International Expert Workshop on CITES Non-Detriment Findings

Working Group 4

Geophytes & Epiphytes FINAL REPORT

Taxa: Epiphytic Orchidaceae **NDF GUIDANCE SHEET**

1. Information about the target species or related species

List and briefly describe the elements that could be considered when making Non-detriment findings:

1.1. Biological and species status:

Taxonomy. CITES has an accepted taxonomy for the Orchidaceae. These references are outlined in Resolution Conf. 12.11(Rev. CoP14) and can be found on the CITES website (http://www.cites.org/eng/res/12/12-11R14.shtml). The checklists are available on line at http://www.kew.org/conservation/cites-checklist.html. These references include full distribution data and synonymy (other names). These references should be used as a standard.

Distribution. The following are key questions. Is the species confined to your country only? If it occurs in other countries then data may be available on NDFs in that country. Is the taxon widespread or does it have a localized distribution? What is the distribution of the harvested populations?

Abundance. Are the populations large throughout their range and throughout the harvested populations? Epiphytes can be abundant in their habitats, but their habitats can be highly fragmented. Estimating the abundance of habitat fragments and/or host plant abundance could be more important than estimating the abundance of the epiphytes themselves.

Life form. Epiphytes are perennial plants that grow on the surface of a host plant. They are normally long lived and reproduce both sexually (from seed) and asexually (by off-shoots).

Habitat specificity. There are different degrees of site specificity in epiphytes generally but they are often site specific and this can make them high risk species to collection.

Life cycle. Epiphytes are generally long-lived. Plants can live for decades. Therefore any destructive harvest of the target species or its host is potentially a risk to the population.

Capacity for populations to regenerate. Epiphytes probably have a low capacity to regenerate. Recovery from harvesting is likely to take a long time. Successful pollination is usually dependent on a specific pollinator but artificial pollination can sometimes be used to improve pollination success. Artificial placement of seedlings (produced *in vitro*) could also improve recruitment.

Role of species in the ecosystem. The presence of epiphytes can indicate a healthy ecosystem. If harvest of the epiphyte also involves the destruction of the host then this could be detrimental to the health of the ecosystem.

RISK ANALYSIS: High risk – harvest intensity, method of harvest (remove whole plant, remove host). Low risk: seed collection or plant parts.

Positive NDF for 1.1: Adequate abundance, low harvest intensity and non-destructive harvest methods.

Note: CITES and Plants: A User's Guide Version 3.0 provides information on the application of CITES to plants and a list of references and resources it can be found at http://www.kew.org/conservation/cites-slidepack.html in English, French and Spanish.

1.2. Takes/uses (e.g. harvest regime):

Type of harvest. Harvesting of whole live plants and possibly including all or part of the host is more likely to be very detrimental, particularly the harvesting of reproductive adults. Harvesting methods that damage the roots usually eventually kill the harvested plant, and this can lead to repeated harvests. Nonlethal harvesting of seed and pods also occurs and is less detrimental.

Timing of harvest. Harvesting can happen at any time of year but usually happens during the periods of plant flowering (usually after rain or the rainy season). The presence of flowers is essential in the identification of the taxon being harvested but this does not need to be confirmed for every individual.

Harvest specificity. Harvesting is often indiscriminate and destructive. It may therefore damage the surrounding habitat and species, especially the host plant. Other species of orchids are likely to be collected as well as the target species. Harvesting by experts can be much more successful at collecting the target species and causing less damage to the ecosystem, and can be targeted to comply with best practice.

Harvest regime. Indiscriminate and opportunistic harvesting occurs therefore information on the harvesting regime is important.

National/International use. Epiphytes are harvested for private, national and international use for horticulture or medicinal purposes.

Harvest source. Are plants harvested only from the wild or do any come from cultivated stocks? In the case of artificially propagated plants an NDF needs to be made on the parental stock and the artificially propagated plants must fulfill the CITES definition of artificial propagation. This is outlined in Resolution Conf. 11.11 (Rev. CoP14) which can be found at http://www.cites.org/eng/res/11/11-11R14.shtml. It is useful to develop guidelines on the national application of this definition and also carry out training to ensure that is being applied in a standardized fashion.

Harvest volume. What fraction of the plants is removed from the collection sites? It is likely that all plants may be removed from a particular locality unless the harvest is subject to regulation and monitoring.

History of harvest. Is there a history of harvesting this taxon? Is this a newly emerging harvest? In the absence of historical data, a precautionary approach is appropriate.

Harvest trends. Is the harvest stable or increasing/decreasing? This can be based on an estimate from the knowledge of local collectors and traders. An increasing harvest would suggest a precautionary approach is appropriate.

Regulation. Is the harvesting regulated?, i.e. government control at a regional or national level. A well regulated harvest is low risk. Some countries have guidelines and legislation in place to ensure that collection complies with the CITES regulations. In some cases collections must be attended by an approved expert. Unregulated harvesting is more likely to be detrimental.

Legal/Illegal use. Does the harvest conform to national or international legislation? Is there illegal harvesting or trade? Are there any reports of illegal harvest form collectors or traders? Orchids to have a high risk of illegal trade, so unless sites are monitored for illegal collection this is a high risk for epiphytes which are horticulturally attractive or have a medicinal use.

Reason for harvest. What are the forces driving the harvest? For example, to date the trade has been driven by demand for horticultural and medicinal purposes. Specialist collectors may target the rarer species.

Commercial destination. Are the plants being collected for specialist collections, a wide range of horticultural uses, scientific research, mother/parental stock? Is it for local, national or international uses?

<u>RISK ANALYSIS</u>: High risk – Unregulated harvest, demand for plants from a wide range of sectors.

<u>Positive NDF for 1.2:</u> Well regulated harvest, limited sector demand.

1.3. Management, monitoring and conservation:

Management. Is there a management plan or an equivalent? For example, there may be a local/national/institutional management plan or guidelines for management. If there is no management plan then you may want to implement a conservative harvest quota and export quota (or even a zero quota where the species is of restricted distribution and population size) until such time as a formal management or appropriate guidelines are in place. A medium term precautionary (or zero) export quota may give the CITES Authorities sufficient time to assess the impact of harvesting and establish an appropriate quota.

If the plants are artificially propagated, then do they strictly conform to the CITES definition of artificial propagation? Has the mother stock been subject to an NDF? Is there a nursery registration scheme?

Monitoring. This includes the verification of the taxon being harvested, confirmination that the correct age/sizes being harvested, assessing the biological status of the source populations and the habitat, and verification of the parental stock.

Confidence in the harvest (legal and illegal). This may be low due to a general lack of data on the population status of the taxon and the harvesting methods used.

Is there legislation in place to control harvesting? If there is no legislation, are there guidelines approved by the CITES Authorities?

History of harvest. Is there a history of harvesting this taxon? Is this a newly emerging harvest? Some orchids have been in trade for decades to centuries. Historical data can assist in the setting of appropriate quotas and in adaptive management of the resource.

<u>RISK ANALYSIS</u>: High risk – no management plan or guidelines, no monitoring system, medium- quantitative system with medium to high confidence. Low- monitoring system in place.

<u>Positive NDF for 1.3:</u> quantitative monitoring system with medium to high confidence.

2. Field methodologies and other sources of information.

List and describe examples of field methodologies and other sources of information for monitoring populations and/or regulating harvests which could be utilized to obtain data on the elements described below.

2.1. Biological and species status data:

Biological data can be obtained from a variety of literature sources.

Biological information can be obtained from national and international experts, including local knowledge. Experts should confirm the identity of species subject to collection. Field inspections are also advisable. Such inspections may be qualitative; for example short visits by a local expert to visually inspect the sites to confirm that the populations are healthy. If possible, quantitative data should also be collected. Quantitative assessments of the population include the overall abundance, size / age / life history stage structure (adults/flowering/seed set seedlings etc) of the population. For example, samples along transects or of population fragments could be taken to assess the overall abundance in the population. Permanently marked areas (or transects) can be used to assess the long term trends in the populations and estimate birth and death rates of different age/size/stage categories.

Generally, for epiphytes, obtaining confidence about the population trends would require monitoring over many years, probably decades.

Population modeling could be used to estimate long term population trends and probabilities of extinction under plausible harvest methods and quotas (see Annex).

Random or permanent transects can be used to assess the overall abundance in the population. The populations will generally be fragmented and this should be considered in survey design. Counts of epiphytes on host trees and the distribution of size and/or age classes could be particularly informative. Population modeling has been done for some epiphyte populations to investigate the population dynamics which may be informative. A core reference here is Sutherland W.J. (ed.) (2006) Ecological census techniques: a handbook, 2nd edition. Cambridge University Press.

Population Modeling Additional Sources:

VORTEX PVA Software: http://www.vortex9.org/vortex.html

Statistical package R (useful for population modelling): http://www.r-project.org/

Caswell, H. (2001). Matrix population models, 2nd edition. Sinauer Associates, Inc.

Bolker, B. J. (2008). Ecological models and data in R. Princeton University Press.

Menges, E.S. (2000). "Population viability analyses in plants: challenges and opportunities". *Trends in Ecology & Evolution* **15**: 51–56.

2.2. Harvesting and trade data:

Harvest data can be confirmed by inspection of the harvest sites or of the harvested stocks held by traders. You can also interview the traders or collectors on an occasional basis. The time taken to obtain a certain harvest level from individual populations (harvest per unit effort) can indicate the health of those populations. An interview with collectors may reveal such information. The traders are likely to hold records of legally harvested stock for purposes of payment, and these can be used for purposes of investigation.

UNEP-WCMC trade data can be reviewed and compared with national records to check for inconsistencies in recorded data and to confirm compliance with national quotas. Phytosanitary records can also assist in confirming the species and volumes exported.

Are there records of illegal trade in this species? This will be available from customs agencies, CITES authorities and international organizations (such as TRAFFIC). Is there any evidence of illegal collection from harvest sites, for example by local collectors or landowners?

Internet trade surveys can indicate species that are in international trade, their relative demand (by price being charged) and their origin. A quick Google of a plant name will immediately reveal its interest to the legal and illegal trade.

Trade routes and ultimate destination (e.g. large scale commercial traders, small scale uses). International orchid shows can help to identify trade routes, the identity of taxa in international trade, and levels of demand.

Population models could incorporate harvesting and trade data to allow estimates of most appropriate harvest regimes, appropriate removal rates per site, and the effective area of habitat required to fulfill the quota.

<u>RISK ANALYSIS</u>: High risk is the in the case of rare species with restricted populations.

3. Data integration for NDF elaboration

List and/or describe <u>data integration that could be helpful in formulating the non-detriment finding.</u>

A committee of experts (scientists, managers, growers) could meet regularly to consider all of the relevant biological, harvest and trade evidence as well as local knowledge and knowledge of legislation to broaden the information available on the species. This could help frame a harvest and export quota.

Bringing all the relevant data, detailed above, into a central location (or a few connected locations) that can be accessed by the CITES authorities (e.g. UNEP-WCMC trade database) would aid in making NDFs.

Population modeling (mechanistic and/ or statistical) is one useful tool to bring together the population and harvest data to obtain predictions of the population dynamics and obtain predictions of sustainable yield.

4. List and describe the ways data quantity and quality may be assessed

   How representative is the sample of the whole population? Most countries have orchid experts and orchid societies- you may find someone in this environment who could estimate population size on a qualitative basis.

   Information quality: Where have the data originated from? How recent is it? How reliable and representative is it? Has the information originated from a national flora, from scientific literature or data, from national reports, from high quality local knowledge?

   Question the data sources. Are the data collected objectively and accurately?

5. Summarize the common problems, error, challenges or difficulties found on the elaboration of NDF.

   Maintaining and updating expert knowledge

   Few quantitative records

   Obtaining quality information from local collectors and traders

   Clarity of process to outside parties

   Understanding of the population dynamics and the variation in site productivity throughout the collection range

   Scarcity of data, case studies, and examples.

   Inadequate resources and personnel to undertake NDFs

   Inadequate information on status of species in the wild

   Lack of national management plans or guidelines for the sustainable use of orchids

   Lack of standardized procedures and guidelines for NDFs and hands on training on same

   High turnover of conservation and enforcement personnel

   Minimal political will to approve and implement species management strategies

   There is need for the development of standard NDFs procedure for Parties

   Species in trade should be subjected to an NDF process before and after listing on

the Appendices There is need for Parties to develop an updated database on the status of species i.e. conservation and utilisation. Such a database should be linked to regional and global processes There is need for continuous training in NDFs procedures of managers and scientists in relevant institutions Parties should be urged to avail funds and resources for NDFs Scientific Authorities need strengthening in their role in implementing CITES for plants
6. Summarize the main <u>recommendations</u> which could be considered when making an NDF for this taxonomic group. Implement an adaptive NDF setting methodology: a feedback process so that quotas can be adjusted Monitor the time taken to fulfill quota Acquire knowledge on what is detrimental, define it in a simple fashion and share same with all stakeholders, ensure you define simple indicators of same Inspect harvested and unharvested populations and the harvested stock Try to harvest after reproduction Centralise the monitoring to allow overall assessments and comparisons to be made Maintain a history of monitoring and expert knowledge

Annexes

Annex A : The value of population modeling in making NDF's - Why do modelling?

Modelling can assist the making of NDFs in several different ways

- Concisely summarising the available knowledge on the biology of the species. We strongly recommend that a life cycle diagram is constructed.
- Revealing aspects of the species biology that are most important in determining it's population dynamics and regenerative response to different harvesting strategies
- Investigating plausible harvesting scenarios and their possible and relative impacts without having to do anything in the field that may be detrimental to the survival of the target species.
- Predicting the dynamics of populations before and after harvesting
- Predicting the change in extinction probability as a result of harvesting
- Estimating uncertainty in the predictions of population dynamics and in the response of the population to harvesting

- Identifying important data to collect to more accurately predict the population dynamics and the effects of harvesting. i.e. knowing where the gaps in knowledge exist
- Indicating where additional information would improve confidence in making NDFs
- Indicating how precautionary NDFs need to be for species with a particular set of biological characteristics

Decisions based on real data, and on models parameterised from real data, generally give a higher level of confidence than those based on educated guesswork.

What data should we consider collecting to parameterise a model?
Modelling can be performed with very little quantitative data. However, large amounts of data are usually required to be able to make meaningful quantitative predictions. In general, collecting more data and obtaining more details about the species concerned, will allow more accurate predictions to be made. The amount and type of data needed depends on the question to be answered.

Models to predict species population dynamics could incorporate data on
- Temporal changes in overall abundance
- Temporal changes in size or age or stage classes in the population
- Information on species life cycles
- Spatial data on the location and characteristics of individuals
- Data on the vital rates of the population such as birth and death rates
- The effects of environmental conditions (abiotic factors)
- The effects of other biological factors such as crowding and availability of mates
- Levels of variation in biological characteristics

Note that only collecting data on temporal changes in presence and numbers in populations can limit the insights that can be gained from models. Collecting more information about birth and death rates, and complete census data (data through time on every individual in a population), allows more information to be extracted and generally leads to more predictive models. Full population census data gives more trustworthy and accurate insights into the determinants of population change. This can be very useful in building accurate models.

Collecting sufficient data to parameterise models can be expensive and time consuming. However, this need not be the case. For example, data could be collected during harvesting or may be available from local or national records. Published information on similar taxa may be available but care must be taken as the dynamics of apparently similar species can be very different.

How is a model developed?
The precise form of a model depends on the question being asked. Standard approaches are available for most conceivable needs in relation to making NDFs.

Life cycle models can be developed by investigating the biology of the taxa through literature sources, and the collection of field data.

Models that represent the biology of a species in a simplified manner are used to estimate the impact of harvesting. This is because such mechanistic population models allow for the incorporation of the details of the harvest, e.g. the particular stages and ages of the population being removed, and the projection of their likely effects.

Transition matrix models are a commonly used formal way of modelling changes in the size/age/stage structure of the population through time. Rates of transition between the different population categories can be calculated from data and these can be used to predict future population dynamics. Note that the accuracy of such predictions depends on the quantity and quality of the data as well as the biological characteristics of a species.

Models can be continually improved as new data become available. Bayesian models allow the estimation of the likelihoods of parameters and biological mechanisms and can also be used to incorporate new data as they become available to update predictions. This could be particularly useful in developing models for species that are repeatedly sampled and / or harvested.

How do I test a model?
A variety of formal methods are used to test models. Almost all of these give an estimation of how well a given model predicts a particular situation. However, if the model is being used to predict a novel scenario (such as a new level or method of harvesting), then the results of such model tests may be misleading. This is because the model may not incorporate important details that strongly affect the dynamics under the new scenario.

Naturally high variability in population behaviour will make forward projection risky for many species. Models that incorporate stochasticity in their structure can be particularly useful for such species to allow the additional estimation of uncertainty in the predictions.

Models analysed using maximum likelihood methods can be used to infer the characteristics of unknown processes and parameters.