.

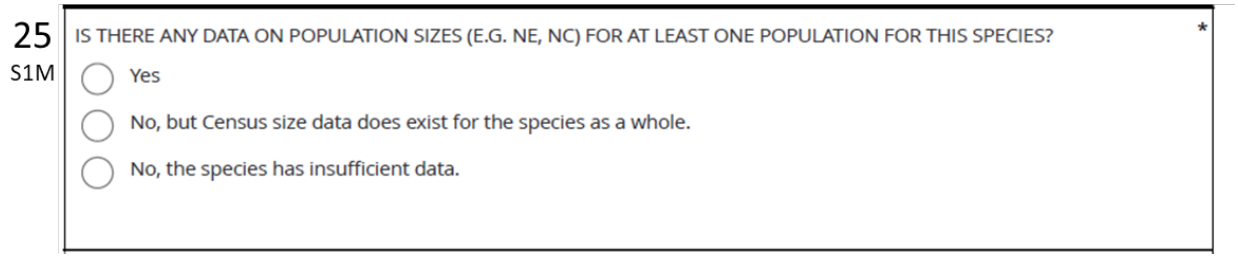


Please list all relevant sources for the population information (Q14-23) in Q24. This may be in the form of, but not limited to scientific literature, government reports, websites, or expert consultation. Please separate each source using a semicolon. To enter each source on a different line, click CTRL+Enter at the end of one reference to move the cursor to the next line. If citing scientific literature or reports, the preferred format is *Harvard* style, but *any standard format will suffice*. If available, please record the DOI as well (as in “DOI: 10.1111/eva.12590”).

It is highly advised that copies of each reference cited be saved in a species-specific folder on the assessor’s own computer to allow for easy retrieval in case further clarification is needed later on.

Section 4: Preface to Indicator 1 (Questions 25-33)

These next questions will help quantify what population size data exists for populations of the species, and in doing so filter out unnecessary questions in Section 5.



In Q25, ‘ANY DATA’ not only refers to quantitative data, but also qualitative and approximate/ imprecise data, or even an ability to confidently say the population is < Nc 5000. All data on population size can be useful and interpretable, even if only available for some populations.

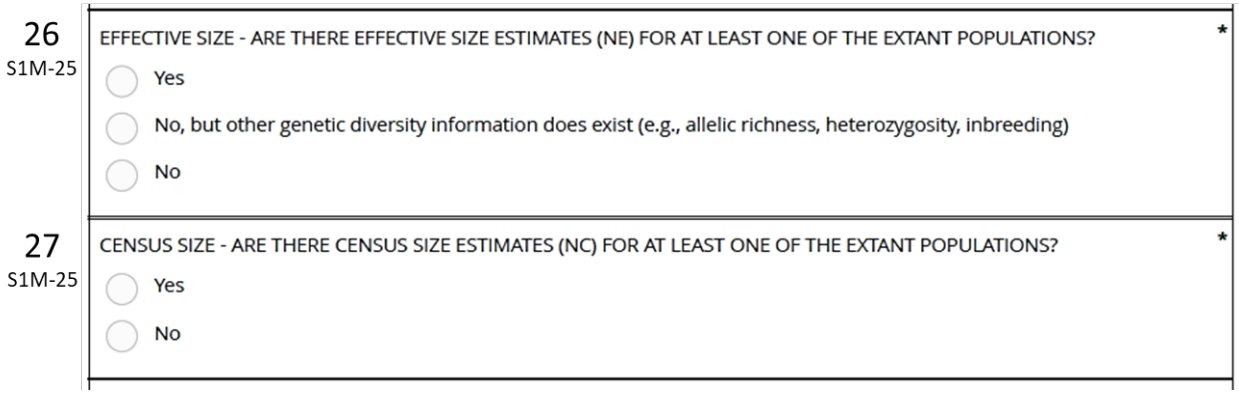
If the answer is Yes, a series of questions will appear asking about effective size, then census size data.

If the answer to Q25 is ‘No, but Census size data does exist for the species as a whole’ the user will be directed to *Section 6: Modified Indicator 1 for the Entire Species within the Country of Assessment*, skipping Section 5 entirely. This means individual population data will not be reported because it is not available.

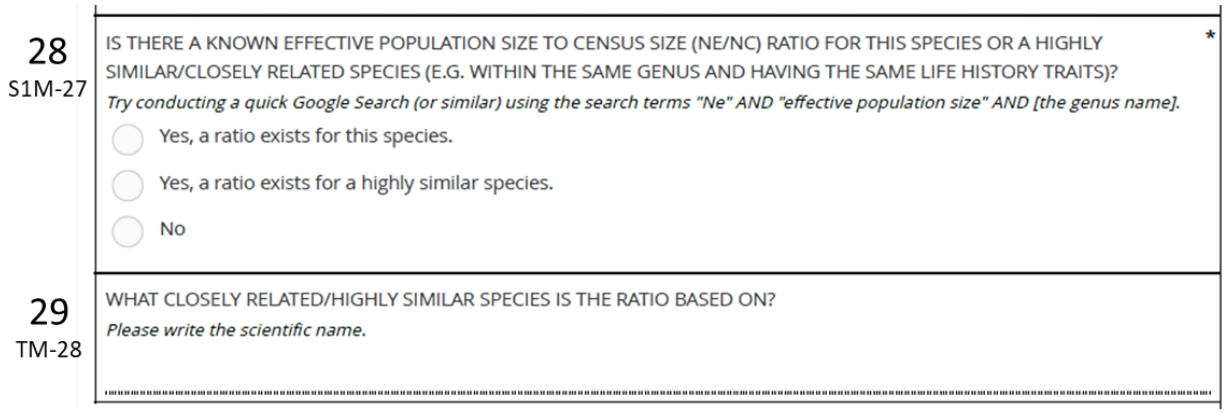
If the answer to Q25 is ‘No, the species has insufficient data’, the form will skip to *Section 7: Indicator 3*.

Questions 26 and 27 are asking about the kind of population size data that exists for the species. If ‘Yes’ is answered for either question, more detailed information related to effective population size and census size will be asked in Section 5: Indicator 1. If ‘No’ is answered for either question, follow-up population size questions in Section 5 will not be presented.

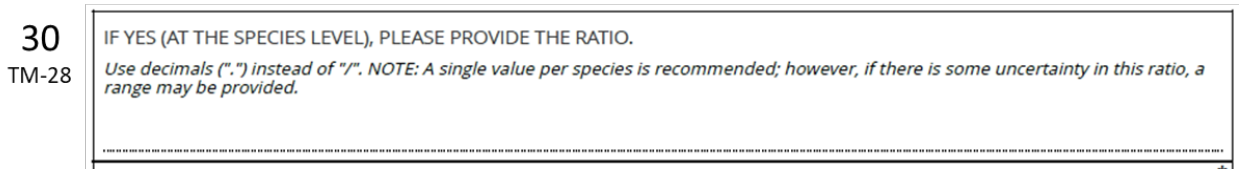
If ‘No, but other genetic diversity information does exist” is selected for Q26, then no effective population size questions will be presented in Section 5.



If 'Yes' is selected for Q27, Q28 will appear asking for whether a ratio of effective population size to census size exists. If one is not immediately known from literature already examined, it is recommended that a Google Search (or similar) be conducted using the following search terms: ("Ne" OR "effective population size") AND ("Nc" OR "census size) AND ratio AND *the genus name for the species*. However, an unreasonable amount of time should not be expended trying to find this information (more than skimming a few papers).

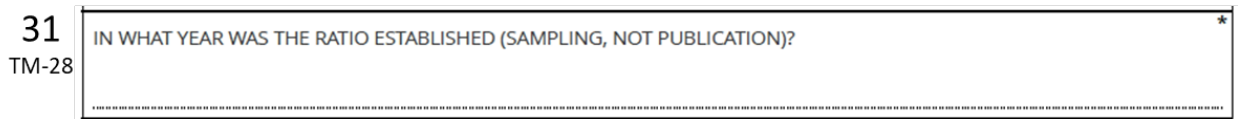


It is possible that a ratio does not exist for the species being assessed, but might exist for a closely related or highly similar (e.g. sharing many life history traits) species. If so, please note which species the ratio exists for (Q29) and to note the ratio (Q30).

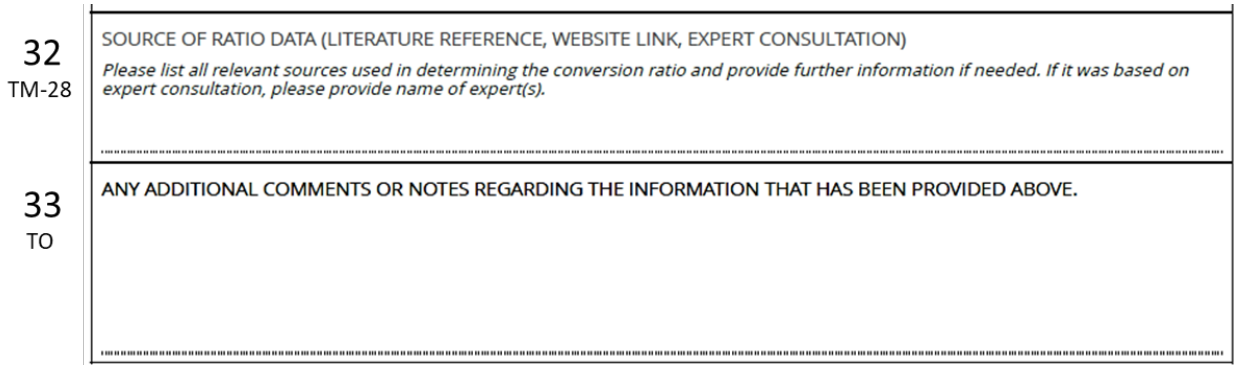


Q30 is specifically asking for an Ne:Nc ratio at the species level, assuming this should not differ between populations. However, there might be some instances in the literature where different

ratios are reported for different populations. This may be the result of different methods or sampling, and as such would be indicative of uncertainty within the ratio. In these instances, please report each value reported, *separated by a semicolon*. Similarly, please report the year(s) that the ratio was established (Q27). Please only enter a single year, years separated by semicolons (;), or range of YYYY-YYYY for your submission, for ease of automated analysis! No other formats



Please record all sources for the ratio information (Q32). This may be in the form of, but not limited to scientific literature, government reports, websites, or expert consultation. Please separate each source using a semicolon. To enter each source on a different line, click CTRL+Enter at the end of one reference to move the cursor to the next line. If citing scientific literature or reports, the preferred format is *Harvard* style, but any standard format will suffice. If available, please record the DOI as well.



The final question for Section 4 (Q33) is optional allowing the assessor to provide any further information or clarification on what has been answered between Q25-Q31.

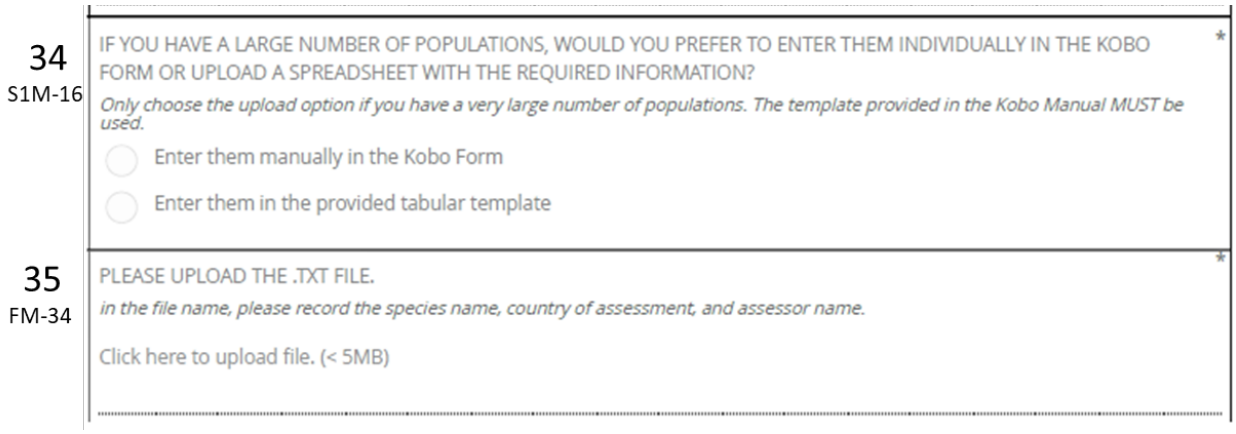
Section 5: Indicator 1 (per population) (Questions 34-56)

The purpose of this section is to provide specific details on population sizes (Ne and Nc) for the number of populations that were indicated in Q16 (Section 3).

If more than 20 extant populations were indicated in Q16, Q34 will appear giving the user the option to either enter individual population information using the Kobo Form (option 1) or submit a tab-delimited document with all required information (option 2). If option 2 is selected, Q35 will allow the user to upload their completed population document. Q36-Q56 will not be presented. In the file name, please record the species name, country of assessment, and assessor name (e.g., Encephalartos-latifrons_South-Africa_Jessica-daSilva.txt). After uploading the document the user will be directed to the next Section. *The **template** for this document can be found here.*

NOTE: the document must be saved as ***tab-delimited*** (.txt) to assist with downstream processing. .csv and .xls files are not permitted.

For species with more than 100 populations, Q34 will not be asked; only Q35 will appear allowing you to upload the population document.

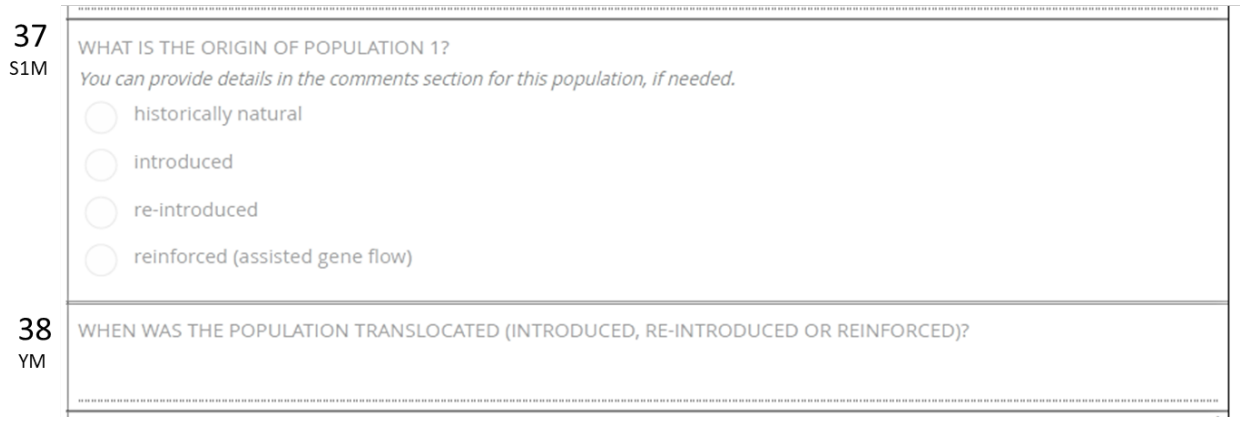


If the species has less than or equal to 20 populations OR the user selected option 1 if there are greater than 20 populations, Questions 36-56 may be presented.

While the form allows for up to 100 populations to be assessed, the example of only one population will be provided here. Answers to population 1 will be automatically entered into the number of extant populations indicated for ease to the user. If answers differ, simply adjust accordingly.

If population names are not known, use a reasonable name based on local governance, landmarks, grid cells, and other such identifying features.

The origin of populations (Q37) is of importance as it will provide insight into the genetic composition for the species as a whole. It will also help inform Indicator 2 (Section 3) on the number of populations maintained. Definitions of each option are provided below..



- ***Historically natural*** means that the native gene pool has been in that location for 'some generations' (e.g. before human influences).
- ***Introduced*** is a population that had never (in recent past e.g. past hundreds of years) been known to occur at that particular location but now does. It is not connected to other locations and is evolving separately from other populations.
- ***Re-introduced*** would be a population that went extinct in a location and was reintroduced (by humans or more rarely naturally) with an altered genetic composition. This could be because it was a captive bred population with small population size, a mixed population, or from another location.
- ***Reinforced*** is a population that has its native gene pool but has had some demographic support from a breeding population or other population and, thus, probably also has some non-local genetic material. But it is likely to be 'mostly' the original gene pool of the location.

While guidance on scenarios involving translocated populations are provided in the Guidance Document, a few aspects will be discussed here to help you quantify the number of extant populations for the species.

Scenario 1*:* A population was showing signs of rapid decline and a decision was made to put a large number of individuals (50-100s) into a captive breeding program. The natural population went extinct, but the population was re-introduced from the captive bred individuals.

Decision: The population can be considered “historically natural”, but an explanation of this scenario should be provided in the comments box (Q56). Also, the captive bred individuals held *ex situ* should NOT be considered a population.

Scenario 2*:* At a given locality Population A has gone extinct. To help encourage connectivity within the species, individuals from Population B have been introduced into the space where Population A previously occupied.

Decision: While the introduced ‘population’ is occupying the space/geography of a previously known population, the original genetic lineage (of Population A) no longer exists. As such, the genetic composition of the new population where Population A used to exist would not represent the original Population A. Instead, these individuals would be considered as an extension of Population B, and their numbers should factor into the details for Population B. This introduced population WOULD NOT be considered a separate population or part of Population A. Population A should be considered extinct as its original genetic composition is not restored. This will need to be reflected in Q14-15.

Scenario 3*:* Some species are solely found as highly managed units, sometimes fenced in private reserves/farms and other times confined to protected areas of varying size. The natural dispersal capabilities of these animals may be restricted or prevented entirely. In an attempt to replicate gene flow, animals may be moved between sites/localities.

Decision: Depending on the extent of the movement of individuals, this scenario can be handled differently.

1) If the translocation of individuals happens across the entire range of the species/subspecies/variety, it can be considered a single metapopulation. Only one population would be counted and it would be classified as “**historically natural**”. This has been a common management practice for highly threatened species (e.g. Cheetah, *Acinonyx jubatus*; Southern white rhino,*Ceratotherium simum simum*, others?) and to proactively prevent inbreeding in isolated, fenced populations of wide-ranging species (e.g., ?).
2) If a population has been supplemented by individuals from a separate population for the purposes of boosting genetic diversity (i.e., genetic rescue), the supplemented population would be classified as “**reinforced**”. Examples include the Florida panther (*Puma concolor coryi*), Mountain pygmy possum (*Burramys parvus*)*,* Scandinavian wolf *(Canis lupus),* and South Island robins (*Petroica australis*) [others?]
3) If it is known that no movement occurs between sites/localities where the species occurs, each site should effectively be considered a population, and the origins of the population will need to be classified for each. If the site is in the known distribution of the species, it can be considered “historically natural”; otherwise it can be considered “introduced”.
4) Movement is known for some sites, but the details of other sites are unknown either because records were not kept or records are inaccessible.

Scenario 4: Domesticate populations of wild relatives (crops/breeds)

If you encounter a species with a highly complex translocation scenario (extensive hybridization from multiple populations OR multiple translocation events related to their genetic origin), we recommend you exclude this species from this project at this time. More detailed investigations will be required which falls outside the scope of the current project. We do, however, encourage you to flag these species for later consideration.

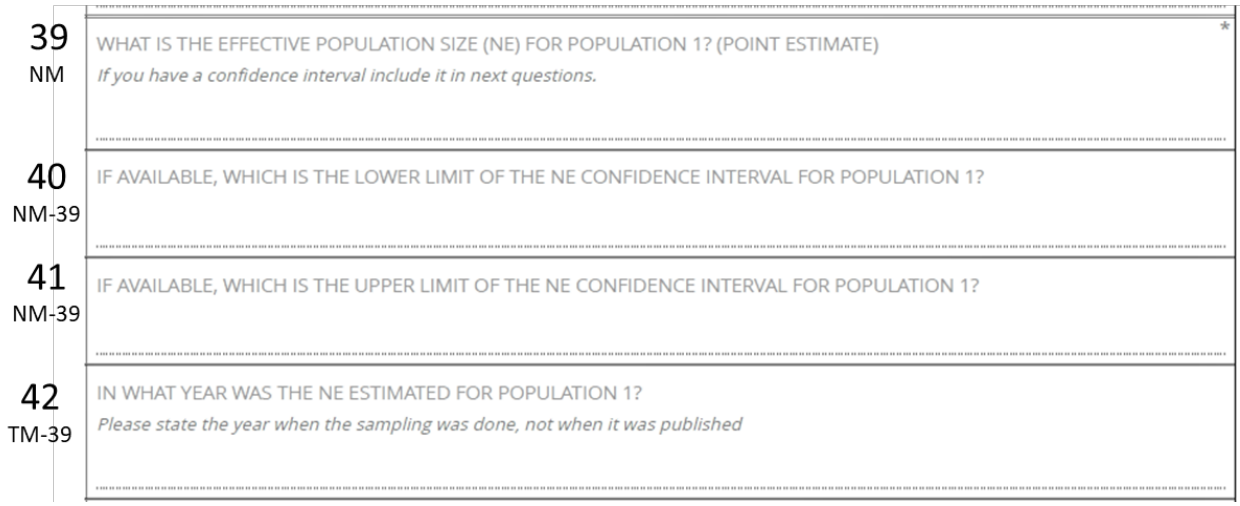
REMINDER: Please clarify details relating to the origins and movements of populations in Q56. Specifically, please note at least if the translocation was (1) from within the natural population´s range, (2) outside of the natural population´s range, (3), mix of different origins, or (4) unknown.

IMPORTANT: *If multiple estimates of Ne or Nc exist for a given population*, and the assessor, to the best of their knowledge, *cannot determine which would be the most appropriate* or accurate to report on, then the assessor will need to complete the entire Kobo form for the same species **again** noting these alternative population size estimates. A specific note **MUST** be made on both forms (e.g., in Q51) explaining the situation so that evaluators can be made aware and review the records together.

Effective population size

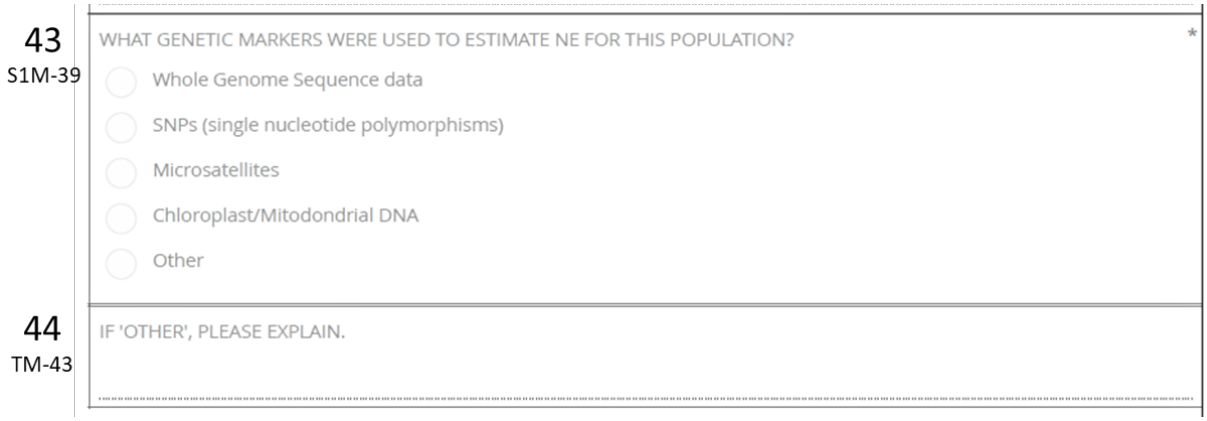
The next questions (Q39-Q46) are related to the effective population (Ne) size data and will only appear if 'Yes' was selected in Q26. Please note that Ne should be provided only as a *point estimate*, with upper and lower confidence limits provided, if available. If Ne is only known for some, but not all populations, please enter **-999** in Q39 for the populations **where Ne is unknown**. If Ne for the population is estimated to be *infinity,* please enter **99999999** in Q39.

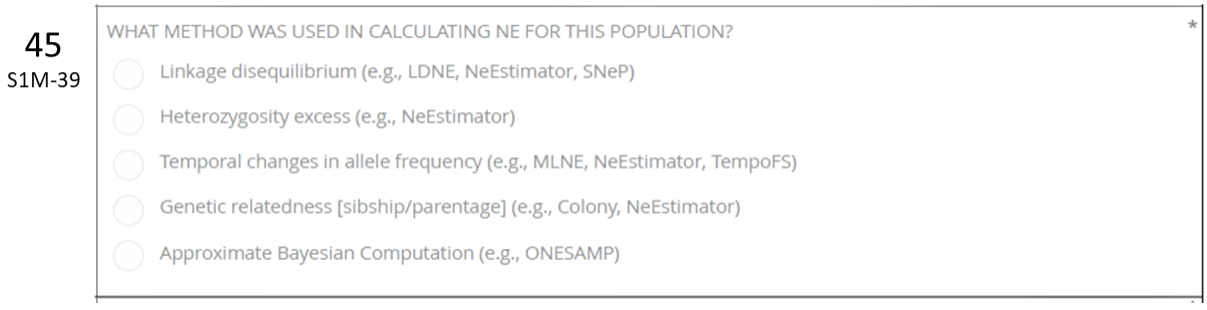
NOTE: The confidence intervals mentioned in Q40 and Q41 are assumed to be the 95% confidence intervals often provided with Ne calculations. However, if a different confidence interval was used, please make note of it in the Additional Comments question at the end of the Section (Q56) (e.g. write "upper and lower confidence intervals were 90%").



For Q42, please type the year the sampling was done NOT the year of the publication., Please only enter a single year or range of YYYY-YYYY for your submission, for ease of automated analysis!

Because Ne can vary depending on the type of marker and analysis used to estimate it, please record this information (Q43-Q45). It could also help in refining Ne:Nc ratios later on.





Previously when asked what methods were used to calculate Ne, the assessor had the option of selecting all that applied. However, in this instance it is assumed the Ne being reported for the

specific population was calculated using a single method. Hence, in Q45, only one answer is permitted.

If multiple estimates of Ne are available for a population, it is advised that the assessor apply their knowledge and expertise on the species to decide which is the most realistic. If the assessor is not knowledgeable on the taxonomic group or does not feel confident in deciding which method is most valid, the method generating the largest Ne could be reported, provided the estimate does not seem to be a gross overestimate compared to other population values. If the largest estimate seems inappropriate, or if you need help deciding, please make a post on the Genetic Indicators Google Group stating the species and link to the source material, to seek further advice. If still uncertain, the assessor should submit the form twice (or however many times) for each of the different Ne values. A specific note **MUST** be made on all (see Q56) explaining the situation (e.g. report A states X while report B states Y) so that evaluators can be made aware and review the records together.

Please list all sources of information provided for Q39-Q45, separated by a semicolon. To enter sources on separate lines, please click CTRL+Enter at the end of one reference to move the cursor to the next line.

Census size

The next questions (Q47-Q52) relate to population census size (Nc) data. They only appear if 'Yes' was selected in Q27. Nc can be provided as qualitative data, a range OR point estimate (a single number), and there may be instances where Nc is only known for some, but not all populations of a species. Please clarify this in 47.

NOTE: the term 'point estimate' can be a bit general. If the report or expert states that population size is "approximately 300", you can simply enter 300. Only enter whole numbers, with no commas.

For populations with entirely unknown Nc (with no way to determine above or below Nc 5000), select "unknown".

If an Nc estimate is known, please record the year the estimate was taken (Q48). This would be the year the actual census was taken which should be available in reports, databases, or from a local expert. Please record this as a single year or range of YYYY-YYYY only. This will help with automated analysis later on.

47
S1M

IF THERE IS A CENSUS POPULATION SIZE (NC) AVAILABLE, IS THIS A RANGE OR POINT ESTIMATE? *

- quantitative range or qualitative data (e.g. "1,000 to 2,000" or "expert says few hundreds")
- point estimate (quantitative data with or without confidence intervals, as well as round estimates e.g. "expert says around 3,000)
- unknown

48
TM-47

IN WHAT YEAR WAS THE NC ESTIMATED FOR POPULATION 1?

Please state the year when the sampling was done, not when it was published

49
TM-47

HOW WAS NC CALCULATED IN THIS POPULATION? *

- Count
- Extrapolated based on habitat area and known density
- Unknown

While it is generally assumed that the Nc estimates are from visual/expert estimates based on counts of individuals (or models from such counts), this is not always the case. Nc estimates may be based on available habitat and estimates of densities, and not actual count data. As such, how Nc was calculated must be specified in Q49.

If a qualitative range or quantitative data for Nc was selected in Q47, please select from the options presented in Q50.

50
TM-47

WHATS THE RANGE OF THE NC FOR POPULATION 1? *

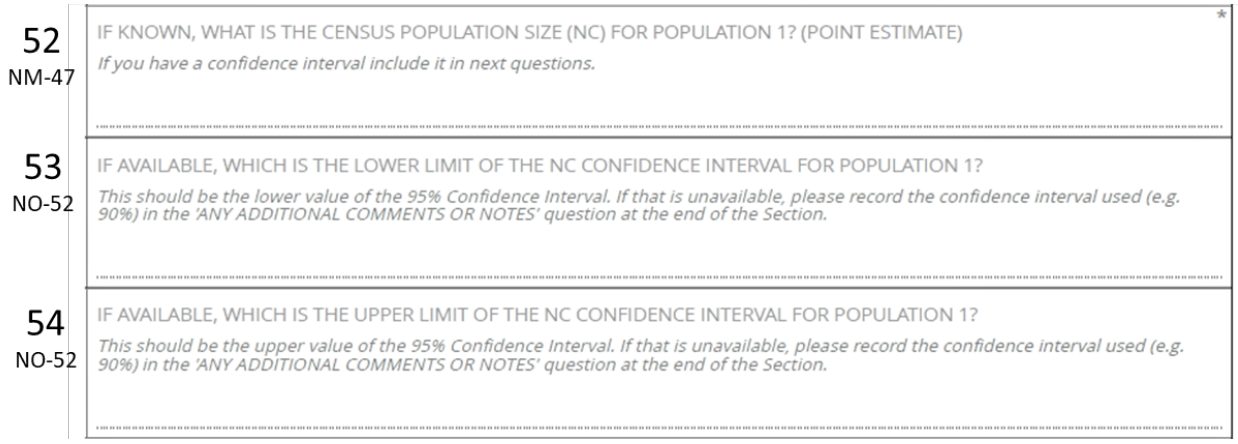
- < 5,000 by much
- < 5,000 but not by much (tens or a few hundred more)
- > 5,000 but not by much (tens or a few hundred more)
- > 5,000 by much
- estimate is a range including both less and greather than 5,000 (e.g. "3,000 to 10,000")

For Indicator 1, interpretation of qualitative or range data is important. The threshold census value is 5000, below which a population is deemed at risk. Information indicating the potential extent below 5000 could be valuable; hence we have provided two options below 5000. Data that would fit into option 1 would be 100 to 1000, for example. An example of a range fitting into option 2 would be 4500-4950. The option '<5,000 by much' could indicate severe risk for the population. While both options would classify the population as Nc<5000 for calculating the Indicator 1 metric, this information could be used to assess potential imminent risk. Similarly, for populations with a census size greater than 5000, it would be informative to know if the population is just above 5000 or well above 5000. Examples of data falling in option 3 would be 5550-6000. Ranges such as 10,000-20,0000 would fall under option 4.

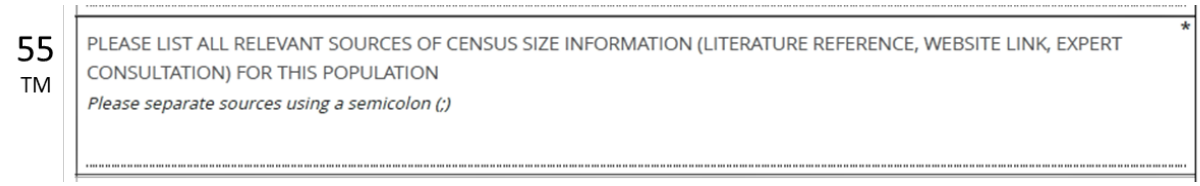
The last option will create difficulty in assigning the population to a side for calculating Indicator 1 because the reported range is both above and below 5000, but such examples do exist. For example, the census size for a population may be reported as 3000-6000. In such instances, downstream analyses will classify the population as greater than and less than in two different calculations and an average metric using both scenarios will be quantified. .

Q51 allows users to enter the specific range referred to in **any of the options within Q50**. While this question is optional, it is highly recommended that it be completed if a clear range is reported, such as 400-600, 100-1000, 4000-6000. We will use this information in calculating mean sizes of populations for reporting in our paper. **Important:** please use the '-' and no spaces between the numbers, no quotes, and no commas! (e.g. 3000-6000).

If a point estimate for Nc is provided, please enter this value, and the upper and lower confidence intervals if available. Confidence intervals are assumed to be the 95% limits; however if a different confidence interval was used, note it in the Comments question at the end of this Section (Q56).



In Q55, please list all sources of information provided for Q47-Q54, separated by a semicolon. To enter sources on separate lines, please click CTRL+Enter at the end of one reference to move the cursor to the next line.



The final question, Q56, for each population in Section 5 is optional, allowing the assessor to provide any further information or clarification on what has been answered between Q34–Q54, such as denoting if Nc was based on habitat data rather than actual counts.

56 TO	ANY ADDITIONAL COMMENTS OR NOTES REGARDING THE INFORMATION THAT HAS BEEN PROVIDED OR WHY IT COULD NOT BE FOR POPULATION 1?

Section 6: Modified Indicator 1 for the Entire Species Within the Country of Assessment (Questions 57-65)

This section will only appear if you answered “No, but Census size data does exist for the species as a whole “ in Q25, Section 4. *This section should not be completed if individual population size data exists*. The questions presented here are identical to the census size questions asked for each population in Section 5 (Q47-55), but these *specifically relate to the entire species within the country*.

For some species, whole species count estimates are available, but not for individual populations (as is sometimes found in the IUCN Red List Assessments). This information can still be valuable, especially if it is already known that the entire species census size is under 5000 mature individuals, which would indicate the species (and each of its population) are at risk. Even if an exact (point estimate) is unknown, a general range may be available, e.g. knowing whether a species is close to or far from 5000 mature individuals.

For transboundary species where a total species count is known, but no specific count exists for the country of the assessment, please estimate a census count by taking the proportion of the species within the country of assessment (Q76 below, Section 8) and multiplying it by the total species count. For example, 25% of species A exists in the assessment country, and the total (global) species count is estimated at 30 000. The estimate for this country will be report as 0.25*30 000 = 7 500. We acknowledge this is an estimation. To be sure it is flagged properly for analysis, please be sure to fill in Q74 and Q75 about the transboundary nature of the species, and make a comment in Q65 as follows: “Species census in country estimated based on X% range in the country.”.

57
S1M

CENSUS SIZE - IS THIS A RANGE OR POINT ESTIMATE? *

- ◯ quantitative range (e.g. "1,000 to 2,000" or "expert says aroung 3,000")
- ◯ point estimate (quantitative data with or without confidence intervals)

58
S1M-57

WHAT IS THE RANGE OF NC FOR THE SPECIES? *

- ◯ < 5,000 by much
- ◯ < 5,000 but not by much (tens or a few hundred more)
- ◯ > 5,000 but not by much (tens or a few hundred more)
- ◯ > 5,000 by much
- ◯ estimate is a range including both less and greather than 5,000 (e.g. "3,000 to 10,000")

59
TO-57

IF A MORE DETAILED RANGE IS AVAILABLE, PLEASE ENTER IT HERE.

60
NM-57

WHAT IS THE CENSUS SIZE (NC) FOR THE SPECIES? (POINT ESTIMATE) *

If you have a confidence interval include it in next questions. Leave blank if Nc was not quantitatively estimated.

61
NO-60

IF AVAILABLE, WHICH IS THE LOWER LIMIT OF THE NC CONFIDENCE INTERVAL FOR THE SPECIES?

This should be the lower value of the 95% Confidence Interval. If that is unavailable, please record the confidence interval used (e.g. 90%) in the 'ANY ADDITIONAL COMMENTS OR NOTES' question at the end of the Section.

62
NO-60

IF AVAILABLE, WHICH IS THE UPPER LIMIT OF THE NC CONFIDENCE INTERVAL FOR THE SPECIES?

This should be the upper value of the 95% Confidence Interval. If that is unavailable, please record the confidence interval used (e.g. 90%) in the 'ANY ADDITIONAL COMMENTS OR NOTES' question at the end of the Section.

63
TM

IN WHAT YEAR WAS NC ESTIMATED FOR THE SPECIES? *

Please state the year when the sampling was done, not when it was published

64
TM

SOURCE OF SPECIES CENSUS SIZE INFORMATION (LITERATURE REFERENCE, WEBSITE LINK, EXPERT CONSULTATION) *

Please list all relevant sources used in acquiring the species information separated by a semi-colon (;). It is advised that all referenced documents are saved to a species specific folder in your personal records in case further consultation is required. If information was based on expert consultation, please provide name of expert(s).

65
TO

ANY ADDITIONAL COMMENTS OR NOTES WITH RESPECT TO THE INFORMATION PROVIDED IN THIS SECTION.

E.g., record the confidence interval used for the point estimate if not 95%.

Section 7: Indicator 3 (Questions 66-69)

Questions in this section will contribute towards Indicator 3 (number of species and populations in which genetic diversity is being monitored using DNA based methods within the country). This indicator is calculated as a count of studies that use DNA data sampled within the country to help managers assess genetic status and choose appropriate actions, such as studies of genetic connectivity, hybridization, adaptation, and mating patterns. *Note* that these studies can sometimes use data from different countries (e.g. genetic monitoring of populations of transboundary species), so please ensure that samples used are for the species within the country of assessment. Phylogenetic studies would refer to studies with many species and typically only a few samples for the focal species. This of course can provide useful information for conservation (e.g., clarifying species boundaries). However, as above, please ensure that samples reported in the phylogenetic study are from the species within the country being assessed. Most other studies would fall under 'population level' studies. It can be included even if only one population is studied.

Temporal studies refer specifically to sampling and analysis that occurred at two time points, typically separated by one or more generations or cohorts (e.g. reflecting genetic change over time).

66
S1M

HAVE GENETIC STUDIES BEEN CONDUCTED INVOLVING THE SPECIES? *

- ◯ Yes, but only phylogenetic/phylogeographic studies.
- ◯ Yes, but only population-level studies.
- ◯ Yes, both phylogenetic and population studies.
- ◯ No

67
S1M

HAS TEMPORAL GENETIC MONITORING BEEN CONDUCTED FOR ONE OR MORE POPULATIONS OF THIS SPECIES? *

A temporal comparison using at least two time points of various genetic diversity metrics for the species.

- ◯ Yes
- ◯ No
- ◯ Unknown

68
TM-67

IF YES, WHAT YEARS DID THIS TAKE PLACE? *

69
TM

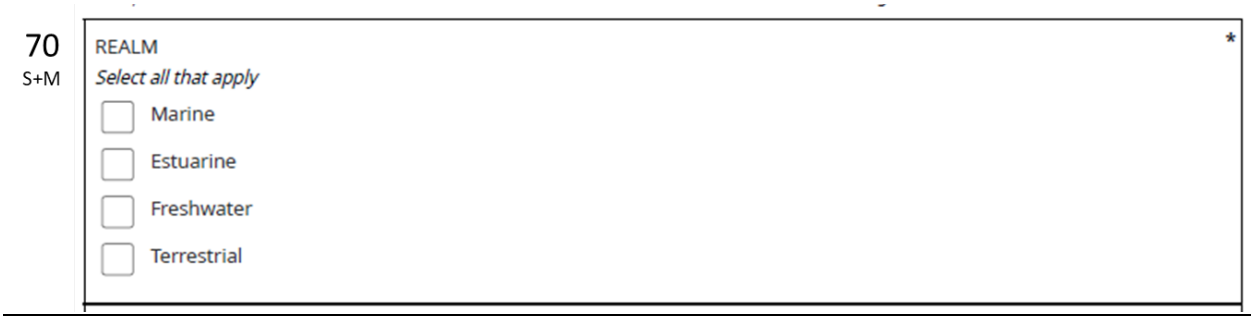
PLEASE CITE ALL DATA SOURCES FOR THE GENETIC STUDIES (LITERATURE REFERENCE, WEBSITE LINK, EXPERT CONSULTATION) SEPARATED BY A SEMI-COLON (;). IT IS ADVISED THAT ALL REFERENCED DOCUMENTS ARE SAVED TO A SPECIES SPECIFIC FOLDER IN YOUR PERSONAL RECORDS IN CASE FURTHER CONSULTATION IS REQUIRED. *

Section 8: Other Species Information (Questions 70-100)

Important Note: **For transboundary species, answer the questions in relation to the country of assessment and NOT for the species entire range.**

Answers to the questions in this section may be used in several ways for our final report and for National Reporting. They may be used to disaggregate the indicators (e.g. report indicator values separately by habitat type, lifespan, threat status, or taxonomic group). They may also help refine metrics, such as the Ne:Nc ratio (e.g. by taxonomic group). Lastly, they provide the country with understanding of bias in the type of species being assessed (e.g., threatened status, life history classifications) which could be important to countries in their national reporting and future efforts. As such, the majority of these questions are mandatory to fill in. However, if the information cannot be found during completion of the assessment (e.g., the information is not provided in the reports/ literature/ databases consulted), *it is perfectly acceptable to mark the questions as Unknown*. Do not spend an unreasonable amount of time searching for this information for each species.

Habitat Data



Four geographic realms are recognized; however some species utilize/inhabit more than one realm. For example, many amphibians exist in the terrestrial and freshwater realms. Similarly, anadromous fish utilize freshwater and marine realms at different stages of their lives. Please select all realms that would apply to your species within the assessment country.

Within each of the four realms, species might occur in one or more major habitat types. The ones listed below are taken from the IUCN Habitat Classification Scheme. If a species has been assessed for IUCN's Red List, all related habitat types will be listed in the Habitat and Ecology section of the report. For a detailed explanation on each habitat type and the sub-types within them, please consult the link above. For species that have not been Red Listed, please try to select the closest match for your species following the Habitat Classification Scheme.

71
S+M

IUCN HABITAT CLASSIFICATION *

IUCN (2012) IUCN Habitat Classification Scheme. https://www.iucnredlist.org/resources/habitat-classification-scheme. Select all that apply.

- [ ] Artificial - terrestial
- [ ] Artificial - aquatic
- [ ] Caves & Subterranean habitat
- [ ] Desert
- [ ] Forest & Woodland
- [ ] Grassland
- [ ] Marine-Neritic
- [ ] Marine-Oceanic
- [ ] Marine-Deep Ocean Floor
- [ ] Marine-Intertidal
- [ ] Marine-Coastal/Supratidal
- [ ] Rocky Area
- [ ] Savanna
- [ ] Shrubland
- [ ] Wetland
- [ ] Unknown/Other

Because the habitat types listed above are broad groups, you may include additional habitat (e.g., sub-type) information (Q72). For example, within IUCN's Habitat Classification Scheme the Wetland habitat type encompasses streams, rivers, and lakes, among others; and areas such as beaches fall within Marine Intertidal, while sand dunes fall within Marine Coastal/Supertidal. Providing this finer habitat detail is welcome here.

72
TO

OTHER HABITAT DATA

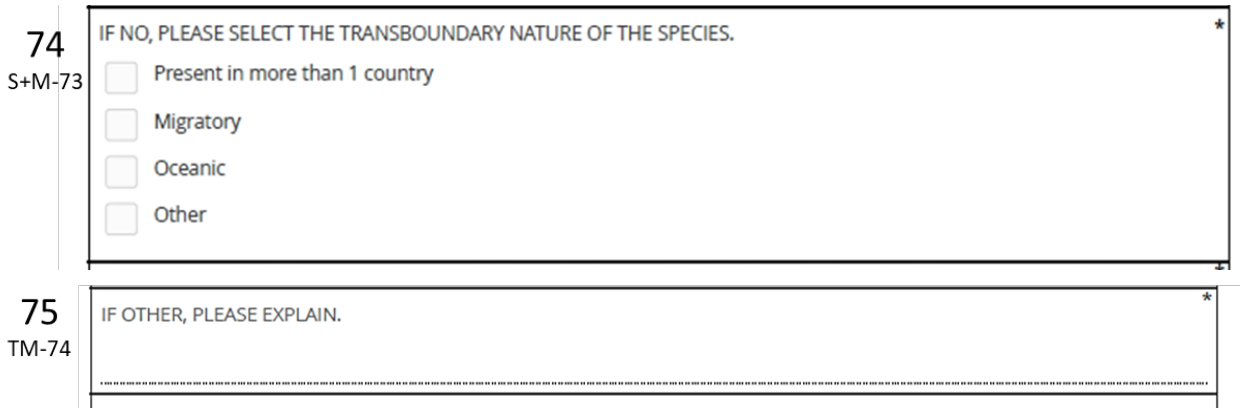
Please feel free to elaborate further on the habitat of the species. E.g., Wetland may be broken down further into streams/rivers, lakes, etc.

Distribution

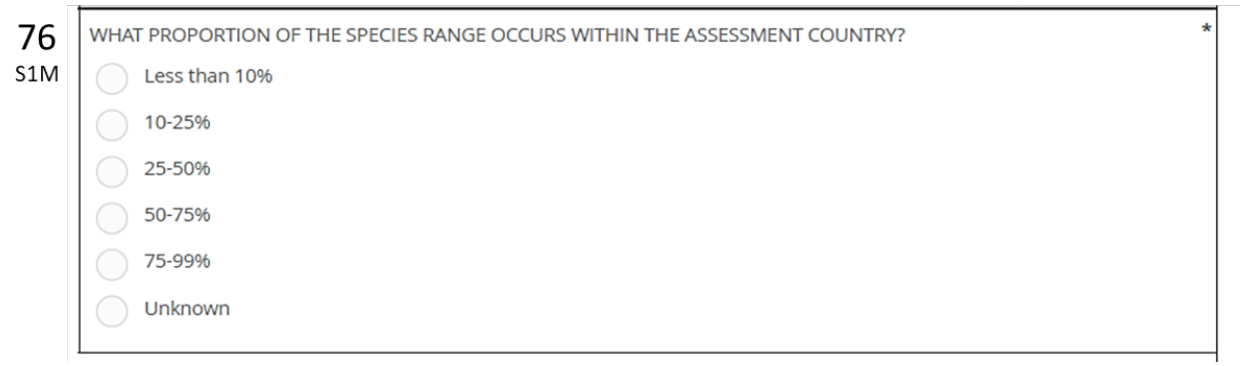
Endemic species are clearly within the purview of national reporting, and are likely to be more straightforward to assess for the proposed genetic indicators than more widespread, transboundary species. However, the inclusion of international, migratory and.or oceanic species is still important.

If a species is not a national endemic, additional questions will appear relating to the transboundary nature of the species.

Because the transboundary nature of a species might be explained by more than one of the options listed below (e.g., whales), please select all that apply.



For Q74, if the species is migratory, *occurs* refers to where the species breeds and/or spends most of its time. It is ok to make a 'best guess' for this question. If you really have no idea, choose Unknown.



Range

Note*: Please remember to only consider *the range of the species within the country of assessment.

The range of a species may be classified as wide-ranging or restricted and/or rare. Each range type can impact on the effective size of species' populations and therefore it is important to understand how species are distributed.

While wide-ranging species are often assumed to be common (and in many instances they are), some species are distributed widely, but occur in scattered, small populations (e.g., *Aloe framesii, Aloe kniphofioides* in South Africa), and are thus "rare". To disentangle this information, the extent and rarity of species distributions are asked separately.

We use the following definitions:

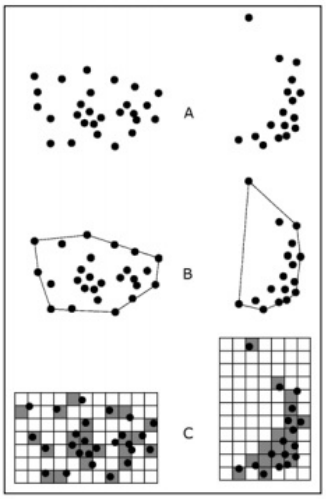


Figure 2. Two examples of the distinction between extent of occurrence and area of occupancy. (A) is the spatial distribution of known, inferred or projected sites of present occurrence. (B) shows one possible boundary to the extent of occurrence, which is the measured area within this boundary. (C) shows one measure of area of occupancy which can be achieved by the sum of the occupied grid squares.

- Extent of occurrence (EOO; as defined by the IUCN) is the general region a species occurs in, including all known, inferred or projected sites. It is calculated as the area of a convex hull around the whole distribution- basically a polygon around the whole range. EOO reflects large or small distribution.

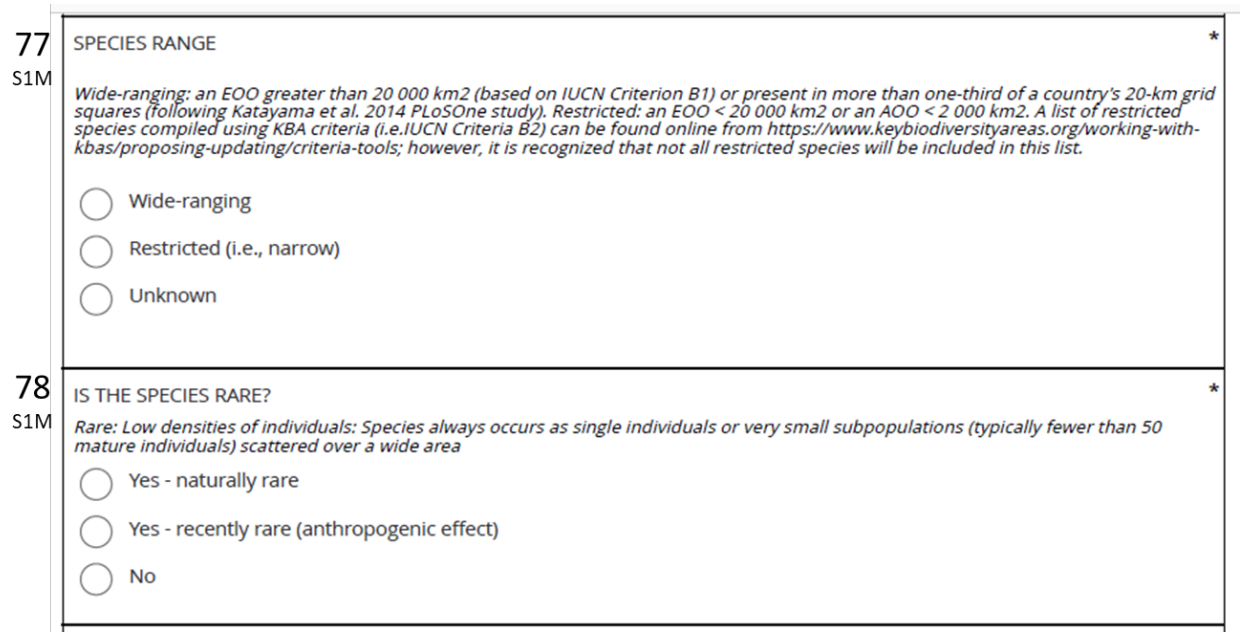
- Area of Occurence (AOO) is the area within its EOO which is actually occupied by a taxon. It is calculated as the area of the sum of grid cells a species occurs in. AOO reflects how often you find the species within its large distribution

- Wide-ranging species have an EOO > 20 000 km^2 following IUCN's Criterion B1 or are present in > ⅓ of a country's 20-km grid squares (following Katayama et al. 2014 in PLoSOne).

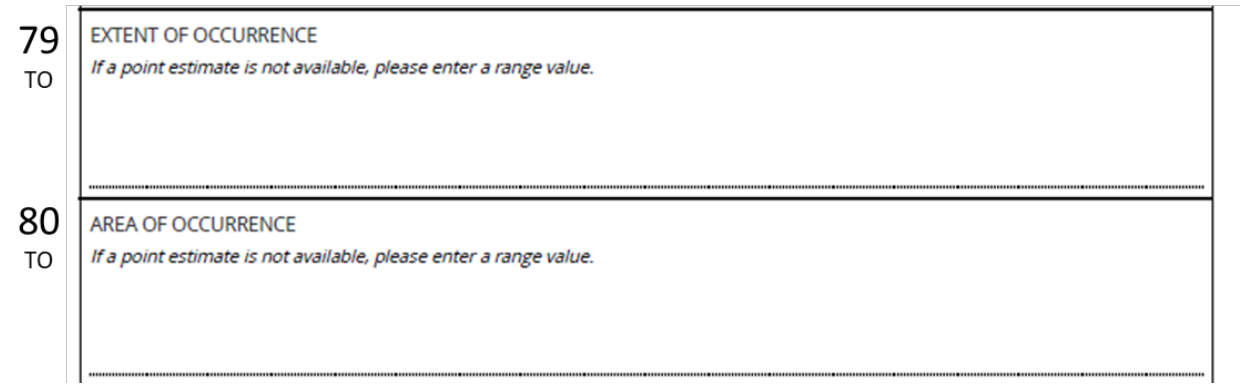
- Restricted species are those with an EOO < 20 000 km^2 or an AOO < 2 000 km^2. A list of restricted species compiled using KBA criteria (i.e.IUCN Criteria B2) can be found online from https://www.keybiodiversityareas.org/working-with-kbas/proposing-updating/criteria-tools; however, it is recognized that not all restricted species will be included in this list.

- Rare species must meet at least one of the three criteria (see Rabinowitz 1981):
    - Restricted range: EOO <500 km^2, OR
    - Habitat specialist: restricted to a specialized microhabitat so that it has a very small AOO (typically smaller than 20 km^2), OR
    - Low densities of individuals: always occur as single individuals or very small subpopulations (typically < 50 mature individuals) scattered over a wide area

In addition, we ask if the species is naturally (historically) rare or recently rare due to anthropogenic influences (i.e., threats) (Q78).



If available, please provide the EOO and AOO of the species in the country being assessed in kilometers squared (km^2). You can sometimes find this in National IUCN Red List Assessments. *For transboundary species, please report only on the EOO and AOO within the country of assessment.* If you cannot find or calculate this information, you may skip this question.



Q81 asks about the level of population fragmentation in the species *within the assessment country*. While this might be inferred from EOO and AOO, a classification would be helpful. This information could inform the number of populations (or meta-populations) for the species.

81
S1M

LEVEL OF POPULATION FRAGMENTATION *

As per IUCN definition, severely fragmented means that more than half of the species' total AOO is in habitat patches that are (1) smaller than would be required to support a viable population, and (2) separated from other habitat patches by a large distance. Moderately fragmented refers to a species with less than half of its AOO in habitat patches.

- ◯ Severely fragmented
- ◯ Moderately fragmented
- ◯ None (continuous population)
- ◯ Unknown

If additional information exists on the species range, please include it as additional information (Q82).

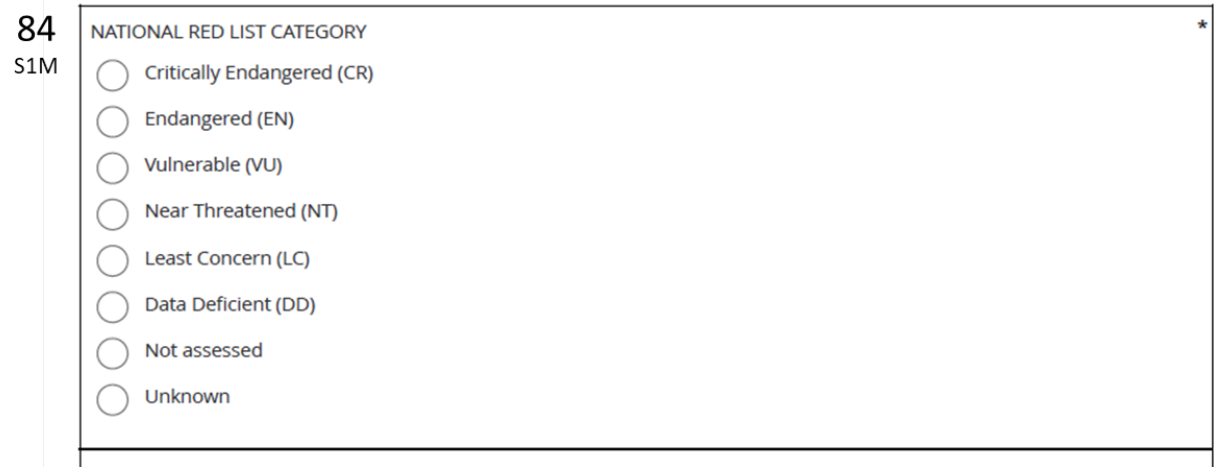
82
TO

ADDITIONAL INFORMATION ON SPECIES RANGE.

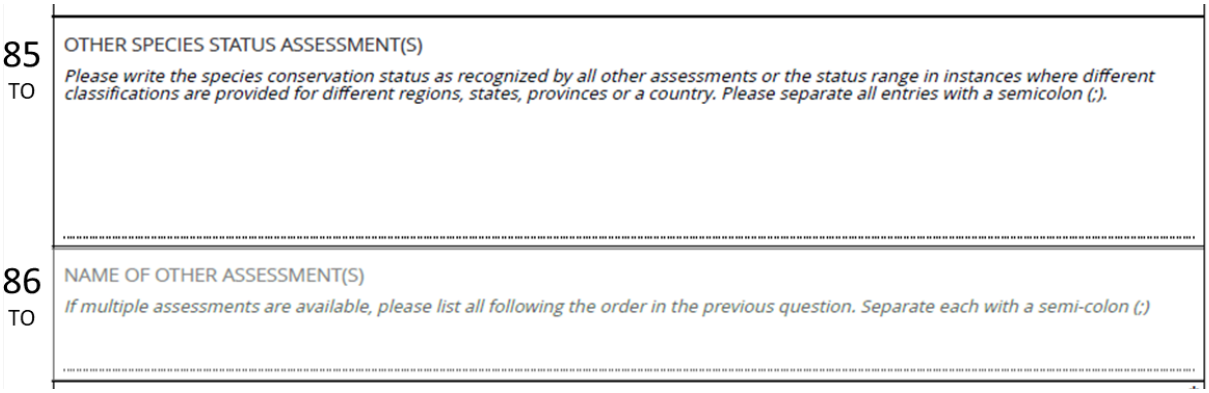
Feel free to include other specific information on the range of the species.

Conservation Status

If a species has been assessed using IUCN's Red List criteria, globally and/or nationally, please enter the current Red List status for the species, under Q83 for global and Q84 for national or regional.



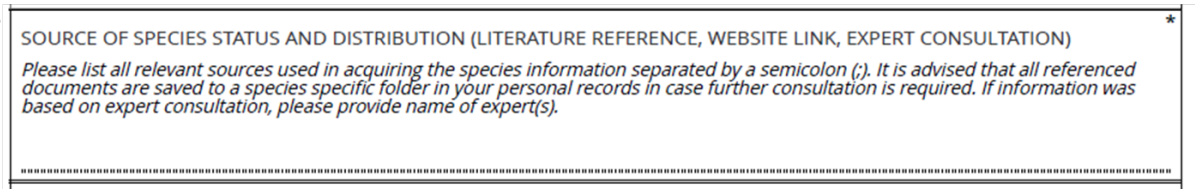
Some countries have species threat status systems (including with legislation at national or state/ province levels). If this applies to the species being assessed, please record the conservation designation for the species (e.g. G1, Threatened, Species of Concern) (Q85), as well as the name of the national/regional assessment (e.g. NatureServe, USA Endangered Species Act) (Q86). CITES status can also be added here.



If multiple assessments are available for a species (e.g., both NatureServe and USA Endangered Species Act OR different assessment between States, Provinces, Regions), please enter the details of all in Q85 and Q86, separating each item with a semicolon, and in the same order for Q85 and Q86.

For example, Species X was classified as G1 under Natureserve and Threatened under USA Endangered Species Act. The entry for Q81 would be 'G1; Threatened'; and the entry for Q82 would be 'Natureserve; USA Endangered Species Act'.

To ensure all data associated with the species' distribution and status is recorded, please provide all relevant sources of information used to compile the information entered. This may be in the form of, but not limited to, scientific literature, government reports, websites, or expert consultation. Please separate each source with a semicolon (;). You may also choose to enter each source on a different line. To do this, click CTRL+Enter at the end of one reference to move the cursor to the next line.



Life History Traits

Life history traits that are known to affect Ne include fecundity, reproductive strategy and age of adults. If this information is unknown for the species being assessed, but it is available for a closely related species, please answer the life history questions based on the closely related species, and record these details in Q98 & Q99.

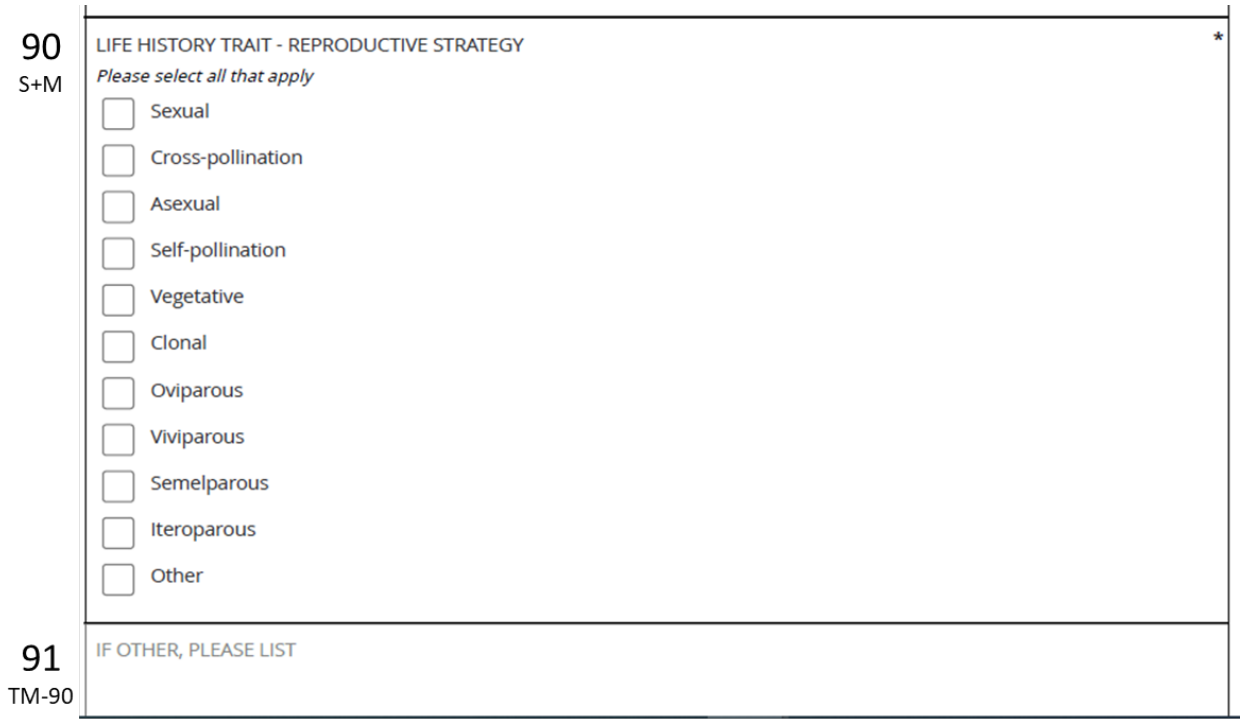
88
S1M

LIFE HISTORY TRAIT - FECUNDITY (NUMBER OF OFFSPRING PER YEAR) *

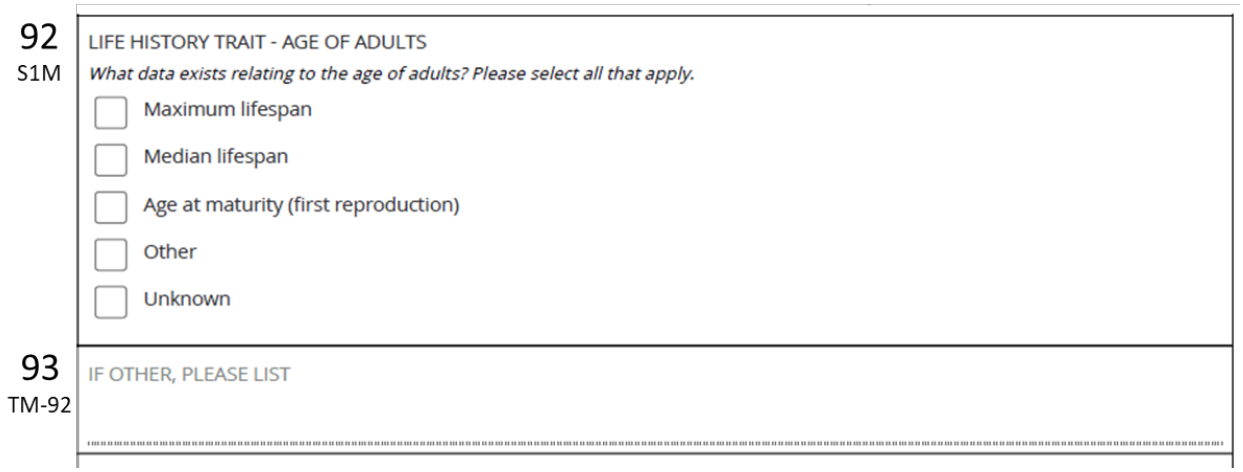
- ◯ < 1
- ◯ 1-2
- ◯ 3-5
- ◯ 6-10
- ◯ 10s
- ◯ 100s
- ◯ 1 000s
- ◯ 10 000s
- ◯ 100 000s
- ◯ >100 000s
- ◯ Unknown
- ◯ Not applicable (e.g., semelparous)

89
NM-88

IF SEMELPAROUS, HOW MANY OFFSPRING ARE PRODUCED IN A SINGLE EVENT?



The next set of questions (Q92-Q96) inquire about the age of adults for the species being assessed. Because various metrics relating to this may be known or reported, Q92 asks the user to select any and all that might apply for the species. Q93-Q97 will then appear based on the selections made in Q92.



94
S1M-92

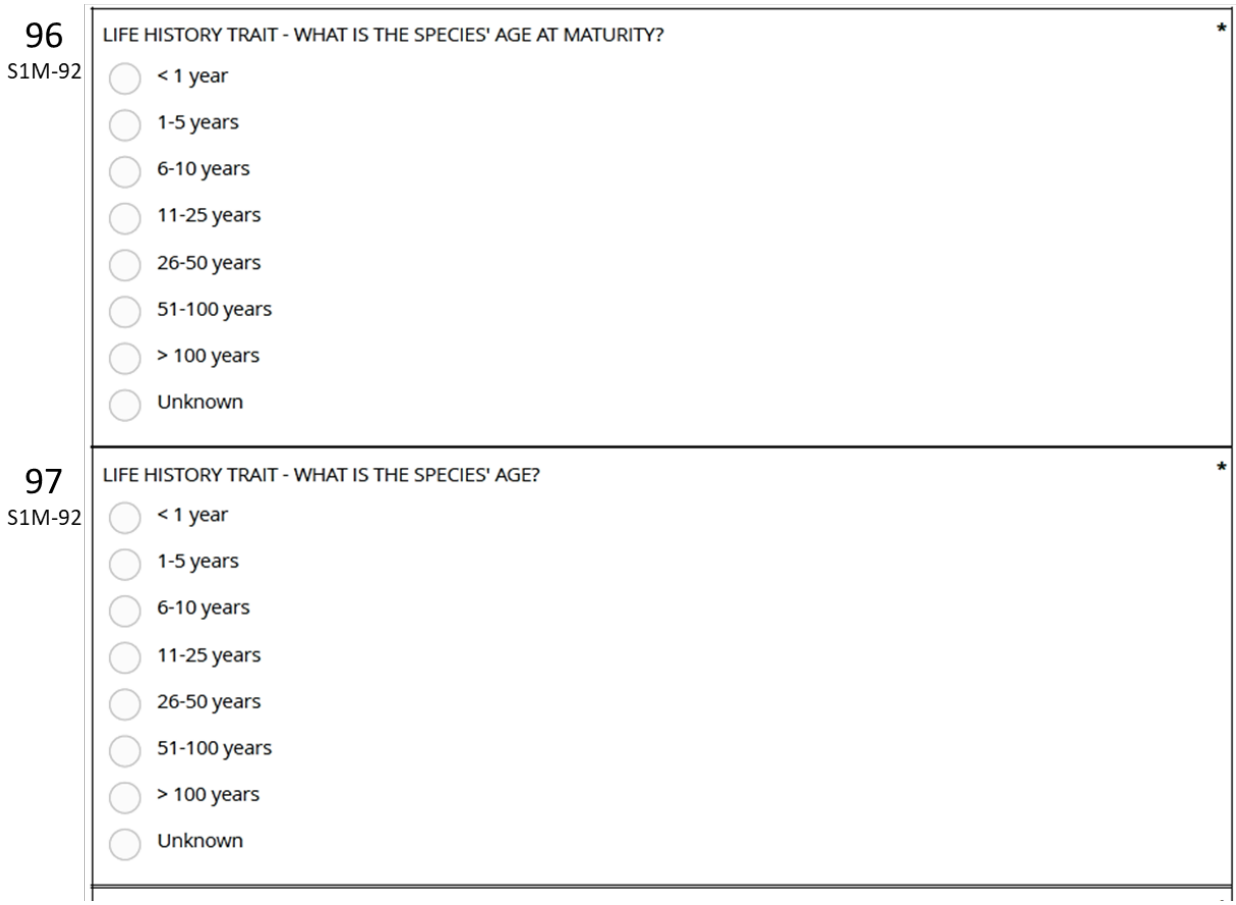
LIFE HISTORY TRAIT - WHAT IS THE SPECIES' MAXIMUM LIFESPAN? *

- ◯ < 1 year
- ◯ 1-5 years
- ◯ 6-10 years
- ◯ 11-25 years
- ◯ 26-50 years
- ◯ 51-100 years
- ◯ > 100 years
- ◯ Unknown

95
S1M-92

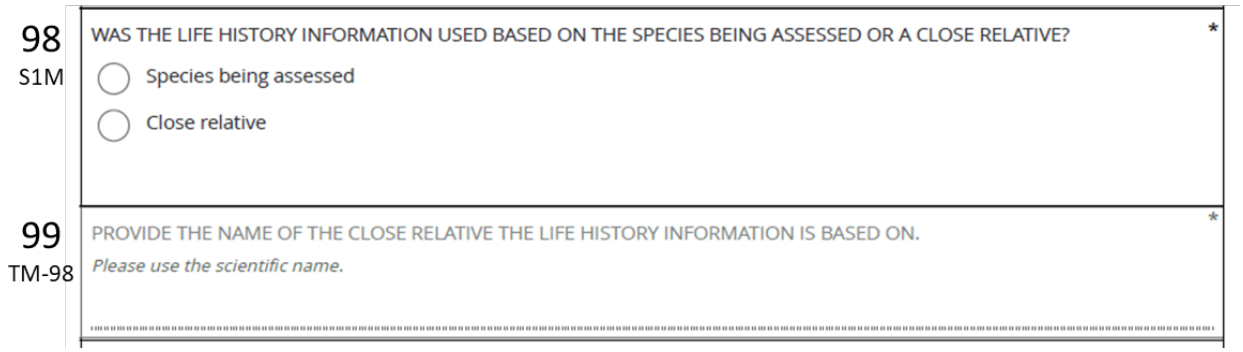
LIFE HISTORY TRAIT - WHAT IS THE SPECIES' MEDIAN LIFESPAN? *

- ◯ < 1 year
- ◯ 1-5 years
- ◯ 6-10 years
- ◯ 11-25 years
- ◯ 26-50 years
- ◯ 51-100 years
- ◯ > 100 years
- ◯ Unknown



Q97 will only appear if the assessor chooses 'Other' in Q92; therefore, the 'Species' Age' refers to whatever metric the assessor has found (i.e., different from the options listed in Q92) and has chosen to report on. This age metric will be specified in Q93.

Q98-99 allow you to indicate the species on which the above life history information (Q88-Q97) was based.



Please provide all relevant sources of information used to compile the information entered. This may be in the form of, but not limited to scientific literature, government reports, websites, or expert consultation. If you selected unknown for any of the life history traits, but have this information for a close relative, please provide those details here. To enter each source on a different line, click CTRL+Enter at the end of one reference to move the cursor to the next line. See note above about citation format.

100
TM

SOURCE OF SPECIES LIFE HISTORY INFORMATION (LITERATURE REFERENCE, WEBSITE LINK, EXPERT CONSULTATION)

Please list all relevant sources used in acquiring the species information separated by a semi-colon (;). It is advised that all referenced documents are saved to a species specific folder in your personal records in case further consultation is required. If information was based on expert consultation, please provide name of expert(s).

How to save assessments

If you are unable to complete the form during one session, please be sure to click *Save Draft*.

If you experienced internet problems, which caused you to lose your entry, before starting over please reopen the Kobo form and follow the instructions under *Accessing Saved and Unsaved Drafts*.

Once information for all populations have been entered, please click Submit.

Common questions asked before and after submission

Can multiple users (i.e., on different computers) fill out the same form?

It is possible for multiple people to provide input into the Kobo form for a species, **but this can only be done after the entry has been submitted.** Users with Kobo login details and editing rights can then go into the backend of Kobo to edit the entry.

Questions do not disappear after changing my answers, which is preventing me from submitting the form. What do I do?

The form can be slow to update due to the amount of questions and conditions many of the questions have on them. As such, if you make a change to an answer that affects which questions show up, there could be some glitches which can prevent you from submitting your form. Please be patient in such situations OR even better try to ensure you select the most appropriate answers the first time around. Planning things out on the PDF version could be a good way to go or saving drafts while you source the needed information.

Is it necessary to save submissions frequently to prevent the loss of information?

Kobo forms work both online and offline, so all data entered should be saved or stored without the need to continuously save your draft. If you do choose to save your draft, the form will exit. You will then need to access the form using the steps mentioned in “Accessing saved and unsaved drafts” below.

Is it possible to preview the form before submitting it?

Unfortunately a form preview function is not provided in Kobo. To review the form before submitting, we recommend saving it as a pdf before submission. To do this click on the print icon at the top right of the screen, and select 'Save as PDF'. You can either preview the pdf and click submit, or save your draft first to preview the pdf at a later time. When you are certain of your choices you can then go back to the saved form and submit it. Instructions on how to access Saved forms are below.

Note: Because all questions (answered and unanswered will appear in the pdf) it might take a while for the pdf to be created. Please ensure you have a stable internet connection with enough capacity to process this request.

After submitting the form, can an email be sent confirming receipt and providing all of the information that was submitted?

Unfortunately, this is not possible. The Kobo community suggests saving the form as a pdf before submission to have as a record. See details on how to do this in the response to the question above.

After submitting the form, is it possible to go back and make changes to the submitted form?

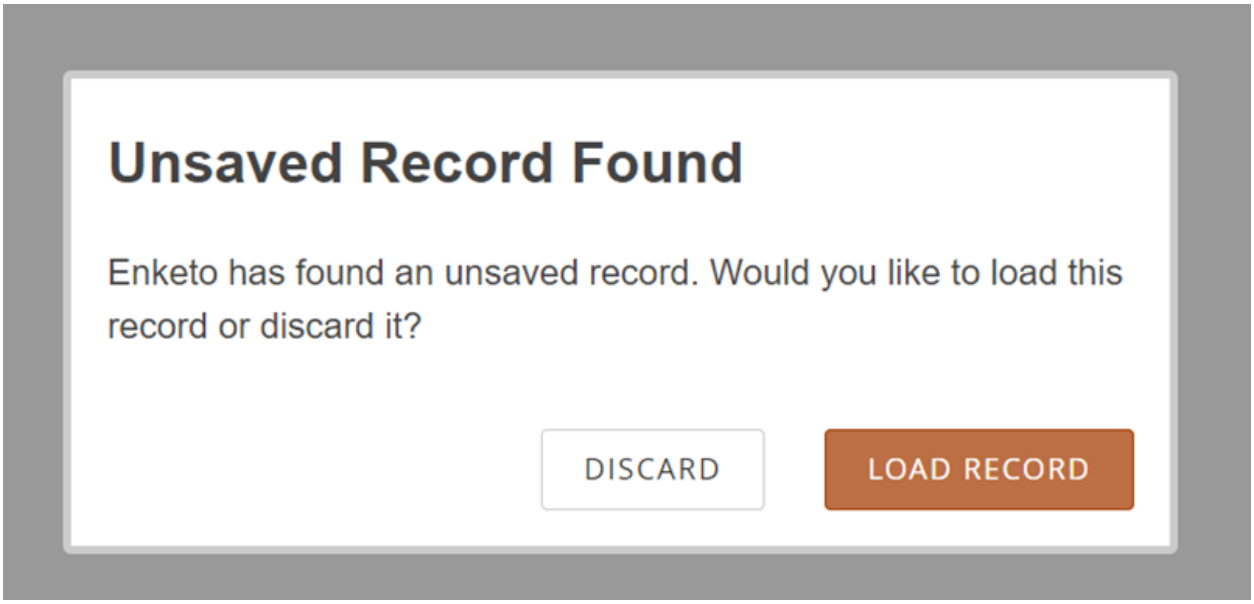
Technically this is possible if you have editing rights to the back end of the project in the Kobo platform. One member of each country team will have access to the backend of this Kobo project. We recommend contacting this person, clearly outlining the changes you would like made. Once logged into Kobo, they can click the pencil icon next to the species record they would like changed. This will open up the Kobo form and allow them to make any change necessary.

Alternatively, you can make a new entry for the species using the correct information and contact the person with access to delete the previous record.

NOTE: Anyone can create a user account in Kobo Toolbox (https://www.kobotoolbox.org/) to view submitted entries. Click on 'Sign Up' and once an account is created, you can share your username with the project administrators (i.e., Jess da Silva or Alicia Mastretta-Yanes).

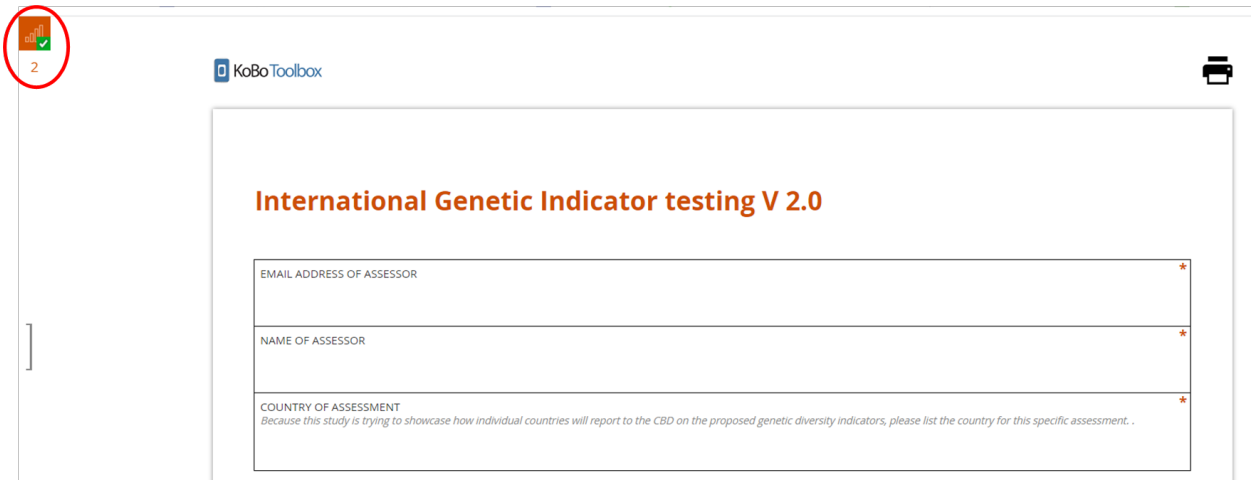
Accessing Saved and Unsaved Drafts

If you saved an assessment (because you could not complete it in one session or were not connected to internet), you can reload the assessment by going to the form link. A pop up should appear informing you of your unsaved (unsubmitted record).

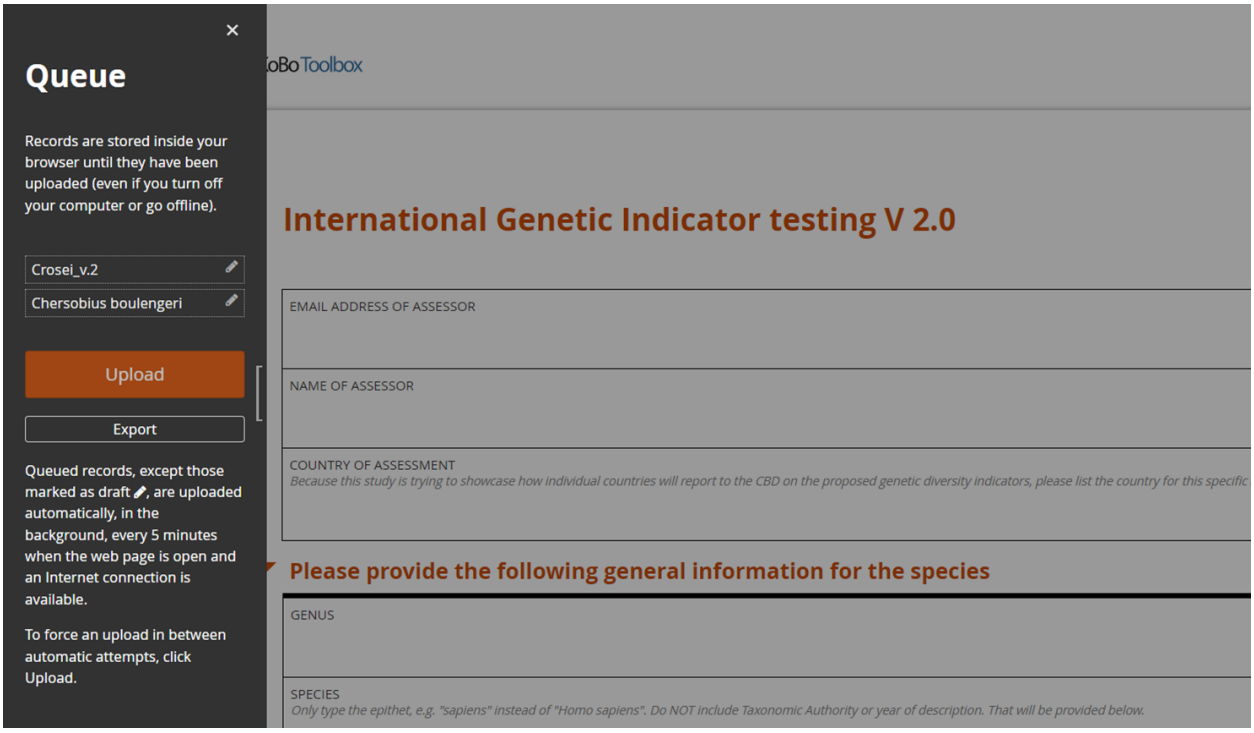


Click on Load Record. This should load the last form you were working on.

However if you cannot see your input, move your cursor to the small number on the top left of your screen.



Left click on the number and a list of queued records will appear.



Click on the record you want to complete. Once all areas have been entered, click submit (as shown above).