CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Fourteenth meeting of the Plants Committee
Windhoek (Namibia), 16-20 February 2004

RELATIONSHIP BETWEEN *IN SITU* CONSERVATION AND *EX SITU* PRODUCTION OF PLANTS [DECISION 12.11 L)]

1. This document has been prepared by the Secretariat.

2. As noted in document PC13 Doc. 19, the Plants Committee has been considering the relationship between *in situ* conservation and *ex situ* production of plants since its 10th meeting held in Shepherdstown, United States of America, in December 2000.

3. Notification to the Parties No. 2001/091 of 19 December 2001 invited all Parties and organizations to provide information on the relationship between *ex situ* production systems and *in situ* conservation programmes for any CITES-listed species. No response to this Notification was received.

4. As part of the work programme of the Plants Committee, Decision 12.11, paragraph l) calls on the Plants Committee to analyse the relationship between *in situ* conservation and *ex situ* plant production between the 12th and 13th meetings of the Conference of the Parties.

5. At its 13th meeting (PC13, Geneva, 2003), the Plants Committee reviewed the draft of a new Notification to the Parties on this subject and agreed that it was unlikely that such a Notification would elicit a good response rate from the Parties. The Plants Committee recommended that the Secretariat to wait until after its 14th meeting before on sending out that Notification.

6. The IUCN/SSC Wildlife Trade Programme has been contracted by the Secretariat to prepare a paper to assist the Plants Committee in its discussions on Decision 12.11, paragraph l). A summary of this work was presented at PC13 as document PC13 Inf. 6, Production systems involving CITES-listed species and their impact on wild populations. It was agreed at PC13 that the full IUCN/SSC report should be circulated to PC members and form the basis for discussion at PC14. This report is provided as an Annex to this document.

7. Understanding the relationship between *in situ* conservation and *ex situ* plant production will be valuable in implementing Target 11 of the CBD Global Strategy Plant Conservation (see Agenda Item 18) and the work the Plants Committee is undertaking on this topic could usefully be communicated to the CBD Subsidiary Body on Scientific, Technical and Technological Advice for their consideration.

8. The Plants Committee is requested to review the Annex to this document and to prepare recommendations to be presented at the 13th meeting of the Conference of the Parties. The Plants Committee may also wish to consider whether its work on this topic is now complete taking into account related Agenda item 21.1 on plant production systems and source codes.

DRAFT

Review of Production Systems Report to CITES Secretariat

Prepared by
IUCN/SSC Wildlife Trade Programme

Review of Production Systems

Report to CITES Secretariat

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TERMS OF REFERENCE

IUCN/SSC shall, in close cooperation with the CITES Secretariat, carry out the following activities:

a) Critically review the current definitions and descriptions of production systems for Appendix-listed animal and plant species used in CITES, taking account of work already undertaken by the Animals Committee at its 16th and 17th meetings.

b) Conduct a literature review and/or consult with appropriate experts to determine which other forms of production systems are being used, or could be expected to be used for CITES-listed species. Consult with the AC and PC working groups on this issue to ensure that production systems in mariculture, aquaculture and sylviculture are fully incorporated.

c) Prepare, in tabulated format along with descriptive text, proposed definitions and categories of production systems for Appendix-listed species for circulation by the Secretariat to Parties for testing and comment against existing systems, proposed production systems.

d) Receive and coordinate comments and other inputs from Parties, consulting where necessary with respondents and collaborators.

e) On the basis of comments received, prepare a revised classification of production systems for Appendix-II species on the basis of their relationship with, and relative impact that such systems may have on wild populations, for consideration by the Animals and Plants Committees. Provide recommendations, where necessary, to amend existing conference resolutions.

f) Identify key parameters that Management Authorities can use to identify, monitor and regulate production systems and their likely impact on wild populations, thus facilitate the making of non-detriment findings or not, based on consultation with relevant experts, the Secretariat and Management Authorities.

g) Make recommendations on incorporating production system categorisation in NDF guidelines when they are next revised.

REVIEW OF PRODUCTION SYSTEMS

EXECUTIVE SUMMARY

The Convention on International Trade of Wild Fauna and Flora (CITES) regulates trade in specimens from a variety of production systems. Difficulties in categorising production systems and in regulating trade in their products have been highlighted by a range of CITES initiatives. This reports reviews the variety of production systems in use for CITES and non-CITES listed species and introduces a rationale for grouping production systems. It then reviews and compares the theoretical costs and benefits of commercial production linked to wild populations with production that is independent of wild populations. Finally, the report examines the current CITES categorisation of production systems to identify various characteristics and control measures for CITES Authorities to use in regulating trade. The term production system has not been formally defined, but throughout this report is taken to refer to the different management systems used to produce specimens of wild species for trade.

The report argues that in terms of potential impacts on the wild population and potential direct economic incentives for sustainable management that production systems can be divided into three broad categories; wild production; rearing systems and closed-cycle captive breeding or artificial propagation systems. Theoretically, wild harvests if mis-managed have the most potential for detrimental impact on the population, but conversely, if well managed have the most potential to provide direct economic benefits to encourage conservation of the species and habitat. At the other extreme, closed-cycle operations producing animal and plant specimens for commercial purposes, if well managed, have the least potential direct impact on the wild population in terms of numbers of animals removed. But such systems also have the least potential to provide direct economic incentives to encourage *in situ* conservation. Ranching or rearing, if it is based on the collection of high mortality life history stages and is well-managed, theoretically has a good potential to provide direct economic incentives to encourage *in situ* conservation. However, reality often bears little relation to theoretical constructs and further evidence is required to investigate these dynamics. In the meantime, it will be important that Scientific Authorities review the costs and benefits of individual operations on a case by case basis.

CITES currently recognises five forms of production (See Table 3; closed-cycle captive breeding/ artificial propagation; animals born in captivity (that do not fulfil the definition of bred in captivity, F1 or subsequent generations); ranching of crocodilians transferred to Appendix II; other forms of ranching; and wild harvesting). The report notes that the recommendations for implementing the CITES Article VII exemptions for captive breeding and artificial propagation are potentially confusing in that plants and animals are treated differently and demonstration of second generation production, is required for animals but not for plants. However a working group at the 19th meeting of the Animals Committee concluded that this difference was not a problem. In which case, Scientific Authorities simply require a clear guide on dealing with these exemptions. A framework for developing such a guide is provided in the final table of this report (Table 4).

In CITES terms, ranching is *the rearing in a controlled environment of specimens taken from the wild*. The term was originally coined to refer to specimens of Appendix I species transferred to Appendix II for the purpose of ranching. Originally, it was expected that ranching would involve the collection of life stages whose survival in the wild was naturally low, so that their survival could be enhanced by rearing them in captive conditions. More recently, ranching *sensu* CITES has been used to rear many species of Appendix II animals and also some plant species. This report questions whether a system akin to ranching for animals might be useful for plants and if so, suggests that the term rearing be used to describe production systems for both plants and animals. Whether or not this recommendation is taken forward, the definition of ranching for animals would benefit from tightening up. Rearing should be restricted to the collection of high mortality life stages and the definition should include reference to the need to maintain specimens in controlled conditions for a minimum time period or proportion of growth that should be achieved before export can take place.

With respect to collection from the wild, the report recommends that the Committees consider subdividing the category *wild collected*. Many production systems work on the basis of manipulating either the species or the environment to enhance production in the wild. Whilst such manipulation may have dangers in terms of impacts on non-target species or habitat, it can also provide direct economic incentives for conservation. Arguably, changes in the CITES implementation systems can be difficult to disseminate and regulate, so an alternative option would be simply to provide guidance that Scientific Authorities should take into account the costs and benefits of such systems when making their non-

detriment findings. The disadvantage of this latter option, is that much of the international oversight of CITES by importing countries and the Animals Committee is made on the basis of the reviews of trade data. These trade data contain no indication of why the level of wild-collected exports appears to be higher than would be expected from knowledge about population numbers etc.

Finally, to develop assistance for Management and Scientific Authorities the report summarises in tabular format, the requirements for registration, monitoring and reviewing different production systems in order to issue either captive breeding or export certificates for different sources of specimens.

REVIEW OF PRODUCTION SYSTEMS

INTRODUCTION

The Convention on International Trade of Wild Fauna and Flora (CITES) regulates trade in specimens from a variety of production systems. This reports reviews the variety of production systems in use for CITES and non-CITES listed species and introduces a rationale for grouping production systems. It then reviews the costs and benefits associated with commercial production linked to wild populations or independent of wild populations. Finally, the report examines the current CITES categorisation of production systems to identify various characteristics and control measures for CITES Authorities to use in regulating trade. The term production system has not been formally defined, but throughout this report is taken to refer to the different management systems used to produce specimens of wild species for trade.

Difficulties in defining production systems and in regulating trade in their products have been highlighted by a range of CITES initiatives. The Animals Committee has discussed this issue at its 15th, 16th and 17th, 18th and 19th Meetings and in relation to means to deal with coral mariculture (Doc. AC 16.12.2). The Plants Committee has discussed the issue in relation to trade in transplanted *Galanthus* spp. bulbs (10th and 11th PC meetings + 12th) and the classification of timber produced from Sylviculture systems (Doc. PC10.8.1). In response to Committee requests, the Secretariat has also looked into the issue (Doc. AC 17.4 and Doc. PC 11.3.Inf.). (See also references in AC18 and PC12).

Describing and defining production systems is important to CITES in its role in the regulation of international trade that may be detrimental to the survival of CITES-listed wild species. To fulfil this role CITES Authorities must be able to clearly define and control production systems that are used to produce CITES-listed species for trade. In particular, Authorities must be able to:

a) ensure that specimens from a particular system fit into the overall CITES legal framework;

b) assess the impact of that trade on the survival of the species; and

c) rationalise levels of management and scientific input; increase transparency; share management programmes and develop targeted capacity building programmes.

For example, where the Convention makes legal exemptions for trade in captive bred and artificially propagated specimens (see Article VII) the Management Authority needs clear criteria and definitions to determine whether a particular production strategy is in accordance with these legal requirements. Furthermore, according to Resolution Conf. 12.3 (on Permits and Certificates), the Management Authority must also report all CITES trade in its Annual Reports, stating amongst other things, the source or broad category of production system from which the specimens derive.

Non-detriment findings are generally required before exports of CITES-listed specimens can go ahead (see Article IV) and to make these findings it is important that Scientific Authorities can gauge the impacts of the export on a) the wild population and b) the role of the taxon in the ecosystem. The impact of the export is likely to depend on the method of production. For example, export of specimens produced *ex situ* through captive breeding / artificial propagation may be expected to have little direct positive or negative impact on the wild population in terms of numbers of individuals removed from the population. But the indirect impacts on conservation of the population, such as competition for markets and loss of economic incentives to promote conservation; masking of illegal trade; and stimulation of demand for wild specimens, or reduction of harvest pressure on wild stocks; may be more complex. In addition Scientific Authorities are also required to monitor exports and if it appears that export levels are likely to be detrimental to the survival of the species then, to limit exports. For these reasons the means of production and source of specimens in trade should be recorded accurately in quota allocations, on permits and in CITES annual reports to allow harvest impacts to be assessed through the monitoring of annual report data. The significant trade review process also examines CITES annual report data to assess whether or not non-detriment findings are being made appropriately, so it is important that the source code data accurately reflect the production system and its impact on the wild population.

Developing capacity to implement the Convention in a transparent fashion is a major task for the Secretariat and Parties, and clarifying how production systems fit into the categories recognised by CITES will greatly assist this process.

SECTION A: TYPES OF PRODUCTION SYSTEM IN USE

There is a great variety of systems used to produce animal and plant specimens for domestic and international trade. But there is no single framework for classifying these production systems although organisations ranging from FAO to IUCN have recognised that some standardisation would be useful. CITES has progressed furthest in this arena, with a number of legally robust definitions of captive bred/ artificially propagated and ranched individuals, by default treating all specimens that do not meet the aforementioned definitions as wild produced (see Table 3 for CITES definitions). Production systems are difficult to classify because the different systems form a continuum from the harvest of truly wild individuals from pristine habitats via production of semi-wild/semi domesticated individuals to multi-generation closed-cycle systems that produce domesticated individuals in agricultural or man-made habitats (see Figure 1 and Box 1).

Figure 1. A diagram to illustrate the inter-gradation of production systems

Wild	**Collection of introduced wild individuals**	**Semi-wild → Semi-domesticated**	**Captive Bred/ Artificially propagated**
The range of productions systems forms a continuum, systems can 'evolve' →			
Reproduces without human assistance in naturally regenerating habitats to which it is native.	Reproduces without human assistance in naturally regenerating habitats to which it is not native i.e. from introduced populations.	Human assistance needed to regenerate \ provide nutrients \ remove predators in natural/ semi-natural habitats e.g. enrichment planting to wild-transplanting.	Micro-propagation / mono-culture crop plantations in controlled environment.

BOX 1 DEFINITIONS OF WILD and SEMI-WILD Prescott-Allen and Prescott-Allen, 1996

- **Wild population:** A population that reproduces without human assistance in naturally regenerating habitats to which it is native.
- **Semi-wild population:** A population that reproduces with human assistance but otherwise lives freely in naturally regenerating habitats to which it is not native. For example, trees from non local seed that are planted on forest land that is not otherwise tended.
- NB. A semi-wild population intergrades with a semi-domesticated population.
- **Semi domesticated population:** A population that reproduces with human assistance but otherwise lives freely in naturally regenerating habitats to which it is not native; or that reproduces without human assistance but requires supplementary feeding to ensure survival because its habitat can not support it throughout the year.

Production systems generally intervene at a particular life history stage of organisms. They also make varying modifications to the natural habitat either to enhance productivity above wild levels, or to ensure a constant supply of product unconstrained by seasonal factors. The great variety of production systems is illustrated by the examples in Box 2 where the life stage collected and the environment of the production system are briefly described. The challenges involved in grouping production systems are obvious in terms such as mariculture or aquaculture (see Box 2) that can include several of the production systems recognised by CITES such as ranching; production of first generation offspring and closed-cycle captive breeding (see Table 3 for summary of CITES-recognised production systems).

A catalogue of production systems currently in use for CITES and non-CITES listed species is provided in Table 1a, b, c. In line with currently recognised CITES systems, the systems have been broadly grouped into those that breed or propagate individuals in captive / artificial conditions (Table 1a); those that collect certain life history stages from the wild and rear them within some sort of enclosure or boundary, to enhance their survival (Table 1b); and finally those that collect individuals for trade directly from the wild (Table 1c) even though the wild population may have been enhanced by head-starting, re-stocking or enrichment planting etc. Table 1 includes the main characteristics of the system, a brief description of the production operation, and some species examples. The final column of Table 1a, b, c attempts to summarise the likely conservation implications of the different categories of systems on the assumption that the system is well managed and that there are no problems in implementing the regulations controlling wild harvest.

TEXT BOX 2 – A SELECTION OF PRODUCTION SYSTEMS

Plants and Animals

Mariculture is a broad term generally applied to the production of marine organisms. It includes the collection of wild adults of clams and other sessile shell fish to produce gametes for artificial fertilisation and subsequent raising of the resulting offspring in either land-based tanks, or placed out in sheltered wild habitats, or in cages in the wild before final collection for market. It can also include the rearing in natural habitats of vegetatively produced pieces of coral, to the rearing in sea based cages of wild collected juvenile wrasse and tuna. Plants such as seaweeds too can be raised through mariculture.

Aquaculture, generally refers to production of freshwater organisms. It too may involve collection of gametes from wild adults, or the collection of wild fry or larger juveniles or the use of captive produced eggs and fry and subsequent rearing in land-based tanks, or in cages in natural freshwater areas. Freshwater plants too can be produced in a variety of ways.

Re-stocking is another variant on aquaculture, depending generally on the rearing of gametes collected from wild or captive stock, to produce fry in land-based facilities that can then be returned to enhance the wild population in the wild habitat and subsequently re-caught at a larger size for trade.

Farming too, is a term that has many uses and refers to production of both plants and animal crops. In the plant context, it can range from highly industrialised production of domesticated species in man-made habitats through the production of wild species in large agricultural field systems to the production of domesticated and wild species in forest clearings, with relatively little impact on wild habitats. In the context of animals, farming can be used interchangeably with ranching of domestic and game species or introductions of non-native species, although farming normally signifies a smaller field system and a greater degree of habitat manipulation than ranching.

Enhanced wild harvests can also be taken from populations, that are essentially wild but may undergo different levels of population or habitat management that enhance the production of the target taxon, such as predator/ competitor control; addition of nutrients or limiting habitat niches etc.

Salvage/ pest harvests of wild individuals can also involve, where either the specimens would be lost through planned land clearance, or there is a policy of reduction/ eradication of pest/ invasive species.

Harvest of introduced species may range from the harvest of exotic wild populations that have been introduced accidentally; to harvest from populations introduced specifically to support a harvest once the population becomes stabilised in non-range States; to domesticated populations which may have lost much of their genetic diversity and generally occur in non-range States.

Plants

Enrichment planting or seeding is the plant equivalent of re-stocking, in which the wild population numbers are enhanced through the planting of additional individual seedlings or the scattering of extra seeds. The seeds and seedlings may either be collected from the wild or produced through cultivation/ artificial propagation in non- natural habitat.

Sylviculture refers to the management of natural forests to enhance the production of particular species that have a high economic importance. The management actions may include weeding out competitive species and thus changing the balance of the natural ecosystem.

Plantations by contrast, are generally regarded like an agricultural crop in that the land is cleared and planted with even aged individuals sown at regular intervals. Seedlings may have been produced from wild collected seed or from artificially propagated seed. Plantations are often established outside the natural range of the species.

Wildcrafting/ wild collection or harvest refers to the collection of individuals from the wild, leaving sufficient individuals to re-seed and replenish the population.

Artificial propagation according to Resolution Conf. 11.11 Regarding the definition of 'artificially propagated' determines that:

a) the term 'artificially propagated' shall be interpreted to refer only to live plants grown from seeds, cuttings, divisions, callus tissues or other plant tissues, spores or other propagules under controlled conditions; and

   that 'under controlled conditions' means in a non-natural environment that is intensively manipulated by human intervention for the purpose of producing selected species or hybrids. General characteristics of controlled conditions may include but are not limited to tillage, fertilisation, weed control, irrigation, or nursery operations such as potting, bedding or protection from weather;

b) the cultivated parental stock used for artificial propagation must be, to the satisfaction of the competent government authorities of the exporting country:

   i) established in accordance with the provisions of CITES and relevant national laws and in a manner not detrimental to the survival of the species in the wild; and

   ii) managed in such a way that long-term maintenance of this cultivated stock is guaranteed;

c) seeds shall be regarded as artificially propagated only if they are taken from specimens acquired in accordance with the provisions of paragraph b) above and grown under controlled conditions, or from parental stock artificially propagated in accordance with paragraph a) above;

d) all other parts and derivatives shall be regarded as being artificially propagated only if they are taken from specimens that have been artificially propagated in accordance with the provisions of paragraph a) above; and

e) grafted plants shall be recognised as artificially propagated only when both the root-stock and the graft have been artificially propagated.

Tissue culture/micropropagation includes Growth of specimens in sterile nutrient medium from plant parts (such as stem tips, nodes, meristems, embryos, or seeds).

Layering includes all types of propagation in which roots are formed while the stem is still attached to the mother plant. Only after the root formation, the layer is detached and planted as a separated plant. Layering is often used in species that are particularly difficult to root from cuttings, as the intact stems allow a continuous supply of water, nutrients and plant hormones to the place of root development.

Animals

Game farming may also involve re-stocking, whereby populations in extensive areas of natural habitat may be enhanced through the introduction of additional animals raised in captivity or translocated from areas where there is a surplus.

Ranching is another term used in a variety of contexts, in CITES terms, it applies to the rearing of animals in a ranching operation and was originally introduced to apply to populations of crocodilians transferred from Appendix I to Appendix II for ranching purposes. Since then it has been used for a variety of species, to indicate cases where specimens, (normally high mortality life stages such as eggs or juveniles), have been collected from the wild and then reared in a ranching operation for some time before subsequent trade. However, in popular usage, particularly in the Americas, ranching more generally refers to a system whereby agricultural animals range freely over extensive areas of natural or improved rangeland. In southern Africa the term ranching applies not only to the husbandry of traditional agricultural species such as cows but also to the production of game animals. In many parts of southern Africa, extensive areas of wild habitat together with natural or re-located populations of indigenous species have been enclosed and the animals are harvested for meat and other products.

Rearing production systems operate on the basis of collecting high mortality life stages from the wild and enhancing their survival under controlled conditions so that the ultimate production is greater than it would have been in the wild. CITES uses the term ranching to apply to such animal production systems and is considering how to deal with such plant production systems. Ranching is defined by CITES as "the rearing in controlled conditions of specimens taken from the wild", with no direct reference to the life history stage that is to be covered. Although the resolution pertaining to transfer to Appendix II for ranching purposes notes that harvest of adults should be avoided.

Table 1a. Catalogue of production systems that produce CITES and non-CITES listed species, showing how systems can be grouped into major categories - Production in Captivity.

Category and characteristics of production system	Brief description of Production System	Species examples	Direct effect on wild population
Captive bred/ Artificial propagation -Closed-cycle *ex situ* • Minimal take of adults from the wild for breeding stock • Demonstration of F2 generation for CITES purposes • Fenced/ contained production operation *ex situ* • May reduce pressure on wild stocks • No obvious direct contribution to habitat conservation, • Rare conservation benefit from taxing the products **Captive bred/ Artificial propagation -Closed-cycle** in range • Minimal take of adults from the wild for breeding stock • Demonstration of F2 generation for CITES purpose • Fenced/ contained production operation established *in situ*, by enclosing portions of natural habitat • Possible benefit to species conservation as demand may be met from the captive operation • Possible benefit to habitat but also damage	Closed-cycle captive breeding second generation animal offspring F2	Birds of Prey; Parrots; Primates; Crocodilians; *Scleropages* spp; (Potentially - *Chelonia mydas*- Cayman turtle farm.)	No/ minimal wild take beyond initial collection
	Micropropagation and tissue culture	Orchids; Cacti	No/ minimal wild take
	Artificial Propagation in nursery/fields	Orchids; Cacti; Galanthus spp.; Cyclamen spp.; Succulents etc Medicinal plants; *Dione edule*	No/ minimal wild take
	Artificial Propagation – Plantations	*Swientenia macrophylla* in Indonesia; *Tecta grandis; Camptotheca acuminata* Happy tree in Brazil; *Aquilaria malacennsis*	No/ minimal wild take
	Artificial Propagation – Plantations in Range State	*Terminalia amazonia,* Platymiscium pinnatum Costa Rica, *Camptotheca acuminata*	No/ minimal wild take
	Fish aqua/ mariculture - Closed-cycle breeding of captive adults in land tanks or sea/lake cages	Salmon, Carp, Trout, ?WhiteSturgeon in USA	No/ minimal wild take
	Captive breeding in semi-natural habitat	*Macaca fasicularis* introduced to Tiwai island Indonesia – natural habitat.	No/ minimal wild take beyond initial collection
Production in captivity/ - minimal wild collection • Minimal take of adults from the wild for breeding stock • Production of first generation offspring • Same balance of conservation risks and benefits as described for the closed-cycle production systems. **Production in captivity – in range** – in enclosed natural habitat, may provide incentives for habitat conservation.	Animals conceived & born in captivity (does not meet CITES F2 criterion) + single collection of adult	Birds and reptiles- for pet trade; *Chelonia mydas* Cayman turtle farm; *Ceratotherium simum* other African game produced in non-range States	No/ minimal wild take beyond initial collection
	Born in captivity in a restricted portion of natural environment	Game farming/ranching – *Ceratotherium simum*; Deer farming	No/ minimal wild take beyond initial collection

Category and characteristics of production system	Brief description of Production System	Species examples	Direct effect on wild population
Production in captivity/ artificial propagation – repeated wild collection • Annual collection of wild adults for gametes for artificial insemination and rearing of progeny. • Dependant on wild breeding stock & may provide incentives for habitat conservation. • Conducted in / or outside natural range. If adult collection is non-detrimental, this system is similar to a "rearing system" as level of production is greater than possible from a wild harvest alone.	Born in captivity + repeated regular wild collection of few low mortality life stages (fecund males and females) to provide spawn that is reared for export sale	Clams; Fish aquaculture – sturgeon salmon in land-based facilities or sea cages	Annual/ regular collections of adults to provide gametes
	Born in captivity + wild collection of low mortality life stage (gravid adults) followed by export of adults and rearing and export of progeny.	*Python regius.* *Chameleo* spp., *Geochelone sulcata;*	Regular collections of females trade offset by raising of young from gravid females.

Table 1b. Catalogue of production systems in use to produce CITES and non-CITES listed species - Rearing production systems.

Major category of production system	Brief description of Production System	Species Examples	Direct Effect on wild population -numbers removed
Rearing production systems • Collect high mortality life stages from the wild. • Enhance survival under controlled conditions. • The ultimate production level is greater than in the wild. • Ranching of animals is defined by CITES as "the rearing in controlled conditions of specimens taken from the wild". The direct impact depends on the • Life history stage collected, • numbers collected, • extent to which enhancing survival can meet demand and reduce overall wild take. • In theory incentives for habitat conservation accrue, as the system is dependent on maintaining a supply of eggs/bulbs etc from the wild population. • Animals rearing operations are generally outside the natural habitat, • Plants rearing operations may contribute more directly to habitat conservation.	Rearing *ex situ* of wild collected high mortality life stage (young/ juv or vegetative reproduction cuttings).	Crocodilians; seed collection - Mexican Cacti; *Aloe thorncroftii*; Grouper aquaculture; *Prunus africana* - agroforestry Tuna ranching; Parrot- collection of econd egg/juvenile to rear *ex-situ; Hippocampus* spp.	Collection of young/juvs/ vegetative cuttings or "buds" (Ranching for crocodiles)
	Wild transplanting Collection of bulbs from wild and replanting and rearing of small bulbs in agricultural fields in former range.	*Galanthus* spp	Collection of high mortality stage
	Rearing of vegetative cuttings and Enrichment planting in natural habitat-May be Classed as wild harvest with habitat manipulation.	Ginseng; *Galanthus* spp; Coral mariculture	Collection of low mortality stage, young/ juveniles also provides some habitat protection.

Table 1c. Catalogue of production systems in use to produce CITES and non-CITES listed species -Wild collection.

Major category of production system	Brief description of Production System	Species Examples	Direct Effect on wild population -numbers removed
Wild Collection - consumptive use population management for harvest so that a sustained harvest can be collected- Collection of annual production of population, ensuring sufficient individuals remain to reproduce/ grow for subsequent collection **Wild collection - consumptive use** • Planned pest reduction or land clearance; • Collection from re-introduced population in enclosed natural range **Wild collection – non- lethal consumptive use** Collection of plant/ animal parts, individual survives in wild or areas enclosed natural habitat	Removal of individuals from wild – either lethal collection or live removal plants/ animals.	Medicinal plant harvest; fish harvest; plains game harvests	Collection of annual production of population, requires management and monitoring
	Specimens produced through planned pest reduction or land clearance where those individuals will be lost to the population, irrespective of trade.	Carnivores –Crocodilians; Primates; Suids; Elephants; etc Plants salvaged from land clearance - Tree ferns; Orchids	No additional effect on wild population, as these individuals already "planned" for removal
	Collection from re-introduced population in enclosed natural range	*Ceratotherium simum*	Positive impact establish new population
	Collection of parts without removal of individual from population; Wildcrafting of plants. Live shearing/ feathers/fur/ nests/antlers; leaf/bark/seed collection.	*Vicuna vicuna; Prunus africana* bark; cacti seeds; medicinal plants leaves; fruits/ nuts	
Wild collection with population/habitat manipulation – Enhanced wild collection systems designed to enhance productivity of the target population including: Headstarting/ re-stocking/ Enrichment planting/ Sylviculture/. involve manipulation of either population or habitat may have ecosystem consequences, other than from harvest of the target population e.g. from predator removal or removal of competitive plants. **Wild collection from individuals stimulated to increase production in the wild – Enhanced wild collection**	Headstarting- rearing of eggs, release of juveniles to supplement wild population, later removal wild adults.	Crocodilians; (Marine turtles – only for conservation purposes?/ domestic trade)	Collection of eggs/ seeds, return of juveniles, whose survival is greater
	Fish re-stocking/ Mariculture – Wild collected adults provide gametes for artificial insemination. The resulting juveniles are grown on in land- based tanks then re-introduced to the wild to supplement the wild population for harvest	Sturgeon; clams salmon?	Collection of small numbers adults, return of greater number of juveniles whose wild survival enhanced
	Enhancing survival and production of target spp. in habitat predator/ competitor control.	Reduction of predators in game farming.	Wild offtake offset by increased productivity of target species.

Major category of production system	Brief description of Production System	Species Examples	Direct Effect on wild population -numbers removed
	Increasing availability of limiting resource: Fertilizer/ supplemental feeding; nest box/ egg deposition site	Parrot, swiftlet "ranching"/ frog "ranching"- involves enhancing availability of nest/oviposition sites.	
	Increasing natural densities by seeding /planting vegetatively produced individuals	Medicinal plants e.g. Ginseng	Wild offtake offset by >productivity of target spp.
	Sylviculture managing forests to reduce competitors etc		Wild offtake offset by >productivity of target spp.
	Artificial inoculation of wild *Aquilaria* trees to increase production of agarwood	Agarwood	By ensuring a tree contains the fungus, could reduce wild collection if managed
Wild collection from introduced populations outside the range State, where, unless the species is critically endangered, the individuals are arguably not part of the natural population, and the only detrimental effect of trade would be the possible laundering of truly wild specimens. **Wild collection from commensal populations** – concerns over levels of offtake from these populations will depend on the extent to which the natural population is endangered.	Collection from naturalised population - outside range State	*Chameleon jacksonii*; *Dendrobates aureus* Tropical tree species; *Aloe vera;Pickly pear cactus.* Brown tree snake in Guam Nile Perch fisheries E. African Lakes.	Provided species not threatened in wild habitat, little impact on wild population if offtake managed
	Collection from commensal population in agricultural/urban habitat	*P. regius* in oil palm; *Agapornis canus* in agricultural lands;	Provided species not threatened in wild habitat, little impact on wild population if offtake managed
Wild collection from wild individuals held in captivity/	Collection of products from wild animals held in captivity Not meeting CITES definitions	Collection of bear bile Bones from Tiger farms	Impacts dependant on need for supplementation with wild individuals

SECTION B: CLASSIFICATION OF PRODUCTION SYSTEMS

Grouping of Production systems

The method used to classify production systems will depend on the reason for grouping the systems. For CITES purposes production systems can be grouped on the basis of three main characteristics:

a) the level of wild collection and its potential impact on population survival;

b) the extent that wild collection maybe offset by enhancing productivity through rearing;

c) the extent that the production potentially contributes economic incentives to encourage conservation of the population and its habitat.

Based on these factors, the following paragraphs indicate that production systems can be separated into three broad categories producing: Wild Collected Specimens; Reared Wild Specimens; and Closed-cycle Captive Bred Specimens. These broad categories, are similar to the categories already recognised by CITES (see Table 3), but incorporate some differences. Each of these major categories in turn comprises a number of further subdivisions and the CITES authorities will need to determine what level of detail to recognise. Once the final grouping of production systems have been agreed, clear definitions of all the recognised systems will be needed for the purposes of regulation and enforcement and may require refinement of or additions to the production systems currently recognised by CITES.

The subdivisons of the major categories are described in the following paragraphs:

a) **Wild Collected Specimens** - where production is based on a high reliance on WILD individuals[1] for trade with frequent removal of individuals from the wild. Wild collection involves the collection and removal of either complete individuals or parts of individuals such as fur, feathers or glandular secretions. Intuitively, this type of production should only occur in the range State, however, current CITES practice reports the source of specimens from introduced populations established in non-range States as wild collected e.g. *Chameleo jacksonii* from Hawaii; *Araucaria arucana* from Europe. Forms of wild collection include:

   i) Direct take from the wild - involves harvesting wild individuals that have not been subject to any form of management aimed at enhancing productivity of the population, other than through managing the level of harvest. Such harvests will generally be from natural ecosystems. This is the generally recognised form of direct wild harvest (e.g. *Chlorocebus aethiops* from Tanzania; *Swietenia macrophylla* from Brazil).

   ii) Planned wild harvest for pest control or as salvage harvest – involves harvest of specimens taken during planned pest control measures or from land that is to be cleared of natural vegetation under some form of accepted planning policy. For example collection of *Papio anubis* and *Crocodilus niloticus* from various African range States, or the collection of cycads and orchids from natural habitat that will undergo land clearance. Although this is a wild harvest, some would argue that a planned control or salvage harvest merits a separate identification on permits and in trade statistics as some economic benefit may be derived from trade in specimens that would anyway be lost to the population. Others argue that the basis for making a non-detriment finding should include an understanding that these specimens derive from planned population reductions.

   iii) Managed and unmanaged introduced populations - involves production of non-native species that have become established and self-sustaining in extensive systems outside the range State. Establishment of the production system requires an initial introduction from the wild, which after the initial establishment then requires no/minimal further augmentation of individuals from the wild population. In effect, these are essentially closed-cycle systems except that they do not

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[1] This type of production system is captured in the current source code: W - Specimens taken from the wild. There is no definition of 'wild' in the text of the Convention or Resolutions. By default "W" must currently be applied to all specimens that are not produced through captive breeding/artificial propagation; ranching of species transferred from Appendix I to II; or more general ranching.

occur in "controlled conditions" (see Resolution Conf. 10.16 (Rev.) for the CITES definition of controlled conditions). For example, the harvesting of unintentionally introduced species such as *Chameleo jacksonii* from Hawaii, *Macaca fasicularis* from Mauritius or *Opuntia* spp. From many non-range States could be classified in this category. However, this form of production is not physically constrained in controlled-conditions *sensu* CITES. Specimens produced in such a way would not be readily distinguishable from wild caught specimens and this might lead to enforcement problems (unless isotope or DNA analysis becomes more generally available).

iv) Enhanced wild production from manipulated ecosystems - involves either the harvest of wild individuals from an ecosystem that is essentially wild but has undergone some intentional modification to increase production of the target taxa. Or the harvest of wild individuals that have adapted to a modified ecosystem, such as species that are commensal with man e.g. *Ptyas mucosus* from oil palm plantations in Indonesia). Intentional ecosystem manipulation may enhance either the carrying capacity of the environment or directly increase the size of the population. Ecosystem manipulation may include:

- providing specialised habitat niches (e.g. reducing bush cover and encouraging grassland to support greater grazer density);

- removing competitors or artificially increasing the supply of nutrients (e.g. predator removal on game farms or collection of trees/ medicinal plants from silviculture systems where competitors are weeded out); and

- directly increasing the size of the population or assisting the population to reproduce (e.g. re-stocking of lakes with fish fry; provision of nest boxes for parrots, or egg deposition sites for frogs (often termed parrot/frog ranching).

b) **Reared Wild Specimens** – where production is also based on a high reliance on wild individuals that are then maintained in some form of enclosure or modified habitat to enhance their survival through REARING[2]. his includes production systems in which individuals are regularly taken from the wild to be reared, generally in non-natural conditions before being traded. CITES has recognised this form of production for ranching of animals, restricting collection to the taking of high mortality life stages such as eggs or juveniles for subsequent rearing. There is disagreement whether collection and rearing of reproductive life stages such as adult animals and bulbs (low mortality life stages) might also be classified under this system. Due to the potentially greater impacts of collecting reproductive life stages such as adults, this report argues that REARING system should be restricted to the collection of high mortality life stages. Currently CITES does not recognise a rearing system foir plants. Rearing differs from artificial propagation in that it depends on repeated collections of seed etc from the wild, whereas the definition of artificial propagation requires that the parental stock be maintained in long term cultivation.

i) Rearing of high mortality life stages in non-natural conditions – involves production from specimens that have high mortality levels in the wild. The production system relies on enhancing survival of the wild collected individuals through investment in rearing and thus offsetting the natural high mortality. Specimens are regularly and repeatedly taken from the wild for rearing in non-natural conditions in the range State (e.g. species transferred from Appendix I to II for ranching purposes and Appendix II species such as *Python regius* eggs). Because of the dependence on a high level of input of wild individuals, rearing systems for animals often occur in the range State and specimens are generally maintained in intensive conditions i.e. outside the natural ecosystem. But, by linking the production system with the wild habitat and perhaps even maintaining the stock in enclosed semi-natutal conditions, economic incentives may be generated to maintain the ecosystem. Currently, CITES does not recognise such a system for Plants.

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[2] This type of production system is partially captured in the current source code: R -Specimens originating from a ranching operation (N.B. the Plants Committee is addressing this issue and PC Doc. 9.1a considers the establishment of a code for wild transplanted specimens (Wt) particularly for the production of *Galanthus* spp. in Turkey).

ii) Rearing of high mortality life stages in natural ecosystems e.g. Game rearing/ and restocking – involves production from populations of animals maintained in captivity in extensive areas of natural habitat in the range State. These populations are supplemented by the repeated introduction of wild stock/ seed/ juveniles (e.g. forms of antelope rearing in southern Africa and forms of clam mariculture, turtle headstarting and fry release). Depending on the degree to which the rearing environment can be classed as "controlled" *sensu* CITES, and the degree of separation from the wild, for CITES purposes, such systems, may more appropriately be considered as forms of *enhanced wild production*. However, in time, these systems may evolve into either closely monitored rearing systems or closed-cycle systems.

iii) Rearing of low mortality life stages – involves collection of specimens that have low mortality levels (generally adults) in the wild and are repeatedly taken from the wild to rear subsequent progeny in non-natural or enclosed semi-natural conditions in the range State (e.g. gravid *P. regius* or *Malacochersus tornieri* and rearing of juvenile fish e.g. Tuna ranching). Unless there is confidence in the reliability of management control, the removal of adults and other low mortality life stages can be a cause of concern. Due to the dangers associated with removal of low mortality life stages, although arguably compensated by the rearing programme, this production system might be viewed as a transitional system between wild capture and rearing systems. Because of these concerns, it is proposed that this type of production, even though it is a form of rearing, is more akin to the category of *enhanced wild production*.

c) **Closed-cycle production** - where production is based on a low reliance on wild individuals for CLOSED-CYCLE Propagation[3]. This generally involves the breeding or propagation of individuals in controlled conditions, with a minimal input of individuals from the wild and hence low direct impact on the wild populations. To qualify as captive bred, CITES requires for animals that production of second generation offspring of the taxon be demonstrated. In turn this appears to have led to a code for trade in first generation offspring. If Management Authorities are required only to allow captive exports from closed-cycle operations, then, there will be no need for the separate F1 code. Superficially, captive production may also appear to include situations where adults are repeatedly brought into non-natural conditions to exchange gametes. Whilst the physical environment of such production operations may resemble a captive breeding system, biologically and functionally the system is more akin to a form of wild harvest, particularly where a significant proportion of the wild population is collected to support the production system.

i) Closed-cycle Captive breeding and production of F1 offspring and artificial propagation *ex situ* – involves production *ex situ* (i.e. in non-natural ecosystems) either in the range State or outside the range States. Establishment of the production system requires an initial take from the wild, which must be non-detrimental to the survival of the wild population. But after the initial establishment the system then requires no/minimal further removal from the wild population (includes operations producing animals bred or born in captivity, particularly for the *pet trade* and *zoological collections* etc.; for plants it includes operations producing plants from artificial cultivation, tissue culture and micro-propagation etc.). This system provides little opportunity to generate direct economic incentives to conserve the wild species and its habitat.

ii) Closed-cycle production and captive born production in natural ecosystem - Game Farming involves production *in situ* in extensive natural ecosystems in the range State, these are generally in fenced areas in private ownership. Establishment of the production system requires an initial take from the wild, but after the initial establishment then requires no/minimal removal from the wild population (e.g. game farming for animals such as white rhinos in South Africa; the introduction of *Macaca fasicularis* to Tiwai island in Indonesia).

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[3] This type of production system is currently captured in the following source codes: A - Appendix I species artificially propagated for commercial purposes; C - Appendix I plant species propagated for non-commercial purposes and propagated species included in Appendix II and Appendix III. C - Animals bred captivity in accordance with Resolution Conf. 10.16, as well as parts and products thereof, exported under the provisions of Article VII, paragraph 5, of the Convention (specimens of species included in Appendix I that have been bred in captivity for non-commercial purposes and specimens included in Appendices II and III). F - First generation (F1) animals born in captivity, but which do not fulfil the definition of "bred in captivity" in Resolution Conf. 10.16, as well as parts and products thereof.

iii) Born in captivity with high reliance on the wild population for adults to provide gametes etc – The maintenance of the production system requires the repeated introduction of adults that exchange gametes in captivity. The challenge is to ensure adequate control of such systems, so that the collection of adults does not impact the wild population. Such systems are more akin to a form of *enhanced wild production* if the wild collections are likely to significantly impact the wild population. For example, there is significant concern at the lack of spawning stock in the wild Beluga Sturgeon population, so any wild collection and subsequent production in captivity should be carefully monitored.

Conclusions from the review of production systems

In summary, this grouping of production systems suggests that:

- the current CITES definition of ranching be refined; and

- CITES Parties consider defining an additional category of production system – *Wild enhanced production*.

An alternative approach would be simply to clarify the means by which non-detriment findings are made to incorporate a review of the costs and benefits associated with *ex situ* and *in situ* production.

Table 2a. Factors underpinning the Grouping of Production Systems

Types of Production (see Table 1)	**Wild harvest**	**Salvage/ Control/**	**Introduced population/ Commensal wild harvest**	**Wild Harvest from managed ecosystem**	**Collect and rear wild bulbs/ gravid females**	**Born in captivity, repeated collection adults/ gametes**	**Ranching- regular collection high mortality life stages**	**Captive bred/ Art. prop/ Born in captivity**	**Capt bred/ Art prop/ Born in capt- closed-cycle production**	**Introduced pop/Farmin g of non- native species**
Reliance On Wild Population	Ongoing removal of individuals				Regular removal specific life stage to rear			Minimal removal from wild post initial set-up		
Wild Life Stage	Low or high mortality				Low mortality		High mortality	Initial collection adults		
CITES legal provisions	Article III IV, V respectively for Appendix I, II and III specimens						Transfer App I to App II; and Article IV for Appendix II	Article VII exemptions		Treated as wild collected, Article III, IV & V
Proposed Category	**WILD Harvest**				**Enhanced WILD HARVEST**		**Ranching/ Rearing**	**Captive breeding/ artificial propagation and first generation animal offspring**		
Guidance on nondetriment findings	Direct wild harvest	Planned pest control or salvage	introduced population	Commensal wild harvest						
CITES CODE	**W**				**WE**		**R I→II; RII**	**A,C,D,F**		
CCS	**Wd**	**Wx**		**Wc**		**Wr**	**Wr**	**C F**		
Brunning	**Wd**	**Wh**	**Wf**	**Wr**	**Wf**	**W**	**W**	**Cc, CI, CII**		

SECTION C: MAKING A NON-DETRIMENT FINDING FOR DIFFERENT PRODUCTION SYSTEMS

Weighing the costs and benefits of *in situ* and *ex situ* production

Much of the debate around production systems concerns the impacts of *ex situ* production on *in situ* conservation (see Decision 11.102 (Rev. COP12) and BOX 3 for definitions). In theory, neither *ex situ* nor *in situ* production for international trade, if effectively managed with appropriate non-detriment findings being made, should adversely affect population survival in the wild (this is the condition on which non-detriment findings are made). Although wild harvest may reduce population size to a planned level, this reduction should not be irreversible provided that the correct management assumptions are made and that trade and management controls are properly implemented.

In practice, management and trade regulation may not always be able to maintain collection from the wild for trade purposes at non-detrimental levels due to a lack of information on species status and biology, unpredicted stochastic events and illegal trade. To complicate matters further, certain forms of trade will be more difficult to regulate than others due to both the nature of market demands driving the trade and the resources available to develop management and to regulate that trade. Trade regulation can be carried out through a mixture of strict State sponsored enforcement activities and incentives schemes and the involvement of resource owners. Often State sponsored enforcement activities have to compete with many other calls on the national treasury.

BOX 3 DEFINITIONS OF *EX SITU* AND *IN SITU* PRODUCTION

E*x situ* or "off-site" production happens away from the organism's habitat and is self contained with no links to the wild populations. Similarly ex situ conservation occurs away from the natural habitat, but can none the less contribute to conservation, by for example maintaining a gene pool through preservation in seed banks etc.

In situ or "on-site" production occurs either in the organism's habitat or linked to the organism's habitat. For example ranching is dependant on inputs of wild stock (home in the wild), although the facility may be outside the natural habitat. Similarly, in situ conservation is habitat based.

In terms of providing direct economic incentives to conserve species and their habitats as well as regulating trade, many conservationists argue that trade from wild collection is potentially more likely to provide such incentives than *ex situ* production for commercial purposes, providing that a benefit sharing infrastructure is in place. In general *ex situ* production facilities, particularly closed-cycle operations, no longer require input of wild stock and may be far from the natural areas where the species that they propagate originate. In such cases, opportunities to directly link *ex situ* production with local conservation efforts are likely to be limited. In contrast, the dependence of ranching on inputs of low-mortality life stages from the wild is thought to improve the chance that the economic incentives for conservation from ranching are more akin to those accruing from wild harvest. In this argument is it important to distinguish between captive breeding for conservation purposes and captive breeding for commercial purposes, as the aims and benefit flows are quite different. But in practice, commercial captive breeding may be linked to breeding for conservation purposes, if progeny are destined for re-introduction to the wild.

Arguably, *ex situ* production for commercial purposes reduces pressure on wild stocks and thus contributes to conservation of the wild stocks (e.g. birds bred for the pet and falconry trades). But it has also been argued that *ex situ* production for commercial purposes can stimulate increased demand for wild products. For example, despite increasing production of captive bred reptiles in Europe and America, it is still cheaper to procure certain species from the wild. Similarly wild collected medicinal products, may have an added value over the nursery produced product as evidenced by the price premium commanded by wild Korean ginseng.

The relationship between *ex situ* production and *in situ* conservation is clearly complex and likely to differ depending on which Appendix the species is listed in. When commercial trade from the wild is prohibited, as is the case for many Appendix-I taxa, there are fewer opportunities for wild collection for international trade to contribute direct economic incentives for conservation, as trade is allowed only in exceptional

circumstances. Notably, when exceptional trade in wild caught Appendix–I specimens is allowed, it is generally on condition that there should be a demonstrable conservation benefit. Similarly trade in Appendix I specimens captive bred or artificially propagated for commercial purposes should also demonstrate a conservation benefit (Resolution Conf 12.10 - Guidelines for a procedure to register and monitor operations that breed Appendix-I Animal species for commercial purposes). So for example trophy hunts of wild Appendix-I listed species can provide considerable economic benefits for *in situ* conservation, as could limited exports for breeding, for exhibitions and for other purposes where funds can be channelled to *in situ* conservation. Arguably such trade for conservation purposes might be jeopardised by *ex situ* captive breeding and domestic trade in captive-bred specimens for exhibitions etc. In such cases, the wild specimens and captive bred products may compete for market share. Consequently whilst establishing a domestic trade between zoos and other breeding centres may reduce the direct impacts in terms of numbers removed from the wild it may also reduce opportunities for controlled wild collection and international trade to raise needed revenue for local conservation.

Clearly the impacts of *ex situ* production on *in situ* conservation will vary on a case by case basis depending on a number of factors, such as:

The Appendix that the species is listed in;

The level of demand for specimens;

The conservation status of the species and the extent to which wild populations can support the demand for specimens;

The likelihood that trade can be regulated and illegal trade prevented;

The price differential between wild and *ex situ* produced specimens;

The likelihood of disease or alien species introductions;

The infrastructure in place for benefit sharing and generating local conservation incentives;

The feasibility of implementing a conservation levy on international trade that reaches the appropriate target;

The level of dependence of *ex situ* production units on the wild population for additional genetic stock;

The extent that *ex situ* domestic production competes with CITES imports to an internal domestic market;

In summary current conservation thinking suggests that production *in situ* will be more likely than *ex situ* commercial production to generate economic incentives for local conservation (See Figure 3). However, the benefits of a wild trade depend on the ability to adequately manage the harvest and trade, the presence of appropriate benefit-sharing infrastructure, and the ability of the wild population to sustain a given level of harvest. In contrast, *ex situ* commercial production often occurs outside the range State where it is effectively de-linked from the wild population and has rarely been shown to provide any direct economic incentives for conservation of the species in the wild, but may arguably reduce pressure on wild stocks. Where wild collection for international trade takes place under an open access system there may be no opportunities for economic incentives to support species or habitat conservation and the conservation benefits of such trade are questionable. **When considering proposals to license or register captive breeding or artificial propagation facilities Management Authorities should review the conservation costs and benefits of the facilities.**

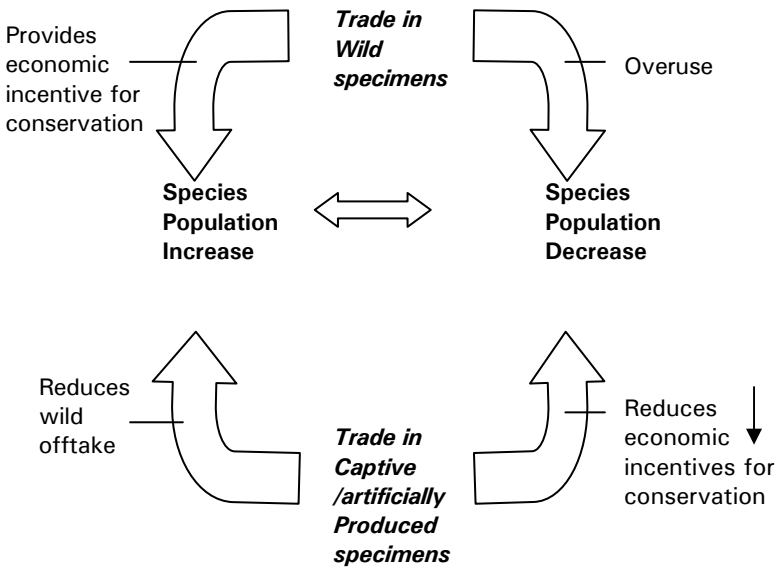

Figure 3. Diagram to show the simplified relationship between the impacts of trade in wild produced specimens and captive or artificially produced specimens

Table 3a. CITES recognised production systems for Animals.

Implementation		Definition	Article	Res. Conf.	Permit	On basis of	Source CODE
Trade in App. I	Wild caught	Currently no definition - default	ART III-non-commercial		Export/ import	NDF, import	W
	App. I Captive breeding for commercial purposes	Produced for commercial purposes in a controlled environment where the breeding stock was established with no detriment to the wild population and is maintained without the introduction of specimens from the wild. The system is capable of producing an F2 generation for animals and the operation is registered with the Secretariat.	ART VIIp4	10.16 (Rev.) 12.16 9.19		Treat as App II if defined as Res. Conf. 10.16 (Rev.) and registered.	D/A
	Captive bred Non-Comm. App. I	Produced in a controlled environment (Appendix I specimens for non-commercial purposes) where the breeding stock was established with no detriment to the wild population and is maintained without the introduction of specimens from the wild; the system is capable of producing an F2 generation for animals.	ART VIIp5	10.16 (Rev.)		Res. Conf. 10. 16 (Rev.) (NDF for Breeding stock and F2)- Captive breeding cert.	C
	Captive bred, but does not meet Definition of 10.16	Animals born in captivity that do not fulfil the definition of 10.16 rev (exchanged gametes in controlled conditions etc)		12.3		Res. Conf. 12.3 on permits	F
Trade in App. II	Wild caught	Currently no definition - default	ART IV		Export	NDF	W
	Captive Bred	Produced in a controlled environment (Appendix I specimens for non-commercial purposes) where the breeding stock was established with no detriment to the wild population and is maintained without the introduction of specimens from the wild; the system is capable of producing an F2 generation for animals.	ART VIIp5	10.16 (Rev.)		Res. Conf. 10.16 (Rev.) (NDF Breeding stock and F2)- Captive breeding cert.	C
	Captive bred	Animals born in captivity that do not fulfil the definition of 10.16 rev (exchanged gametes in controlled conditions etc.)		12.3			F
	Transfer from App. I to II for ranching		Res. Conf. 11.16	CoP decision? Res. Conf. 11.16		Export	R
Trade in App. III	Wild caught		ART V		Cert. of origin		W
	Captive bred App. III		ART VIIp5	10.16		Res. Conf. 10.16 (Rev.) (NDF Breeding stock and F2)- Captive breeding certificate.	C
	Captive Bred App. III	Captive born F1					F?

Table 3b. CITES recognised production systems for plants.

Implementation		Definition	Article	Res. Conf.	Permit	On basis of	Source CODE
Trade in App. I	Wild collected	Currently no definition - default	ART III- non-commercial		Export/ import	NDF, import	W
	App. I - Artificial propagation for commercial purposes	Artificially propagated' refers to live plants grown from seeds, cuttings, divisions, callus tissues or other plant tissues, spores or other propagules under controlled conditions; where the cultivated parental stock must be established non-detrimentally, in accordance with national laws and managed for the long-term maintenance of the cultivated stock. Seeds are artificially propagated only if taken from specimens acquired in accordance with the provisions above and grown under controlled conditions, or from parental stock artificially propagated from propagules or vegetative cuttings etc. Grafted plants shall be recognised as artificially propagated only when both the root-stock and the graft have been artificially propagated. Nurseries should be registered with the Secretariat.	ART VIIp4	11.11 & 9.19		Treat as App. II if defined as Res. Conf. 11.11 & (Res. Conf. 9.19 Registration process)	A
	App. I - Artificial propagation Non-Commercial	As Above	ART VIIp5	11.11		Res. Conf. 11.11	C
Trade in App. II	Wild collected	Currently no definition - default	ART IV		Export	NDF	W
	Artificial propagation	As Above	ART VIIp5	11.11		Res. Conf. 11.11	C
Trade in App. III	Wild collected		ART V		Cert. of origin		W
	Art Prop. App. III		ART VIIp5	11.11		Res. Conf. 11.11	C

N.B. Regarding flasked seedlings Resolution Conf. 11.11 RECOMMENDS that flasked seedlings of orchid species listed in Appendix I be interpreted as being exempt from CITES control, taking into account the provisions of Article VII, paragraph 4, and Article I, paragraph (b) (iii), and agreeing to a derogation from Resolution Conf. 9.6 (Rev.) for this exemption;

SECTION D: PERMITTING REQUIREMENTS AND NON-DETRIMENT FINDINGS

This section reviews the current CITES permitting and monitoring requirements for trade from different production systems. To fully recognise the full range of production systems, CITES can either modify the current definitions of production systems as laid out in various resolutions, or provide more specific advice on making non-detriment findings for specimens from different production systems. A summary of trade regulations provided for in Articles III, IV, V and VII of the Convention, together with guidance on making non-detriment findings and on monitoring and inspection regimes for captive breeding and ranching facilities and nurseries is compiled in Table 4.

Wild collected specimens

In CITES terms, specimens from production systems that do not meet the definitions of bred or born in captivity, artificially propagated or ranched are all classified as wild collected. Trade in wild collected CITES-listed specimens requires the issue of an import and export permit for Appendix-I listed specimens; the issue of an export permit for Appendix II listed specimens and a certificate of origin for Appendix III listed specimens (see Articles III, IV and V and Tables 3a, b and Table 4). These permits are issued on the basis of findings that the specimens was obtained legally, that the export will be non-detrimental to the survival of the species in the case of trade in Appendix I and II specimens and that specimens from all three Appendices will be adequately housed/ transported. Guidance on making a non-detriment finding is provided in Resolution Conf 10.3. The resolution recommends that the Scientific Authority "base its advice on the scientific review of available information on the population status, distribution, population trend, harvest and other biological and ecological factors as appropriate, and trade information relating to the species concerned".

Captive bred/ artificially propagated specimens

Trade in captive bred/ artificially propagated CITES-listed specimens is regulated through different permitting requirements described in two separate exemptions as follow:

Firstly, Article VII paragraph 4 requires that Appendix-I specimens captive bred/ artificially propagated for commercial purposes shall be treated as Appendix II specimens. As a safeguard, the Parties require that all facilities producing Appendix I specimens for commercial purposes be registered with the Secretariat (See Resolution Conf. 12. 10 for animal captive breeding operations and Resolution Conf. 9.19 for plant nurseries). Once registered, specimens can be exported on the basis of an export permit alone. The registration process requires that the breeding stock has been obtained legally and with no detriment to the wild population and that second generation production for animals has been demonstrated.

Secondly, Article VII paragraph 5 provides that captive bred/ artificially propagated specimens of Appendix II and III, and non-commercial specimens of Appendix I can be traded under a certificate of captive breeding/ artificial production. To issue this certificate the CITES Authority must ensure that all aspects of captive breeding/ artificial production as laid out in Resolution Conf. 10.16 (Rev.) and Resolution Conf. 11.11 are satisfied.

For animals, first generation offspring that are born in controlled conditions, but do not meet the definition of bred in captivity can only be traded according to the standard provisions for Appendix I, II, or III specimens. If they are Appendix I specimens they cannot be imported for primarily commercial purposes although the export can involve a commercial transaction. Non-detriment findings will be required for trade in Appendix I and II first generation specimens.

It is clear that for captive bred and artificially propagated specimens traded under the provisions of Article VII paragraphs 4 and 5, non-detriment findings are only required in relation to establishment of the breeding stock. But in addition, the Management Authority should undertake regular checks of the nursery or facility to verify that the breeding stock is maintained with minimal input from the wild. Detailed guidance on how to undertake these checks or monitoring is not provided specifically, but the guidance in Resolution Conf. 12.10 provides a useful framework for such monitoring that can be modified for application to Appendix II and III specimens as well as to non-commercial production of Appendix I specimens.

For Plants, there is no reference to production of second generation offspring.

Ranched specimens

The CITES definition of ranching and regulations for oversight of ranching operations apparently only apply to instances where species are transferred from Appendix I to Appendix II for ranching purposes (see title of Resolution Conf. 11.16 On Ranching). However, in addition Resolution Conf. 12.3 on permits and certificates notes that source code R refers to specimens produced in a ranching operation and thus many Appendix II specimens are now traded as originating from a ranching operation and many countries establish export quotas for ranched specimens.

There has been confusion over what constitutes ranching of Appendix II species and a clear definition that applies to Appendix II species as well as to those transferred from Appendix I to Appendix II is needed. This definition should restrict the life history stage that can be collected from the wild and specify either the length of time that individuals should be maintained in the rearing facility or the average proportion of overall growth that the specimens must achieve before being traded. Detailed recommendations on monitoring a ranching operation for specimens transferred from Appendix I to Appendix II are laid out in Resolution Conf. 11.16. Although the Convention and Resolutions provide no guidance on monitoring ranching operations for Appendix II specimens, the provisions in Resolution Conf. 11.16 provide a useful framework.

SECTION E: CONCLUSIONS and RECOMMENDATIONS for CONTROL and DEFINITION of CITES PRODUCTIONS SYSTEMS

CITES currently recognises six types of specimens including (See Table 3a,b):

- Closed-cycle captive breeding/ artificial propagation of Appendix I specimens for commercial purposes;
- Closed-cycle captive breeding/ artificial propagation of Appendix II and III specimens and of Appendix I for non-commercial purposes;
- Production of F1 offspring (that do not fulfil the definition of bred in captivity, F1 or subsequent generations);
- Ranching of crocodilians transferred to Appendix II;
- Other forms of ranching; and
- Wild harvesting.

The legal and scientific requirements for trade in specimens from these types of production differ and can be challenging to implement. Several difficulties with the present CITES system of regulating production systems are highlighted in the following paragraphs.

Provisions regarding captive production for animals and artificial propagation of plants differ in the level of restriction between plants and animals, requiring demonstration of F2 production for captive bred Appendix I, II and II animals, but not for artificially propagated plants. In addition, captive/ artificial propagation involves three different forms of trade regulation (Article VII para 4 and para 5; and Article IV provisions) and four different source codes. Standardising the provisions for plants and animals could simplify CITES implementation, particularly if such operations are required to operate on a virtually closed system basis to be verified by the CITES MA on a regular basis. This would remove the need for the category of *first generation offspring* or born in captivity (F). However, at the 19th meeting of the Animals Committee a working group rejected the recommendation that it consider revoking the need for demonstration of second-generation production for animals.

The definition of *controlled environment* is rarely interpreted to recognise the possibility of production in extensive semi-natural surroundings (see Resolution Conf. 10.16 and 1.11). Given the contributions that breeding and rearing for commercial purposes in virtually wild conditions in the range States can make to conservation, it is recommended that guidance be provided to encourage rearing and captive breeding/ artificial propagation to be carried out in extensive "controlled" conditions. This would require either that the progeny or reared individuals can be marked and traceable in extensive situations or that the operation is carried out within a perimeter enclosure. Such extensive systems would occur in the range State.

Given the potential for providing economic incentives to promote conservation from rearing systems it is suggested that the Animals and Plants Committees consider adopting the term "Rearing" for both animal and plant systems that rely on rearing high mortality stages (currently known as ranching for animals). Also that CITES considers differentiating species transferred to Appendix II for Ranching/ rearing from other Appendix II rearing operations. The definition of ranching could be tightened up to restrict ranching to the collection of high mortality stages, where rearing in a controlled environment can significantly increase survival. To support non-detriment findings for such rearing operations, regular monitoring should be undertaken to ensure that:

a) egg/juvenile collection etc is non-detrimental to the wild population; and

b) that the reared individuals are grown/maintained in the rearing environment for a specific time period (species-specific) or whilst an average percentage increase in size is attained.

It is suggested that the Committees consider adopting of a new form of production to be known as *enhanced wild production*. This category would allow recognition that certain forms of semi-wild production may have conservation benefits, but also require oversight to ensure that any harvest is

managed so as not to be detrimental to species" survival. This new category would include products from manipulated wild systems, from vegetative reproduction, as well as products from rearing operations or captive breeding operations that rely on repeated collection from the wild of a high proportion of low mortality stages such as adults and juvenile fish. The Scientific Authority would need to assess whether the manipulation is non-detrimental to the survival of both species and habitat/ ecosystem. Acknowledging this form of production could have two benefits. Firstly, it could encourage recognition of the potential economic incentives for conservation. Secondly, it could help to avoid instances of over-collection being inferred from reviews of the trade data even when the non-detriment finding was made on the basis that the harvest is rendered sustainable by the increased productivity.

Specimens collected from introduced populations are treated by CITES as wild collected specimens, but the balance of costs and benefits of trade in such specimens may be very different from costs and benefits associated with trade in specimens from range State populations. Whilst regulation of trade from introduced populations maybe needed to control trade from wild populations, non-detriment findings for the introduced population should require little effort.

Finally, to clarify the permitting and monitoring requirements for trade in specimens from different production systems it is suggested that a manual that describes the requirements for each possible scenario would assist Scientific and Management Authorities. For example, the use of source codes by CITES can be confusing. Some codes indicate the legal provisions for Trade (Codes A, D, C, W, I, O, U). In contrast, code F does not signify the legal trade requirements, but is a short-hand indicator for a non-detriment finding. Code R has a mixed application. Code R can be used either for ranching of specimens transferred from Appendix I for ranching purposes, for which the Parties have laid out monitoring and other requirements. Alternatively, code R can be used to signify the source of other ranched Appendix II specimens, for which there are no specific requirements. Table 4 provides an initial attempt compile the relevant provisions of CITES from the text of the Convention and subsequent Resolutions and some suggestions for developing the structure of national monitoring systems.

	ANNEX A Table showing the CITES requirements and suggested control measures for and characteristics of different production systems used to produce CITES-listed species.									
	*Specimens that do not meet the definitions will be subject to standard CITES provisions for Appendix I, II or III specimens									
	CITES Production systems	***App. I animal specimens bred in captivity for commercial purposes**	***App. I plant specimens artificially propagated for commercial purposes**	***Captive bred or artificially propagated specimens of App. I for non commercial. purposes or App. II & App. III**	**Captive produced specimens of App.I , II & III that do not meet the definition of bred in captivity**	**Transfer App I to App II for ranching/ rearing.**	**App. II or App. III- Repeated wild collection of high mortality life stage of animal or plant for rearing for a certain time in controlled conditions.**	**App. II or App. III-Repeated wild collection of low mortality life stage for transplanting/ Rearing/ breeding.**	**Wild specimens from manipulated natural habitat**	**Wild specimens**
	CURRENT CODE	D	A	C	F	R	R	W	W	W
	PROPOSED CODE					R	R	We/ We	We/We	W
	Permits required:									
Art. III/VII	Import				y if App.I	y if App.I	y if App.I	y if App.I	y if App.I	y if App.I
Art. III/IV/VII	export	y	y		y	y	y	y	y	y
Art. VII	captive breeding			y						
Art. V	certificate of origin				y if APP. III	y if APP. III	y if APP. III	y if APP. III	y if APP. III	y if APP. III
	Permit Requirements:									
Art. III/IV/V	Appropriate housing/ transport requirements									
Res Conf.	legal acquisition of parental stock	y		y						
Art. III/IV/V	Legal acquistion specimens				y	y	y	y	y	y
Res Conf.	Non-dterimental acquistion of parental stock	y		y						
Res. Conf. 10.16	Exchange of gametes under controlled conditions	y								
Res. Conf. 10.16	Demonstration of production of F2	y		y						
Res. Conf. 10.16	Maintained in controlled conditions	y	y	y		y	y			
Res. Conf. 12.10	Operation registered with Secretariat	y	y							
Art. VII	NON-COMMERCIAL									
Res. Conf. 10.16	Fulfil res conf 10.16(Rev)	y		y						
Res. Conf. 11.16	Monitoring of wild population to demonstrate conservation benefit (only for Ap I to II transfer)					y				
Res. Conf. 10.3	Monitoring wild population to demonstrate NDF or ND take of broodstock	y	y	y	y	y	y	y	y	
Res. Conf. 10.3	Monitoring of trade data to ensure NDF	y	y	y	y	y	y	y	y	
Res. Conf.12.10 & 11.16	Evidence that the operation contributes to conservation of the taxa	y				y				

Res. Conf. 11.11	In accordance with Resolution Conf 11.11		y							
Res. Conf. 11.11	Trade in hybrids controlled under Res. Conf 11.11									y
Res. Conf. 11.11	Trade of salvaged App I and App II specimens where trade "may be detrimental to survival of species in the wild" only if: a) captive population enhanced; b) import is for care and propagation; c) import by bone fide nursery or botanic garden									y
Res. Conf. 10.13	Res Conf 10.13 - timber from monospecific plantations considered to be Art prop (note error in 10.13 which refers to 9.18 instead of 11.11)		y							
Res. Conf. 9.19	Requirements for - Nursery registration		y							
Res. Conf 11.11	Appendix I orchids traded as flasked tissue culture and seedlings are exempt from CITES controls - once plants leave the container they are subject to control.									
	CHARACTERISTICS OF SYSTEMS									
	Independant from wild pop	y	y	y						
	On-going dependence on wild population					y	y	y	y	y
	Required to contribute to conservation of wild resource	y		y		y				
	May provide direct economic incentives for conservation					y	y	y	y	y
	Expedited NDF on basis of national Policy									y pest/ salvage specimens
	Export quota supplemeted by juveniles									
	Monitor to ensure management objectives being met									
	May reduce pressure on wild populations/habitats	y?	y?	y?	y?	y?	y?	y?	y?	
	High degree of genetic diversity od specimens in trade					y	y	y	y	y
	Wild population/ecosystem otherwise destroyed									
	Management intervention- supplementary feeding; removal of pests/competitors; addition of limiting resources (nestboxes etc)							y		
	Results in ecosystem disturbance					y	y	y	y	y
	May mask illegal trade?	y?	?y	y?	y?			y?	y?	y?

	CONTROL MEASURES suggested:									
	License	y		y		y		y		
	Registration of specimens	y		y		y		y		
	Record no. eggs/ neonates produced	y		y		n/a		n/a	n/a	
	Record no. eggs/ neonates harvested	n/a		n/a		y	y	y		
	Record nos harvested						y		y	
	Record no. of rearing stock	y		y		y	y	y		
	Record no. specimens from other sources	y		y		y		y		
	Record dates of acquisitions	y		y		y	y	y		
	Record deaths and or disposals	y		y		y	y	y		
	Neonates kept separate	y		y		y	y	y		
	Rearing stock kept separate	y		y		y	y	y		
	Incubation/ other facilities	y		y		y	?	y		
	Foodsupply	y		y		y	y	y		
	Regular inspections and stock audits	y		y		y	y	y		
	Export quota = poduction	y		y		y		n		
	Export quota based on Art IV					y	y	y		
	Size and no. restrictions in place	y		y		y	y	y		
	Export permit									
	OLD Source Code	D	A	C/C	F	R	Rh	W/W	W	W
	CCS proposed code	…		C		R		Wc		Wx/Wd
	Brunning proposed code	CC		Cn/Cl		Wr		Wc		Wh/Wd