Prioritising Conservation Translocations for Scotland: Production of Discussion Materials

Authors

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Keywords

Conservation translocation; guidance; conservation strategy

Background

Conservation translocation (CT) is "the intentional movement and release of a living organism where the primary goal is a conservation benefit" (IUCN/SSC, 2013). This usually applies to two main situations:

- Improving the conservation status of a focal species
- Restoring natural habitat or ecosystem functions or processes

These two categories are, hereafter, referred to as 'focal species' and 'ecosystem species' respectively.

The National Species Reintroduction Forum (NSRF) has focussed on developing, improving and communicating best practice approaches to conservation translocations. This culminated with the Scottish Code for Conservation Translocations and the associated Guidelines, published in July 2014. Following the production of the Scottish Code the NSRF is now considering how it might develop a more strategic approach to advising on conservation translocation action. This work is being led by NatureScot and the Royal Botanic Garden Edinburgh on behalf of the NSRF.

The eventual aim is to produce a 'guidance' publication for practitioners, policy makers etc., endorsed by the NSRF, that identifies potential, practical conservation translocation projects that could have significant benefits to Scotland's biodiversity and the wider environment.

The aim of this current project is for the contractor to prepare provisional material to inform this process, and provide information to enable and promote discussion within the NSRF and other fora. The focus of this exercise should be the biological considerations based on the available evidence-base and specialist experience.

It is anticipated that some conservation translocation projects may also involve significant biological and/or socio-economic/cultural challenges that would need to be considered. The contractors are invited to assess socio-economic/cultural implications (benefits and risks) but it is anticipated that the NSRF will also have a particular focus on these.

This work will contribute towards Scotland's Biodiversity Strategy, noting that the current draft refers to the need, by 2030, to "Continue effective species recovery, reintroduction and reinforcement programmes…" and the targets of the COP15 Kunming-Montreal Global Biodiversity Framework agreed on 18 December 2022. Target 4 states:

> "Ensure urgent management actions to halt human induced extinction of known threatened species and for the recovery and conservation of species, in particular threatened species, to significantly reduce extinction risk, as well as to maintain and restore the genetic diversity within and between

populations of native, wild and domesticated species to maintain their adaptive potential, including through *in situ* and *ex situ* conservation and sustainable management practices, and effectively manage human-wildlife interactions to minimise human-wildlife conflict for coexistence."

Main findings

- An initial list for discussion of 81 species from the vascular plants, bryophytes, lichens, fungi, invertebrates, birds and herptiles has been drawn up by species experts from Scottish Environment LINK membership, with input from NatureScot and RBGE. Mammals and fish were not included in this exercise.
- This list was drawn up according to criteria provided by NatureScot within a time limited framework. The list serves as a starting point for further research and deliberation. This list is underpinned by expert views and has not been cross checked against published evidence. Any final list will need to go through a much more robust process, using data from recent fieldwork and monitoring as well as scientific research on translocation approaches and techniques for different species groups.
- Comments on this exercise have been collated in this report to help inform next steps.
- Conservation translocation is just one tool in the conservation toolbox. It should only be adopted as part of a wider conservation strategy in preventing a species becoming extinct or to restore a key missing, or failing, ecosystem function. However, that does not mean that conservation translocation should only be started once a species reaches critical levels. Planning for successful translocation takes time, investment and research if it is to succeed.

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Abbreviations

National Species Reintroduction Forum (NSRF)

Conservation Translocation (CT)

Royal Botanic Gardens Edinburgh (RBGE)

Red Data Book (RDB)

Endangered (E) /Critically Endangered (CE)/ Extinct (EX)

Plant Link Scotland (PLINKS)

Environmental Non-Governmental Organisations (eNGOs)

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Main body of the report

Introduction

This exercise aimed to produce provisional ‘discussion material’ for the NSRF and others that will inform the later production of ‘guidance’ for practitioners, policy makers, land managers etc. Specifically, to:

(i) Provide a spreadsheet list of up to 130 species scored against some key criteria, that could be prioritised for CT.
(ii) Provide an associated report describing the process and appropriate additional information.

Exclusions:

- This phase of the work resulted in a provisional list for discussion, rather than any final, formally endorsed list.
- Individual species accounts for each candidate on the list were not produced at this stage (this is anticipated for the final guidance that will be produced through the NSRF).
- Mammals and fish were not included.

Approach

A joint meeting of species specialists working for Scottish Environment LINK member bodies formed the basis of this work. Specialists from NatureScot and RBGE also participated throughout the exercise. The final outputs are designed to help NatureScot, the NSRF and others in the production of a final publication on conservation translocation prioritisations.

For the purposes of this current provisional exercise, it was originally proposed that up to about 130 species be put forward in the discussion documents (noting that additional mammal and fish species will be added through a separate and parallel exercise), with the expectation that some will not be included in the final outputs. This initial exercise has in fact produced a list of 81 species.

Two main outputs were produced from this project. First, this report provides details of the context, aims, methods, the summary results and a discussion of the key issues that arose. Second, an associated spreadsheet which lists the 78 species and records how they scored against the criteria, with associated specific notes.

Species list

It is anticipated that the final proposed NSRF publication, building on this initial exercise, may include a list of about 100 species divided up into taxonomic groups approximately as follows (to be confirmed with the NSRF):

- 35 plant and fungi species (vascular and non-vascular)
- 35 invertebrate species
- 30 vertebrate species (divided into fish, amphibians, reptiles, birds, mammals)

This current exercise was designed to produce a provisional spreadsheet list of up to 130 species that approximately reflects the numbers set out for the above taxonomic groups (apart from fish and mammals, which will be drafted by NatureScot as a starting point). It is anticipated that some species from this provisional exercise may not be included in the final NSRF-endorsed publication. An initial assessment of prioritisation, based on urgency, practicality and timescale was provided (See spreadsheet list, column P).

A limited number of coastal/inshore marine species have been included but it should be noted that most expertise within this exercise focussed on terrestrial and freshwater ecosystems. There may therefore be some under-representation of coastal species. Species that are considered extinct in Scotland were considered and a very small number are included.

In addition, species for potential assisted colonisation were discussed, including those not native to Scotland but native to England, where Scotland could provide future receptor sites. A very small number are included and the notes give indication about donor and receptor sites. The understanding underpinning these species is that the potential role of assisted colonisations will be investigated at a later date, and that these proposals for some initial candidates would be useful in initiating further discussion and debate. Some archaeophytes/ neophytes are also included.

Information on the listed species has been provided in the spreadsheet by scoring them against simple, broad criteria, which were agreed and designed to help inform current, and future, assessments and discussions (see Annex A).

Two broad categories of species were identified:

- Focal species - Those which have a poor conservation status and for which CT is an essential or significant tool to improve their status;
- Ecosystem species - Those which may have a positive habitat/ecosystem-scale effect following their CT (e.g. keystone species).

The list includes more focal species than ecosystem species: this is reflected in criterion 4, ecosystem influence, which is filled in where an ecosystem impact is known. For some invertebrates, bryophytes and lichens, a discernible ecosystem effect is not considered likely or known so this criterion is blank for some focal species.

Expert judgement

Given the exploratory nature of the exercise and its aim being to provide a starting point for further discussions, the scoring was completed by experts through online workshops and working sessions. These expert opinions are built upon personal expertise and knowledge of published, unpublished and personal research. A full list of data sources is not included.

Instead, the scoring was based upon the objective application of evidence, expert judgement and experience of relevant species/ecosystem specialists. Reference was also made to a draft ‘Species at Risk’ list which is being developed by NatureScot,

and provided some preliminary assessments of species that are critically endangered at the European/Global and British level, and some of the Endangered/Vulnerable species. The focus were biological considerations although a simple assessment of potential socio-economic/cultural considerations was provided where possible. Annex A provides details of the agreed scoring approach.

Scottish Environment LINK members have a wide range of expertise upon which this exercise relied. Species experts from the following member organisations expressed an interest and capacity to be involved in this exercise:

Plantlife Scotland; Froglife; Buglife; Royal Zoological Society Scotland; Royal Society for the Protection of Birds Scotland; Scottish Wildlife Trust, Amphibian & Reptile Conservation, Butterfly Conservation, Bumblebee Conservation Trust.

Experts from NatureScot and RBGE also participated in the workshop and spreadsheet design.

Exercise structure

Date	Task	Who
By 27 January	Design an assessment spreadsheet.	LINK Chief Officer
By 27 January	Appoint facilitator to coordinate workshop	LINK Chief Officer
Week beginning 6 February	Coordinate a 1-day workshop for member specialists to work though and produce a draft list	Facilitator
Workshop 1: 9 February	Attend workshop: produce a draft list	Member specialists
Workshop 2: 20 February	Attend workshop: prioritise long lists from workshop 1	Member specialists
20 February – 8 March: optional drop in sessions	Clarify any queries, identify challenges and solutions.	Facilitator, with LINK staff support
13 Feb – 8 March	Coordinate and support feedback on proposed list to ensure completed spreadsheet	Facilitator
By 8 March	Provide feedback on list	Member specialists
14 March	Submit first draft of spreadsheet and report to NatureScot	LINK staff
27 March	Edit spreadsheet and report as required	LINK staff
28 March	Final changes to list and report back to NatureScot	LINK Chief Officer

Table 1. Exercise structure and timeline during 2023.

These experts were invited to a half day online structured workshop on 9 February, facilitated by Jacqueline and Stacey Norwood of Full Circle Solving. The workshop task was to record, from species experts, as many species onto the designed spreadsheet as they think should be included in this exercise. The spreadsheet was issued prior to the workshop to allow participants to become familiar with it. The criteria were also sent out prior to the workshop so experts were able to access relevant data (see Annex A).

The agenda of Workshop 1 is set out in Table 2.

Time	Activity	Resources	Output	Lead
10.30	Introduction and background to project and exercise		Outline of task and approach	Deborah Long and Martin Gaywood
10.40	Housekeeping		Outline of workshop process	Stacey Norwood
10.45	Input into spreadsheet	Spreadsheet	Spreadsheet completion	Facilitators in breakout rooms.
12.45	LUNCH BREAK			
13.15	Continue input into spreadsheet	Spreadsheet	Spreadsheet completion	Facilitators in break out rooms
15.15	Agree follow up meetings	Calendar of appointments 20-24th February	Completed spreadsheet	Jacqueline Norwood
15.30	Close			Deborah Long

Table 2. Agenda of Workshop 1, 9 February 2023

The first workshop was structured as three break out groups, each one allocated to a species group as follows:

Attendance 9th February 2023 online workshop		
Group 1 Plant and Fungi	Deborah Long	Chief Officer at Scottish Environment LINK
	Alistair Whyte	Head of Plantlife Scotland
	Oliver Moore	Saving Scotland Rainforest Lichens and Bryophytes Advisor at Plantlife Scotland
	Aline Finger	Conservation Geneticist at Royal Botanic Garden Edinburgh (RGBE)
	Iain Macdonald	Biodiversity Strategy Officer at NatureScot
	Kat O'Brien	Bryophyte Lichen and Fungi Advisor at NatureScot
	Ewan Lawrie	Advisory Officer, Freshwater at NatureScot
Group 2 Invertebrate Species	Juliet Caldwell	Advocacy Officer at Scottish Environment LINK
	Tom Prescott	Senior Conservation Officer at Butterfly Conservation Scotland
	Helen Taylor	Conservation Programme Manager at Royal Zoological Society Scotland (RZSS)
	Jamie Robins	Programmes Manager at Buglife
	Michael Rogers (for part of the workshop)	Conservation Manager at Bumblebee Conservation Trust
Group 3 Vertebrate Species	Martin Gaywood	Species Projects Manager at NatureScot
	Jim Foster	Conservation Director at Amphibian and Reptile Conservation (ARC)
	Rachael Cooper-Bohannon	Project Officer at Amphibian and Reptile Conservation (ARC)
	Paul Walton	Head of Habitats and Species at Royal Society Protection of Birds (RSPB)
	Robyn Stewart	Species and Habitats Officer at Royal Society Protection of Birds (RSPB)
	James Silvey	Senior Species and Habitats Officer at Royal Society Protection of Birds (RSPB)

Table 3. Workshop 1 species groups and contributing specialists.

Experts continued to work on the online Google spreadsheets started during the first workshop. The vascular plant, fungi, bryophytes and lichens groups were offered a second workshop, owing to the large number of species they had to consider. This second workshop was held on 20 February and used to prioritise a list produced in the first workshop. All experts were also offered two drop-in sessions with the facilitators, with LINK staff on hand for any technical issues, although these were not utilised. However, regular contributions to the spreadsheets continued to be submitted and members welcomed the option of drop-in sessions and weekly emails providing deadline reminders and help from the facilitators.

The spreadsheets were completed by the experts between the first workshop of 9 February until the completion deadline of 8 March. In addition to the spreadsheets, all experts were asked to contribute responses to the following questions:

1. How should the list be used/not used?
2. What are the risks and opportunities now the list has been compiled?
3. What are the next steps that should be included in the final report to NatureScot?
4. How do you think this approach to prioritising CTs could be improved, and what are the key limitations/issues with the current exercise?

A collation of these responses is included in the discussion section of this report.

Findings

This was a quick exercise, designed to provide materials to start a conversation on suitable species for conservation translocation in Scotland. Discussion around the process and how the resulting list might be used took place throughout the exercise and are summarised in the Discussion section.

Within these provisos, the exercise produced the following:

Species group	Number of species suggested as priorities for potential conservation translocation	Level of prioritisation*			
		A	B	C	?
Vascular plants,	16	5	4	7	0
Bryophytes,	8	2	2	4	0
Lichens	6	4	1	1	0
Fungi	6	1	1	4	0
Total	36				
Invertebrates	22	10	4	7	1
Birds	19	4	2	9	1
Amphibian and reptiles	4	0	0	4	0
Total	23				
Total	81				

Table 4. Total numbers of species identified for proposed conservation translocation action, with associated prioritisation.

*The level of prioritisation was assessed as follows (spreadsheet list, column P):

- A: CT is judged as an essential and practical tool that should be applied for the species within the next 0-5 years
- B: CT is judged a significant and practical tool that should be applied for the species within the next 0-10 years
- C: CT is judged to be a useful tool and practical tool that should be applied for the species within the next 0-15 years

The full list of species that could be prioritised for CT is available in the accompanying spreadsheet, with associated scores against some key, broad criteria.

Specialists were asked to record additional useful details in the spreadsheet including their own names, links, and notes. Full details are in the spreadsheet list (columns R - T). The notes are summarised in Table 5.

Group	Additional detail noted during scoring of criteria
Vascular plants, bryophytes, lichens, fungi	● In situ complexity often relates to wider habitat management issues including deer control and forestry/woodland management operations. ● Monitoring and survey are very often required to establish range and populations. ● Ongoing requirements may sometimes be ongoing monitoring rather than ongoing habitat management. Check each species listing where this is the case. ● For some lichens and bryophytes the impact of tree disease is significant: host trees are also required.
Invertebrates	● Two species have livestock implications as liver fluke hosts. ● Examples to be built on where captive breeding has been successful. ● CT suggested for some species in face of climate change. ● One species thought to be extinct in Scotland.
Birds and herps	● Birds: Cross border translocations important for some species, both donor and recipient populations. ● Lessons can be learnt from translocation in England and elsewhere. ● Amphibians and reptiles: Habitat often both terrestrial and freshwater.
General	● Habitat management is often given as key to longer term success. ● Habitat quality is not always known but will be key to success and would need to be established first. ● Ecosystem influence is difficult to assess and may not be crucial for some listed invertebrates, bryophytes and lichens, whose wider ecosystem impact can be very limited.

Table 5. Summary of the key points made in the notes for each species group in the spreadsheet list.

Discussion

During the exercise, there was a lot of discussion about how the exercise was designed and how the outputs might be used. This reflected deep concerns amongst some of the participants about how these lists may be used after this initial exercise was completed and handed onto other groups. The lively nature of these discussions underlined the very high levels of interest and sensitivity around the topic of conservation translocation. The scope of this exercise did not include further exploration of the issues raised and so they are included here to help inform next steps and future iterations of this list, as well as offer some thoughts on future similar exercises. As the commissioning document made clear, this list and this process is not suitable for wider and public discussion. However, the discussion documents produced serve as helpful starting points for further discussion, refinement and revision. This far from finished and robust list is merely the start of a much longer and more involved process.

Question 1. How the list should be used/not used

Limitations of the list:

Appropriate and proportionate use of CT

There was very strong and consistent agreement that mitigation conservation should never be used as a justification for habitat destruction (IUCN/SSC, 2013). Any list produced for species translocation should be a part of a wider conservation strategy with translocation just one possible action to halt species loss and decline. All those involved in this exercise agreed that these lists should be used for conservation effort rather than mitigation and that this list should not be used to enable development schemes to go ahead. This is especially important given that not all such mitigation translocations are successful and therefore their use cannot justify the destruction of their original site.

Conservation strategies

Translocations need to be an integral part of a species recovery strategy, built in from the start in order to ensure sufficient resource and time to ensure success. Translocation takes time and can be expensive. Furthermore, they are often difficult and not always successful. All translocation methodology should be recorded and the transplanted organisms, as well as the subsequent populations, should be monitored to assess the success of the method.

Translocations must first do no harm to the source population. The accompanying spreadsheet list includes species which are endangered enough that they may require a translocation in the short term. Therefore the first consideration must be to ensure that the extant populations of these species are improved (through necessary research, conservation interventions, etc) before organisms are removed for translocation purposes.

From a species perspective, translocations should be undertaken where a species is at risk of extinction, the recipient habitat extent and quality is suitably restored, the species has no realistic chance of recolonising naturally on any reasonable

timescale, or the species is unable to naturally track suitable climate envelopes due to low dispersal ability or fragmented habitat. Equally, species translocation is also sometimes used to help restore ecosystem functions and processes, sometimes involving species that are not necessarily at risk of extinction but that help restore habitats. Examples include Eurasian beaver, woodland herbaceous species as part of multi-species translocations, seagrass restoration and Great Skua. Translocation is an appropriate conservation approach in these circumstances. In contrast, translocation should never be used to permit the destruction of sites occupied by rare and threatened species.

Monitoring and survey

Many bryophyte, lichen, and fungi species have very selective habitats. The advice of expert field ecologists for these taxa should be sought in order to select the best potential microhabitats for any translocation. These microhabitats are often difficult to describe, so site-by-site examination and assessment is key.

From a bryophyte and lichen perspective, the current status of many Red Data Book species classed as Vulnerable or above is often poorly known. While the species listed in this exercise, may well benefit from conservation translocation, species with extremely limited range and distribution, may also benefit from more localised and responsive translocations following stochastic events, including the loss of Ash trees for example. Some of the species listed in this exercise for example, have distributions limited to single trees, which if they died or fell, would result in the loss of entire populations. Such species that would be impacted catastrophically by single stochastic events are listed as priority A for CT, and further survey is also recommended to check the known species range. Targeted survey for rare species and/or monitoring the status of known populations is vital and would be an efficient use of resources as part of the species conservation strategy prior to CT. The expert advice is that funding for recording would provide a better basis for CT, given that the range of many species is not clearly known or understood. For example, species such as *Hygrohypnum styriacum* are likely to be found with further survey. The balance between survey and monitoring and investment in CT is a delicate one, given current low levels of knowledge around species distribution and range. This underlines the importance of species conservation strategies that incorporate CT as part of wider action to understand species ecology, habitat function and ecosystem change in order to inform and guide appropriate species action and habitat management.

This balance and the discussions this exercise generated around it reflect the different approaches adopted within PLINKS by eNGOs and specialist societies. In any discussion, a variety of views and perspectives is always important but further discussions on where the balance should lie, for these species groups in particular, is warranted.

Opportunities of the list:

Survey

Conservation strategies for each proposed species are vital: targeted surveys for the threatened species in key poorly recorded groups such as bryophytes, lichens and fungi, would be a useful investment prior to translocation.

Flexibility

The list should allow for flexibility in case species not currently on the list need to be included, for example if a new tree disease has detrimentally affects rare epiphytes.

Resources

This exercise supports the advice of the Scottish Code and IUCN Guidelines, which highlight the importance of having the biological knowledge necessary to inform the consideration, design and follow up of any CT process. The developing spreadsheet may be helpful in allocating resources appropriately.

For example, assessing whether it is feasible and appropriate to use European continental populations as donor sources for the lichen Nephroma resupinatum, which in Scotland, is only known to occur on one tree in mid-Perthshire. Any translocation would, in addition, benefit from long term monitoring to assess long-term viability of the introduced individuals and resulting populations.

Question 2. What are the risks and opportunities now the list has been compiled?

Risks:

Resource allocation

A key risk considered by everyone involved in this project is how these lists and this approach might be used to influence funding and budgets. The advice from those involved in this exercise is that translocation must be assessed on biological grounds to prevent species extinction or habitat collapse. While financial resources may be limited, biological need must be the initial consideration. Translocation should also be part of an effective long term conservation strategy, which should include, where needed, investment in other approaches including monitoring and survey (National Species Reintroduction Forum, 2014).

The role of CT in wider conservation strategies

Translocation attracts news headlines. It is vital that translocation is only considered as part of wider conservation strategies. The motivation for CTs should be conservation benefits. Translocation can generate headline news stories but as part of wider conservation strategies must be a part of saving species and habitats rather than pursued to gain publicity or profile to the detriment of less newsworthy but vital monitoring and conservation work.

Translocations should only occur where the habitat requirements of the species and the reasons for its decline are understood, and the causes of its extinction or decline at the receptor site have been managed. It is vital that translocations are attempted

by people/organisations with sufficient knowledge of the taxa to mitigate and eliminate significant risk or damage to fragile donor populations.

Monitoring and survey

All translocations should be properly monitored, recorded, and evaluated. In order to ensure translocation knowledge contributes much more widely to conservation strategies, a standard reporting framework for translocations would ensure overall rates of success/failure can be assessed, and better understood. This would build a much stronger knowledge base and, with effective dissemination, would provide a stronger legacy for translocations. This compares with the current approach where the details of successful translocations are more likely to be published.

Opportunities:

Learning lessons

Collating examples through a designed process offers the opportunity to compare successful and unsuccessful methods, and to learn and apply lessons for future success.

Autecological knowledge

Building species knowledge is key to any translocation success. The autecology of many of the highly threatened species on the list is poorly known, for example those surviving at single sites. Detailed studies of such species are therefore required.

Impact of habitat loss, including tree disease

Conservation translocation might contribute to the long-term survival of rare epiphytes that are currently known only from ash trees in Scotland, such as the liverwort *Lejeunea mandonii* and the lichen *Catapyrenium psoromoides*. There are already examples of relatively successful translocations of these lichens where the host trees have died because of ash dieback for example.

However, long term success and species and habitat resilience will depend on restoring networks of populations as opposed to single-site translocations. For example, an assessment of ecological resilience will identify where translocation can help a species on the verge of local extinction from a site or network through the reintroduction of individuals of genetic diversity or populations to complete a population network. Long term success where natural re-establishment is unlikely can be achieved through translocation providing a mechanism for that species to continue to contribute to ecosystem resilience.

Question 3. What are the next steps that should be included in the final report to NatureScot?

Resources

Although these outputs are designed to help initiate a discussion on conservation translocation in Scotland, the species lists will need to be updated in order to remain relevant and useful. This would require additional commitment and capacity to that

already required for many other important commitments, for example the resourcing of the Red Data List Groups.

A key message to come out of this exercise is that translocation requires a significant investment of resources and capacity, and that conservation strategies including monitoring and other conservation strategies, including habitat management and restoration, are vital for long term success.

Cross-border considerations

This approach has been very much from a Scotland perspective but for those species that may require cross border translocation into and out of Scotland, consultation with specialists from England and Wales will be required. This may require a GB list approach.

Flexibility

This exercise has also only given limited consideration of those species not threatened in Europe but threatened in Scotland. This should be explored further.

Any final lists will need to be flexible to take account of stochastic, widespread and sudden events that may take place, for example the arrival of new tree diseases. Therefore, some species not currently on the translocation list might become a future priority.

Ongoing monitoring

The success of translocations depend in large part on ongoing and continued monitoring and documentation. This includes both successful and unsuccessful conservation translocations, in order to improve the evidence base. The project design should refer to the resources required for appropriate long-term monitoring of the translocated species.

Conservation translocations must be part of a long term conservation strategy. Their use has to be informed by monitoring and surveying threatened species, and identifying appropriate action to secure and maintain habitat without which translocation will not succeed. Translocation sometimes requires initial investment in developing methods such as captive breeding and associated genetic work.

Managing habitats will often be vital for the long-term success of conservation translocations. Priority should be given to conserving existing populations in the areas where they occur naturally, while promoting improvements in land management to enable species to recolonise former areas and to extend their ranges naturally.

Wider consultation

This has been an initial exercise. Further direct consultation with a wider number of experts in the field would be helpful. The short timescale of this exercise has highlighted that much more discussions involving expert groups is needed. The general feeling from the British Bryological Society was “...that there needed to be a lot of thought before a positive decision was made”. Current species distribution and

range knowledge is low, and for bryophytes in particular, an immediate action may be to re-evaluate the bryophyte list for possible conservation translocations once the revised Red List has been published later this year.

Question 4. How do you think this approach to prioritising CTs could be improved, and what are the key limitations/issues with the current exercise?

Decision making processes

This approach has had to be swift and there are both advantages and disadvantages to that. The advantage is that we have collated expert opinions and drawn together a provisional list, which will form a strong basis for ongoing discussions and further research and cross checking. The disadvantages are that the speed of the process has been uncomfortable for some. A longer length of time would have been helpful. Some issues raised are listed below.

There is a wealth of literature on decision science, the basis of any prioritisation exercise, which would make the ongoing process more robust. See for example: An introduction to decision science for conservation (Hemming et al. 2021). There are six common mistakes in conservation prioritisation exercises, listed here.

There are three that are relevant to the current exercise and which should be taken into account in the next steps after this initial discussion exercise:

Mistake 2: Trying to Solve an Ill-Defined Problem – while this is a helpful process and an opportunity to start the discussion, a co-designed process may bring additional benefits and inputs that we were unable to explore in this timescale. For example, agreement of what this exercise is designed to achieve and the problem it is addressing would uncover additional opportunities and challenges.

Mistake 4: Arbitrariness – The next stage of the decisions should be informed by the best data available, where possible. This will not be possible for all species groups, for example fungi, but these initial lists should be cross checked against all available and most recent data.

Mistake 5: Hidden Value Judgements – This initial exercise has, by necessity, been based on expert judgement and therefore includes some individual intuition and bias. This can be addressed in the next stage through the data cross checking exercise above and bringing in a wider range of experts with a clear set of criteria that can be tested against evidence (where there is some). This will require investment for specialists to review the current status of all RDB species, backed up with field surveys/monitoring.

Conservation Translocation as part of wider conservation strategies

In terms of how any conservation translocation list should be used, all those involved in this exercise agree that translocation is a valuable tool for conservation but should not be used unless all other conservation measures have failed. While it is in that sense a last resort, opting into translocation at a last minute stage is unlikely to be successful. For success, translocation approaches need to be embedded in conservation strategies so that donor populations are genetically varied, that host

habitats are resilient and secured into the longer term and so that captive breeding and release approaches have been assessed and proven to be successful.

There will always be a case for including those species where data are lacking but where it is clear that urgent remedial action, possibly including translocation, will be needed to prevent loss at population or species scale.

Finally, conservation translocation, as a part of species conservation, requires finance and long term planning. Both need to be in place for success. Assessment of where finances are best allocated to achieve long term conservation aims should include assessment of the most appropriate conservation actions, including habitat restoration and ecosystem health, as well as habitat protection. Given that conservation translocation should be a last resort for species conservation, it still needs to be planned, prepared for and financed if it is to prevent species becoming extinct.

Database

For the longer term, many experts involved in this exercise noted that a database for all species groups, but especially, plants, bryophytes, lichens, fungi and invertebrates with extinct, critically endangered/ vulnerable status, would be helpful to underpin longer term prioritisation. The benefits of such a database would be to lend flexibility, reactivity and effectiveness to the process so that as conditions change, the most appropriate conservation approach can be identified and adopted. This database should also include translocation aims, including for example species retention, habitat restoration, genetic resilience. This has also been identified as a helpful product by the NSRF in the past, but unfortunately the resources have not been allocated to it to date.

In assessing whether a species should be part of assisted colonisation, a measure of dispersal rates would be helpful. This is a longer term task but would make the resulting assessment more robust and flexible.

Any CT list will also need to be regularly reviewed to ensure it remains relevant and up to date. A suitable review period may be every 5 - 10 years.

Conclusion

This exercise, based on expert opinion, has provided a list of 81 species prioritised for conservation translocation in Scotland. The specialists involved have highlighted the need to cross check the list against data sources and to consult wider experts during the next phase of work. However, the list is considered a useful starting point for wider discussions and cross checking with the available evidence. It should be noted that for fungi in particular, data on range and distribution is too poorly known and understood to know if conservation translocation would be helpful. However, ongoing work using eDNA is increasing knowledge on distribution and status.

As is highlighted in the Scottish Code for Conservation Translocations, conservation translocation should never be an end in itself but part of wider conservation strategies, firmly based on appropriate habitat management and restoration to ensure longer term success. Conservation translocation also requires substantial

resources, planning and research for success: it is less likely to be successful if left too late. In many cases, especially for bryophytes and lichens, investment in survey and monitoring would initially be invaluable in order to check the status of these species: they may be more numerous if appropriate surveys are conducted.

However, as an island nation with one of the lowest biodiversity intactness scores of any country in the world, conservation translocations are likely to remain an incredibly useful tool in the conservation toolkit for some time. At a national scale conservation translocations have restored some of our most iconic species such as red kite and white-tailed eagle reversing the actions of our ancestors that brought about their local extinction. In the case of red kites the translocation to the UK as a whole has been so successful that we now hold an internationally important population of the species.

This approach provides a route to restore species like beavers that, whilst doing well on the continent, would find it impossible to reach the UK without CT. Now beavers are expanding their population in Scotland with further translocations planned and in place to benefit from the positive impacts beavers can have on wetland biodiversity. At a more local level CT enables the movement of species such as the dark bordered beauty moth into new areas of habitat that they would never reach owing to poor dispersal capabilities and lack of habitat connectedness. This safeguards the future of the species by creating multiple populations. Importantly not only do conservation translocation, when clearly part of wider conservation strategies that include other conservation measures like habitat management and restoration, allow us to achieve important conservation outcomes for some of our rarest species but they also inspire and engage, sparking debate and driving interest representing some of our most exciting conservation projects with tangible results.

This list and this report mark the start of wider conversations, from which, if the risks and opportunities noted here are accounted for, could be a timely step forward for Scotland's endangered species and habitats and towards meeting the commitments of Scotland's Biodiversity Strategy.

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Tables

Date	Task	Who
By 27 January	Design an assessment spreadsheet.	LINK Chief Officer
By 27 January	Appoint facilitator to coordinate workshop	LINK Chief Officer
Week beginning 6 February	Coordinate a 1-day workshop for member specialists to work though and produce a draft list	Facilitator
Workshop 1: 9 February	Attend workshop: produce a draft list	Member specialists
Workshop 2: 20 February	Attend workshop: prioritise long lists from workshop 1	Member specialists
20 February – 8 March: optional drop in sessions	Clarify any queries, identify challenges and solutions.	Facilitator, with LINK staff support if needed
13 Feb – 8 March	Coordinate and support feedback on proposed list to ensure completed spreadsheet	Facilitator
By 8 March	Provide feedback on list	Member specialists
14 March	Submit first draft of spreadsheet and report to NatureScot	LINK staff
27 March	Edit spreadsheet and report as required	LINK staff
28 March	Final changes to list and report back to NatureScot	LINK CO

Table 1. Exercise structure and timeline during 2023.

Time	Activity	Resources	Output	Lead
10.30	Introduction and background to project and exercise		Outline of task and approach	Deborah Long and Martin Gaywood
10.40	Housekeeping		Outline of workshop process	Stacey Norwood
10.45	Input into spreadsheet	Spreadsheet	Spreadsheet completion	Facilitators in breakout rooms.
12.45	LUNCH BREAK			
13.15	Continue input into spreadsheet	Spreadsheet	Spreadsheet completion	Facilitators in break out rooms
15.15	Agree follow up meetings	Calendar of appointments in week 20-24th February	Completed spreadsheet	Jacqueline Norwood
15.30	Close			Deborah Long

Table 2. Agenda of Workshop 1, 9 February 2023

Attendance 9th February 2023 online workshop		
Group 1 Plant and Fungi	Deborah Long	Chief Officer at Scottish Environment LINK
	Alistair Whyte	Head of Plantlife Scotland
	Oliver Moore	Saving Scotland Rainforest Lichens and Bryophytes Advisor at Plantlife Scotland
	Aline Finger	Conservation Geneticist at Royal Botanic Garden Edinburgh (RGBE)
	Iain Macdonald	Biodiversity Strategy Officer at NatureScot
	Kat O'Brien	Bryophyte Lichen and Fungi Advisor at NatureScot
	Ewan Lawrie	Advisory Officer, Freshwater at NatureScot
Group 2 Invertebrate Species	Juliet Caldwell	Advocacy Officer at Scottish Environment LINK
	Tom Prescott	Senior Conservation Officer at Butterfly Conservation Scotland
	Helen Taylor	Conservation Programme Manager at Royal Zoological Society Scotland (RZSS)
	Jamie Robins	Programmes Manager at Buglife
	Michael Rogers (for part of the workshop) _	Conservation Manager at Bumblebee Conservation Trust
Group 3 Vertebrate Species	Martin Gaywood	Species Projects Manager at NatureScot
	Jim Foster	Conservation Director at Amphibian and Reptile Conservation (ARC)
	Rachael Cooper-Bohannon	Project Officer at Amphibian and Reptile Conservation (ARC)
	Paul Walton	Head of Habitats and Species at Royal Society Protection of Birds (RSPB)
	Robyn Stewart	Species and Habitats Officer at Royal Society Protection of Birds (RSPB)
	James Silvey	Senior Species and Habitats Officer at Royal Society Protection of Birds (RSPB)

Table 3. Workshop 1 species groups and contributing specialists.

Species group	Number of species suggested as priorities for potential conservation translocation	Level of prioritisation* A	B	C	?
Vascular plants, Bryophytes, Lichens Fungi Total	16 8 6 6 36	5 2 4 1	4 2 1 1	7 4 1 4	0 0 0 0
Invertebrates	22	10	4	7	1
Birds Amphibian and reptiles Total	19 4 23	4 0	2 0	9 4	1 0
Total	81				

Table 4. Total numbers of species identified for proposed conservation translocation action, with associated prioritisation.

Group	Notes on criteria application

Vascular plants, bryophytes, lichens, fungi	● In situ complexity often relates to wider habitat management issues including deer control and forestry / woodland management operations. ● Monitoring and survey are very often required to establish range and populations. ● Ongoing requirements may sometimes be ongoing monitoring rather than ongoing habitat management. Check each species listing where this is the case. ● For some lichens and bryophytes the impact of tree disease is significant: host trees are also required.
Invertebrates	● Two species have livestock implications as liver fluke hosts. ● Examples to be built on where captive breeding has been successful. ● CT suggested for some species in face of climate change. ● One species thought to be extinct in Scotland.
Birds and herps	● Birds: Cross border translocations important for some species, both donor and recipient populations. ● Lessons can be learnt from translocation in England and elsewhere. ● Amphibians and reptiles: Habitat often both terrestrial and freshwater.
General	● Habitat management is often given as key to longer term success. ● Habitat quality is not always known but will be key to success and would need to be established first. ● Ecosystem influence is difficult to assess and may not be crucial for some listed invertebrates, bryophytes and lichens, whose wider ecosystem impact can be very limited.

Table 5. Summary of the key points made in the notes for each species group in the spreadsheet list.

Annexes

Annex A: For LINK Conservation Translocation workshop 9 February 2023

Proposed criteria and scoring to inform the CT prioritisation exercise.

The main criteria listed below were supplied by NatureScot, with some amendments made in discussions with LINK. These criteria relate to biological considerations. It is proposed that the specialists first look at the criteria below to inform their general thinking over what species might be prioritised based on biological (not socio-economic/cultural) considerations and whether CT is a practical tool, and then use their expert judgement, experience and any information available to produce their short lists.

Therefore, it is assumed that the species initially selected for their shortlist list will have been judged as relatively high priority candidates for CT. Then, for each of the short listed species, they can be scored on the accompanying spreadsheet using the criteria below. This scoring will help inform the refinement of the final listing process, and also help to inform other parties about the issues relevant to each species. Inevitably the scoring is likely to reflect the fact that the specialists consider these

shortlisted species as reasonable candidates for conservation translocation based on biological considerations alone.

The aim is for these 'scores' is to enable quick assessments, and provide a simple reference, of the degree of threat (which is relevant to 'focal' species in particular), the ecosystem value of the species (which is relevant to 'ecosystem' species in particular), and the practical considerations that may apply.

Following an assessment of these biological considerations the specialists are asked to provide a simple, single score of prioritisation for CT, using expert judgement and the criteria descriptions as a guide.

Finally, there is an additional criterion that relates to the anticipated complexity of socio-economic/cultural considerations. It is anticipated this criterion will be a focus of future discussions within the NSRF and elsewhere, but the contractor is invited to provide an initial score (it does not distinguish between socio-economic/cultural risks or benefits).

The scoring is not necessarily ranked 'good' to 'bad' for each criterion and there are differences in the range of category scores for each criterion. Consequently it is not anticipated that these scores should be used for any detailed, quantitative analyses, but instead provide useful and accessible information to inform further discussion and refinement of the lists.

There is no single, 'best' approach to this type of exercise. A balance is needed between collating and providing relevant information to inform decision-making, and providing a relatively simple, defensible approach based on existing information where available, expert judgement and experience, that does not become overly complex and time consuming.

The spreadsheet includes a general 'notes' column for any narrative that may need to be included. Please feel free to populate this with detail if you wish (e.g. uncertainties, caveats, wider issues) as this could be useful material to consider in producing final outputs later on this prioritisation process after this specific contract is completed.

The main categories and proposed criteria are listed here:

A. BIOLOGICAL CONSIDERATIONS

(a) DEGREE OF THREAT
- Criterion 1 – **Species threat status**
- Criterion 2 - Endemism
- Criterion 3 - **Number of individuals or populations remaining within GB**

(b) ECOSYSTEM VALUE
- Criterion 4 – **Ecosystem influence**

(c) PRACTICAL CONSIDERATIONS OF A CONSERVATION TRANSLOCATION
Criterion 5 - **Knowledge of biology, genetics, ecology etc. of species available**

- Criterion 6 - **Habitat availability**
- Criterion 7 - ***Ex situ* biological complexity of translocation process**
- Criterion 8 - ***In situ* biological complexity of translocation process**
- Criterion 9 - **Long term viability of translocated species, assuming necessary, ongoing intervention is in place**
- Criterion 10 - **Scale of ongoing intervention and monitoring required after translocation**
- Criterion 11 - **Species where assisted colonisation might be considered.**

B. OVERALL CT PRIORITY RE. BIOLOGICAL CONSIDERATIONS

C. SOCIO-ECONOMIC/CULTURAL CONSIDERATIONS

- Criterion 12 – **Socio-economic/cultural implications**

Details and definitions of the proposed 12 criteria are provided below.

A. BIOLOGICAL CONSIDERATIONS

(a) DEGREE OF THREAT

Criteria 1 to 3 are designed to highlight and describe 'focal' species where CT may serve as a tool to improve their conservation status.

Criterion 1 - Species threat status – to be added after the workshop from the Species at Risk list.

Assessed using Global or European Red Data status, and GB Red Data status, where available (this information may be available via the ongoing 'Species at Risk' exercise).

- Extinct in GB
- Extinct in Scotland but not GB
- Critically endangered globally/Europe
- Critically endangered in GB
- Endangered/Vulnerable globally/Europe
- Endangered/Vulnerable in GB
- Near threatened globally/Europe
- Near threatened in GB
- Least concern in GB
- Not evaluated/Data deficient

Criterion 2 – Endemism – to be added after the workshop from the Species at Risk list.

A record of endemism within GB and Scotland, highlighting additional conservation responsibilities.

- Endemic to Scotland
- Endemic to GB
- Not endemic in GB

- Data deficiency

Criterion 3 – Number of individuals or populations remaining within GB

Estimates to be made, based on expert judgement and data available, on the approximate number of individuals and sites (sub-populations) in GB. GB figures may differ significantly from Scottish figures – if this is the case, this should be noted in the 'notes' column. This information provides an indication of the degree of threat to the species, but also the potential availability of individuals for any CT.

- <10 individuals remaining
- Around 11 to 100 individuals remaining at only one site
- Around 100 to 1000 individuals remaining at only one site
- Around 11 to 100 individuals across multiple sites remaining
- Around 100 to 1000 individuals across multiple sites remaining
- Around 1000 to 10,000 individuals remaining at only one site
- Around 1000 to 10,000 individuals across multiple sites remaining
- Over 10,000 individuals remaining at only one site
- Over 10,000 individuals across multiple sites remaining
- Over 10,000 individuals across multiple, well-connected sites remaining
- Data deficiency

(b) ECOSYSTEM VALUE

Criteria 4 is designed to highlight and identify 'ecosystem' species on the list where CT may serve as a tool to contribute to ecosystem restoration and resilience.

Criterion 4 – Ecosystem Influence

This criterion is designed to indicate the level of influence the species may have at the habitat/ecosystem scale, and its potential role in ecosystem restoration and resilience in biological/physical terms. Considerations should include the role and influence of the species' biotic and abiotic processes and functions. This could include, for example, large scale effects through the implications of their foraging, providing physical structures, pollination roles etc. These influences may have the potential to provide significant nature-based solutions and contribute in protecting and restoring ecosystems to combat climate change (for example carbon sequestration, hydrological influences, coastal defence, cooling and shading).

Significant and influential keystone species, foundation species, ecosystem engineers etc would have a very significant ecosystem influence. The level of ecosystem-scale influence decreases with some species having no known significant ecosystem-scale role. It is recognised that all species will have some influence within ecosystems, but this criterion should aim to highlight those with particularly significant roles in ecosystem restoration and resilience building. For some species, this may be unknown and a reasonable judgement cannot be made.

[Note that some species can also contribute to cultural ecosystem services. However these, and other socio-economic/cultural issues, are not part of this criterion and not to be considered here]

- Very significant ecosystem influence

- High ecosystem influence
- Moderate ecosystem influence
- Limited ecosystem influence
- No/extremely low ecosystem influence
- Data deficiency

(c) PRACTICAL CONSIDERATIONS OF A CONSERVATION TRANSLOCATION

Criteria 5 to 11 are designed to provide an initial assessment of the practical considerations and feasibility in carrying out a CT for the species concerned.

Criterion 5 – Knowledge of biology, genetics, ecology etc. of species available

This provides an indication of how much we know about the species concerned, and how much species knowledge is available to inform the design of any CT. This would include information on the biology, ecology and genetics of the species.

We have very significant knowledge for species that have been well researched and their biology etc. well understood. Levels of knowledge will decrease with some species where very little is known about the species.

- Very significant knowledge
- High knowledge
- Moderate knowledge
- Limited knowledge
- No/extremely low knowledge
- Data deficiency

Criterion 6 - Habitat availability

This is designed to provide an estimate of the extent of suitable habitat available in Scotland to receive a translocation of the species concerned, taking into account the effects of climatic change in the medium to longer term.

- Regions of suitable habitat available across large parts of Scotland
- Regions of suitable habitat available in some parts of Scotland
- Regions of suitable habitat available in limited parts of Scotland
- Some suitable habitat may be available after significant habitat restoration
- No suitable habitat available and habitat restoration unlikely
- X: Data deficiency

Criterion 7 – *Ex situ* biological complexity of translocation process

This is designed to indicate the anticipated level of complexity, and associated practical challenges, which would be relevant to the *ex situ* phase of any CT project for the species concerned. *Ex situ* considerations will include collection and transport, propagation/breeding, husbandry, welfare, health and disease, biosecurity etc. until release/planting out. It also includes any wild to wild translocations where there may be some very limited *ex situ* elements.

[Note that socio-economic/cultural issues, including the potential for associated benefits and risks, are not part of this criterion and not to be considered here]

For the most simple translocations, potentially involving very little *ex situ* activity at all and/or a very high likelihood of success with limited input, the species will be scored as very limited complexity. As situations become more complex with increasingly significant *ex situ* requirements, and / or where *ex situ* activities are unlikely to be successful, the species would be scored as very significant complexity.

- Very limited complexity
- Limited complexity
- Moderate complexity
- High complexity
- Very significant complexity
- Data deficiency

Criterion 8 – *In situ* biological complexity of translocation process

This criterion is designed to indicate the anticipated level of biological complexity, and associated practical challenges, which would be relevant to the *in situ* phase of any CT project for the species concerned, up until shortly after the release phase. *In situ* considerations will include pre-release activities (such as research, surveys, preparatory habitat management, identification of suitable donor populations and individuals for translocation) and release and short-term post-release activities (such as short-term monitoring the population/health/welfare of translocated species after release, and their interactions with other key biological/physical elements of the habitat at the release site, the protection of the translocated individuals where necessary etc.).

[Note that socio-economic/cultural issues, including the potential for associated benefits and risks, are not part of this criterion and not to be considered here]

For ‘simple’ translocations with a very high likelihood of success requiring limited activity / input, the species will score as very limited complexity. For more complex situations with significant *in situ* requirements and resourcing needed to ensure success, species will score as high complexity and for situations where the complexity is such that there is a likelihood of failure of the translocation, species will score very significant complexity. Where the requirements and level of complexity are unknown and a judgement cannot be made, the species are data deficient.

- Very limited complexity
- Limited complexity
- Moderate complexity
- High complexity
- Very significant complexity
- Data deficiency

Criterion 9 – Long term viability of translocated species, assuming necessary, ongoing intervention is in place

This criterion is designed to indicate the anticipated likelihood of the species establishing a viable population on a long term basis, assuming any necessary, ongoing interventions and resourcing (e.g. ongoing habitat management, species protection measures etc.) are in place. Considerations would include the expectation of success based on previous experience and research, the level of certainty over the biological requirements of the species, the extent of threats present at the release site, the dispersal abilities of the species etc.

Where there is a high confidence of a translocated species establishing long-term populations assuming intervention measures are available, species would be assessed with a very significant likelihood of long term viability. Lower levels of confidence of long term viability would be listed down to no / extremely low likelihood of long term viability, when there is a high expectation of the species not being able to establish a viable population. Where this is unknown and a reasonable judgement cannot be made, the species is listed as data deficient.

- 5: Very significant likelihood of long-term viability
- 4: High likelihood of long-term viability
- 3: Moderate likelihood of long-term viability
- 2: Limited likelihood of long-term viability
- 1: No/extremely low likelihood of long-term viability
- X: Data deficiency

Criterion 10 – Scale of ongoing intervention and monitoring required after translocation

This criterion is designed to indicate the level of expected longer term, ongoing intervention and monitoring (and therefore resources) that will be required for the species to ensure and measure the long-term viability of the population, and to address any land/water management issues that may arise from the activities of the species. Considerations would include ongoing needs for medium/longer term monitoring of the species and their interactions to measure translocation success/failure, habitat management, INNS management, species protection measures, mitigation activities necessary to address land/management issues etc. The inclusion of this criterion is designed to reflect the level of investment required: it is not included as a means to remove ‘expensive’ species.

Where there is a high confidence of a translocated species requiring no or extremely little further intervention and limited monitoring after release/planting with lower scores, species are scored as very limited further intervention. Higher levels of anticipated intervention are scored accordingly with species requiring extremely high levels of ongoing intervention into the long term after translocation assessed as very significant further intervention. Where this is unknown and a reasonable judgement cannot be made, species are assessed as data deficient.

- Very limited further intervention
- Limited further intervention
- Moderate further intervention
- High further intervention
- Very significant further intervention

- Data deficiency

Criterion 11 - Species where assisted colonisation might be considered

This criterion will only be relevant to some CT candidates. This provides an initial opportunity to identify situations where assisted colonisation may be an appropriate CT tool in response to certain threats e.g. loss of climate space, disease.

- Occurs in England / Wales (Scotland not in natural range) but Scotland currently has suitable habitat and climate
- Occurs in England / Wales (Scotland not in natural range) but Scotland has suitable habitat and future climate (i.e. medium to longer term)
- Occurs in parts of Scotland but suitable habitat and climate in other parts of Scotland not in natural range, and assisted colonisation a potential tool.
- Occurs in parts of Scotland but suitable habitat and future climate (i.e. medium to longer term) in other parts of Scotland not in natural range, and assisted colonisation a potential tool
- Assisted colonisation not appropriate/required for this species
- Data deficiency

B. **OVERALL CT PRIORITY RE. BIOLOGICAL CONSIDERATIONS**

A simple score of prioritisation for CT based on the biological considerations, using expert judgement and the criteria scores as a guide. It is assumed that if the species is on the short list then the expert will have judged it to be of higher priority for CT, so this exercise is to provide a refinement of the prioritisation based on the level of urgency.

- CT is judged as an essential and practical tool that should be applied for the species within the next 0-5 years
- CT is judged a significant and practical tool that should be applied for the species within the next 0-10 years
- CT is judged to be a useful tool and practical tool that should be applied for the species within the next 0-15 years

C. SOCIO-ECONOMIC/CULTURAL CONSIDERATIONS

The biological considerations relating to CT are the focus of this overall exercise, but specialists are invited to provide a very provisional score of anticipated socio-economic/cultural complexity.

Criterion 12 – Socio-economic/cultural implications

Socio-economic/cultural issues associated with the species identified through this exercise will be addressed through other fora. However, this criterion is designed to provide an initial and simple score of the anticipated socio-economic implications associated with any CT. Such implications may involve potential risks and/or benefits, and are not separated here. They include considerations relating to land and water management, infrastructure, public health, public desirability, cultural/educational/recreational benefits, tourism etc.

Where it is judged that there may be an extremely limited likelihood of socio-economic/cultural implications surrounding the CT of the species, species are

assessed as very limited implications through to species where there may be a very high likelihood of such implications.

- Very limited socio-economic/cultural implications
- Limited socio-economic/cultural implications
- Moderate socio-economic/cultural implications
- High socio-economic/cultural implications
- Very significant socio-economic/cultural implications
- Data deficiency